LAKE VERMONT MEADOWBROOK PROJECT EIS – ECONOMIC IMPACT ASSESSMENT

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EXECUTIVE SUMMARY

BACKGROUND

Bowen Basin Coal Pty Ltd (Bowen Basin Coal) proposes to commence the assessment and finalisation of environmental approvals for the Lake Vermont Meadowbrook Project (the Project). The Project is located approximately 25 kilometres northeast of Dysart and approximately 160 kilometres southwest of Mackay, within central Queensland.

The Project proposes an underground, two-seam, longwall coal mining development adjoining the north of the existing Lake Vermont open cut operations as well as supporting infrastructure.

The Project is planned to:

- Supplement the scheduled future decline in coal output from the existing Lake Vermont Mine to maintain existing (approved) production levels across an extended life of mine.
- Maximise the use of Bowen Basin Coal owned land and existing infrastructure at the Lake Vermont Mine, so as to minimise the environmental impacts from additional infrastructure and to provide Project efficiencies.
- Design, construct and operate a Project that minimises adverse impacts on the social environment and complies with all relevant statutory obligations.

The key activities associated with the proposed Project will include:

1 Underground longwall coal mining to recover the coal resource,

2 Open cut mining (of one satellite pit) to recover the coal resource,

3 Development of a new infrastructure corridor linking the Project to the existing infrastructure of the Lake Vermont Mine,

4 Development of a supporting mine infrastructure area (including run of mine stockpile, laydown area, ventilation shafts and supporting buildings), and

5 Construction of drifts and shafts (to provide access to underground operations).

The study area used in the assessment of regional impacts is defined as the aggregation of the following Local Government Areas (LGAs), Isaac, Mackay, Livingstone, Rockhampton. This study area is hereafter referred to as the “Catchment”. This study area was chosen as it encompasses the Project location as well as the key source markets for goods and labour.

EXISTING ECONOMIC ENVIRONMENT

Mining, particularly coal mining, is the key driver of the Catchment’s economy and has seen considerable growth in the last decade overall, despite some fluctuations year to year. The Catchment produced around 122.6 million tonnes of coal per annum on average between 2012-13 and 2019-20, representing 52.2% of Queensland’s (the State’s) total coal production. In 2020-21, mining accounted for 44.2% of total sector Gross Value Added (GVA) in the Catchment, as well as 15.9% of total jobs, to be the largest sector in the Catchment across both measures. Mining activity in the Catchment has seen significant growth in the 10 years to 2020-21, recording an average annual increase in GVA of 6.9% (AEC, unpublished). Over this period, mining saw a 14.6 percentage point increase in its proportion of the Catchment’s Gross Regional Product (GRP). This increase in mining activity also resulted in an increase in mining employment of 26.3% over the ten year period.

Other industries in the catchment have seen significantly lower growth compared to mining. Excluding mining, the economy on aggregate has remained relatively constant over the last decade recording 0.4% average annual growth over the last decade.

The Catchment has generally recorded lower unemployment rates than the State with a ten year average of 5.6% compared to 6.1% for the State. Unemployment in the Catchment peaked in 2015, coinciding with a downturn in

coal production. The Catchment has seen a declining unemployment rate since then with the exception of a spike in 2019 which coincided with the initial impacts of COVID-19.

Population in the Catchment has grown at a lower rate than the State over the last decade and is projected to continue to do so for the next 20 years to 2041. The Catchment population growth averaged 0.5% per annum over the last decade, compared to 1.6% average annual growth for the State. The low growth rate in the Catchment included a period of annual population declines from 2015 to 2018, with a low of -0.8% annual growth in 2016. This is correlated with a period of decline in mining employment from 2014-15 to 2016-17. Between 2021 and 2041 the Catchment is anticipated to record an average annual growth rate of 1.3% to reach a population of around 335,000.

Building approvals and property prices closely align with the population and mining growth trends. The number of residential building approvals in the Catchment declined from just under 3,400 approvals in 2012-13 to under 700 approvals each year between 2016-17 and 2018-19. Similarly, property prices in the Catchment underwent a period of decline between 2012-13 and 2017-18 to reach a ten year low of $280,000. These declines in property approvals and prices closely align with the Catchment's population growth trends which, following strong annual growth to 2013, entered a period of annual decline from 2014 to 2018 as mining experienced a downturn in 2014. Since then, as both mining employment and population growth have rebounded, building approvals and prices have been increasing.

REGIONAL IMPACT ASSESSMENT

Potential Beneficial Impacts

Key beneficial impacts arising from the Project are outlined in Table ES.1. Beneficial impacts are examined in consideration of what would otherwise occur if the Project does not proceed.

Table ES.1. Assessment of Beneficial Impacts of the Project

Impact	Description
Economic Growth	The Project will contribute to economic growth directly and indirectly through increased industry output and GRP during construction and operation compared to what would occur without the Project. Including both direct and flow-on impacts, the Project is estimated to support an additional: • $146.3 million in GRP in the Catchment during construction. • $33.6 million in GRP in the Catchment during capital replacement activities. • $315.7 million in GRP per annum on average through mining activity in the Catchment during peak Project operations (i.e., 2027-28 to 2047-48) compared to what would otherwise occur. • Decommissioning/ rehabilitation for the Project is not anticipated to differ significantly from that already anticipated for the broader Lake Vermont Mining Complex. In consideration of current GRP in the Catchment, this impact is estimated to be of moderate consequence, with a very high likelihood of occurring (i.e., expected to occur), providing an overall impact rating of high.
Employment and Incomes	The Project will support additional employment and household incomes during construction and maintain employment for an extended period of operations, compared to what would occur without the Project, flowing from both direct and indirect impacts. Including both direct and flow-on (supply chain) impacts, the Project is estimated to support an additional: • 1,044 Full Time Equivalent (FTE) job years[(a)] (in total) for residents of the Catchment during construction, over the six-year initial capital expenditure phase (noting the majority of construction activity will occur across a two-year period). • 289 FTE job years (in total) for residents of the Catchment through capital replacement activities between 2031-32 to 2044-45. • 414 FTE jobs[(b)] per annum for residents of the Catchment on average during peak mining activity between 2027-28 and 2047-48 (above what would otherwise occur without the Project, i.e., the Base Case not existing operations). • Decommissioning/ rehabilitation for the Project is not anticipated to differ significantly from that already anticipated for the broader Lake Vermont Mining Complex. In consideration of current employment in the Catchment and the longer-term support for jobs in the Catchment the Project will provide, this impact is estimated to be of moderate consequence with a very high likelihood of occurring (i.e., expected to occur), providing an overall impact rating of high.

Impact	Description
Support for Local Businesses	The Project will support demand for goods and services for a number of businesses within the Catchment, including local worker accommodation villages, businesses within the construction and mining supply chains, as well as providers of export infrastructure. In total, Catchment construction businesses and the supply chain are estimated to receive revenue of approximately $361.9 million through construction phase activity. Capital replacement activity is estimated to generate business revenues of $83.4 million, while mining supply chain businesses in the Catchment are estimated to receive an additional $8.4 million in business revenue per annum during peak operations that would not occur without the Project, providing additional security and longevity of business incomes. Decommissioning/ rehabilitation for the Project is not anticipated to differ significantly from that already anticipated for the broader Lake Vermont Mining Complex. Lake Vermont is an important supplier of coal, primarily to international markets (i.e., exports). Whilst the majority of benefits of this are received by international consumers and businesses, domestic transport and logistics businesses will also benefit through the transport of coal to ports/ customers. This benefit to local businesses is estimated to be of moderate consequence with a high likelihood of occurring (i.e., will probably occur), providing an overall impact rating of medium.
Government Revenue	The Project will provide a lift in local, State, and Australian government taxation revenues through a variety of taxes and duties. Overall, the Project is estimated to deliver: • $1,919.4 million in additional revenue to the Australian Government, through personal income tax, fringe benefits tax, company tax and Goods and Services Tax (GST), compared to what would occur without the Project. • $1,334.5 million in additional revenue to the Queensland Government compared to what would occur without the Project, primarily through royalty payments. These additional revenues can be used by government to provide additional infrastructure and services to support business and households throughout Australia. This impact is estimated to be of moderate consequence, with a very high likelihood of occurring (i.e., expected to occur), providing an overall impact rating of high.

Notes: (a) FTE job years refers to the total FTE jobs supported over the years examined. It can be interpreted as equivalent to the total FTE jobs that would be supported if the Project was developed in one year, or the number of years it would take one FTE worker to complete the Project. (b) One FTE is equivalent to one person working full time for a period of one year. This differs to the total number of individual workers.
Source: AEC.

Potential Adverse Impacts

Key adverse impacts arising from the Project are outlined in Table ES. 2. Adverse impacts are examined in consideration of what would otherwise occur if the Project does not proceed.

Table ES. 2. Assessment of Adverse Impacts of the Project

Impact	Description
Impacts on Local Businesses from Competition for Resources	The Project may (moderate likelihood) increase competition for labour and resources, leading to inflationary pressure and increased costs to businesses as well as potential difficulties for local businesses attracting and retaining staff. However, in the longer term as the Project in an extension of existing mining and supply chain activity with only a moderate lift compared to what would otherwise occur, the contribution of the Project to competition for resources is estimated to be relatively minor and unlikely to be noticeable against baseline/ existing levels (very low consequence), providing a low overall impact rating.
Impacts on Agricultural Production	The Project is located on/ under land that is currently primarily used for cattle grazing. As the Project is primarily an underground mine, only a small proportion of the Project site is anticipated to be removed from grazing purposes. The proponent intends to allow grazing to continue within the Project site in areas not impacted by surface infrastructure (and allowing for buffer areas). Given carrying capacities can be increased on grazing land where needed, the small reduction in grazing land available as a result of the Project is not anticipated to have any tangible impacts on grazing production in the region. Rehabilitation of the open cut satellite pit area will also ultimately return this area to a grazing use. As such, this impact is very low, given a very low likelihood and very low consequence rating.

Impact	Description
Impacts on Local Property Market	There is anticipated to be a short-term increase in demand for accommodation during construction whereby the majority of workers are anticipated to reside outside a one-hour drive of the Project site, however, the workers are primarily anticipated to be accommodated through existing accommodation village capacity within Dysart. Operational workers will be accommodated through the refurbished and expanded Lake Vermont Accommodation Village. The Social Impact Assessment (SMEC, 2022) suggests there is ample capacity for Dysart to provide housing for families moving to town (with approximately 42.5% of total dwellings unoccupied), however, the low quality of housing may present a barrier to permanent relocations. There is not expected to be a substantial effect on housing. It is, therefore, assessed that any potential increase in demand for housing has a low likelihood of placing upward pressures on residential property prices, and any impact is likely to be small (low consequence), with an overall impact rating of very low.
Impacts on Industry from Exchange Rates	The Project will result in the export of over 100 Mt of coal that would not otherwise occur without the Project. There is some potential for this export activity to result in an increase in exchange rates as a result of Project's impacts on balance of payments, which would make Australian exports less competitive, while imported goods and services would cost comparatively less). This primarily impacts industries that operates in global markets competing with international producers, such as agriculture and manufacturing. Industries such as agriculture, manufacturing and tourism are strong contributors to the Queensland and national economy, though the contribution of these industries can fluctuate due to a number of macro-economic factors (including exchange rates). However, considering the total export value of the Project relative to total national exports, the Project is anticipated to result in a relatively immaterial impact on state and domestic trade balances, and thereby have a negligible impact on factors such as exchange rates and the value of the Australian dollar. As such, an overall impact rating of very low has been allocated (in consideration of the low likelihood and very low consequence).
Impact on Economic Resources	The Bowen Basin contains the largest coal reserve in Australia, extending over approximately 60,000 square kilometres (BBGG, 2022). This Catchment represents a significant contribution to the State of Queensland's coal production, its most significant export commodity. Queensland produced approximately 218,500,500 tonnes of saleable coal in 2020-21 (Department of Resources, 2021). The Project will provide an extended supply source to the export market, which will thereby improve security of supply. The Project is anticipated to provide up to 6.2 Mtpa (by 2030-31) of product coal for the export market, which will only further benefit the overall supply with Queensland and support future demand. Queensland's untapped coal resources have been estimated at 63 billion tonnes of raw coal, as of 2019, and the Project will extract only 0.1% of these identified reserves, indicating there will still be a large quantity of remaining resources following extraction associated with the Project (QRC, 2019). As such, an overall impact rating of very low has been allocated (in consideration of the low likelihood and very low consequence).

Source: AEC.

CUMULATIVE IMPACT ASSESSMENT

The cumulative impact assessment examines the potential cumulative impact of a large number of major infrastructure and industry projects (including the Project) being developed concurrently in the Catchment. The impact assessment does not assess the aggregate impacts of all developments in combination, but rather the relative implications of developing the Project should other projects also be undertaken concurrently.

Only projects within a 50 km radius of the Project have been included in the cumulative impact assessment. This is because the impacts of the Project are anticipated to be felt most acutely locally, where the bulk of Project activity will occur, and on the basis the other regions within the Catchment have sufficiently large economies to withstand the cumulative impact the Project may place on these economies. Existing operational projects have not been included in the table below, however, these are inherently incorporated in the analysis as they form part of the existing economic conditions in the Catchment for which the assessment of impacts in Section 5 was undertaken. Projects included for consideration in the cumulative impact assessment are outlined in the table below include:

- Saraji East Project (proposed).
- Olive Downs

- Olive Downs North
- Winchester South Project (proposed)
- Eagle Downs
- Vulcan Complex
- Isaac Plains East and Isaac Plains East expansion

It should also be recognised that some of the mining projects, like the Project, will augment or replace existing mining operations that are nearing completion. Where this occurs, much like with the Project these projects will effectively result in a continuation of jobs and economic activity rather than a genuine lift in activity (outside of short-term construction impacts).

Table ES. 3. Assessment of Cumulative Impacts of the Project

Impact	Description
Impacts on Local Business from Competition for Resources	The development of the Project as well as other proposed projects for the Catchment will result in additional demand and competition for labour and other inputs to supply these projects. This may erode the viability of some businesses, in particular smaller businesses operating near the margin or lower income paying industries that may struggle to attract and retain labour. As the Project will, effectively, maintain production at existing levels for an extended period at the Lake Vermont Mining Complex, the contribution of the Project to this would be smaller relative to the adverse impacts generated by other proposed projects upon the baseline environment. The Project, in consideration of other major projects, is assessed of having a moderate likelihood of impacting on local business through competition for resources with a low consequence, providing an overall impact rating of low.
Impacts on Agricultural Production	Some of the other developments considered in the cumulative impact assessment are likely to impact on agricultural production through disruption or take-up of land. These mining-related projects may be developed on land that is currently primarily used for agricultural activities, some of which will have a larger footprint than the Project. The cumulative impacts on land availability for agricultural production of all proposed projects proceeding is considered possible to exacerbate the adverse impacts on agricultural production that may be delivered by the Project alone, through a combination of reduced capacity to replace this activity elsewhere in the Catchment and overall contraction of land available for agricultural purposes. However, the likelihood of the Project tangibly contributing to a reduction in grazing activity is still considered low in consideration of the cumulative consequence of these projects, in consideration of the very low disturbance to agricultural land afforded by the Project. Where this does occur, the impact is assessed as being very low, providing an overall impact rating of very low.
Impacts on Local Property Market	The cumulative development of the Project as well as the other projects will increase overall labour requirements in the Catchment which has the potential to increase demand for residential property both locally (i.e., Dysart, and surrounding areas) and in nearby major centres such as Mackay. While most workers will operate on a DIDO basis, in consideration of the large workforces for projects the additional demand for residential property that may be generated by the Project has a moderate likelihood of placing upward pressure on property prices in these centres. The Social Impact Assessment (SMEC, 2022) suggests demand for housing from the Project is expected to be low, and while this may increase if competition for local labour from other projects results in the Project sourcing more labour from outside the local area than anticipated, the impact generated by the Project is still expected to be relatively small (low consequence) even where other projects result in the local property market tightening, providing an overall impact rating of low.
Impacts on Industry from Exchange Rates	Some projects considered in the cumulative impact assessment will directly result in increased exports over and above what would be achieved by the Project alone. The combination of these projects is likely to place upward pressure on exchange rates in consideration of national trade balances, and thereby adversely affect trade-exposed industries, and it is possible the contribution of the Project's exports to exchange rate impacts may be exacerbated (moderate likelihood). The impact on exchange rates (and thereby trade-exposed industries) is assessed to be higher than the impact of the Project in isolation, though the marginal impact of the Project on exchange rates will still be small (low consequence), providing an overall impact rating of low.

Impact	Description
Impact on Economic Resources	The projects listed above will assist in increasing the Catchment's supply of coal product for Queensland's export market. The Project, in consideration of the other projects listed above, will provide an extended supply source to the export market, and thereby increase overall depletion of Queensland's remaining coal supply. However, Queensland's untapped coal resources have been estimated at 63 billion tonnes of raw coal, as of 2019, and coal production from identified major projects will extract a very small proportion of these reserves. This indicates that even in consideration of the other projects listed above, the Project's impacts on the availability of coal resources will be negligible (QRC, 2019). An overall impact of very low is assessed (based on a low likelihood and very low consequence).

MITIGATION STRATEGIES

Assessment of the economic impacts of the Project above identified the Project will extend Lake Vermont's activities to provide an important retention of economic activity within the Catchment and Queensland economy that would otherwise be lost without the Project. Economic impacts of the Project are anticipated to be overwhelmingly positive, with minimal adverse economic impacts.

While the remaining potential adverse economic impacts from the Project are low, there are some potential areas that should be monitored, and strategies employed to ensure benefits of the Project to the Catchment and Queensland are maximised and any potential adverse impacts minimised:

- To minimise adverse impacts on agricultural production in the Catchment, the proponent will avoid or minimise disturbance of productive land in any areas not immediately affected by mining activity and ensure land above the underground mine (where possible) is of adequate safety standards for continuing grazing activities.
- To maximise local benefits derived from the Project, and consistent with existing policies implemented at Lake Vermont, the proponent and contractors engaged by the proponent will be encouraged to source labour locally where possible and practical and provide training opportunities where practical. The proponent will also implement training programs to assist existing open cut mine workers transition to underground mining roles should they wish to do so, in order to maintain continuity of workforce.
- The proponent has long standing relationships with local business and an established supply chain for its existing activities in the Catchment. To maximise local benefits derived from the Project, the proponent (and contractors engaged by the proponent) will continue to support local business by utilising these established supply networks and providing sufficient opportunities and information for local business to secure new supply contracts.
- While the Project is anticipated to have minimal impacts in terms of additional demand for accommodation / housing in the local area, the proponent will monitor the local accommodation / housing market and demands placed on it by its workforce. The Proponent has also committed to provide financial support to the Isaac Affordable Housing Trust, to support low-cost housing development within Dysart.

It should be recognised that these strategies form part of the proponent's Project planning and modelling of impacts in this report has been based on these strategies being implemented.

COST BENEFIT ANALYSIS

The cost benefit analysis (CBA) examines the net (or incremental) impacts (benefits and costs) of the Project (the 'Project Case' scenario) compared to a 'Base Case' scenario of what would be expected to occur without the Project. For the purposes of this CBA:

- The Project Case scenario includes overall Lake Vermont Mining Complex activity with the Project (i.e., inclusive of the existing mine and approved satellite pit).
- The Base Case scenario assumes the Project is not developed and outlines activity of the Lake Vermont Mining Complex where the Project does not proceed.

In the CBA, only the incremental difference in activity (benefits and costs) between the Project Case and Base Case scenarios is modelled.

The CBA examined the impacts of the Project across a 40-year modelling timeframe, from financial year 2021-22 to financial year 2060-61, incorporating the construction period, the operational life of the Lake Vermont Mining Complex with the Project, as well as decommissioning/ rehabilitation (noting decommissioning/ rehabilitation expenditure has all been included in one year in 2060-61).

The following costs and benefits were examined, noting only the incremental difference between the Project case and base case was modelled:

- Costs:
    - Initial capital expenditure for the Project.
    - Replacement capital expenditure for the Project.
    - The incremental annual change in operating expenditure for the Lake Vermont Mining Complex.
    - Post-mining decommissioning and rehabilitation expenditure.
    - The biodiversity offset costs related to the Project.
    - The incremental annual change in GHG emissions resulting from the Project.
    - The incremental annual change in travel task and costs related to the Project.
- Benefits:
    - The incremental annual change in value of production/ revenue for the Lake Vermont Mining Complex.
    - Benefits to labour from additional wages and salaries paid as a result of the Project.

Table ES. 4 below outlines the present value (PV) of the incremental additional costs and benefits associated with the Project case relative to the base case, between the financial year ended June 2022 and financial year ended June 2061, at discount rates of 4%, 7% and 10%. The Project is estimated to return a Net Present Value (NPV) of $968.2 million over the assessment period (discount rate of 7%) with a Benefit Cost Ratio (BCR) of 1.28. The Project returns a desirable result across each of the discount rates examined, with the BCR ranging between 1.23 (10% discount rate) and 1.29 (4% discount rate). The CBA is insensitive to the discount rate used with minimal change in BCR across discount rates examined. The Project has an internal rate of return (IRR) of 18.2%.

Table ES. 4. Summary of CBA Results

Impact	PV ($M) – 4% Discount Rate	PV ($M) – 7% Discount Rate	PV ($M) – 10% Discount Rate
Costs			
Initial Capital Expenditure	$631.8	$561.5	$501.3
Replacement Capital Expenditure	$154.8	$99.7	$65.7
Operating Expenditure	$4,746.0	$2,677.4	$1,597.1
Decommissioning/ Rehabilitation Expenditure	$15.9	$5.2	$1.8
Biodiversity Offset	$44.0	$41.6	$39.3
GHG Emissions	$196.6	$121.3	$78.6
Cost of Increased Travel	$12.1	$8.7	$6.7
Total Costs	***$5,801.1***	***$3,515.3***	***$2,290.6***
Benefits			
Value of Production/ Revenue	$7,249.7	$4,343.5	$2,729.9
Benefits to Labour	$247.9	$140.0	$84.8
Total Benefits	***$7,497.6***	***$4,483.5***	***$2,814.8***
Summary			
Net Present Value (NPV)	**$1,696.5**	**$968.2**	**$524.2**
Benefit Cost Ratio (BCR)	**1.29**	**1.28**	**1.23**

Source: AEC.

Sensitivity analysis at a discount rate of 7% shows there is a 90% probability the Project will provide an NPV between $120.5 million and $1.81 billion. The NPV is most sensitive to the net operating result (i.e., difference between value of production/ revenue and operational expenditure in the table below); the larger the net operating result the larger the NPV.

ABBREVIATIONS, ACRONYMS AND UNITS

Abbreviation/ Acronym/ Unit	Term
Abbreviations/ Acronyms	
AEC	AEC Group Pty Ltd
ANZSIC	Australian and New Zealand Standard Industrial Classification
Bowen Basin Coal	Bowen Basin Coal Pty Ltd
CBA	Cost Benefit Analysis
CHPP	Coal Handling and Preparation Plant
DES	Department of Environment and Science
DIDO	Drive-In Drive-Out
EIS	Environmental Impact Statement
EP Act	Environmental Protection Act 1994
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
FIFO	Fly-In Fly-Out
FTE	Full Time Equivalent
GRP	Gross Regional Product
GSP	Gross State Product
GST	Goods and Services Tax
GVA	Gross Value Added
HCC	Hard Coking Coal
IO	Input-Output
LGA	Local Government Area
MLA	Mining Lease Application
ML	Mining Lease
MIA	Mine Infrastructure Area
PCI	Pulverised Coal Injection
PoW	Place of Work
Qld	Queensland
RoQLD	Rest of Queensland
RIA	Regional Impact Assessment
ROM	Run of Mine
SIA	Social Impact Assessment
The Project	Lake Vermont Meadowbrook Project
Units	
ha	hectare
km	kilometre
km^2	square kilometres
Mt	million tonnes
Mtpa	million tonnes per annum

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1. INTRODUCTION

1.1 BACKGROUND

Bowen Basin Coal Pty Ltd (Bowen Basin Coal) proposes to commence the assessment and finalisation of environmental approvals for the Lake Vermont Meadowbrook Project (the Project). The Project is located approximately 25 kilometres (km) northeast of Dysart and approximately 160 km southwest of Mackay, within Central Queensland.

The Project proposes an underground, multi-seam, longwall coal mining development adjoining the north of the existing Lake Vermont Mine.

The Project is planned to:

- Supplement the scheduled future decline in coal output from the existing Lake Vermont Mine to maintain existing (approved) production levels across an extended period.
- Maximise the use of Bowen Basin Coal owned land and existing infrastructure at the Lake Vermont Mine, so as to minimise the environmental impacts from additional infrastructure and to provide Project efficiencies.
- Design, construct and operate a Project that minimises adverse impacts on the social environment and complies with all relevant statutory obligations.

The key activities associated with the proposed Project will include:

- Underground longwall coal mining to recover the coal resource.
- Open cut mining (of one satellite pit) to recover the coal resource.
- Development of a new infrastructure corridor linking the new mining area to the existing infrastructure of the Lake Vermont Mine.
- Development of a supporting mine infrastructure area (including run of mine stockpile, laydown area, ventilation shafts and supporting buildings).
- Construction of drifts and shafts (to provide access to underground operations).

1.2 PURPOSE OF THIS REPORT

This report has been developed as a technical document for use in preparing the Economic Impact Statement. The report quantifies the expected beneficial and adverse economic impacts of the Project on the Catchment and State economies. The report also recommends mitigation strategies to ensure Catchment economic values are enhanced or, as a minimum, maintained if the Project proceeds.

2. ASSESSMENT APPROACH

2.1 ASSESSMENT REQUIREMENTS

The Environmental Impact Statement (EIS) is being prepared in accordance with the *Environmental Protection Act 1994 (EP Act)*. The Project was determined to be a controlled action (EPBC Referral 2019/8485) under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 22 November 2019. The controlling provisions are Sections 18 and 18A (listed threatened species and communities), Sections 20 and 20A (listed migratory species), and Sections 24D and 24E (a water resource, in relation to coal seam gas development and large coal mining development). This EIS will be assessed under the bilateral assessment agreement between the State of Queensland and the Commonwealth of Australia. The bilateral assessment agreement provides accreditation of the Queensland processes for assessment of proposed actions that would otherwise be assessed by the Commonwealth Government, for approval under the EPBC Act.

The Queensland Department of Environment and Science (DES) has produced a Terms of Reference (ToR) for this EIS under the EPBC Act which outlines the economic analysis required. This analysis is required to be undertaken in accordance with the *Coordinator-General's Economic Impact Assessment Guideline (2017).* The key requirements in each of these documents is presented in Table 2.1, along with the corresponding location in the report.

Table 2.1. Requirements Relevant to Economic Analysis

Item	Location in Report
ToR Requirements	
Identify the potential adverse and beneficial economic impacts of the proposed project on the local[1] and regional area and the State.	Section 5
Estimate the costs and benefits and economic impacts of the proposal using both regional impact analysis and cost-benefit analysis. The cost-benefit analysis must include reference to the basis for each element's estimation.	Section 5 Section 8
Separately address each major stage of the proposed project (e.g., construction, operation, and decommissioning).	Section 5
The construction and operation of the proposed project should ensure that it: • Avoids or mitigates adverse economic impacts arising from the proposed project • Capitalises on opportunities potentially available for local industries and communities • Creates a net economic benefit to the region and State.	Section 7 Section 5 Section 8
The proponent is to identify, describe, and assess the potential adverse and beneficial environmental, economic, and social impacts of the proposed project, and outline the management, monitoring, planning, and other measures proposed to avoid, minimise and/ or mitigate any adverse impacts of the proposed project.	Section 5 Section 7
Provide an analysis of the economic costs to agricultural activities on land, including any impacts to supply chains.	Section 5.3.3 Section 6.2.2
Economic impacts must be considered at the local[1], regional, and national levels.	Section 5
Employment opportunities expected to be generated by the action (including construction and operational phases).	Section 5
Describe and evaluate the comparative economic impacts of each alternative (such as the option of not proceeding).	Section 3.4 Section 5 Section 8
Undertake the analysis in accordance with the Coordinator-General's Economic impact assessment guideline.	See below.
Coordinator-General's Economic Impact Assessment Guideline (2017)	
The EIA must estimate the project's economic impacts and identify measures to manage any negative impacts and capture economic opportunities generated by the project.	Section 5 Section 7

[1] Modelling for the economic impact assessment has been carried out at the regional (Catchment) and national levels, given limitations surrounding reliability of the data at a more localised level. Where possible and relevant, impacts have also been discussed qualitatively at a local level.

Item	Location in Report
The EIA must include both a description of the economic environment with and without the project, make all assumptions transparent, and propose targeted impact management measures.	Section 4 Section 5 Section 7
The EIA must use a risk management framework to focus on the impacts with the highest probability and consequential impacts.	Section 5
Consider cumulative impacts of other developments in the Catchment, where feasible.	Section 6
The specific considerations of Catchment economic impacts must also provide an overview of: • The key stakeholders and communities of interest • The local, Catchment, State, and national economies of interest • Local business and industry content opportunities • Source locations of employees and contractors • Cost of living pressures such as impacts on housing supply and demand and household goods and services • Demand for other essential services and facilities • Expected timing and geographic distribution of impacts • Any relevant positive and negative externalities.	Section 5 Section 3.2 Section 5.6 Section 5.5
Where possible, impact modelling should also describe and quantify the following: • Capital and operational expenditure • Project revenues • Direct impacts on gross Catchment product and gross state product • Any relevant royalties, taxes, and duties • Any relevant site remediation costs • Source of goods and services, Queensland, interstate and overseas • Workforce and labour market impacts, including effects on wages and local labour supply and demand • Direct and indirect full time equivalent job numbers at each phase of construction and operation.	Section 3.2 Section 5.1 Section 5.4 Section 5.2
The RIA should identify: • The level of stimulus to the regional and state economy • The level and location of employment change through direct labour inputs, indirect labour inputs, and the projected effects on the local economy (including housing, labour costs, and services). Proponents should consider the timing and geographic distribution of impacts, and qualitative analysis may be used to describe indirect impacts where quantitative information is limited or unavailable.	Section 5

Source: Department of State Development (2017), Bowen Basin Coal (2019).

2.2 STANDARDS AND GUIDELINES

In addition to the ToR and Coordinator-General's Economic Impact Assessment Guideline (2017), the following Standards and Guidelines have been used in this study:

- Australian Government guidance note for conducting Cost Benefit Analysis (OBPR, 2020) and the *Handbook of Cost Benefit Analysis* (Commonwealth of Australia, 2006).
- The *Australian Transport Assessment and Planning Guidelines* (ATAP, 2016) for valuing traffic impacts.

2.3 METHOD OF ASSESSMENT

2.3.1 Existing Economic Environment

The existing economic environment section provides an overview of the existing economic profile of the Project study area (see Section 2.4 for a definition of the Catchment used for the Project study area) and provides a current baseline for assessment of the significance of potential impacts of the proposed development. Catchment economic data collected during this stage is used to develop economic models and informs the 'Base Case' (or baseline scenario) against which the Project's impacts are assessed.

A summary of the existing economic environment is presented in Section 4, with supporting data in Appendix A.

The existing economic environment includes an assessment and overview of the prevailing conditions of the economy based on available data sets at the time of writing. However, the timing of release of many data sets can lag by three to six months (and in the case of Census data this is only available every five years), which can mean recent developments and macro-economic conditions may not be fully reflected in the statistics and data presented.

2.3.2 Regional Impact Assessment (RIA)

The RIA uses economic impact modelling results as well as information from the existing environment and desktop research to analyse, assess and discuss the economic impacts of the Project.

The RIA includes input and information from:

- Economic modelling using Input-Output (IO) modelling techniques (a description of IO modelling is provided in Appendix B).
- Interpretation of modelling output in the context of the Catchment and state economies, and analysis of other non-quantified changes to the economic environment.
- Evaluation of the extent of impacts upon local infrastructure and services, local property market, balance of payments, and economic resources.
- A summary assessment of the magnitude of key identified impacts based on the above analysis and using a risk assessment framework as outlined in Appendix C.

The assessment identifies the economic impacts specific to the Project compared to what would be anticipated if the Project does not proceed. The RIA is presented in Section 5.

2.3.3 Cumulative Impact Assessment

The cumulative impact assessment in Section 6 qualitatively examines the potential impacts on the local/ Catchment economy where a large number of currently planned projects for the Catchment (including the project) proceed. Cumulative impacts have been assessed using the risk assessment framework described in Appendix C.

The assessment of cumulative impacts has been undertaken based on input and information from:

- Desktop review of other projects planned for the Catchment and the impacts identified in relevant documentation.
- Considered evaluation by the project team of the likely consequences of identified impacts.

The cumulative impact assessment is presented in Section 6. Projects considered in the cumulative impact assessment are outlined in ‘Major Projects’ in Appendix A.

2.3.4 Development of Mitigation and Enhancement Strategies

Impacts of the project are identified in Section 5, including a description of the impact, a quantification of the impact (where possible), and the significance of the impact. Following on from this, the mitigation strategies section identifies strategies to avoid, reduce or mitigate adverse economic impacts of the project where they were identified to be of greater than low impact significance, or enhance and facilitate the capture of the positive impacts identified in the economic impact assessment. Mitigation and enhancement strategies are presented in Section 7. Residual impacts post-mitigation are also examined in this section.

Where adverse economic impacts of the project are assessed as being of greater than low significance and mitigation strategies proposed, a residual impact assessment post mitigation is also applied using the qualitative impact assessment framework outlined in Appendix C.

2.3.5 Cost Benefit Analysis (CBA)

The Cost Benefit Analysis (CBA) has been conducted in line with Australian Government guidelines, examining the stream of relevant economic, social, and environmental costs and benefits anticipated from the project to assess the net present value of the project to the Queensland community. Additional details regarding the CBA

assessment method used is provided in Appendix D. The results of the CBA are presented in Section 8 of this report.

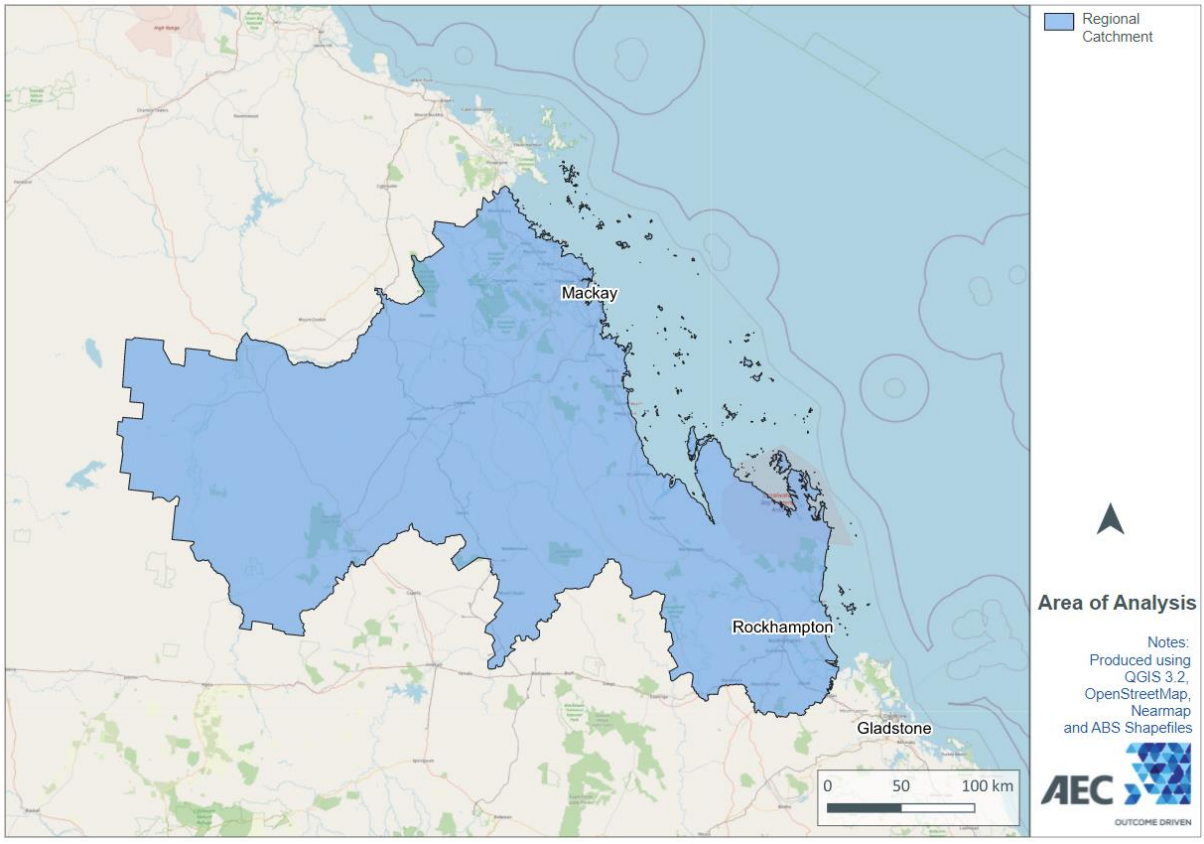
2.4 STUDY AREA

The study area used in the RIA is defined as the aggregation of the following Local Government Areas (LGAs):

- Isaac
- Mackay
- Livingstone
- Rockhampton.

The above study area is referred to as the “Catchment”. A map of the Catchment is presented in the figure below. This study area was chosen as it encompasses the Project location as well as the key source markets for goods/ labour.

Figure 2.1. Map of Catchment



Source: AEC.

3. PROJECT OVERVIEW AND ASSUMPTIONS

3.1 PROJECT DESCRIPTION

Bowen Basin Coal is proposing to extend the existing Lake Vermont Mine, through the development of an underground longwall mine and a satellite open cut pit (the Lake Vermont Meadowbrook Project, or the Project) towards the immediate northern area of the existing Lake Vermont Mine.

Details surrounding the existing operations and proposed extension (the Project) are discussed in the following sections.

3.1.1 Existing Operations

The existing Lake Vermont Mine is an open cut coal mine producing primarily Hard Coking Coal (HCC) and Pulverised Coal Injection (PCI) coal to be exported for steel production (AARC Environmental Solutions, 2021). The Lake Vermont Mine is located approximately 25 km northeast of Dysart and 160 km southwest of Mackay in the Bowen Basin of central Queensland (see Figure 3.1). The mine is located close to rail, road, and power infrastructure. The mine has good access to exporting facilities. By rail, the mine is approximately 320 km from the Abbot Point Coal Terminal, 430 km to the RG Tanna Coal Terminal and 235 km from the Dalrymple Bay Coal Terminal (Bowen Basin Coal, 2019). Dysart is an established Catchment township servicing both mining and pastoral industries.

Coal production at this site commenced in January 2009. Target coal seams at the Lake Vermont Mine include the Vermont Seam and Leichhardt Seam; both contained within the Rangal Coal Measures. Over the years, Bowen Basin Coal has been granted several extensions to both mining operations (to new resource areas) and construction of infrastructure (including additional supporting infrastructure). The mine operates 24 hours per day, seven days per week.

Coal is mined using traditional truck and excavator methods and the ROM coal is hauled by truck and deposited in the two ROM coal hoppers located adjacent to the Coal Handling and Preparation Plant (CHPP). The ROM coal is conveyed, blended, and washed in the CHPP before producing the final products – HCC, industrial (i.e., thermal) and PCI coal. At the same time, reject material is crushed, processed, and rehabilitated. The final product coal is railed along the Lake Vermont spur line towards the RG Tanna Coal Terminal in Gladstone, Abbot Point Coal Terminal in Bowen, or Dalrymple Bay Coal Terminal in Mackay (where opportunities permit) for export.

Key existing Lake Vermont Mine infrastructure includes:

- CHPP.
- Raw and product stockpile areas and associated infrastructure.
- Rejects disposal and containment areas.
- Clean water, mine water storage dams and pipelines.
- Onsite electrical substation and electricity transmission lines.
- Rail balloon loop and train load out facility.
- Administration buildings.
- Workshops, warehouse, and laydown areas.
- Explosives magazine.
- Lake Vermont Mine access road and internal roads.
- Other associated mining infrastructure (AARC Environmental Solutions, 2021).

3.1.2 Proposed Extension (the Project)

The Project represents an extension of mining activities at the existing Lake Vermont Mine (see detail in Section 3.1.1). Key components of the Project include:

- Underground longwall mining of the Leichhardt Lower Seam and Vermont Lower Seam; the depth and thickness of the coal seams in the Project area means the coal resource can be extracted using underground mining methods.
- One small-scale 'satellite' open cut pit to mine the Leichardt Lower Seam, Vermont Seam, and Vermont Lower Seam.
- Development of a new infrastructure corridor linking the new mining area to existing infrastructure at the Lake Vermont Mine.
- Development of a Mine Infrastructure Area (MIA), including a run of mine stockpile, a laydown area, ventilation shafts and supporting buildings.
- Construction of a drift and shafts to provide access to underground operations.
- Development of other supporting infrastructure and associated activities, including expansion of the Lake Vermont Accommodation Village in Dysart (AARC Environmental Solutions, 2021).

Without the Project, mining activity at the Lake Vermont Mine will gradually decline to 2029-30 (to just over 8.0 Mt), with further sharp decreases every 3 to 7 years to 2050-51 (to just under 1.0 Mt) before ceasing operations.

Activity associated with the Project will see production of the underground mine ramping up to 6.2 Mt by 2030-31, before averaging between 3.2 Mtpa and 5.7 Mtpa over the following years to 2044-45. As the underground mine reaches its final years, the proposed open cut satellite pit will commence to further supplement existing operations, albeit with production levels continuing to tail off until Project mining completion in 2054-55. Final mining at the existing open cut mine will occur for a period of approximately 6 years following completion of the proposed Project.

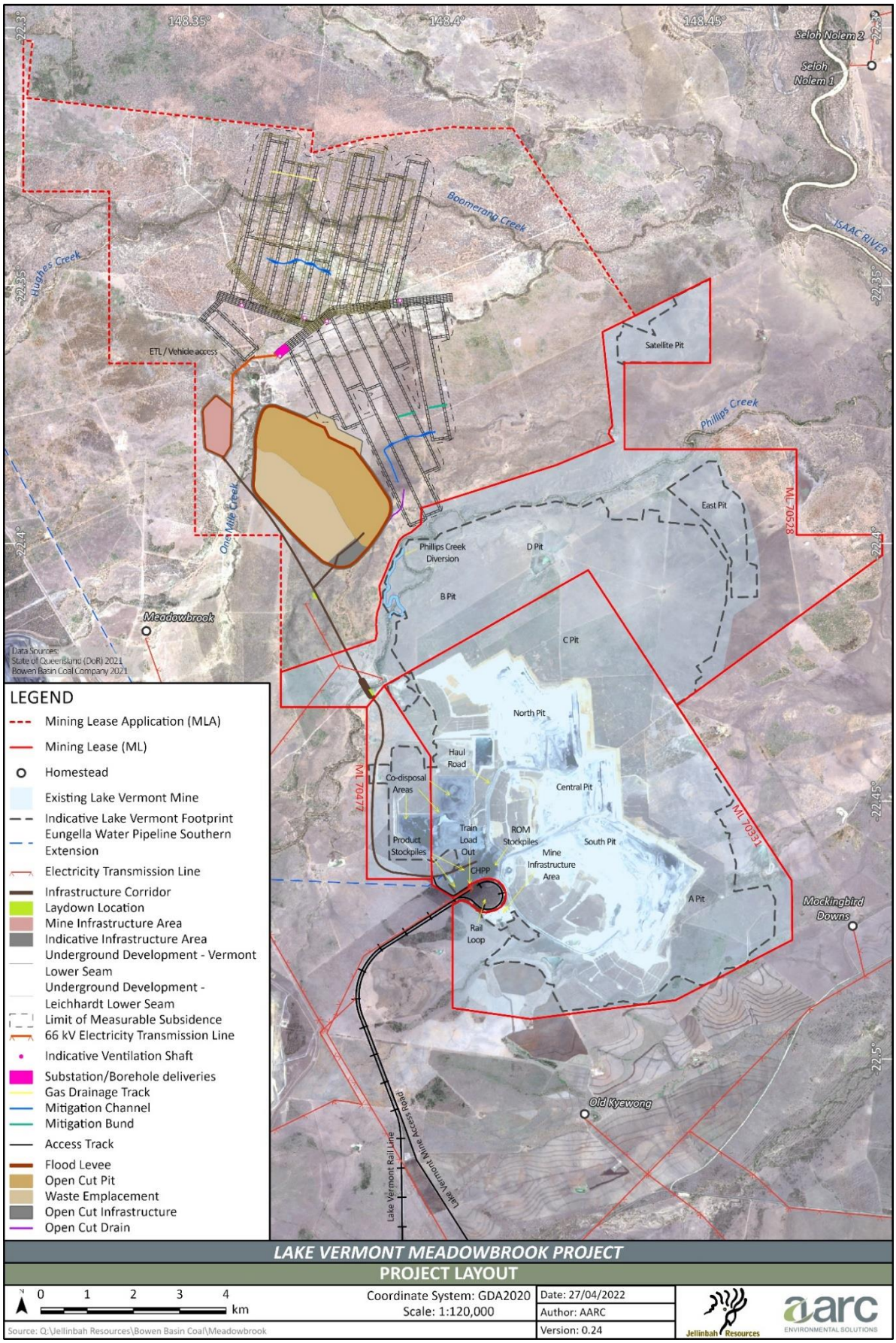
The Project, therefore, proposes to provide additional product coal to augment the reduced open cut output, maintaining production levels at the Lake Vermont Mining Complex at approximately 9.0 Mtpa to 2041-42 before experiencing sharp declines every 3 to 7 years and ceasing operations following 2060-61. The Project essentially extends operations at the Lake Vermont Mining Complex by 20 years compared to the existing Lake Vermont Mine.

Progressive rehabilitation will occur throughout the life of the Project. Backfilling of the open cut pit is scheduled to be completed in 2060-61 with achievement of a stable post mining land use (grazing) anticipated by 2078-79.

Figure 3.1. Lake Vermont Meadowbrook Project Location

Source: AARC Environmental Solutions (2021).

Figure 3.2. Lake Vermont Meadowbrook Project Layout



3.2 PROJECT SCENARIO

3.2.1 Scenarios Examined

For the purposes of this report, the following terminology has been used in referring to the scenarios examined for assessing economic impacts related to the Project:

- **Lake Vermont Meadowbrook Project (the Project):** This refers to the development of the underground longwall mine and satellite open cut pit for which approvals are being sought. This is referred to as the Project (see Section 3.1.2).
- **Lake Vermont Mining Complex:** The Lake Vermont Mining Complex refers to the broader Lake Vermont complex for which the Project will form part of. It includes the existing Lake Vermont Mine (and supporting infrastructure), the Project, as well as an already approved satellite pit. With regards to analysis of the Lake Vermont Mining Complex in this report, three scenarios are examined:
    - **Lake Vermont Mining Complex – Base Case:** This refers to the anticipated future activity of the Lake Vermont Mining Complex in a scenario where the Project does not proceed, reflecting future activity of the existing Lake Vermont Mine only.
    - **Lake Vermont Mining Complex – Project Case:** This refers to the anticipated future activity of the Lake Vermont Mining Complex in a scenario where the Project proceeds, reflecting the future activity associated with the existing Lake Vermont Mine and the Project.
    - **Lake Vermont Mining Complex – Incremental Additional Activity:** This refers to the annual net/ incremental additional future activity of the Lake Vermont Mining Complex realised if the Project proceeds (Project Case) compared to what would occur if the Project does not proceed (Base Case). This incremental change is what is used for assessing the annual economic impacts of the Project.

In terms of assessing economic impacts:

- The RIA (Section 5) includes analysis of both the Lake Vermont Meadowbrook Project scenario in isolation (see Section 3.2 for details of the Project), but also in consideration of the net/ incremental change in Lake Vermont Mining Complex's overall mining activity in the Catchment (i.e. Lake Vermont Mining Complex – Incremental Additional Activity scenario).
- The CBA (Section 8) focuses on the net impact of the Project in consideration of the incremental change in Lake Vermont Mining Complex's overall mining activity in the Catchment (Lake Vermont Mining Complex – Incremental Additional Activity scenario).

Furthermore, modelling conducted for the RIA assessed the initial construction and replacement capital (inclusive of all replacement capital related to the underground mine/ satellite pit and any capital works associated with the existing mine) construction components separately. Whilst initial construction activity is anticipated to commence in the 2022-23 financial year (subject to approvals) and be completed by the end of 2027-28, the majority of on-site construction works is anticipated to occur in the 2024 and 2025 calendar years. Replacement capital activity is anticipated to occur sporadically from 2031-32 through to 2045-46.

The Project is anticipated to commence mining operations in financial year 2025-26, with a transition from the majority of activity occurring at the existing open cut mine, towards the majority of activity occurring at the underground mine. Underground operations are anticipated to occur through to financial year 2047-48. Mining of the open cut satellite pit will commence in 2044-45 near the end of underground mining operations and will further supplement mining activity at the Lake Vermont Mining Complex to 2054-55. Decommissioning and rehabilitation is anticipated will occur in parallel with final mining activities of the Lake Vermont Mine, with a stable rehabilitated landform expected to be achieved by 2078-79.

Activity in the Lake Vermont Mining Complex – Project Case is estimated to peak at around 9.3 Mtpa of product coal due to the Project by 2030-31, with a total of approximately 258.7 Mt of product coal anticipated to be produced over the remaining life between 2021-22 and 2060-61 (Jellinbah Group, unpublished). Of this, the Project itself is estimated to peak at around 6.2 Mt of product coal in 2030-31, with a total of approximately 104.2 Mt of product coal anticipated to be produced from the Project.

Products are expected to be exported overseas, via the RG Tanna Coal Terminal in Gladstone, Abbot Point Coal Terminal in Bowen, or Dalrymple Bay Coal Terminal in Mackay (where opportunities permit).

Modelling of economic impacts has been undertaken in financial years.

Note: All dollar values presented in this section are in Australian dollar terms unless otherwise specified.

3.2.2 Construction

3.2.2.1 Construction Costs and Timing

Construction costs and timing has been presented for the Project as well as the Lake Vermont Mining Complex under the Base Case (i.e., if the Project does not proceed), Project Case (i.e., if the Project does proceed), and incremental additional activity associated (i.e., Project Case less Base Case).

Project

The Project is anticipated to require the following infrastructure to facilitate the newly proposed mining operations:

- New surface MIA, including a pit top ROM stockpile pad, mine clean water and waste water dams, workshop facilities, diesel refuelling tank(s), mine warehouse and stores yard, equipment washdown and laydown areas, administrative and operational office facilities, bath house facilities, and potable water and waste water/ sewerage treatment plants.
- Access drifts and shafts.
- Access and infrastructure corridor connecting the Project to the existing mine, including provisioning for road access, extension of high voltage power line and water delivery line, coal haulage road.
- A network of gas drainage bores and associated surface infrastructure.
- Expansion of the existing Lake Vermont Accommodation Village in Dysart.

For modelling purposes, the capital costs of the Project by component have been allocated to industries represented in the IO model (based on the Australian and New Zealand Industrial Classification (ANZSIC) categories). A breakdown of construction cost components by time period and industry used for modelling is presented in the table below. As indicated in the information from the proponent, initial construction works has been assumed to occur between 2022-23 and 2028-29, with the majority of onsite construction works occurring in the 2024 and 2025 calendar years. All replacement and sustaining capital have been excluded (as this is assessed in Section 3.2.3), as well as any capital works associated with the existing mine (i.e., the Lake Vermont Mine). The construction activity in the following table is associated with the Project only.

Table 3.1. Construction Costs and Timing ($M), Project

Construction Component	IO Industry	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	Total
UG Equipment								
New	Specialised and other Machinery and Equipment Manufacturing	$0.0	$0.0	$0.0	$191.4	$0.0	$232.8	$424.2
Surface								
Seam Access (Drifts and Shafts)	Specialised and other Machinery and Equipment Manufacturing	$0.0	$9.2	$37.1	$12.2	$0.0	$0.0	$58.5
	Heavy and Civil Engineering Construction	$0.0	$21.6	$86.5	$28.5	$0.0	$0.0	$136.6

Construction Component	IO Industry	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	Total
MIA	Specialised and other Machinery and Equipment Manufacturing	$0.0	$0.6	$4.5	$8.2	$0.0	$0.0	$13.2
	Heavy and Civil Engineering Construction	$0.0	$0.6	$4.5	$8.2	$0.0	$0.0	$13.2
	Non-Residential Building Construction	$0.0	$1.5	$11.2	$20.4	$0.0	$0.0	$33.0
	Construction Services	$0.0	$0.3	$2.2	$4.1	$0.0	$0.0	$6.6
Power & Water Supply	Electrical Equipment Manufacturing	$1.4	$6.4	$15.1	$0.0	$0.0	$0.0	$22.9
	Heavy and Civil Engineering Construction	$0.4	$1.8	$4.3	$0.0	$0.0	$0.0	$6.5
	Construction Services	$0.2	$0.9	$2.2	$0.0	$0.0	$0.0	$3.3
Access & Coal Haulage Road	Construction Services	$0.0	$0.0	$1.7	$4.1	$0.0	$0.0	$5.8
	Heavy and Civil Engineering Construction	$0.0	$0.0	$2.6	$6.1	$0.0	$0.0	$8.7
CHPP Tie In	Specialised and other Machinery and Equipment Manufacturing	$0.0	$0.0	$0.7	$1.7	$0.0	$0.0	$2.5
	Professional, Scientific, Computer and Electronic Equipment Manufacturing	$0.0	$0.0	$0.2	$0.4	$0.0	$0.0	$0.6
	Heavy and Civil Engineering Construction	$0.0	$0.0	$0.7	$1.7	$0.0	$0.0	$2.5
Village Accommodation	Residential Building Construction	$12.6	$0.0	$0.0	$0.0	$0.0	$0.0	$12.6
	Construction Services	$1.4	$0.0	$0.0	$0.0	$0.0	$0.0	$1.4
Total	-	**$16.0**	**$42.9**	**$173.5**	**$286.9**	**$0.0**	**$232.8**	**$752.1**

Notes: Totals may not sum due to rounding.
Source: Jellinbah Group (unpublished), AEC.

Assumptions surrounding the source of goods, and services relating to the Project have been assumed as per the assumptions outlined in 3.2.2.2.

Lake Vermont Mining Complex – Base Case

The only construction activity planned for the Lake Vermont Mining Complex if the Project does not proceed (i.e., Base Case) is the extension of the Lake Vermont Accommodation Village, but only to half of the extent of that occurring if the Project proceeds (i.e., $7.0 million). This expenditure has been assumed to occur within the Residential Building Construction Input-Output (IO) industry for modelling purposes. Assumptions regarding sourcing of goods, and services under the Base Case has been assumed as per the assumptions outlined in Section 3.2.2.2.

Lake Vermont Mining Complex – Project Case

Construction activity associated with the broader Lake Vermont Mining Complex – Project Case is as per the Project above.

Lake Vermont Mining Complex - Incremental Additional Activity

Net additional construction activity in the Lake Vermont Mining Complex – Incremental Additional Activity scenario is estimated at approximately $7.45 billion. This is equal to the total expenditure occurring if the Project proceeds (i.e., $752.1 million) minus the $7.0 million anticipated to be spent on the Lake Vermont Accommodation Village in the Lake Vermont Mining Complex – Base Case.

3.2.2.2 Source of Goods and Services

The economic analysis assumed the majority of goods and services will be sourced from inside the Catchment, due to the specialised nature and existing capacity within the Catchment. For the purposes of the economic impact assessment, assumptions regarding where goods and services will be sourced from were developed in consideration of the construction components. A summary of the assumptions used is presented in the table below.

Table 3.2. Assumed Source of Goods and Services During Construction

Construction Component	Catchment	Rest of State	Rest of Australia	Overseas
UG Equipment				
New	25%	10%	5%	60%
Surface				
Seam Access (Drifts and Shafts)	60%	30%	10%	0%
MIA	60%	30%	10%	0%
Power & Water Supply	25%	50%	25%	0%
Access & Coal Haulage Road	100%	-	-	-
CHPP Tie In	25%	55%	20%	0%
Village Accommodation	50%	50%	-	-

Source: Jellinbah Group (unpublished).

For businesses/ services sourced from outside the Catchment, approximately 25% of purchases on goods and services (supply chain related activity) would be spent within the local economy (i.e., 25% of the Type I flow on activity associated with non-local construction companies is assumed to represent additional local activity in the Catchment).

3.2.2.3 Construction Labour

Construction labour has been presented for the Project as well as the Lake Vermont Mining Complex under the Base Case (i.e., if the Project does not proceed), Project Case (i.e., if the Project does proceed), and incremental additional activity associated (i.e., Project Case less Base Case).

Project

Information regarding on-site construction labour associated with development of the Project were developed by AEC based on expenditure information provided by Jellinbah Group (unpublished) on behalf of the proponent, estimates by Bowen Basin Coal of a peak construction workforce of up to 250 workers, and an assumption that approximately 30% of total expenditure in infrastructure development reflects expenditure on construction labour (with the exception of expenditure for developing the seam access, which is assumed to be 20% of expenditure).

Based on this information and assumptions, it is estimated the on-site construction workforce is anticipated to peak at approximately 240 full time equivalent (FTE)[2] employees in 2024-25. No on-site construction workers are anticipated following 2025-26 as the capital expenditure in these years is associated with purchases of new underground mine equipment. A total of 525 FTE job years[3] is estimated to be required during construction of the Project.

[2] Where one FTE is equivalent to one person working full time for a period of one year. This differs to the total number of individual workers.

[3] FTE job years refers to the total FTE jobs supported over the years examined. It can be interpreted as equivalent to the total FTE jobs that would be supported if the Project was developed in one year, or the number of years it would take one FTE worker to complete the Project.

Table 3.3. On-Site Construction Labour, FTE Jobs, Project

Year	FTEs
2022-23	40
2023-24	65
2024-25	240
2025-26	180
2026-27	0
2027-28	0
Total	**525**

Source: Jellinbah Group (unpublished).

Lake Vermont Mining Complex – Base Case

As the only construction activity planned under the Base Case is a smaller scale extension of the Lake Vermont Accommodation Village, half of the labour associated with this component has been included in the Base Case. Assumptions regarding sourcing of labour under the Base Case has been assumed as per the assumptions outlined in Section 3.2.2.4.

Lake Vermont Mining Complex – Project Case

Construction labour associated with the broader Lake Vermont Mining Complex – Project Case is as per the Project above.

Lake Vermont Mining Complex - Incremental Additional Activity

Net additional construction labour in the Lake Vermont Mining Complex – Incremental Additional Activity scenario is estimated at approximately 508 FTE job years. This is equal to the total labour occurring if the Project proceeds (i.e., 525 FTE job years) minus the 17.5 FTE job years anticipated for the Lake Vermont Accommodation Village in the Lake Vermont Mining Complex – Base Case.

3.2.2.4 Source of On-Site Labour

Construction will use labour from the Catchment where feasible, with the rest of the construction workforce supplemented by workers outside the Catchment. The economic analysis assumed the majority of labour will be sourced from the Catchment, with the exception of manufacturing and some professional services which will require more specialised skillsets not available within the Catchment.

Assumptions regarding the source of labour from within the Catchment during constructions was based on the anticipated skills required within the Catchment's labour market. An overview of the existing labour market is presented in Section 4 and Appendix A.

For the purposes of the economic impact assessment, assumptions regarding where labour will be sourced from were developed in consideration of the construction components. A summary of the assumptions used is presented in the table below.

Table 3.4. Assumed Source of On-Site Labour During Construction

Construction Component	Catchment	Rest of State	Rest of Australia	Overseas
Seam Access (Drifts and Shafts)	20%	50%	30%	0%
MIA	75%	25%	0%	0%
Power & Water Supply	75%	25%	0%	0%
Access & Coal Haulage Road	100%	0%	0%	0%
CHPP Tie In	75%	25%	0%	0%
Village Accommodation	100%	0%	0%	0%

Source: Jellinbah Group (unpublished).

3.2.3 Replacement Capital

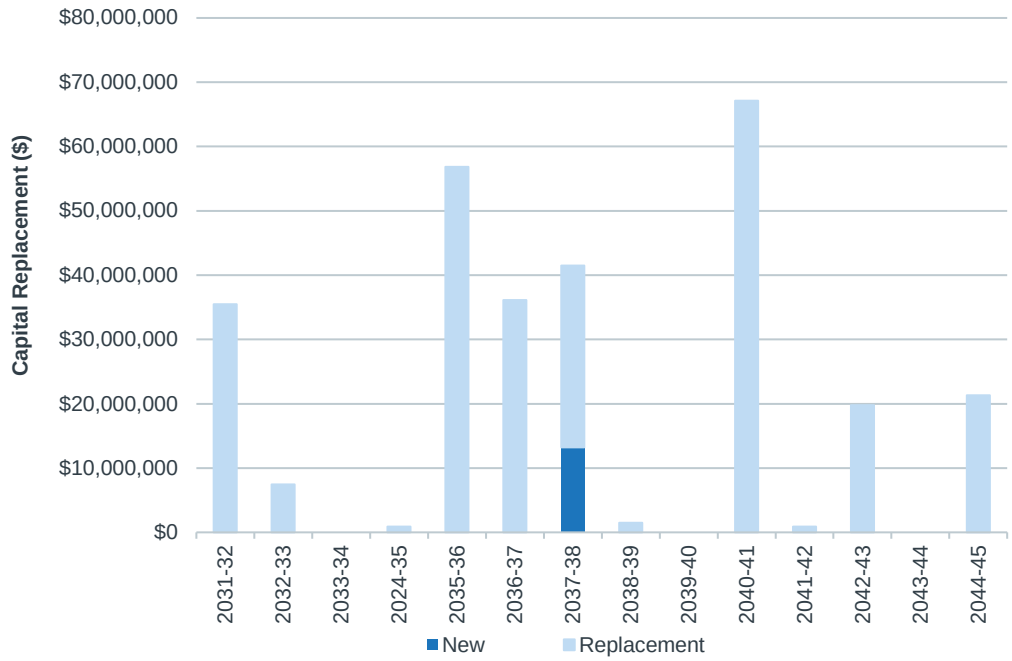
3.2.3.1 Replacement Capital Costs and Timing

Replacement capital costs and timing has been presented for the Project as well as the Lake Vermont Mining Complex under the Base Case (i.e., if the Project does not proceed), Project Case (i.e., if the Project does proceed), and incremental additional activity associated (i.e., Project Case less Base Case).

Project

The Project is anticipated to require replacement capital works associated with the infrastructure and equipment purchased/ developed for the underground mine (discussed in Section 3.2.2). The anticipated replacement capital expenditure over the course of the mine life is presented in the figure below (totalling $288.9 million), broken down by new infrastructure investment and replacement capital.

Figure 3.3. Replacement Capital Expenditure ($), Project



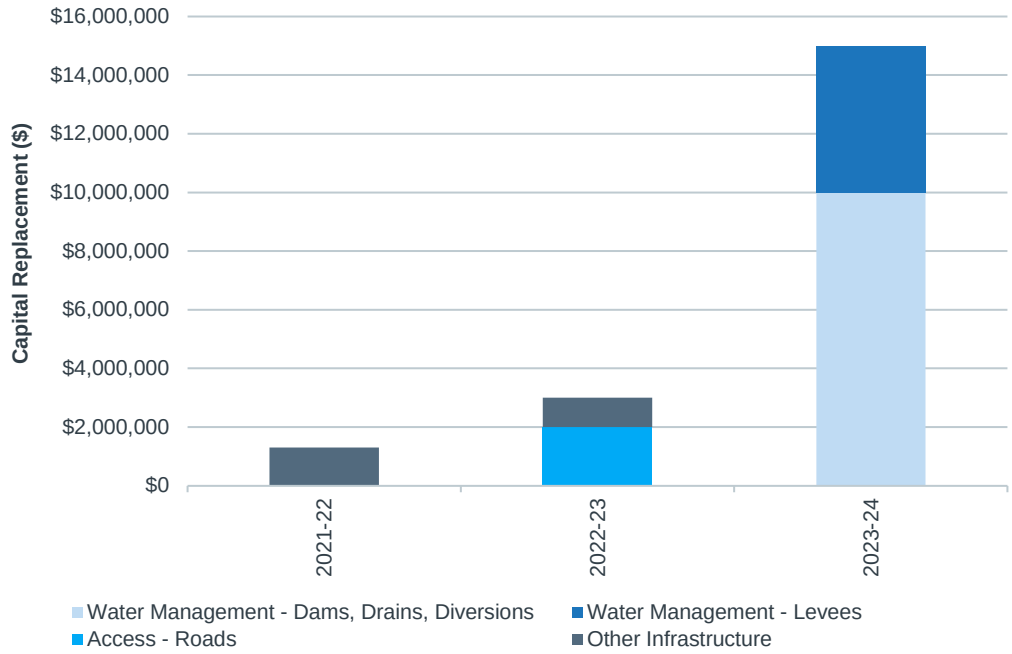
Source: Jellinbah Group (unpublished).

The above expenditure has been allocated to the specialised and other machinery and equipment manufacturing Input-Output sector for modelling purposes. This expenditure excludes all sustaining or similar capital, which has been included within the operating costs on the basis that this most closely matches how the Input-Output transaction tables account for sustaining capital (see Section 3.2.4).

Lake Vermont Mining Complex – Base Case

The Project is part of the broader Lake Vermont Mining Complex, and as such, some activities at the open cut mine (i.e., the Lake Vermont Mine) will still occur regardless of whether the Project proceeds. This includes some capital replacement activities in 2021-22 to 2023-24, valued at approximately $19.3 million.

Figure 3.4. Replacement Capital Expenditure ($), Lake Vermont Mining Complex – Base Case



Source: Jellinbah Group (unpublished).

Lake Vermont Mining Complex – Project Case

Replacement capital activity associated with the Lake Vermont Mining Complex – Project Case is equal to that associated with both the Lake Vermont Mine and the Project. Replacement capital activity at the Lake Vermont Mining Complex – Project Case is equal to $308.2 million. Assumptions regarding sourcing of goods, and services under the Project Case has been assumed as per the assumptions outlined in Section 3.2.3.2.

Lake Vermont Mining Complex – Incremental Additional Activity

As the capital replacement activity associated with the Lake Vermont Mining Complex – Base Case will occur regardless of the Project it has been excluded from the assessment on the basis that it will provide no net change to economic activity in the economy (as it would occur no matter whether the Project proceeds). Activity associated with the Lake Vermont Mining Complex – Incremental Additional Activity scenario is, therefore, estimated at $288.9 million from 2031-32 to 2044-45, as per the Project.

3.2.3.2 Source of Goods and Services

The below table highlights the source of goods and services by industry for each capital replacement component for the Project.

Table 3.5. Source of Goods and Services, By Component

Component	Catchment	Rest of State	Rest of Australia	Overseas
New	25%	10%	5%	60%
Replacement	25%	10%	5%	60%

Source: Jellinbah Group (unpublished).

3.2.3.3 Replacement Capital Labour

As per the disaggregation into Input-Output sectors, replacement capital activity is inclusive of only purchases of equipment, which is then used by operations labour. As such, no on-site construction labour is anticipated to result in the Catchment. Labour associated with manufacturing the required equipment (i.e., production induced labour) is estimated in Input-Output modelling.

3.2.4 Operations

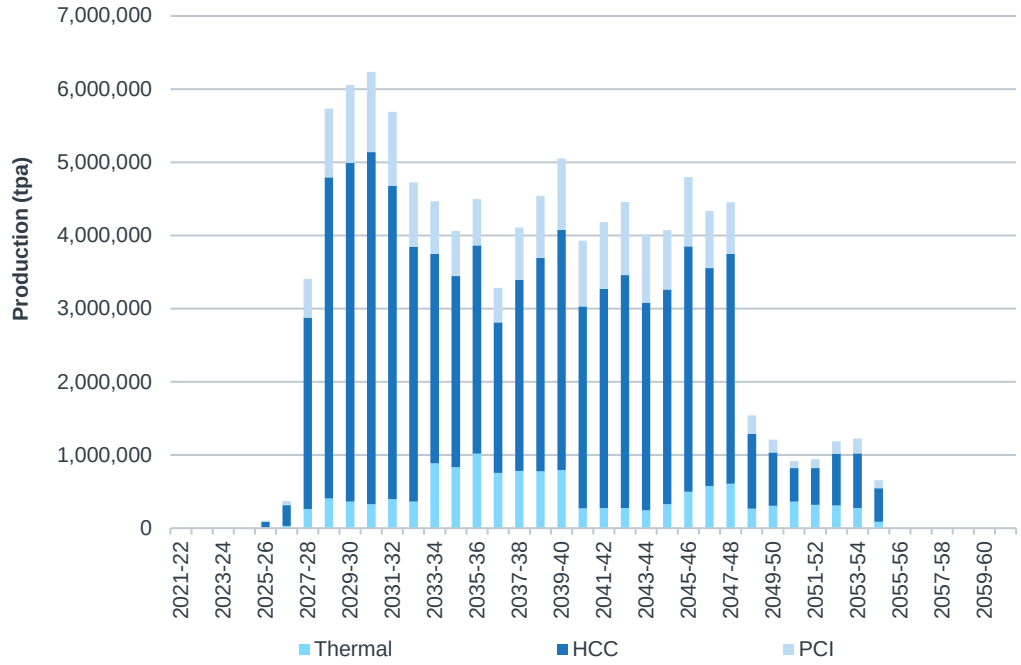
3.2.4.1 Production and Timing

Operations production and timing has been presented for the Project as well as the Lake Vermont Mining Complex under the Base Case (i.e., if the Project does not proceed), Project Case (i.e., if the Project does proceed), and incremental additional activity associated (i.e., Project Case less Base Case).

Project

The Project intends to extend the life of operating activity at the Lake Vermont Mine and allow for production to be maintained at the currently approved levels by replacing the scheduled decline in output from the existing open cut operation. The figure below outlines the annual production of processed material (saleable product) due to the Project. The Project is anticipated to contribute to the majority of activity at the Lake Vermont Complex between 2025-26 and 2054-55 (the end of operations of the Project). Production of processed material related to the underground mine will commence in 2025-26 and rise to a peak of 6.2 Mtpa by 2030-31. By the end of the operating period, the Project will have produced a total of 104.2 Mtpa of coal product. The majority of this is HCC product (69.6%), followed by PCI (17.9%) and Industrial coal (12.5%).

Figure 3.5. Annual Production of Processed Material (tpa), Project

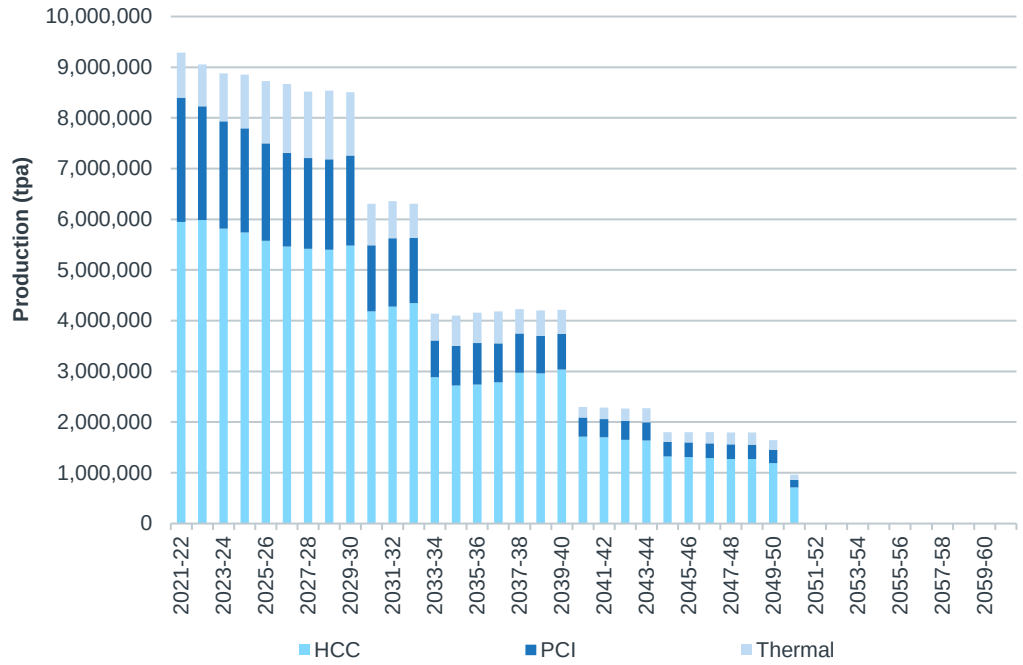


Source: Jellinbah Group (unpublished).

Lake Vermont Mining Complex – Base Case

Without the Project, the Lake Vermont Mine is anticipated to incrementally decline in production every 3 to 7 years, before ceasing operations by 2051-52. Figure 3.6 demonstrates the scheduled decline in output from the Lake Vermont Mine with no further investment/ development over the years through to 2050-51.

Figure 3.6. Annual Production of Processed Material (tpa), Lake Vermont Mining Complex – Base Case

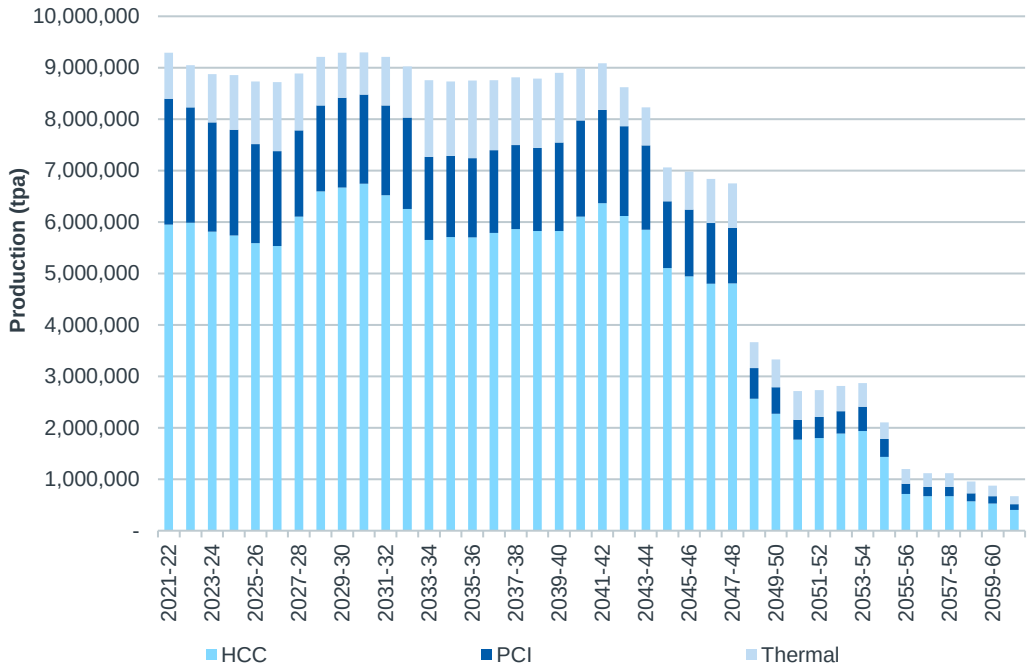


Source: Jellinbah Group (unpublished).

Lake Vermont Mining Complex – Project Case

The Project will essentially extend operations under the Lake Vermont Mining Complex – Project Case scenario to 2060-61. The following figure (Figure 3.7) depicts the total product coal produced from the Lake Vermont Mining Complex – Project Case scenario to 2060-61 if the Project proceeds, including coal produced from the existing Lake Vermont Mine as well as the Project.

Figure 3.7. Annual Production of Processed Material (tpa), Lake Vermont Mining Complex – Project Case



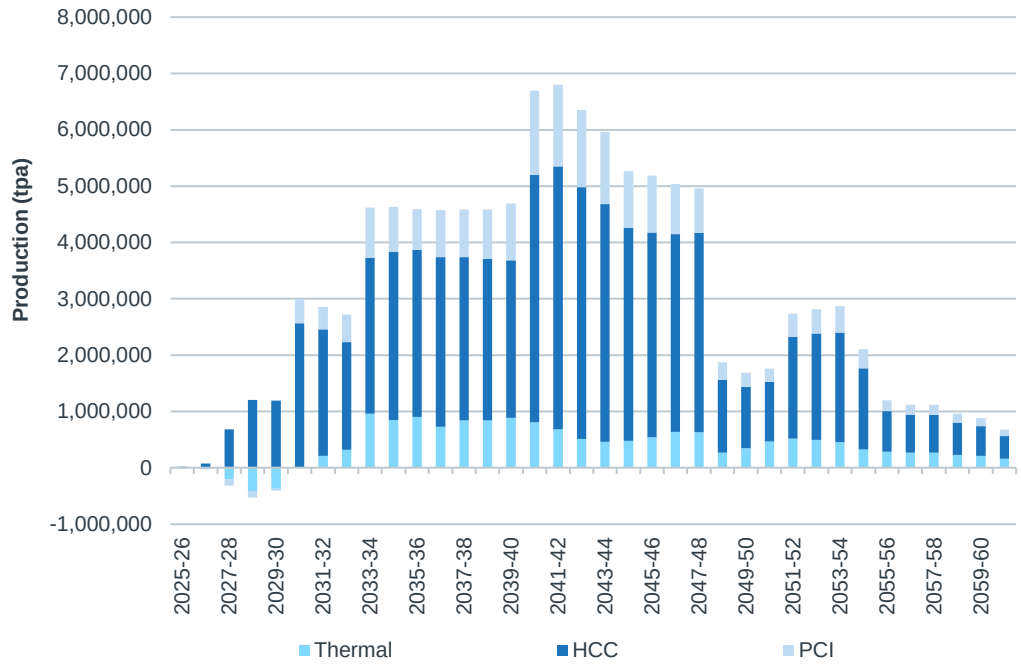
Source: Jellinbah Group (unpublished).

Lake Vermont Mining Complex – Incremental Additional Activity

Modelling examines the net change in economic impacts for the Lake Vermont Mining Complex due to the Project compared to a Base Case without the Project. The figure below outlines the net change in annual production of processed material (saleable product) for the Lake Vermont Mining Complex in the Project Case compared to if the Project did not proceed (i.e., the Base Case). Mining related to the Project is anticipated to replace the scheduled decline in output from the existing open cut operation, so as to maintain production around the currently approved levels.

Production of processed material related to the Project commences in 2025-26, resulting in a peak in net additional production (compared to the Base Case) of 6.8 Mtpa by 2041-42. By the end of the operating period, the Lake Vermont Mining Complex will have produced over 100 Mt of coal product compared to the Base Case, due to the Project. Over the 2027-28 to 2029-30 period, the incremental change in PCI and Industrial product production is negative compared to the Base Case, as only the main product, HCC, is initially produced from the Project.

Figure 3.8. Net Change in Annual Production of Processed Material (tpa), Lake Vermont Mining Complex – Incremental Additional Activity



Source: Jellinbah Group (unpublished).

3.2.4.2 Prices

Estimates of annual prices received for HCC, PCI and Industrial product coal were provided by the proponent based on anticipated grade and price movements for these commodities. While prices are expected to fluctuate year to year, over the life of the Project prices are assumed to average approximately:

- $131 per tonne of HCC.
- $96 per tonne of PCI.
- $52 per tonne of Industrial (Jellinbah Group, unpublished).

3.2.4.3 Operating Expenditure

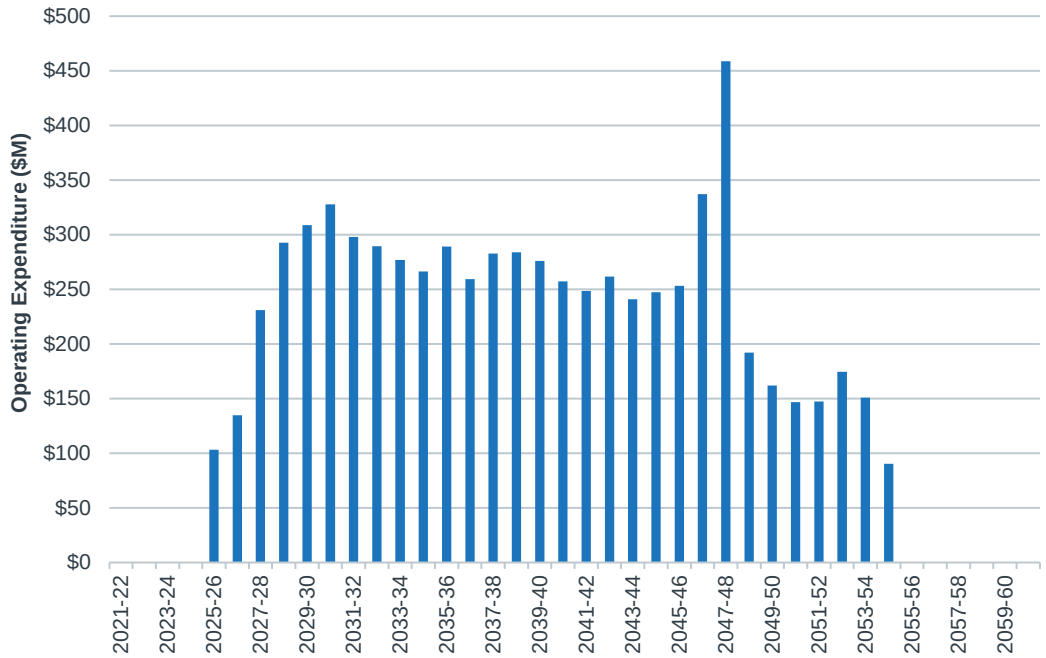
Operating expenditure has been presented for the Project as well as the Lake Vermont Mining Complex under the Base Case (i.e., if the Project does not proceed), Project Case (i.e., if the Project does proceed), and incremental additional activity associated (i.e., Project Case less Base Case).

For the purposes of the economic impact assessment, assumptions regarding where goods and services will be sourced from were derived from standard industry structures for the mining industries aligning with activity of the Project and in consideration of the local capacity in the supply chain to meet demands.

Project

Estimates of operating costs and timing over the life of the mine were provided by the proponent. Total operating expenditure over the life of the Project is anticipated to total approximately $7.3 billion, with the underground mine anticipated to contribute to the majority of activity of the broader Lake Vermont Mining Complex between 2025-26 and 2047-48. Activity associated with the satellite pit will ramp up from 2046-47 before declining year on year from 2048-49 through to the end of the Project's life.

Figure 3.9. Operating Expenditure, Project

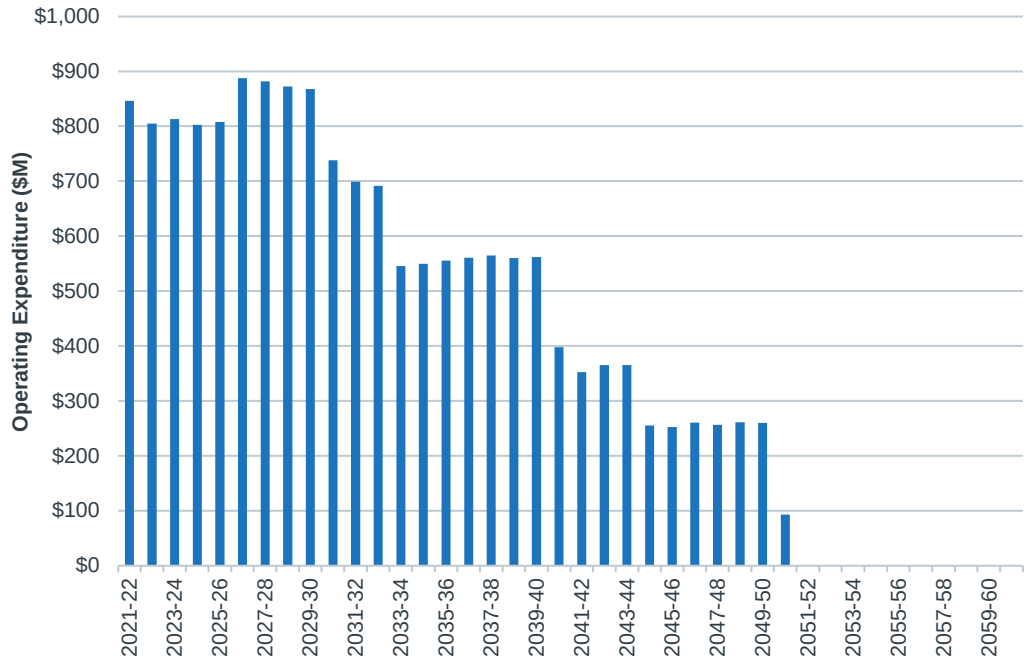


Source: Jellinbah Group (unpublished).

Lake Vermont Mining Complex – Base Case

In line with production estimates, the figure below demonstrates the scheduled decline in operating expenditure associated with the existing Lake Vermont Mine over the years through to 2050-51, in a scenario where the Project does not proceed. Total operating expenditure over the remaining life of the existing mine is anticipated to total approximately $16.7 billion.

Figure 3.10. Annual Operating Expenditure, Lake Vermont Mining Complex – Base Case

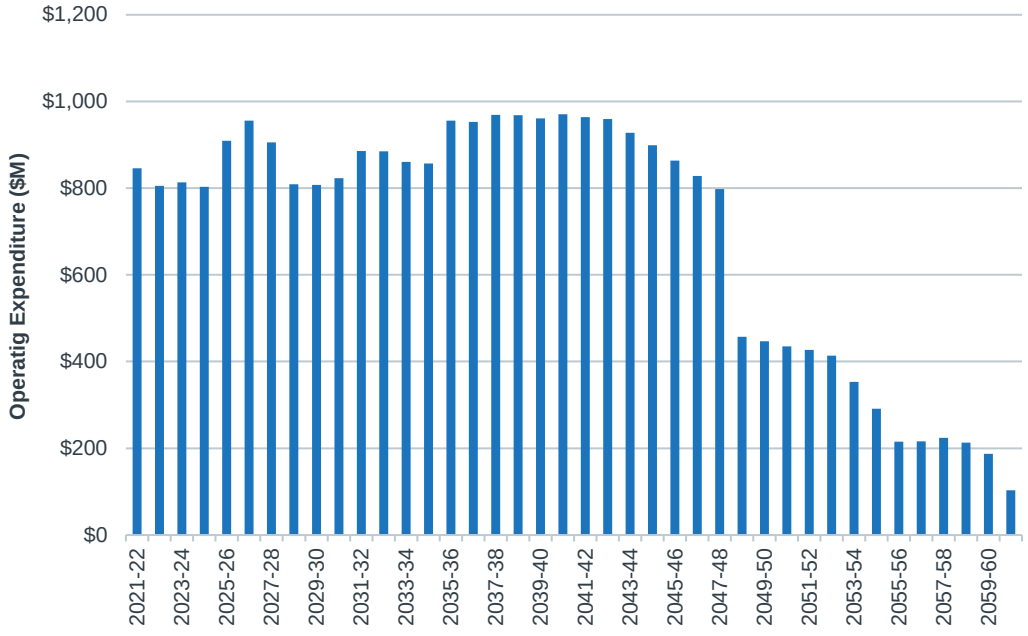


Source: Jellinbah Group (unpublished).

Lake Vermont Mining Complex – Project Case

The following figure depicts the total operating expenditure relating to the Lake Vermont Mining Complex – Project Case to 2060-61, including coal anticipated to be produced from the existing Lake Vermont Mine as well as that associated with the Project.

Figure 3.11. Operating Expenditure, Lake Vermont Mining Complex – Project Case

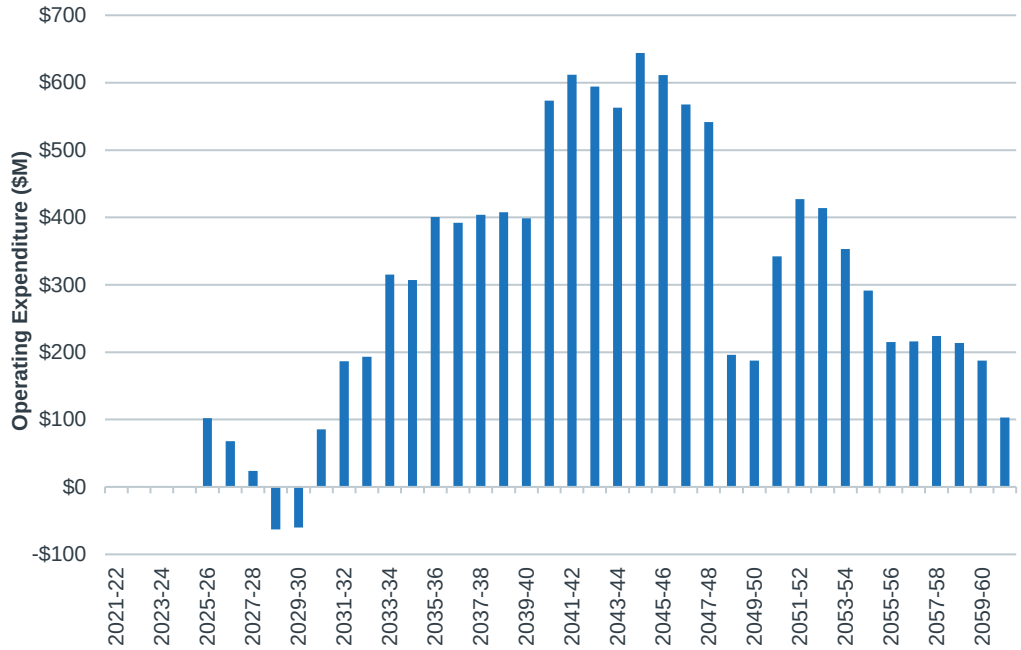


Source: Jellinbah Group (unpublished).

Lake Vermont Mining Complex – Incremental Additional Activity

Total operating expenditure for the entire complex with the Project is anticipated to be approximately $11.2 billion higher than if the Project did not proceed. The figure below outlines the net additional annual expenditure under the Lake Vermont Mining Complex – Incremental Additional Activity scenario.

Figure 3.12. Net Additional Operating Expenditure, Lake Vermont Mining Complex – Incremental Additional Activity



Source: Jellinbah Group (unpublished).

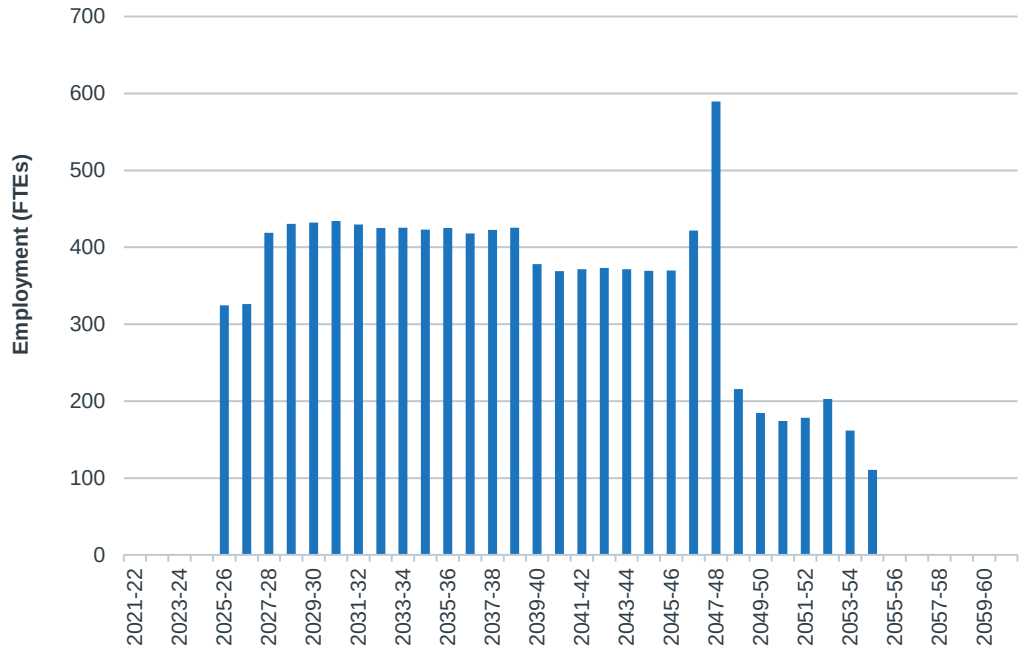
3.2.4.4 Operations Labour

Estimates of employment during operations were provided by Jellinbah Group (unpublished) on behalf of the proponent. Operations labour has been presented for the Project as well as the Lake Vermont Mining Complex under the Base Case (i.e., if the Project does not proceed), Project Case (i.e., if the Project does proceed), and incremental additional activity associated (i.e., Project Case less Base Case).

Project

Operations labour relating to the Project itself is anticipated to ramp up to between 325 and 435 between 2025-26 and 2047-48, before spiking to nearly 600 in 2048-49 (as production from the underground mine and satellite open cut pit overlap) and then declining until operations cease in 2054-55.

Figure 3.13. Operations Labour (FTE Jobs), Project

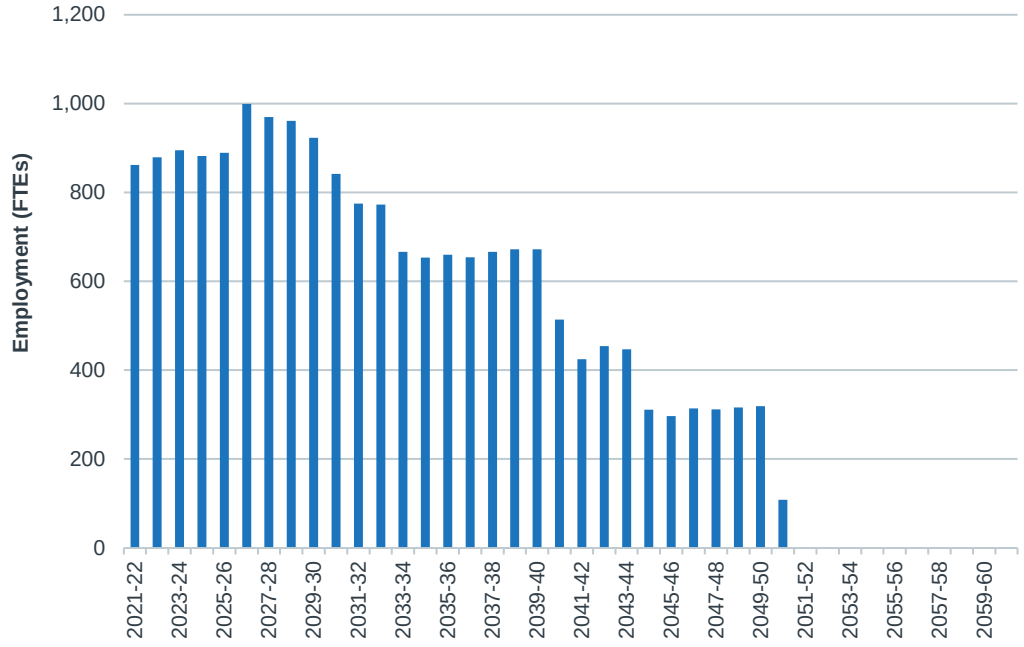


Source: Jellinbah Group (unpublished).

Lake Vermont Mining Complex – Base Case

Operations labour associated with the Lake Vermont Mining Complex – Base Case scenario is anticipated to ramp up to just under 1,000 FTE job years in 2026-27, before declining year on year until operations cease following 2050-51.

Figure 3.14. Operations Labour (FTE Jobs), Lake Vermont Mining Complex – Base Case

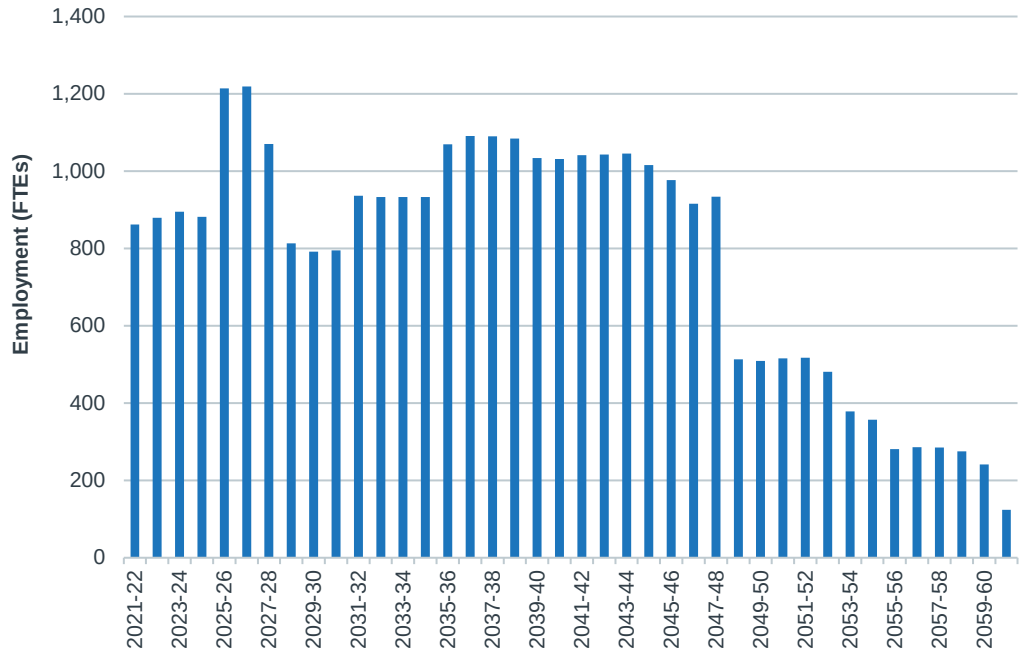


Source: Jellinbah Group (unpublished).

Lake Vermont Mining Complex – Project Case

The following figure depicts the total operating labour relating to the Lake Vermont Mining Complex – Project Case to 2060-61.

Figure 3.15. Operations Labour (FTE Jobs), Lake Vermont Mining Complex – Project Case

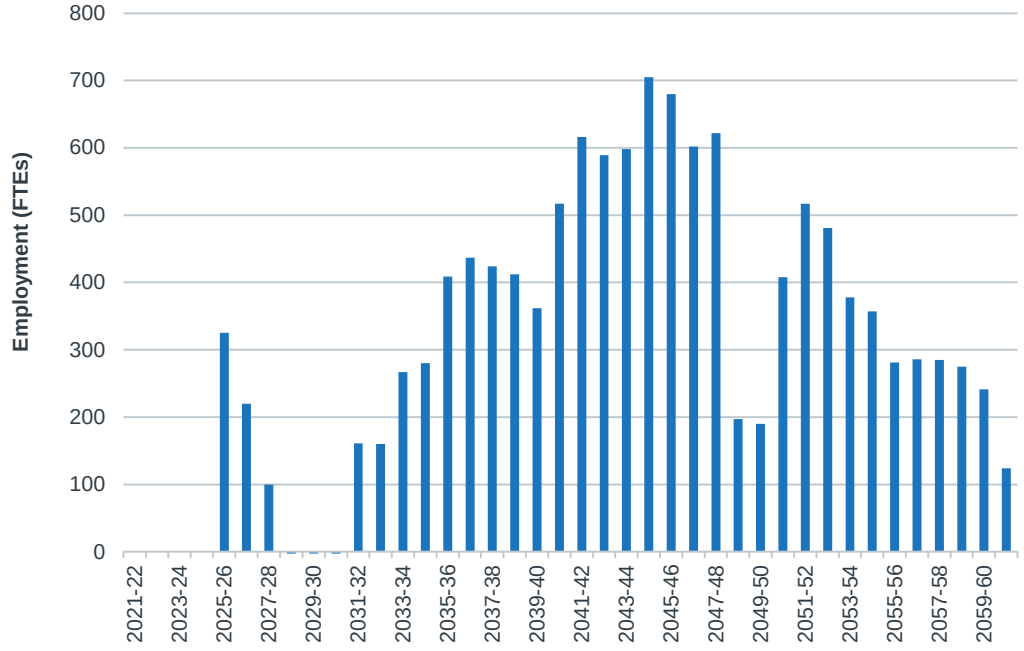


Source: Jellinbah Group (unpublished).

Lake Vermont Mining Complex – Incremental Additional Activity

Operations labour for the entire complex with the Project is anticipated to be approximately 12,180 FTE job years higher over the duration of operations than if the Project did not proceed. The figure below outlines the net additional annual labour of the Lake Vermont Mining Complex – Incremental Additional Activity scenario.

Figure 3.16. Operations Labour (FTE Jobs), Lake Vermont Mining Complex – Incremental Additional Activity



Source: Jellinbah Group (unpublished).

3.2.4.5 Source of Labour

A large share of the operations labour of the existing mine is sourced from the Catchment, due to the availability of appropriate labour and skillsets. The table below provides an overview of the existing source of operations labour for the Lake Vermont Mine. Discussions with the proponent indicate a similar labour profile is anticipated for the new underground mine.

Table 3.6. Source of Labour, Lake Vermont Mine

Area	Share (%)
Local Area and Catchment	45.0%
Rest of State	52.0%
Rest of Australia	3.0%
Overseas	0.0%
Total	**100.0%**

Source: Jellinbah Group (unpublished).

3.2.5 Post-Extraction Decommissioning and Rehabilitation

Decommissioning/ rehabilitation activity associated with the underground mine and satellite pit is minimal by comparison to that required by for the broader Lake Vermont Mining Complex. As such, no expenditure associated with this activity has been included in modelling associated with the Project itself. The decommissioning/ rehabilitation expenditure associated with the Lake Vermont Mining Complex has been assumed to occur regardless of whether the Project proceeds.

In terms of the broader Lake Vermont Mining Complex, decommissioning/ rehabilitation activity will occur progressively, with the majority of activity occurring over the first year of mining cessation at the Lake Vermont Mining Complex and the remainder occurring over another 18 years. Information regarding the anticipated costs for decommissioning and rehabilitation works associated with the Project was provided by Jellinbah Group (unpublished) on behalf of the proponent, indicating total costs for decommissioning and rehabilitation of approximately $73.2 million. This does not include any progressive rehabilitation that may be undertaken during the mine life.

Decommissioning / rehabilitation labour is assumed to be entirely sourced from within the Catchment, with employment estimates developed based on standard industry multipliers for the construction services industry for this level of expenditure.

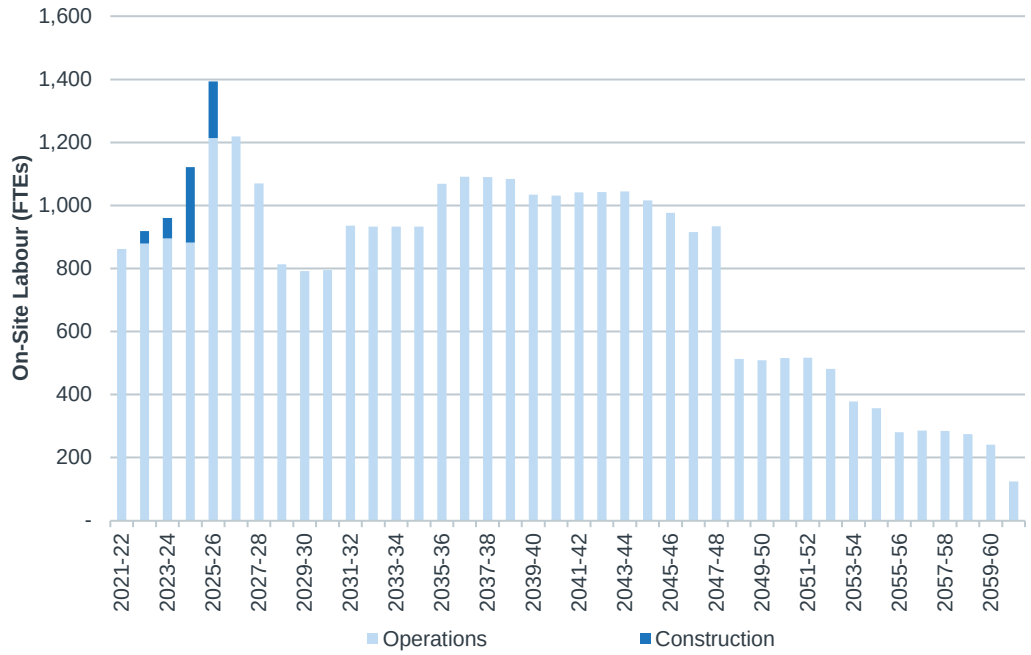
3.3 WORKFORCE ACCOMMODATION

Approximately 860 FTEs are employed at the Lake Vermont Mine as of 2021-22, primarily employed on a seven-day roster (Jellinbah Group, unpublished). Just under 10.0% of the workforce resides locally in surrounding townships (e.g., Dysart, Middlemount and other nearby townships). The Lake Vermont Accommodation Village in Dysart accommodates workers who chose to drive-in-drive-out (DIDO) to work at the mine. A small number of workers who reside locally also choose to stay in the Lake Vermont Accommodation Village while on roster.

The Project will employ up to 250 construction workers at any time during peak construction activity (with an annual peak of 240 FTE construction employees in 2024-25). Whilst the construction phase is from 2022-23 to 2025-26, the majority of construction activity occurs in the 2024 and 2025 calendar years. At Project full development, the operational workforce for the Lake Vermont Mining Complex – Project Case scenario (i.e., operation of the existing Lake Vermont Mine, together with the proposed Project) is estimated to reach up to 1,219 workers (846 workers associated with open cut operations and 324 workers associated with underground operations and 49 workers associated with the CHPP).

A summary of the Lake Vermont Mining Complex – Project Case workforce (including construction and operations, which will both impact on workforce accommodation) is outlined in Figure 3.17 below.

Figure 3.17. Lake Vermont Mining Complex – Project Case



Source: Jellinbah Group (unpublished). AEC.

The Lake Vermont Accommodation Village in Dysart is proposed to be refurbished and expanded to support the proposed Project. This expansion will be sufficient to meet the operational accommodation requirements for workers at the Lake Vermont Mining Complex as a result of the Project.

3.4 CONSEQUENCES OF NOT PROCEEDING WITH PROJECT

In understanding the implications of the Project not proceeding it is important to note the Project will deliver a continuation of mining and processing activities within the Lake Vermont Mining Complex. Remaining economic resources at the open cut mine are nearing depletion, and without the Project it is anticipated that Lake Vermont's operating activity would wind down in the near future. With the Project, mining and processing activity and supply contracts will continue to be delivered in the Catchment, with a retention of activity in the Catchment as production at existing approved operations winds down.

The Project thereby represents an important contributor to maintaining and extending activity and jobs supported by the Lake Vermont Mining Complex to 2060-61. Where the Project does not proceed, the economic contribution by Lake Vermont Mine to the local and State economies would reduce considerably in the near future and the contribution to be delivered by the Project would not be realised. A scenario has been included in the economic modelling undertaken in this study (i.e., IO modelling and CBA) which presents a comparison of Lake Vermont Mining Complex activity with the Project (Project Case) against a Base Case where the Project does not proceed to understand the incremental additional activity delivered by the Project. Where the Project not to proceed, the Catchment would miss out on some 12,180 FTE job years of mining work over the remaining life of the Lake Vermont Mining Complex as well as the flow-on indirect economic impacts.

4. EXISTING ECONOMIC ENVIRONMENT

This section provides a summary of the current economic environment of the Catchment as of March 2022, where impacts of the Project are expected to primarily be felt, with comparisons to Queensland provided where relevant. Additional details of the existing economic environment are provided in Appendix A.

The following are key attributes of the Catchment's existing environment:

- **The mining sector, in particular coal mining, is a key driver of the economy:** Mining accounted for 44.2% of total sector Gross Value Added (GVA) in the Catchment in 2020-21, as well as 15.9% of total jobs, to be the largest sector in the Catchment across both measures. Coal production comprises the vast majority of mining activity in the Catchment.
- **Mining has accounted for an increasing share of economic activity in the Catchment over the past decade:** Mining activity in the Catchment has seen significant growth in the 10 years to 2020-21, recording an average annual increase in GVA of 6.9% (AEC, unpublished). Over this period, mining saw a 14.6 percentage point increase in its proportion of the Catchment's Gross Regional Product (GRP). This is in line with the increases seen in mining's share of employment in the Catchment which has been on an upwards trend over the past 10 years, increasing by 3.1 percentage points from 2010-11 to 2020-21.
- **The Catchment accounts for over 50% of Queensland's coal production:** Coal production in the Catchment averaged around 122.6 million tonnes per annum (mtpa) between 2012-13 and 2019-20, or 52.2% of Queensland's total coal production, with a nine year peak in 2017-18 of 137.1 mtpa which represented 55% of Queensland's coal production for the year (DoR, 2021). Aside from a slight dip in 2016-17, coal production generally increased from 2012-13 to 2017-18. However, coal production in the Catchment fell to around 114.9 mtpa in 2020-21, in line with an overall contraction in Queensland's coal production. This closely aligns with the trends seen in the Catchment's mining GVA, which increased steadily between 2012-13 and 2019-20, but in 2020-21 declined annually for the first time since 2011-12.
- **Employment in the mining industry has increased over the past decade:** Mining employment in the catchment increased by 26.3% in total over the 10 years to 2020-21 with an average annual increase of 2.4%, increasing its share of total employment from 12.8% in 2010-11 to 15.9% of all employment in 2020-21 (AEC, unpublished). On an annual basis, employment in mining over the ten year period has fluctuated year to year, growing steadily to 2013-14, before contracting over the three years to 2016-17, then spiking again to 2018-19.
- **Other industries in the Catchment have seen significantly lower growth compared to mining:** After mining, the largest industries are healthcare and social assistance comprising 6.3% of GVA in 2020-21, construction at 5.3% and manufacturing at 4.5% (AEC, unpublished). Excluding mining, the economy on aggregate has remained relatively constant over the last decade recording 0.4% average annual growth over the last decade. At 2.6% per year over the same period, GRP growth in the Catchment has been largely driven by growth in mining (6.9% per year). The next fastest growing sector after mining has been healthcare and social assistance (5.7% per annum on average over the past decade), while the construction sector has experienced the most significant decline between 2010-11 and 2020-21 at -4.3% per annum.
- **COVID-19 and border closures resulted in a slowdown in the Catchment:** As has been experienced throughout Australia, the Catchment's economy was impacted by COVID-19 and subsequent measures by the Australian and Queensland Governments to slow the spread of the virus. This resulted in a -0.8% contraction in GRP in 2019-20, and a -1.4% contraction in 2020-21.
- **Unemployment in the Catchment has recovered from peak levels in 2015:** The Catchment has generally recorded lower unemployment rates than the State with a 5-year average of 5.8% and a 10-year average of 5.6% compared to 6.3% and 6.1% for the State respectively (DoESE, 2022). Unemployment in the Catchment peaked at 8.0% in the September and December quarters of 2015 and, with the exception of a spike in 2019 to 6.4%, has been on a downward trend since. The peak in unemployment in 2015 coincided with a downturn in the coal industry which saw mining employment contract between 2013-14 and 2016-17, while the peak in

unemployment in 2019 coincided with the initial impacts from COVID-19 and the closing of Australia's borders on the national economy.

- **The Catchment's labour force has experienced periods of high volatility since 2015:** The Catchment's labour force generally trended upwards from June 2006 to June 2014, however, since then has experienced considerable fluctuation. The Catchment's labour force declined from mid-2014 through 2015, and declined again from late 2018 through the first half of 2019 (DoESE, 2022). Labour force trends in the catchment have generally reflected the inverse of the unemployment rate, suggesting that as people lose work or have difficulty acquiring work, they become discouraged and leave the Catchment's labour force.
- **The Catchment recorded lower population growth than the State over the past decade:** The Catchment population has recorded low growth by comparison to the State over the ten years to 2020, averaging 0.5% per annum, to reach approximately 259,500 residents by 2020 (ABS, 2021). Average annual population growth was 1.1 percentage points lower than the 1.6% average annual population growth recorded by the State during the same period. The low growth rate in the Catchment included a period of annual population declines from 2015 to 2018, with a low of -0.8% annual growth in 2016. While positive population growth was recorded in 2019 and 2020, this remained well below the State. Such population growth trends are correlated with mining employment trends in the Catchment. From 2014-15 to 2016-17 employment in mining experienced a period of decline which aligns with the period of declining population. This may be due to mining employees losing work in the industry and moving away from the area.
- **Population in the Catchment is projected to grow at a slower rate than the state in the next 20 years:** Population in the Catchment is expected to grow at in increasing growth rate over the next 12 years. Between 2021 and 2041 the Catchment is anticipated to record an average annual growth rate of 1.3%, 0.3 percentage points lower than the State population growth over the same period (QGSO, 2019). The Catchment is projected to reach a population of approximately 335,600 by 2041.
- **The Catchment is both highly self-sufficient and self-contained:** The Catchment is 80.6% self-sufficient, indicating the majority of local jobs are held by residents and there is an appropriate match between skillsets (ABS, 2017). The Catchment also has a high self-containment rate (83.4%), reflecting the majority of residents found work in the region, or relocated to the region for work purposes. Given the prevalence of mining employment in the Catchment, such strong self-containment and self-sufficiency suggest that mining employees have elected to relocate to the catchment or that the industry employed residents.
- **Following a period of decline, building approvals in the Catchment have been increasing since 2016-17:** The number of residential building approvals in the Catchment declined from just under 3,400 approvals in 2012-13 (valued at over $1.0 billion in total) to under 700 approvals each year between 2016-17 and 2018-19 (valued at between $225 million and $250 million in those years in total) (ABS 2021e). This steep decline in residential building approvals closely aligns with the Catchment's population growth trends which, following strong annual growth to 2013, entered a period of annual decline from 2014 to 2018 as mining experienced a downturn in 2014. Residential building approvals have increased in recent years, reaching over 1,200 approvals in 2020-21, as both mining employment and population growth have rebounded. By comparison, Queensland has seen a general upward trend in the number and value of residential building approvals over the nine year period at 4.0% and 7.8% growth respectively. The value of non-residential building approvals followed a similar path of decline as residential building approvals from 2012-13 to 2018-19, with the exception of a one year spike in non-residential building approvals in 2017-18, and has also been increasing the past two years.
- **Property prices in the Catchment have recently begun increasing following an extended period of decline:** Property prices in the Catchment underwent a period of decline between 2012-13 and 2017-18 with an average annual decrease in prices of -5.7%. In this period, median property prices reached a ten year low of $280,000. Since then, prices have been increasing at an average annual rate of 4.4%. This aligns with the trends in the Catchment's population growth and reflects the impacts of increased demand for housing on prices. In comparison, Queensland has largely seen consistent growth in property prices in the ten years to 2020-21.

5. REGIONAL IMPACT ASSESSMENT

This section examines the economic impacts of the Project within the Catchment as well as impacts to the State of Queensland for context. Impacts to Australia are also examined where relevant and appropriate, noting the vast majority of impacts will occur within Queensland.

This analysis uses economic modelling as well as findings from the literature review and existing environment to inform the assessment of economic impacts as appropriate. **All modelling outcomes are presented in 2022 Australian dollar values** unless otherwise specified. IO modelling has been used in modelling impacts to the Catchment and State (while it is noted that impacts to Australia are also to be considered in the EIS ToR, modelling of impacts to the rest of Australia have not been reported as the vast majority of impacts will occur within Queensland). The modelling outcomes identified throughout this impact assessment depict the impact value of a range of economic indicators anticipated as a result of the Project. A description of the IO modelling framework used is provided in **Appendix B**.

Modelling results used in this section present both direct (i.e., the **initial stimulus** from the Project) and flow-on (i.e., **production-induced**) impacts of the Project. Only the production-induced flow-on impacts are included (i.e., type I flow-on), which reflects the first-round supply chain impacts as well as the second and subsequent round effects of increased purchases by suppliers in response to increased sales resulting from demand for goods and services from the mine and associated infrastructure manufacturing and development activity. Household consumption induced flow-on impacts (i.e., type II flow-on impacts) are excluded from this analysis to provide a more conservative estimate of impacts.

Sections 5.1 (Contribution to the Economy) and 5.2 (Contribution to Employment and Wages) of the RIA examine both:

- The impacts of the Project in isolation (see Section 3.2 for details of the Project). This is the primary focus of the analysis, with reference to industry impacts by phase and annual impacts over the assessment period. In reporting impacts:
    - Construction phase impacts have been assessed and reported in aggregate over the construction phase. This includes the six financial years of capital expenditure outlined in section 3.2.2.1 between 2022-23 and 2027-28, noting the majority of on-site construction activity is expected to occur over a two-year period in 2024 and 2025. This excludes any replacement capital and sustaining capital, as well as any capital works associated with the existing mine.
    - Capital replacement phase impacts have been assessed and reported in aggregate for the period between 2031-32 to 2044-45. This includes capital replacement as well as any capital works associated with the existing mine.
    - Operations phase activities have been assessed and reported as a peak average annual impact between 2027-28 and 2047-48, inclusive of sustaining capital works.
    - Decommissioning/ rehabilitation phase impacts related to the Project specifically will be negligible and have therefore not been modelled in isolation (though have been considered in the context of the impact on the broader Lake Vermont Mining Complex's activity which would not significantly differ to that of the Base Case).
- The impacts of the Project in consideration of the net change in Lake Vermont Mining Complex's overall mining activity in the Catchment with and without the Project. This is referred to as Lake Vermont Mining Complex – Incremental Additional Activity scenario and is the secondary focus of the analysis, with reference to only the annual impacts over the assessment period.

All other sections of the RIA primarily focus on Project in isolation, with reference to the Lake Vermont Mining Complex – Incremental Additional Activity scenario where appropriate.

IO modelling has been conducted for construction, capital replacement and operations phase activities separately (noting that decommissioning/ rehabilitation phase activities for the Project are described separately but will be negligible compared to the $73.2 million anticipated to be spend for the broader Lake Vermont Mining Complex –

Project Case, and therefore were not modelled for the Project in isolation). The direct activity associated with each phase (construction, capital replacement, operations, and decommissioning/ rehabilitation) is outlined in Section 3.2. Annual estimates of total Project impacts have also been presented, reflecting the annual direct and flow-on impacts on key measures from all phases in combination.

5.1 CONTRIBUTION TO THE ECONOMY

The Project will generate economic activity directly through the construction of the mine, capital replacement activities, extraction, and export of mined product during operations, and through onsite rehabilitation/ decommissioning activities. Economic activity will also be supported indirectly for the supply of goods and services to support the Project across all these phases. Impacts of the Project on gross product across construction, capital replacement, operations, and post-mine rehabilitation and decommissioning phases are examined in this section. The analysis disaggregates impacts between:

- Gross Catchment Product (GRP) for impacts accruing in the Catchment.
- Gross State Product (GSP) for impacts accruing in the rest of Queensland (or when referring to the total Queensland impact, this includes the Catchment and rest of Queensland impact in aggregate).

Gross product (e.g., GRP / GSP) refers to the value of goods and services produced after deducting the costs of intermediate purchases of goods and services used as inputs in the production process. That is, gross product defines the true net economic contribution of a project (or value added).

5.1.1 Project Scenario

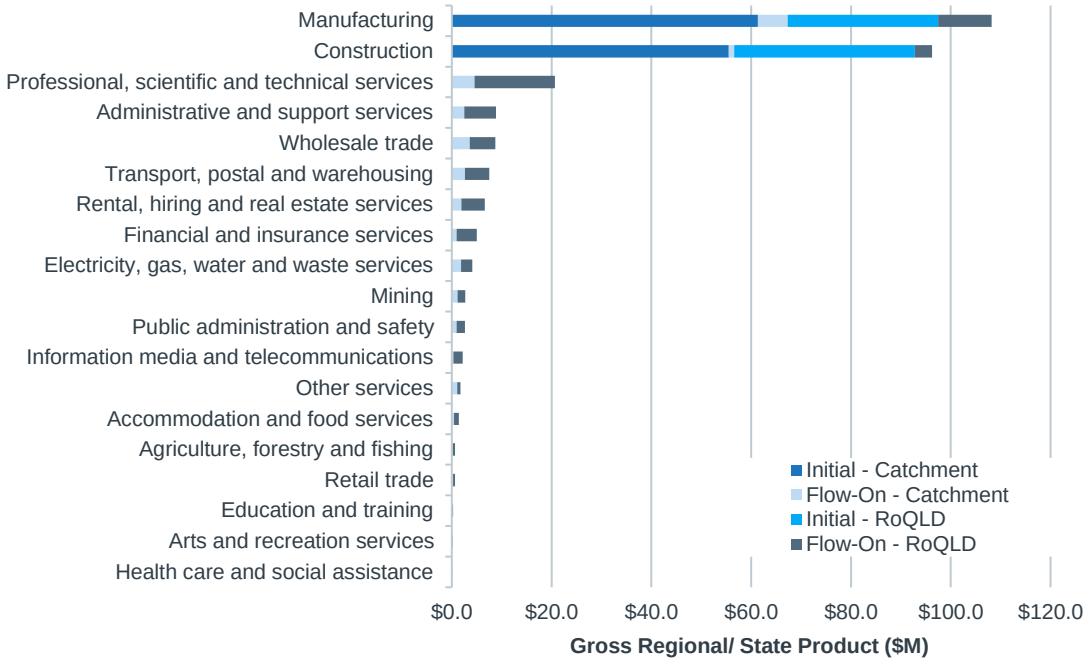
5.1.1.1 Construction Phase Impacts

The construction phase of the Project is expected to commence in the 2022-23 financial year and end in 2027-28 (noting the majority of on-site construction activity will occur in the 2024 and 2025 calendar years). The Project is estimated to generate $149.5 million in GRP in the Catchment economy over the six-year construction phase, including $119.2 million through direct activity and $30.3 million through production-induced flow-on impacts.

Approximately $133.2 million in GSP is estimated to be generated in the rest of Queensland, $66.6 million of which will be supported by direct activity and $66.6 million through flow-on activity.

The following figure (Figure 5.1) outlines the quantum of GRP / GSP supported in aggregate during the construction phase, by industry. The manufacturing industry is estimated to receive approximately 39.1% of total GSP impacts from construction, with construction (35.6%) and professional, scientific, and technical services (7.5%) the other main industries estimated to receive a boost in activity.

Figure 5.1. GRP/ GSP ($M) Supported During Construction Phase, Project, Aggregate Impacts (2022-23 to 2027-28)



Note: RoQLD = Rest of Queensland.
Sources: ABS (2012; 2017; 2021a, 2021b, 2021c), DoESE (2022), Jellinbah Group (unpublished), AEC.

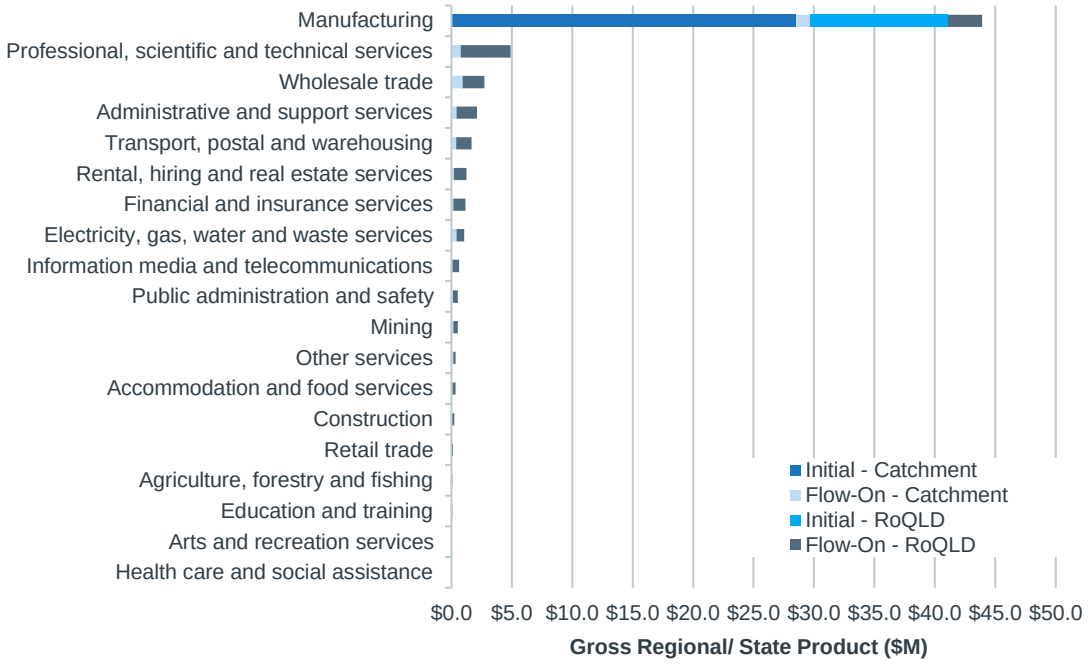
5.1.1.2 Capital Replacement Phase Impacts

The capital replacement phase of the Project is expected to commence in the 2031-32 financial year and end in 2043-44. The Project is estimated to generate a total of $33.6 million in GRP in the Catchment economy during the capital replacement activities, including $28.5 million through direct activity and $5.1 million through production-induced flow-on impacts.

Approximately $28.0 million in GSP is estimated to be generated in the rest of Queensland by the Project, $11.4 million of which will be supported by direct activity and $16.6 million through flow-on activity.

The following figure (Figure 5.2) outlines the quantum of GRP / GSP supported in aggregate during capital replacement activities of the Project, by industry. The manufacturing industry is estimated to receive approximately 71.2% of total GSP impacts from construction, with professional, scientific, and technical services (7.9%) and wholesale trade (4.4%) the other main industries estimated to receive a boost in activity.

Figure 5.2. GRP/ GSP ($M) Supported During Capital Replacement Activities, Project, Aggregate Impacts (2031-32 to 2043-44)



Note: RoQLD = Rest of Queensland.
Sources: ABS (2012; 2017; 2021a, 2021b, 2021c), DoESE (2022), Jellinbah Group (unpublished), AEC.

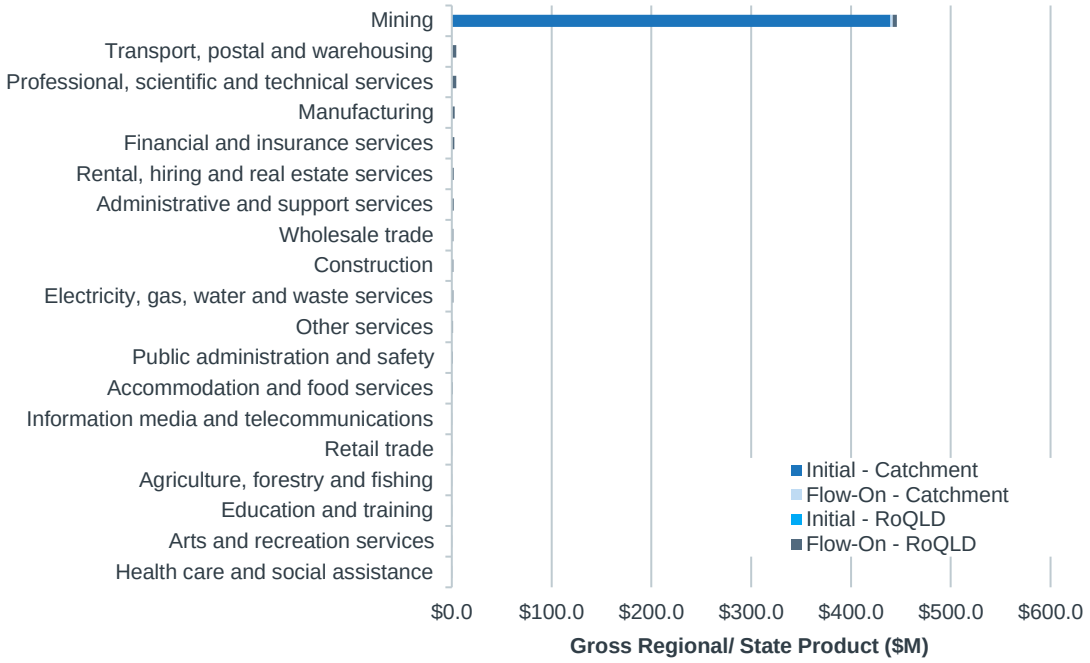
5.1.1.3 Operations Phase Impacts

The Project is anticipated to commence operations in 2025-26 with production expected to continue through to 2054-55. Peak operations, however, are largely associated with the underground mine and is anticipated to occur from 2027-28 through to 2047-48. The analysis in the following section refers to the average annual impacts of the Project during peak mining operations.

During peak operations, the Project is estimated to support a total of $443.7 million in GRP in the Catchment per annum on average, including $439.7 million supported directly through mining activity and $4.0 million supported through flow-on activity. Approximately $28.7 million in GSP per annum is estimated to be supported in the rest of Queensland through flow-on activity.

Figure 5.3 outlines the quantum of GRP and GSP supported on average each year, broken down by industry. The mining industry is estimated to record approximately 94.4% of total GSP impacts during peak operations, the majority a result of direct Project operating activity. The transport, postal and warehousing industry is estimated to produce approximately $4.5 million per annum on average in GSP as a result of flow-on activity, and the professional, scientific, and technical services industry is estimated to produce approximately $4.3 million per annum on average in GSP through flow-on activity, whilst a number of other industries are estimated to produce more than $3.0 million per annum on average.

Figure 5.3. GRP / GSP ($M) Supported During Peak Operations Phase, Project, Average Annual Impacts (2027-28 to 2047-48)



Note: RoQLD = Rest of Queensland.
Sources: ABS (2012; 2017; 2021a, 2021b, 2021c), DoESE (2022), Jellinbah Group (unpublished), AEC.

5.1.1.4 Decommissioning and Rehabilitation Phase Impacts

Decommissioning/ rehabilitation activity typically associated with underground mines includes:

- Demolition and removal of infrastructure.
- Consolidation and decommissioning of the tailings facilities.
- Reshaping of remaining mining landforms.
- Re-establishment of surface hydrology and drainage systems.
- Treatment, discharge, or disposal of poor-quality water.
- Completing the rehabilitation and remediation processes (Australian Government, 2016).

Decommissioning/ rehabilitation activity associated with the Project (inclusive of the underground mine and satellite pit) is minimal by comparison to that required by for the broader Lake Vermont Mining Complex – Project Case. As such, this activity has not been modelled for the Project in isolation as it is not anticipated to impact significantly on the $73.2 million anticipated to be spent in decommissioning/ rehabilitation for the broader Lake Vermont Mining Complex – Project Case.

5.1.1.5 Annual Impacts on GRP / GSP

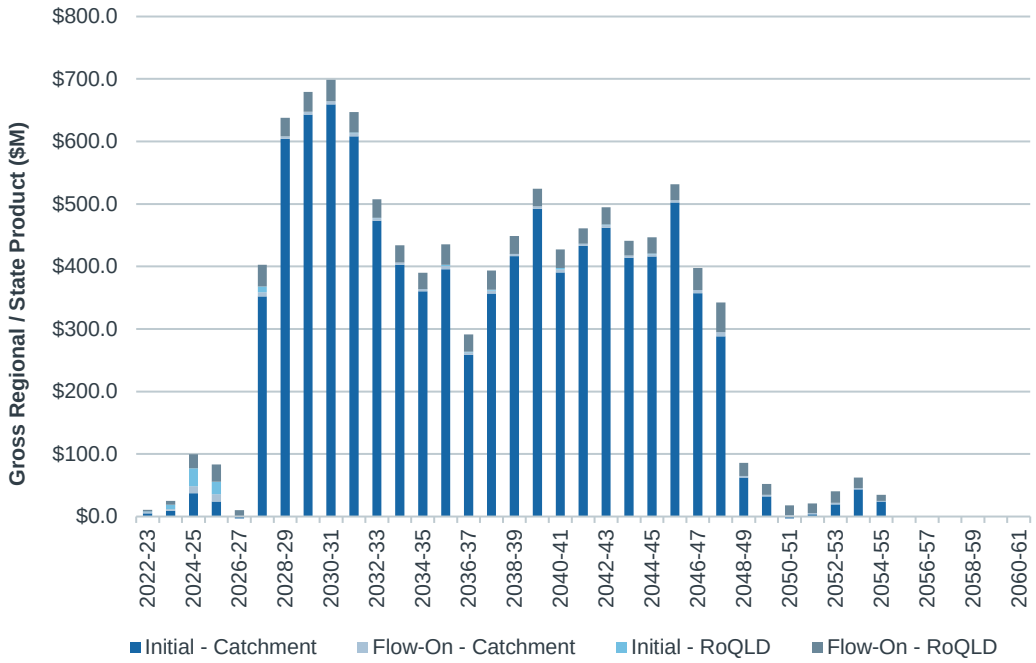
Annual impacts on GRP/ GSP have been assessed for the Project and are presented below.

Modelling outcomes of the annual impacts of the Project on the Catchment's GRP and Queensland GSP between 2022-23 to 2054-55 are presented in Figure 5.5, based on the timing of these phases outlined in the Project overview and assumptions (Section 3.2). Both direct and flow-on impacts of the Project are presented.

The contribution to GSP will increase from around $10.5 million in 2022-23 (first year of construction) to just under $100.0 million between 2024-25 and 2025-26, as construction activity ramps up. The contribution to GSP is then estimated to spike to approximately $402.8 million in 2027-28, as production at the underground mine ramps up, peaking in 2030-31 at $698.7 million. The contribution to GSP is estimated to average around $450.0 million per

annum following this peak to 2047-48, then fall to lowers levels over the years to 2054-55 as production of the underground mine winds down and is supplemented by activity at the satellite pit.

Figure 5.4. Annual Impact on GRP / GSP in the Catchment and Rest of Queensland, Project



Note: RoQLD = Rest of Queensland.
Sources: ABS (2012; 2017; 2021a, 2021b, 2021c), DoESE (2022), Jellinbah Group (unpublished), AEC.

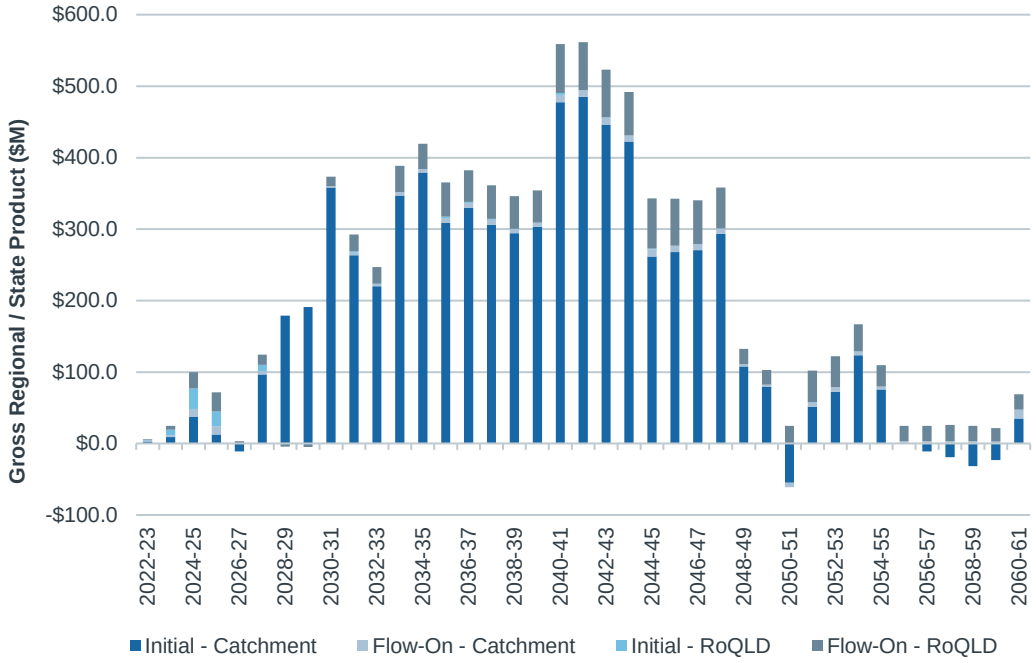
5.1.2 Lake Vermont Mining Complex – Incremental Additional Activity

Modelling outcomes of the Lake Vermont Complex – Incremental Additional Activity on the Catchment's GRP and Queensland GSP between 2022-23 to 2060-61 are presented in Figure 5.4. In some years there are negative values for some direct or flow-on impacts (though the overall impact including direct and flow-on activity is positive). These instances are a factor of the timing of anticipated peaks and troughs of mining output and operating activity between scenarios where the Project does or does not proceed.

The net contribution of the Lake Vermont Mining Complex – Incremental Additional Activity scenario to GSP will increase from around $5.9 million in 2022-23 (first year of construction) to just under $100.0 million between 2024-25 and 2025-26, as construction activity ramps up. The net contribution to GSP is then estimated to become negative (negative 8.0 million) in 2026-27 as underground mining operations ramp up to a lesser degree than open cut operations ramping down. Following this period, underground mining operations enable a net additional contribution to GSP of $358.8 million on average between 2027-28 and 2047-48 (the end of underground operations). The contribution to GSP is estimated to decline following this period as open cut mining operations (including the introduction of the satellite pit) continue. A contribution of approximately $69.0 million in estimated in 2060-61 as a result of the final year of operations as well as decommissioning and rehabilitation activities for the open cut mine (with the majority of expenditure anticipated to occur in this year).

In total, the Catchment is estimated to capture approximately 83.9% of the total contribution to GSP, with the rest of Queensland accounting for approximately 16.1%.

Figure 5.5. Net Change in Annual Impact on GRP / GSP in the Catchment and Rest of Queensland, Lake Vermont Mining Complex – Incremental Additional Activity



Note: (a) RoQLD = Rest of Queensland. (b) Instances where the net change is below zero refers to periods where the contribution to GRP of the broader Lake Vermont Mining Complex is less than that which would otherwise occur without the Project.
Sources: ABS (2012; 2017; 2021a, 2021b, 2021c), DoESE (2022), Jellinbah Group (unpublished), AEC.

5.2 CONTRIBUTION TO EMPLOYMENT AND WAGES

This section examines the modelled impacts of the Project on employment across the construction, capital replacement, operations, and decommissioning / rehabilitation phases of the Project, including direct and production induced flow-on impacts. It also outlines modelled estimates of incomes (i.e., wages and salaries) paid to employees.

5.2.1 Project Scenario

5.2.1.1 Construction Phase Impacts

Estimates of the direct workforce required for construction phase activity of the Project are based on data provided by Jellinbah Group (unpublished) on behalf of the proponent and assumptions by AEC, as outlined in Section 3.2. Flow-on estimates of employment during construction were developed using assumptions of construction activity outlined in Section 3.2.2 and IO multipliers.

Overall, the construction phase is estimated to directly support:

- 525 FTE job years for on-site construction workers over the six-year construction period between 2022-23 and 2027-28 (noting the majority of activity is anticipated to occur in the 2024 and 2025 calendar years), 300 FTE job years of which are estimated to be sourced from the Catchment, 164 sourced from elsewhere in Queensland and 61 sourced from rest of Australia.
- 797 FTE job years supported in the manufacturing industry in Queensland between 2022-23 and 2027-28, 537 of which are assumed to reside in the Catchment.

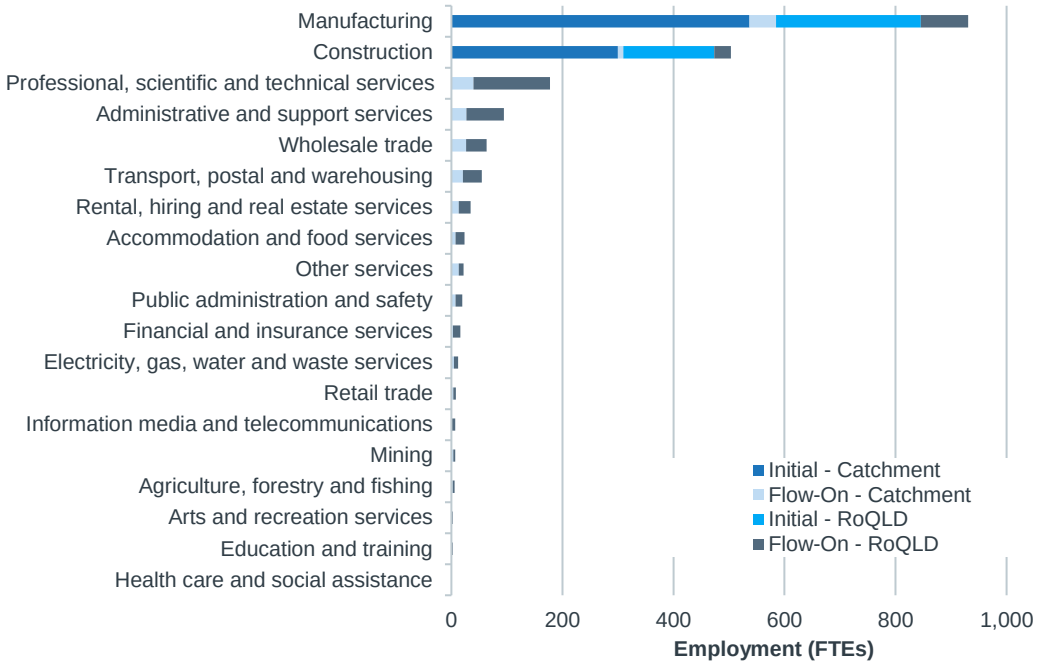
For construction phase impacts, on-site construction workers sourced from outside the Catchment have not been included in the Catchment impacts on the basis that construction jobs are highly mobile and short-term in nature, and these workers are likely to primarily operate out of their usual place of residence / business location. The same approach has been used in estimating Queensland employment impacts for workers sourced from outside Queensland. A comparison of place of work versus place of usual residence employment across each stage is provided in Section 5.2.1.6.

The construction phase of the Project is estimated to support 1,069 FTE job years for local residents in the Catchment in total over the course of the six-year construction phase (2022-23 to 2027-28), 837 of which will be supported directly by the Project with a further 232 FTE job years supported through flow-on activity. This is estimated to support $109.4 million in wages and salaries in the Catchment (including direct and flow-on activity).

Approximately 753 FTE job years are estimated to be supported by construction phase activity in the rest of Queensland, including 260 FTE job years directly and 492 FTE job years through flow-on impacts. These jobs will pay net additional $72.5 million in wages and salaries. It is anticipated 164 FTE job years across Queensland will reflect construction workers directly employed by the Project and working on-site but sourced from outside the Catchment.

A breakdown of construction phase impacts on employment across industries in the Catchment and rest of Queensland is presented in Figure 5.6. The majority of jobs during construction in the Catchment and rest of Queensland are expected to be employed in the manufacturing and construction industries.

Figure 5.6. Employment by Place of Usual Residence (FTE Job Years) Supported During Construction Phase, Aggregate Impacts (2022-23 to 2027-28)



Note: RoQLD = Rest of Queensland.
Sources: ABS (2012; 2017; 2021a, 2021b, 2021c), DoESE (2022), Jellinbah Group (unpublished), AEC.

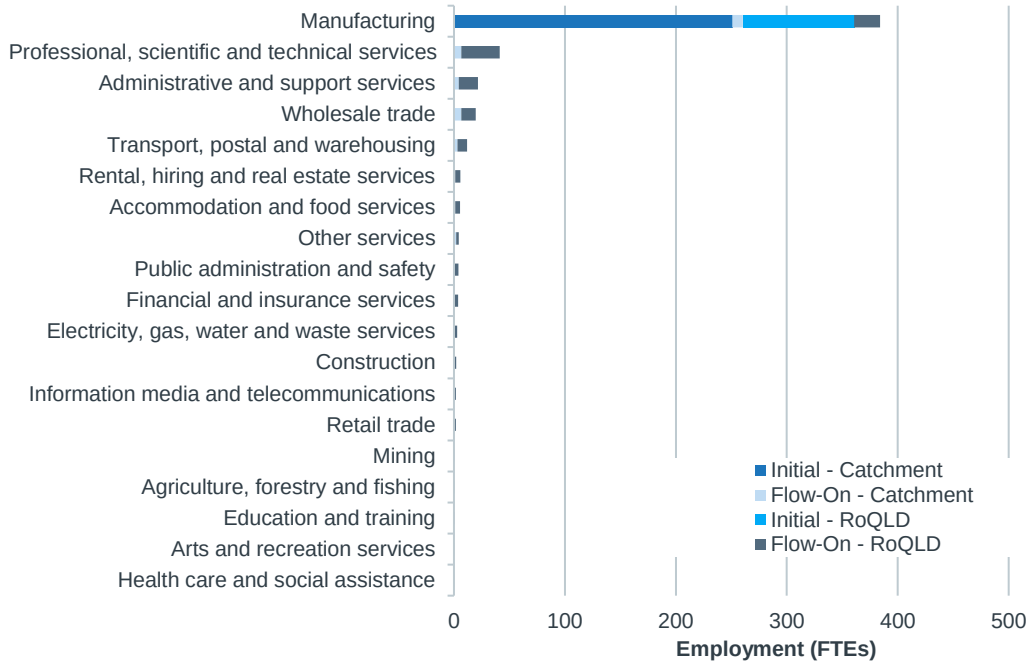
5.2.1.2 Capital Replacement Phase Impacts

Estimates of the direct and flow-on workforce required for capital replacement activity of the Project are based on Input-Output multipliers, as outlined in Section 3.2.3.

Capital replacement activity of the Project is estimated to support 289 FTE job years for local residents in the Catchment in total, 251 of which will be supported directly by the Project with a further 38 FTE job years supported through flow-on activity. This is estimated to support of $26.2 million in wages and salaries in the Catchment (including direct and flow-on activity). Approximately 223 FTE job years are estimated to be supported by capital replacement activity in the rest of Queensland, including 100 FTE job years directly and 123 FTE job years through flow-on impacts. These jobs will pay $20.9 million in wages and salaries.

A breakdown of capital replacement activity impacts on employment across industries in the Catchment and rest of Queensland is presented in Figure 5.6. The majority of jobs during capital replacement activity in the Catchment and rest of Queensland are expected to be employed in the manufacturing industry.

Figure 5.7. Employment by Place of Usual Residence (FTE Job Years) Supported During Capital Replacement Activities, Aggregate Impacts (2031-32 to 2044-45)



Note:
RoQLD = Rest of Queensland.
Sources: ABS (2012; 2017; 2021a, 2021b, 2021c), DoESE (2022), Jellinbah Group (unpublished), AEC.

5.2.1.3 Operations Phase Impacts

Estimates of the direct operations workforce are based on information provided by Jellinbah Group (unpublished) on behalf of the proponent, as outlined in Section 3.2.4. Flow-on estimates of employment during operations were developed using assumptions of operational activity outlined in Section 3.2.3 and IO multipliers. Estimates presented in this section refer to average annual peak operations from 2027-28 to 2047-48.

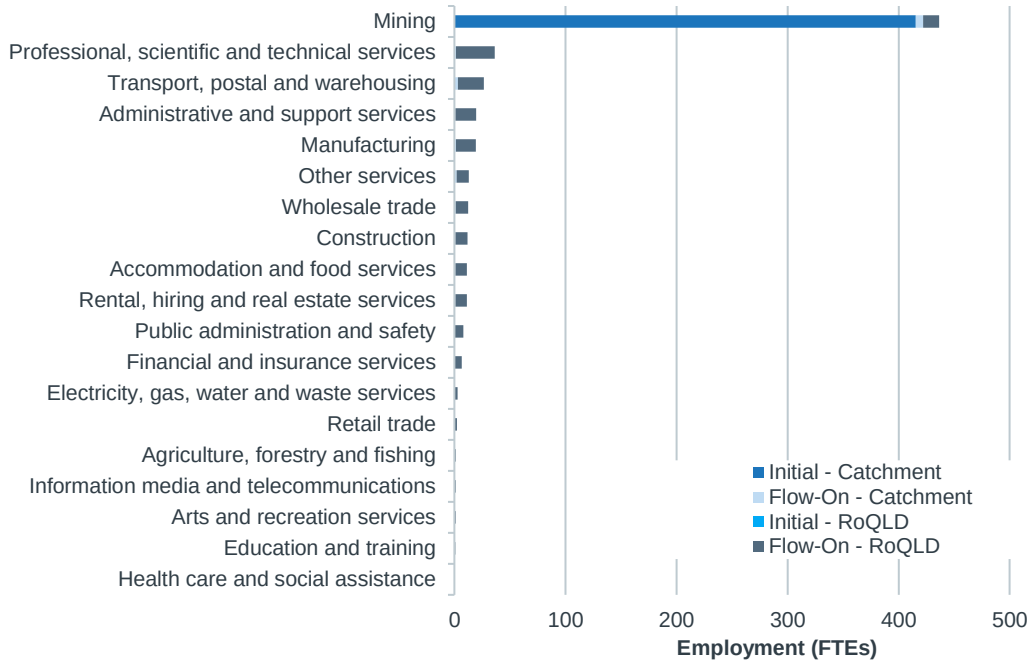
Unlike construction phase employment impacts, workers sourced from outside the Catchment for mining and processing activities are included within the Catchment's employment impacts. These workers are included given the jobs provided represent longer-term jobs located in the Catchment and these workers will thereby secure employment and incomes from the Catchment in the longer-term, despite needing to travel for work during shifts. A comparison of place of work versus place of usual residence employment across each stage is provided in Section 5.2.1.6.

The Project is estimated to support 434 FTE jobs annually on average during peak operations in the Catchment, 415 of which will be supported directly by mining activities and 19 through flow-on activity. This is estimated to support $77.6 million in wages and salaries in the Catchment (including direct and flow-on activity).

Approximately 186 FTE jobs per annum on average during peak operations are estimated to be supported in the rest of Queensland by the Project, through flow-on impacts. These jobs are estimated to support an average of $18.8 million in employee incomes each year over this period.

For the Project, the mining industry will account for around 70.3% of jobs supported in Queensland during remaining operations, with around 5.9% in the professional, scientific, and technical services industry (Figure 5.8).

Figure 5.8. Employment by Place of Work (FTE Jobs) Supported During Peak Operations Phase, Average Annual Impacts (2027-28 to 2047-48)



Note: RoQLD = Rest of Queensland.
Sources: ABS (2012; 2017; 2021a, 2021b, 2021c), DoESE (2022), Jellinbah Group (unpublished), AEC.

5.2.1.4 Decommissioning and Rehabilitation Phase Impacts

As discussed in Section 5.1.1.4, decommissioning/ rehabilitation activity associated with the Project (i.e., underground mine) is minimal by comparison to that required by for the broader Lake Vermont Mining Complex – Project Case. As such, no employment associated with this activity has been included in modelling associated with the Project, though is anticipated to contribute some level towards employment for the Catchment and Queensland.

5.2.1.5 Annual Impacts on Employment

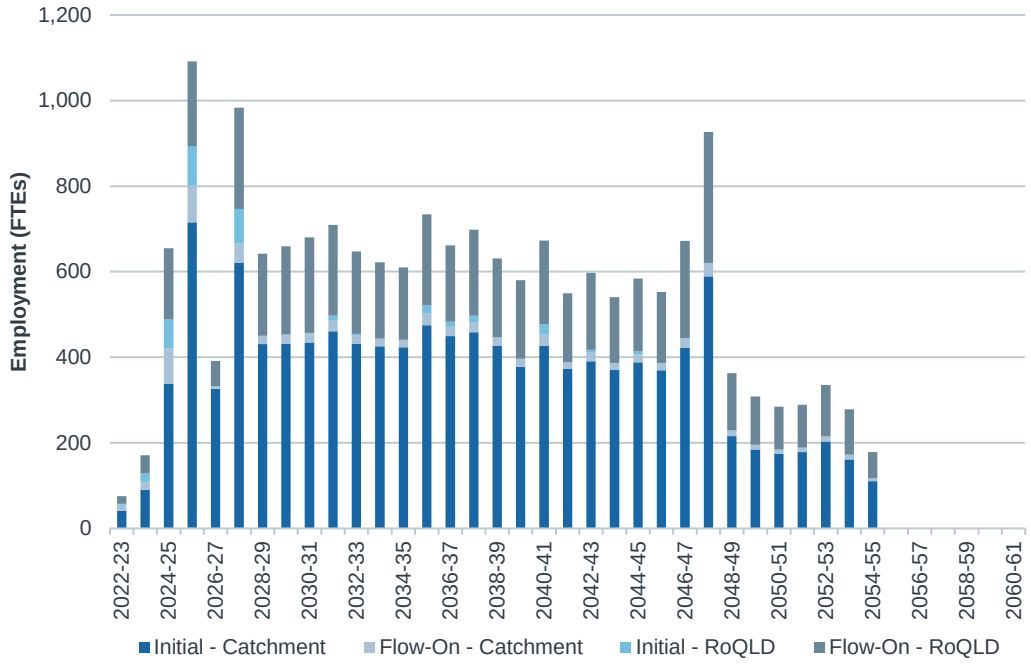
Annual impacts on employment have been assessed the Project and are presented below.

Annual employment impacts are presented in Figure 5.9 and follow a similar path as annual impacts on GRP / GSP outlined in Section 5.1.1.5, with the number of jobs supported spiking during key construction years and remaining closer to a steady state levels during operations before declining as operations cease. Including direct and flow-on activity:

- 75 FTE jobs are estimated to be supported in Queensland in the first year of construction (2022-23), increasing to a peak of 1,091 in 2025-26, as construction activity ramps up.
- FTE jobs supported in Queensland are then estimated to lower to 980 FTE jobs in 2027-28, as construction activity slows and production at the underground mine ramps up. FTE jobs are then estimated to average around 550 following this peak to the end of operations in 2054-55.

Approximately 69.0% of jobs supported in Queensland will be within the Catchment, with the remainder in the rest of Queensland.

Figure 5.9. Annual Impact on Employment by Place of Work (FTE Jobs) in the Catchment and Rest of Queensland, Project

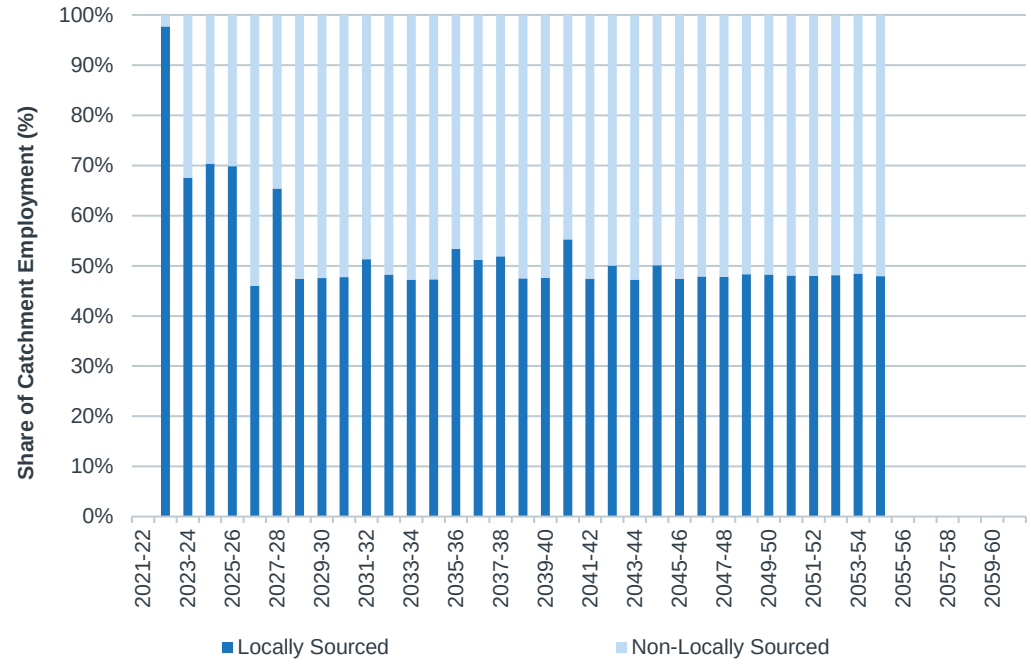


Note: RoQLD = Rest of Queensland.
Sources: ABS (2012; 2017; 2021a, 2021b, 2021c), DoESE (2022), Jellinbah Group (unpublished), AEC.

5.2.1.6 Place of Work vs Place of Usual Residence

Annual impacts on employment by place of work versus place of usual residence have been assessed for the Project. In consideration of the Project in isolation, between 46.0% to 97.8% of total jobs supported in the Catchment are estimated to be filled by locals (i.e., those who reside within the Catchment) depending on the project phase (i.e., construction, capital replacement, operations, and decommissioning/ rehabilitation). The figure below provides an overview of the share of local versus non local employment for construction, operations and decommissioning/ rehabilitation activities carried out within the Catchment for the Project.

Figure 5.10. Local versus Non-Local Employment, Project, Catchment

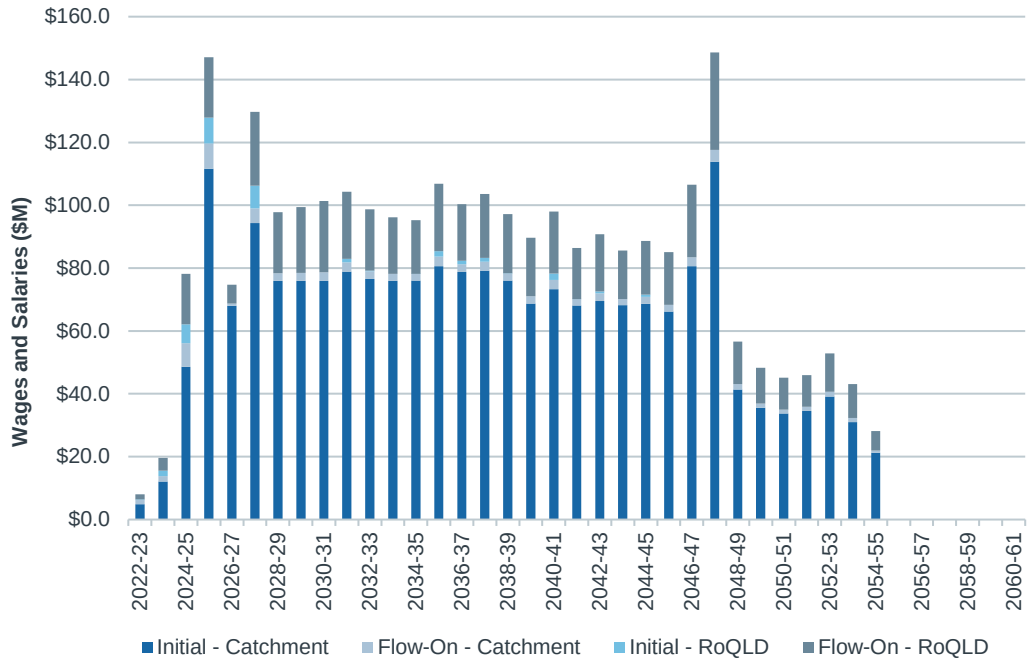


Sources: ABS (2012; 2017; 2021a, 2021b, 2021c), DoESE (2022), Jellinbah Group (unpublished), AEC.

5.2.1.7 Annual Impacts on Incomes

Annual estimates of wages and salaries paid to employees is presented in Figure 5.11, highlighting incomes paid for activities associated with the Project will peak during construction at over $140 million before maintaining a steady state during operations of the underground mine at around $100 million per annum to 2047-48, in line with employment. Following cessation of underground mining activities, wages associated with open cut operations (i.e., the satellite pit) will commence and continue to decline through to 2054-55. In total, approximately 79.3% of total wages and salaries paid in Queensland as a result of the Project will be for jobs in the Catchment, and 20.7% in the rest of Queensland.

Figure 5.11. Annual Impact on Incomes by Place of Work in the Catchment and Queensland, Project



Note: RoQLD = Rest of Queensland.
Sources: ABS (2012; 2017; 2021a, 2021b, 2021c), DoESE (2022), Jellinbah Group (unpublished), AEC.

The income estimates above include all incomes paid to mining and processing workers directly engaged by activities associated with the Project, however, some of these incomes of non-locally sourced workers will be repatriated to their place of residence.

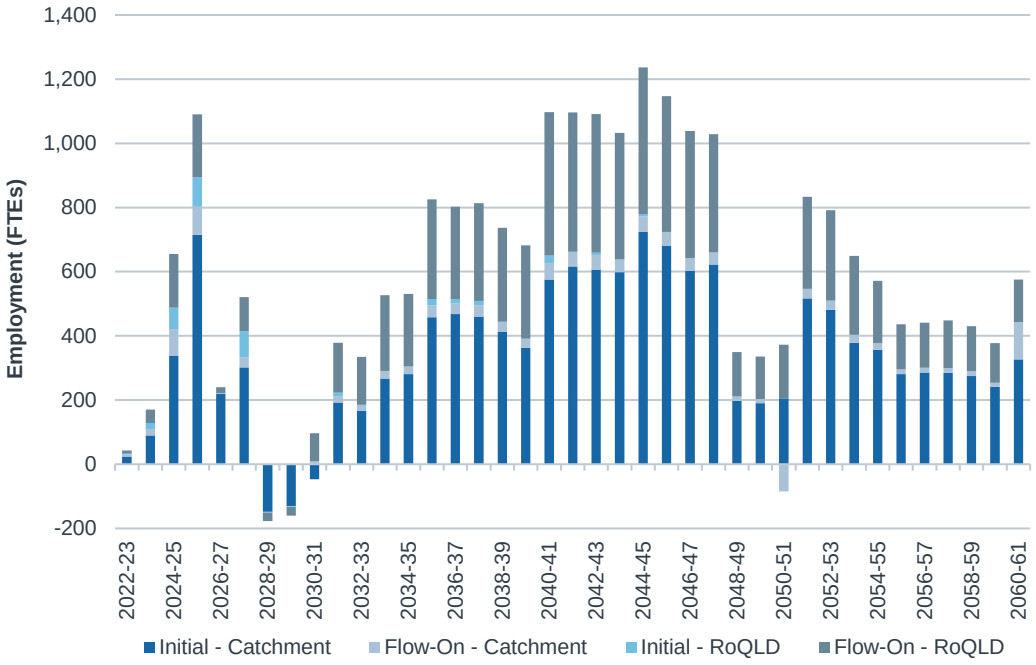
5.2.2 Lake Vermont Mining Complex – Incremental Additional Activity

5.2.2.1 Annual Impacts on Employment

Modelling outcomes of the Lake Vermont Mining Complex – Incremental Additional Activity scenario on the Catchment and Queensland's employment between 2022-23 to 2060-61 are presented in the figure below. In some years there are negative values for some direct or flow-on impacts (though the overall impact including direct and flow-on activity is positive). These instances are a factor of the timing of anticipated peaks and troughs of mining output and operating activity between scenarios where the Project does or does not proceed.

The net change in employment provided by the Lake Vermont Mining Complex – Incremental Additional Activity scenario will equate to around 43 FTE jobs in 2022-23 (first year of construction) and reach a high of 1,090 net additional FTE jobs in 2025-26, as construction activity ramps up. The change in employment is then estimated to become negative between 2028-29 and 2029-30 as underground mining operations ramp up to a lesser degree than open cut operations ramping down. Following this period, underground mining operations enable a net additional employment of approximately 800 FTE jobs on average between 2029-30 and 2047-48 (the end of underground operations). The net additional employment is estimated to decline to an average of around 400 to 500 FTE jobs per annum on average following this period as open cut and satellite pit mining operations continue. A net additional 575 FTE jobs is estimated in 2060-61 as a result of decommissioning and rehabilitation activities.

Figure 5.12. Net Change in Annual Impact on Employment by Place of Work (FTE Jobs) in the Catchment and Rest of Queensland, Lake Vermont Mining Complex – Incremental Additional Activity

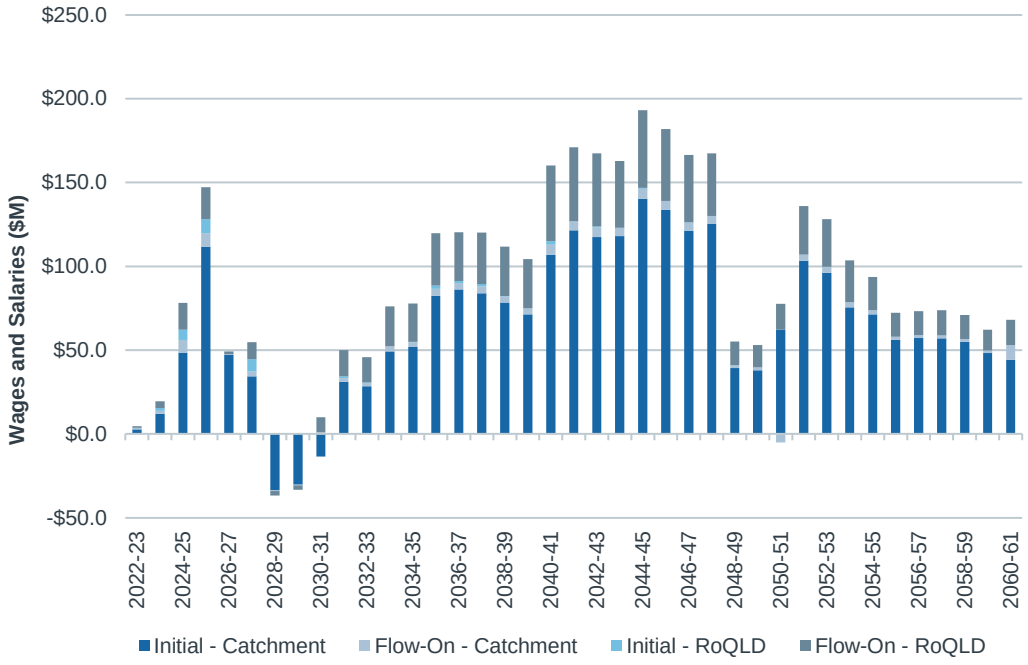


Note: (a) RoQLD = Rest of Queensland. (b) Instances where the net change is below zero refers to periods where the contribution to GRP of the broader Lake Vermont Mining Complex is less than that which would otherwise occur without the Project.
Sources: ABS (2012; 2017; 2021a, 2021b, 2021c), DoESE (2022), Jellinbah Group (unpublished), AEC.

5.2.2.2 Annual Impacts on Incomes

The net change in annual estimates of wages and salaries paid to employees resulting from the Lake Vermont Mining Complex – Incremental Additional Activity scenario is presented in Figure 5.11, highlighting incomes paid for activities associated with the Project will have an overall positive impact in most years on wages and salaries paid in the Catchment and Queensland, peaking at just under $200 million in 2044-45. In total, approximately 75.0% of net additional wages and salaries paid in Queensland resulting from the broader Lake Vermont Mining Complex – Incremental Additional Activities scenario will be for jobs in the Catchment, and 25.0% in the rest of Queensland.

Figure 5.13. Net Change in Annual Impact on Incomes by Place of Work in the Catchment and Queensland, Lake Vermont Mining Complex – Incremental Additional Activity



Note: RoQLD = Rest of Queensland.
Sources: ABS (2012; 2017; 2021a, 2021b, 2021c), DoESE (2022), Jellinbah Group (unpublished), AEC.

5.3 IMPACTS TO BUSINESSES

5.3.1 Benefical Impacts

5.3.1.1 Benefits to Business Upstream in the Supply Chain

Bowen Basin Coal has in place an extensive supply chain for their existing operations at the Lake Vermont Mine. The Project will extend the mining and processing activities at the Lake Vermont Mining Complex to 2061 and, thereby, enable continued support and opportunities for suppliers in the Catchment and Queensland that otherwise would be lost, providing additional security and longevity of business incomes (and employment). The Project will also create opportunities to secure new contracts and increase sales to supply and service the needs of the Project through flow-on impacts in the supply chain, during all phases of the Project.

The construction phase is estimated to support business revenues for local businesses (compared to business as usual) within the Catchment of approximately $293.8 million through direct construction activity. Flow-on supply chain impacts during construction are estimated to support $68.1 million in business revenue in the Catchment (compared to business as usual). Approximately $291.5 million in business revenues are estimated to be supported in the rest of Queensland through direct and flow-on activity. Capital replacement activities are estimated to support $83.4 million in business revenues in total, through direct and flow on activity in the Catchment, with the rest of Queensland anticipated to support a further $64.2 million.

During operations, the Project is estimated to support $8.4 million in business revenues per annum on average in the Catchment through flow-on activity, with a further $62.3 million in revenues supported for businesses in the rest of Queensland.

These business revenues in the Catchment and rest of Queensland would not be supported without the Project.

5.3.1.2 Benefits to Business Downstream in the Supply Chain

Lake Vermont Mine is an important supplier of coal, primarily to international markets (i.e., exports). The Project will enable Bowen Basin Coal to extend their supply of coal product to meet the demands of their customers. Without the Project these customers would be required to source product from alternative suppliers (which may be

expected to place upward pressure on input costs for these customers), or potentially reduce their own production where appropriate alternative supply is unable to be sourced. To this end the Project can be seen as important for the longer-term security of supply of coal, though will primarily impact international businesses downstream in the supply chain. Domestically, transport and logistics businesses for the transport of coal to ports/ customers will benefit from the Project.

5.3.2 Adverse Impacts

5.3.2.1 Impacts on Business from Competition for Resources

While the Project will provide opportunities for businesses within the mining supply and value chain, some businesses and industries may be adversely impacted by the Project. For instance, mining projects typically compete with industries such as manufacturing and construction for labour as these industries have similar skill sets, which can drive up costs for labour in these industries. The Project can also lead to increases in other costs of business as competition for goods and services drives input prices up.

The flow-on impacts of the Project presented in the economic modelling do not account for potential adverse impacts on business and industry due to the above factors. However, given the Project will primarily result in an extension of existing mining and supply chain activity with a moderate net increase in the total operating workforce, the impacts of the Project in terms of demand for resources are expected to overwhelmingly be positive in nature (through the ongoing support for jobs and suppliers, see Section 5.3.1) and it is anticipated any adverse impacts of the Project on other businesses will be unlikely to be noticeable in the context of existing market conditions.

5.3.2.2 Impacts on Industry from Exchange Rates

The Project will result in the export of more than 100 Mt of additional coal product that would not otherwise occur without the Project. There is some potential for this export activity to result in an increase in exchange rates as a result of Project's impacts on balance of payments, which would make Australian exports less competitive, while imported goods and services would cost comparatively less). This primarily impacts industries that operates in global markets competing with international producers, such as agriculture and manufacturing.

Industries such as agriculture, manufacturing and tourism are strong contributors to the Queensland and national economy, though the contribution of these industries can fluctuate due to a number of macro-economic factors (including exchange rates).

However, considering the total export value of the Project relative to total national exports, the Project is anticipated to result in a relatively immaterial impact on state and domestic trade balances, and thereby have a negligible impact on factors such as exchange rates and the value of the Australian dollar.

5.3.3 Impacts on Agricultural Production

The Project is located on/ under land that is currently primarily used for cattle grazing. As the Project is an underground mine, with a small satellite open-cut pit, only a small proportion of the Project site is anticipated to be removed from grazing purposes. The proponent intends to allow grazing to continue within the Project site in areas not impacted by surface infrastructure (and allowing for buffer areas). Given carrying capacities can be increased on grazing land where needed, the small reduction in grazing land available as a result of the Project is not anticipated to have any tangible impacts on grazing production in the region. Following mining completion, the open cut satellite pit will also be rehabilitated (partially backfilled) to achieve a post mining land use of grazing. This will further mitigate impacts on agricultural production.

5.4 CONTRIBUTION TO GOVERNMENT REVENUES

5.4.1 Approach

Estimates of taxation revenue to the Queensland and Australian Government have been developed based on benchmarks of taxation revenue received compared to relevant Queensland and Australian measures and applied to results from IO modelling for Queensland[4]. The following benchmarks were applied by taxation item:

- Personal income tax (Australian Government): total income tax received (ABS, 2022a) compared to total wages and salaries paid to Australian employees (ABS, 2022c; ABS, 2022d) between the financial years of 2009-10 and 2020-21. This was applied to estimates of incomes paid in Queensland from the IO modelling.
- Fringe benefits tax (Australian Government): total fringe benefits tax received (ABS, 2022a) compared to total wages and salaries paid to Australian employees (ABS, 2022c; ABS, 2022d) between the financial years of 2009-10 and 2020-21. This was applied to estimates of incomes paid in Queensland from the IO modelling.
- Company income tax (Australian Government): total company tax received (ABS, 2022a) compared to total gross profit of businesses in Australia (i.e., total GDP less total wages and salaries paid to employees) (ABS,2021a) between the financial years of 2009-10 and 2020-21. This was applied to estimates of GDP less incomes paid in Queensland from the IO modelling. This approach was utilised except for company income tax from mining operations, which was based on data from the proponent.
- Goods and Services Tax (GST) (Australian Government): total GST received (ABS, 2022a) compared to total Australian GDP (ABS, 2021a) between the financial years of 2009-10 and 2020-21. This was applied to estimates of GSP for Queensland from the IO modelling.
- Payroll tax (Queensland Government): total payroll tax received (ABS, 2022a) compared to total wages and salaries paid to Queensland employees (ABS, 2022c; ABS, 2022d) between the financial years of 2009-10 and 2020-21. This was applied to estimates of incomes paid in Queensland from the IO modelling.

Both direct and flow-on impacts are included in the estimation of the above taxation revenues.

In addition to the above, the Project will also pay the Queensland Government royalties for the extraction of minerals. Royalty payments were provided by Jellinbah Group (unpublished), on behalf of the proponent.

5.4.2 Tax Revenues

Details of anticipated taxation revenue from both direct and flow-on activity associated with the Project are summarised in Table 5.1. The Queensland Government is expected to receive approximately $1,189.0 million in net additional revenue, primarily through royalty payments, over the life of the Project. The Australian Government is estimated to receive approximately than $1,635.7 million in various taxes. Overall, the Project is anticipated to generate net additional $1,334.5 million in Queensland Government revenues and $1,919.4 million in Australian Government revenues when considering the broader Lake Vermont Mining Complex – Incremental Additional Activity scenario.

It should be noted that a portion of Australian Government revenues are likely to provide benefits to Queensland, with the State allocated a portion of GST revenue as well as through the subsequent expenditure and redistribution of Australian Government revenues to provide services and infrastructure throughout Australia (including Queensland).

[4] Modelling results for Queensland were used for Australian Government revenue impacts as modelling for Australia was not undertaken. As the Project is anticipated to primarily source goods, services and labour from Queensland the vast majority of impacts are anticipated to occur within the Queensland economy and as such the Queensland results are considered a reasonable approximation for the national impact.

Table 5.1. Aggregate Government Revenues

Taxes	Project ($M)	Lake Vermont Mining Complex – Incremental Additional Activities ($M)
Queensland Government Revenues		
Payroll Tax	$69.3	$73.5
Royalties	$1,119.8	$1,261.0
Total	**$1,189.0**	**$1,334.5**
Australian Government Revenues		
Personal Income Tax	$645.3	$828.4
Fringe Benefits Tax	$15.9	$20.5
Company Income Tax	$655.8	$834.6
GST	$318.6	$235.9
Total	**$1,635.7**	**$1,919.4**

Note: Totals may not sum due to rounding.
Source: ABS (2021g), ABS (2021f), ABS (2021h), ABS (2021i), AEC.

5.5 DEMAND FOR LOCAL INFRASTRUCTURE AND SERVICES

The Project will, effectively, deliver a continuation and extension of operational activity and workforce at the Lake Vermont Mining Complex, with the development of the underground mine allowing for the extension of mine life by ten years.

The development and operation of the underground mine will result in moderate lift in the on-site workforce during operations of the underground mine and satellite pit relative to current employment levels. A short-term increase in employment will occur during construction, with this to be a short-term impact (with the majority of activity occurring over the 2024 and 2025 calendar years). In the longer-term, the Project will result in employment in the Catchment being sustained (at a slightly higher level) for an extended period).

The extended period of employment for the workforce, in the Catchment, is likely to result in some level of increased demand for local infrastructure and services, however, most of this workforce will continue to be accommodated in the Lake Vermont Accommodation Village in Dysart and are not anticipated to be place any significant strain on local infrastructure and services.

5.6 IMPACT ON LOCAL PROPERTY MARKET

While the Project will maintain employment opportunities in the Catchment for an extended (and slightly higher) period, the contribution to the property market demand (and thereby impact on property prices and availability) is anticipated to be small for the following reasons:

- Workforce accommodation arrangements for the Project will be similar to those for the existing Lake Vermont Mine, being a mix of the Lake Vermont Accommodation Village, which accommodates workers who choose to DIDO as well as more permanent workers who reside locally during their roster, and a small share of the workforce which is anticipated to reside locally in surrounding townships (e.g., Dysart, Moranbah, Middlemount and other nearby townships).
    - During construction, while over half (57.1%) of on-site construction workers are anticipated to be workers sourced from within the Catchment, most of these will be workers that reside outside a one-hour drive of the Project site and will require accommodation closer to the mine site. The remaining 42.9% of on-site construction workers are expected to be transient workers sourced from outside the Catchment and also require accommodation. It is anticipated construction workers requiring accommodation will primarily be accommodated through the existing accommodation village capacity within Dysart (Civeo and/or stayover accommodation villages).
    - During operations, while the Project will result in up to approximately 300 additional workers at the Lake Vermont Mining Complex compared to existing employment levels at the Lake Vermont Mine (approximately 880 workers) at peak, for most years the operational workforce will be just over 1,000

workers (see section 3.2.4.4) through peak years of production. It is intended that, where appropriate, the opportunity will be provided for many of the underground mining roles to transition from the slowing open-cut operations to the ramping up of the Project, thereby promoting a retention of these workers residing in the Catchment. The Social Impact Assessment (SMEC, 2022) for the Project suggests there is ample capacity for Dysart to provide housing for families moving to town (with approximately 42.5% of total dwellings unoccupied), however, the low quality of housing may present a barrier to permanent relocations.

- Overall, the net change in operational jobs resulting from the Project is not anticipated to place significant pressure on the local property market, but rather sustain demand at similar levels over the longer term. Where additional workers require accommodation, they are primarily anticipated to be accommodated through the Lake Vermont Accommodation Village.

5.7 IMPACTS ON BALANCE OF PAYMENTS

The Project will primarily impact on Queensland and Australia's trade balance through the production of coal product. Coal is anticipated to be exported from Queensland to offshore clients. In total, the value of product extracted is estimated to be valued at approximately $14.7 billion, with a peak annual value of $911.3 million.

Partially offsetting the anticipated lift in exports for Queensland and Australia will be an increase in imports to supply the Project (relative to what would otherwise occur without the Project). In total, approximately $4.8 billion in goods and services are estimated to be imported to Queensland between 2022-23 and 2047-48 to directly support the Project. A modest amount of additional goods and services will also be imported through supply chain impacts. On average, the Project is estimated to support approximately $158.8 million in additional imports to Queensland per annum.

While the Project is anticipated to result in a small increase in net exports for Australia, the value of imports and exports generated by the Project are relatively small in consideration of existing annual imports and exports for Australia ($48.3 billion in in imports and $57.9 billion in exports 2019-20) (DFAT, 2021). While the Project will support economic growth and the value of the Australian dollar, in the context of Australia's overall economy and trade balance the impact of the Project on factors such as exchange rates and the value of the Australian dollar is anticipated to be negligible.

5.8 IMPACT ON ECONOMIC RESOURCES

The Project involves the extraction of up to 6.2 Mtpa (by 2030-31) of metallurgical product coal for the export market.

The Bowen Basin contains the largest coal reserve in Australia, extending over approximately 60,000 square kilometres (BBGG, 2022). This Catchment represents a significant contribution to the State of Queensland's coal production, its most significant export commodity. Queensland produced approximately 218,500,500 tonnes of saleable coal in 2020-21 (Department of Resources, 2021).

The Project is anticipated to provide up to 6.2 Mtpa (by 2030-31) of product coal for the export market, which will only further benefit the overall security of supply of coal from Queensland and support future demand. Queensland Treasury suggests Queensland coal exports are anticipated to remain in demand for at least the next 20 years, with future demand primarily linked to key economies in North-East and South-East Asia (Queensland Treasury, 2020).

Queensland's untapped coal resources have been estimated at 63 billion tonnes of raw coal, as of 2019, indicating there will remain a large quantity of remaining coal resources following extraction associated with the Project (QRC, 2019).

5.9 SUMMARY OF IMPACTS

The following summary distils the wide range of impacts down into the key beneficial and adverse impacts arising from the Project. These impacts are examined during a risk assessment framework described in Appendix C.

5.9.1 Potential Beneficial Impacts

Key beneficial impacts arising from the Project are outlined in Table 5.2, including assessment of anticipated level of associated benefit. Beneficial impacts are examined in consideration of what would otherwise occur if the Project does not proceed (i.e., the incremental additional activity scenario comparing the Project Case less the Base Case).

Table 5.2. Assessment of Beneficial Impacts of the Project

Impact Description	Likelihood	Consequence	Overall Impact
Economic Growth The Project will contribute to economic growth directly and indirectly through increased industry output and GRP during construction and operation compared to what would occur without the Project. Including both direct and flow-on impacts, the Project is estimated to support an additional: • $146.3 million in GRP in the Catchment during construction. • $33.6 million in GRP in the Catchment during capital replacement activities. • $315.7 million in GRP per annum on average through mining activity in the Catchment during peak Project operations (i.e., 2027-28 to 2047-48) compared to what would otherwise occur. • Decommissioning/ rehabilitation for the Project is not anticipated to differ significantly from that already anticipated for the broader Lake Vermont Mining Complex. In consideration of current GRP in the Catchment, this impact is estimated to be of moderate consequence, with a very high likelihood of occurring (i.e., expected to occur), providing an overall impact rating of high.	Very High	Moderate	**High**
Employment and Incomes The Project will support additional employment and household incomes during construction and maintain employment for an extended period of operations, compared to what would occur without the Project, flowing from both direct and indirect impacts. Including both direct and flow-on (supply chain) impacts, the Project is estimated to support an additional: • 1,044 FTE job years (in total) for residents of the Catchment during construction, over the six-year initial capital expenditure phase (noting the majority of construction activity will occur across a two-year period). • 289 FTE job years (in total) for residents of the Catchment through capital replacement activities between 2031-32 to 2044-45. • 414 FTE jobs per annum for residents of the Catchment on average during peak mining activity between 2027-28 and 2047-48 (above what would otherwise occur without the Project, i.e., the Base Case not existing operations). • Decommissioning/ rehabilitation for the Project is not anticipated to differ significantly from that already anticipated for the broader Lake Vermont Mining Complex. In consideration of current employment in the Catchment and the longer-term support for jobs in the Catchment the Project will provide, this impact is estimated to be of moderate consequence with a very high likelihood of occurring (i.e., expected to occur), providing an overall impact rating of high.	Very High	Moderate	**High**

Impact Description	Likelihood	Consequence	Overall Impact
Support for Local Businesses The Project will support demand for goods and services for a number of businesses within the Catchment, including local worker accommodation villages, businesses within the construction and mining supply chains, as well as providers of export infrastructure. In total, Catchment construction businesses and the supply chain are estimated to receive revenue of approximately $361.9 million through construction phase activity. Capital replacement activity is estimated to generate business revenues of $83.4 million, while mining supply chain businesses in the Catchment are estimated to receive an additional $8.4 million in business revenue per annum during peak operations that would not occur without the Project, providing additional security and longevity of business incomes. Decommissioning/ rehabilitation for the Project is not anticipated to differ significantly from that already anticipated for the broader Lake Vermont Mining Complex. Lake Vermont is an important supplier of coal, primarily to international markets (i.e., exports). Whilst the majority of benefits of this are received by international consumers and businesses, domestic transport and logistics businesses will also benefit through the transport of coal to ports/ customers. This benefit to local businesses is estimated to be of moderate consequence with a high likelihood of occurring (i.e., will probably occur), providing an overall impact rating of medium.	High	Moderate	**Medium**
Government Revenue The Project will provide a lift in local, State, and Australian government taxation revenues through a variety of taxes and duties. Overall, the Project is estimated to deliver: • $1,919.4 million in additional revenue to the Australian Government, through personal income tax, fringe benefits tax, company tax and GST, compared to what would occur without the Project. • $1,334.5 million in additional revenue to the Queensland Government compared to what would occur without the Project, primarily through royalty payments. These additional revenues can be used by government to provide additional infrastructure and services to support business and households throughout Australia. This impact is estimated to be of moderate consequence, with a very high likelihood of occurring (i.e., expected to occur), providing an overall impact rating of high.	Very High	Moderate	**High**

Source: AEC.

5.9.2 Potential Adverse Impacts

Key adverse impacts arising from the Project are outlined in Table 5.3, including assessment of anticipated level of associated impact. Impacts are examined in consideration of what would otherwise occur if the Project does not proceed (i.e., the incremental additional activity scenario comparing the Project Case less the Base Case). This table also includes assessment of impacts on local property values and the Australian balance of payments (with consideration of implications on the Australian dollar/ exchange rates), which can provide both beneficial consequences for some stakeholders and adverse consequences for others.

Table 5.3. Assessment of Adverse Impacts of the Project

Impact Description	Likelihood	Consequence	Overall Impact
Impacts on Local Businesses from Competition for Resources The Project may (moderate likelihood) increase competition for labour and resources, leading to inflationary pressure and increased costs to businesses as well as potential difficulties for local businesses attracting and retaining staff. However, in the longer term as the Project in an extension of existing mining and supply chain activity with only a moderate lift compared to what would otherwise occur, the contribution of the Project to competition for resources is estimated to be relatively minor and unlikely to be noticeable against baseline/ existing levels (very low consequence), providing a low overall impact rating.	Moderate	Very Low	**Low**
Impacts on Agricultural Production The Project is located on/ under land that is currently primarily used for cattle grazing. As the Project is primarily an underground mine, only a small proportion of the Project site is anticipated to be removed from grazing purposes. The proponent intends to allow grazing to continue within the Project site in areas not impacted by surface infrastructure (and allowing for buffer areas). Given carrying capacities can be increased on grazing land where needed, the small reduction in grazing land available as a result of the Project is not anticipated to have any tangible impacts on grazing production in the region. Rehabilitation of the open cut satellite pit area will also ultimately return this area to a grazing use. As such, this impact is very low, given a very low likelihood and very low consequence rating.	Very Low	Very Low	**Very Low**
Impacts on Local Property Market There is anticipated to be a short-term increase in demand for accommodation during construction whereby the majority of workers are anticipated to reside outside a one-hour drive of the Project site, however, the workers are primarily anticipated to be accommodated through existing accommodation village capacity within Dysart. Operational workers will be accommodated through the refurbished and expanded Lake Vermont Accommodation Village. The Social Impact Assessment (SMEC, 2022) suggests there is ample capacity for Dysart to provide housing for families moving to town (with approximately 42.5% of total dwellings unoccupied), however, the low quality of housing may present a barrier to permanent relocations. There is not expected to be a substantial effect on housing. It is, therefore, assessed that any potential increase in demand for housing has a low likelihood of placing upward pressures on residential property prices, and any impact is likely to be small (low consequence), with an overall impact rating of very low.	Low	Low	**Very Low**

Impact Description	Likelihood	Consequence	Overall Impact
Impacts on Industry from Exchange Rates The Project will result in the export of over 100 Mt of coal that would not otherwise occur without the Project. There is some potential for this export activity to result in an increase in exchange rates as a result of Project's impacts on balance of payments, which would make Australian exports less competitive, while imported goods and services would cost comparatively less). This primarily impacts industries that operates in global markets competing with international producers, such as agriculture and manufacturing. Industries such as agriculture, manufacturing and tourism are strong contributors to the Queensland and national economy, though the contribution of these industries can fluctuate due to a number of macro-economic factors (including exchange rates). However, considering the total export value of the Project relative to total national exports, the Project is anticipated to result in a relatively immaterial impact on state and domestic trade balances, and thereby have a negligible impact on factors such as exchange rates and the value of the Australian dollar. As such, an overall impact rating of very low has been allocated (in consideration of the low likelihood and very low consequence).	Low	Very Low	**Very Low**
Impact on Economic Resources The Bowen Basin contains the largest coal reserve in Australia, extending over approximately 60,000 square kilometres (BBGG, 2022). This Catchment represents a significant contribution to the State of Queensland's coal production, its most significant export commodity. Queensland produced approximately 218,500,500 tonnes of saleable coal in 2020-21 (Department of Resources, 2021). The Project will provide an extended supply source to the export market, which will thereby improve security of supply. The Project is anticipated to provide up to 6.2 Mtpa (by 2030-31) of product coal for the export market, which will only further benefit the overall supply with Queensland and support future demand. Queensland's untapped coal resources have been estimated at 63 billion tonnes of raw coal, as of 2019, and the Project will extract only 0.1% of these identified reserves, indicating there will still be a large quantity of remaining resources following extraction associated with the Project (QRC, 2019). As such, an overall impact rating of very low has been allocated (in consideration of the low likelihood and very low consequence).	Low	Very Low	**Very Low**

Source: AEC.

6. CUMULATIVE IMPACT ASSESSMENT

This section provides an assessment of the cumulative economic impacts arising from the proposed Project in combination with other established mines and expected future mining operations in the Catchment, as well as other potential major projects.

6.1 CUMULATIVE IMPACT ASSESSMENT FRAMEWORK

The cumulative impact assessment examines the potential cumulative impact of a large number of major infrastructure and industry projects (including the Project) being developed concurrently in the Catchment using a risk assessment framework described in Appendix A.

In interpreting this analysis, note the cumulative impact assessment ratings (likelihood, consequence, and overall impact ratings) are based on the potential for cumulative development to exacerbate the impacts of the Project (as outlined in Section 5.9) and to what degree. The impact assessment does not assess the aggregate impacts of all developments in combination, but rather the relative implications of developing the Project should other projects also be undertaken concurrently.

Projects included for consideration in the cumulative impact assessment are outlined in the table below. Only projects within a 50 km radius of the Project have been included in the cumulative impact assessment. This is because the impacts of the Project are anticipated to be felt most acutely locally, where the bulk of Project activity will occur, and on the basis the other regions within the Catchment have sufficiently large economies to withstand the cumulative impact the Project may place on these economies. Existing operational projects have not been included in the table below, however, these are inherently incorporated in the analysis as they form part of the existing economic conditions in the Catchment for which the assessment of impacts in Section 5 was undertaken.

Table 6.1. Projects Included for Consideration in the Cumulative Impact Assessment

Project	Location
Saraji East Project (proposed)	On land adjoining the western boundary of the Project
Olive Downs	Approximately 2 km to the north of the Project
Olive Downs North	Approximately 40 km to the north of the Project
Winchester South Project (proposed)	Approximately 8 km to the north north-west of the Project
Eagle Downs	Approximately 13 km to the north-west of the Project
Vulcan Complex	Approximately 20 km to the north-west of the Project
Isaac Plains East and Isaac Plains East expansion	Approximately 50 km to the north-west of the Project

Summary details of these projects are provided in the Major Projects section in Appendix A. The cumulative impact assessment focuses on the potential for impacts identified in Section 5 to be exacerbated by the concurrent development of a range of projects in the Catchment. In undertaking this analysis, it has been assumed that all projects identified proceed in accordance with timelines outlined in Appendix A (based on existing information in the public domain); for projects in which timelines are not known or are currently on hold, specific timings have not been adopted and it has been assumed these will not crossover with the timing for the Project.

It should also be recognised that some of the mining projects, like the Project, will augment or replace existing mining operations that are nearing completion. Where this occurs, much like with the Project these projects will effectively result in a continuation of jobs and economic activity rather than a genuine lift in activity (outside of short-term construction impacts).

6.2 POTENTIAL CUMULATIVE IMPACTS

6.2.1 Potential Beneficial Cumulative Impacts

The development of the Project, in combination with multiple other major projects will result in higher overall output, GRP, employment and household income estimates in the Catchment and Queensland than those depicted in Section 5.9 (though flow-on impacts of the Project specifically may be reduced due to competition for resources

and a requirements for higher levels of imports if all projects proceed). Other potential beneficial impacts of concurrent development may include:

- Stabilisation and growth in the Catchment population which has seen declining and slowing growth in previous years.
- Additional business activity and population would increase demand for a range of business and household support services. It is expected that the delivery of a suite of projects will provide an important contribution to stabilising and supporting growth in the Catchment in the medium term.
- Increased labour compensation and real wage effects in order to attract constrained labour resources, thereby enhancing some household incomes.
- Development of a "critical mass" of projects to support existing and potentially expand local supply chain networks.
- Increased government revenues through taxation and royalties.
- Coordinated and potentially enhanced use of infrastructure developed to support major projects.
- Enhanced business, consumer and investor confidence arising from greater certainty in demand for goods, services and local infrastructure and assets.

While there are some real and tangible cumulative benefits likely to arise from the concurrent development of a number of projects, with respect to government as well as local community and business investment in the local and Catchment economy, it is more important to understand the stresses that will be collectively created by multiple projects. As such, the focus of the cumulative impact assessment is on understanding these stresses.

6.2.2 Potential Adverse Cumulative Impacts

Key resources (factors of production) likely to be affected by development of multiple projects in terms of increased demand and competition include:

- Labour.
- Capital.
- Accommodation and land.
- Infrastructure/ services.

Adverse impacts potentially resulting from increased stresses on the above factors of production have been identified through the preceding analysis, desktop review of other projects proposed for the Catchment and the impacts identified in relevant documentation. The key potential adverse impacts expected to result are assessed below and include:

- Impacts on local/ Queensland business through competition for labour and labour draw.
- Impacts on agricultural production.
- Impacts on residential property values through increased demand and amenity effects.
- Impacts on trade exposed industries through changes to Australia's balance of payments, and the Australian dollar and exchange rates affects.
- Impacts on economic resources through increased extraction.

Table 6.2. Assessment of Cumulative Adverse Impacts

Impact Description	Likelihood	Consequence	Overall Impact
Impacts on Local Business from Competition for Resources The development of the Project as well as other proposed projects for the Catchment will result in additional demand and competition for labour and other inputs to supply these projects. This may erode the viability of some businesses, in particular smaller businesses operating near the margin or lower income paying industries that may struggle to attract and retain labour. As the Project will, effectively, deliver a continuation in operational activity, with a short-term increase in workforce during construction, the contribution of the Project to this would be smaller relative to the adverse impacts generated by other proposed projects upon the baseline environment outlined in Section 4. The Project, in consideration of other major projects, is assessed of having a moderate likelihood of impacting on local business through competition for resources with a low consequence, providing an overall impact rating of low.	Moderate	Low	**Low**
Impacts on Agricultural Production Some of the other developments considered in the cumulative impact assessment are likely to impact on agricultural production through disruption or take-up of land. These mining-related projects may be developed on land that is currently primarily used for agricultural activities, most of which will have a larger footprint than the Project. The cumulative impacts on land availability for agricultural production of all proposed projects proceeding is considered possible to exacerbate the adverse impacts on agricultural production that may be delivered by the Project alone, through a combination of reduced capacity to replace this activity elsewhere in the Catchment and overall contraction of land available for agricultural purposes. However, the likelihood of the Project tangibly contributing to a reduction in grazing activity is still considered low in consideration of the cumulative consequence of these projects, in consideration of the very low disturbance to agricultural land afforded by the Project and in consideration of rehabilitation achieving a post mining land use of grazing. Where this does occur, the impact is assessed as being very low, providing an overall impact rating of very low.	Low	Very Low	**Very Low**
Impacts on Local Property Market The cumulative development of the Project as well as the other projects will increase overall labour requirements in the Catchment which has the potential to increase demand for residential property both locally (i.e., Dysart, Middlemount, Moranbah, and surrounding areas) and in nearby major centres such as Mackay. While most workers will operate on a DIDO basis, in consideration of the large workforces for projects the additional demand for residential property that may be generated by the Project has a moderate likelihood of placing upward pressure on property prices in these centres. The Social Impact Assessment (SMEC, 2022) suggests demand for housing from the Project is expected to be low and while this may increase if competition for local labour from other projects results in the Project sourcing more labour from outside the local area than anticipated, the impact generated by the Project is still expected to be relatively small (low consequence) even where other projects result in the local property market tightening, providing an overall impact rating of low.	Moderate	Low	**Low**

Impact Description	Likelihood	Consequence	Overall Impact
Impacts on Industry from Exchange Rates Some projects considered in the cumulative impact assessment will directly result in increased exports over and above what would be achieved by the Project alone. The combination of these projects is likely to place upward pressure on exchange rates in consideration of national trade balances, and thereby adversely affect trade-exposed industries, and it is possible the contribution of the Project's exports to exchange rate impacts may be exacerbated (moderate likelihood). The impact on exchange rates (and thereby trade-exposed industries) is assessed to be higher than the impact of the Project in isolation, though the marginal impact of the Project on exchange rates will still be small (low consequence), providing an overall impact rating of low.	Moderate	Low	**Low**
Impact on Economic Resources The projects listed above will assist in increasing the Catchment's supply of coal product for Queensland's export market. The Project, in consideration of the other projects listed above, will provide an extended supply source to the export market, and thereby increase overall depletion of Queensland's remaining coal supply. However, Queensland's untapped coal resources have been estimated at 63 billion tonnes of raw coal, as of 2019, and coal production from identified major projects will extract a very small proportion of these reserves. This indicates that even in consideration of the other projects listed above, the Project's impacts on the availability of coal resources will still be negligible (QRC, 2019). An overall impact of very low is assessed (based on a low likelihood and very low consequence).	Low	Very Low	**Very Low**

Source: AEC.

7. MITIGATION AND ENHANCEMENT STRATEGIES

Assessment of the economic impacts of the Project above identified the Project will extend Lake Vermont's activities to provide an important retention of economic activity within the Catchment and Queensland economy that would otherwise be lost without the Project. Economic impacts of the Project are anticipated to be overwhelmingly positive, with minimal adverse economic impacts.

While the remaining potential adverse economic impacts from the Project are low, there are some potential areas that should be monitored, and strategies employed to ensure benefits of the Project to the Catchment and Queensland are maximised and any potential adverse impacts minimised:

- To minimise adverse impacts on agricultural production in the Catchment, the proponent will avoid or minimise disturbance of productive land in any areas not immediately affected by mining activity and ensure land above the underground mine (where possible) is of adequate safety standards for continuing grazing activities.
- To maximise local benefits derived from the Project, and consistent with existing policies implemented at Lake Vermont, the proponent and contractors engaged by the proponent will be encouraged to source labour locally where possible and practical and provide training opportunities where practical. The proponent will also implement training programs to assist existing open cut mine workers transition to underground mining roles should they wish to do so, in order to maintain continuity of workforce.
- The proponent has long standing relationships with local business and an established supply chain for its existing activities in the Catchment. To maximise local benefits derived from the Project, the proponent (and contractors engaged by the proponent) will continue to support local business by utilising these established supply networks and providing sufficient opportunities and information for local business to secure new supply contracts.
- While the Project is anticipated to have minimal impacts in terms of additional demand for accommodation / housing in the local area, the proponent will monitor the local accommodation / housing market and demands placed on it by its workforce. The Proponent has also committed to provide financial support to the Isaac Affordable Housing Trust, to support low-cost housing development within Dysart.

It should be recognised that these strategies form part of the proponent's Project planning and modelling of impacts in this report has been based on these strategies being implemented.

8. COST BENEFIT ANALYSIS

8.1 METHOD AND APPROACH

The CBA assesses the impact of the Project scenario compared to a scenario without the Project to present the incremental benefits and costs delivered by the Project, to understand the net benefit of the Project to Queensland. For the purposes of the CBA, the Project scenario reflects the overall activity of the Lake Vermont Mining Complex with the Project, compared to a base case of activity at the Lake Vermont Mining Complex without the Project.

The methodology used in conducting the CBA is outlined in Appendix D. Other key considerations for the CBA are outlined in the sections below.

8.1.1 Modelling Timeframe

The CBA examined the impacts of the Project across a 40-year modelling timeframe, from financial year 2021-22 to financial year 2060-61, incorporating the construction period, the operational life of the Lake Vermont Mining Complex with the Project, as well as decommissioning/ rehabilitation (noting decommissioning/ rehabilitation expenditure has all been included in one year in 2060-61).

Modelling for the impacts has been undertaken starting from the financial year ending June 2022, with all dollar values presented in 2021-22 Australian dollar terms and all values discounted to 2021-22 financial year values.

8.1.2 Discount Rates

A base discount rate of 7% has been used for demonstration purposes (in line with State and national standards for real discount rates used in economic appraisal of projects), with additional discount rates also examined (4% and 10%). As all values used in the CBA are in real terms, the discount rate does not incorporate inflation (i.e., it is a real discount rate, as opposed to a nominal discount rate).

8.1.3 Description of Project Scenarios Examined

The CBA examines the net (or incremental) impacts (benefits and costs) of the Project (the 'Project Case' scenario) compared to a 'Base Case' scenario of what would be expected to occur without the Project. For the purposes of this CBA:

- The Project Case scenario is as per the Lake Vermont Mining Complex – Project Case description in section 3.2.
- The Base Case scenario assumes the Project is not developed and is as per the Lake Vermont Mining Complex – Base Case scenario in section 3.2, which outlines activity of the Lake Vermont Mining Complex where the Project does not proceed.

In the CBA, only the incremental difference in activity (benefits and costs) between the Project Case and Base Case scenarios is modelled. To this end, the Lake Vermont Mining Complex – Incremental Additional Activity scenario in section 3.2 is the scenario that has been modelled in the CBA.

8.2 COSTS AND BENEFITS EXAMINED

8.2.1 Costs

8.2.1.1 Initial Capital Expenditure

The incremental additional initial capital expenditure and timing is as per that outlined in the Lake Vermont Mining Complex – Incremental Additional Activity scenario in section 3.2.2.1.

8.2.1.2 Replacement Capital Expenditure

The incremental additional replacement capital expenditure and timing is as per that outlined in the Lake Vermont Mining Complex – Incremental Additional Activity scenario in section 3.2.3.

8.2.1.3 Operating Expenditure

Incremental additional annual operating expenditure is as per that outlined in the Lake Vermont Mining Complex – Incremental Additional Activity scenario in section 3.2.4.

8.2.1.4 Decommissioning/ Rehabilitation Expenditure

Post-mining decommissioning and rehabilitation expenditure is per that outlined in the Lake Vermont Mining Complex – Incremental Additional Activity scenario in section 3.2.5. For the purposes of the CBA the full $73.2 million in post-mining decommissioning and rehabilitation expenditure was included in 2060-61, though it is noted that while the bulk of this expenditure will occur in the first year or two post-mining the site rehabilitation activities will be ongoing over an 18 year period and some of this $73.2 million will be spent in later years. Including the full amount in 2060-61 thereby presents a conservative approach (as due to discounting, disaggregating this expenditure across 18 years would result in a lower overall present value of cost).

8.2.1.5 Biodiversity Offset

The Biodiversity Offset Strategy (Earthtrade, 2022) has identified approximately 1,190 hectares of offset area will be required to offset impacts of the Project to identified areas of environmental significance (including brigalow and poplar box threatened ecological communities, as well as habitat for koalas, ornamental snakes, greater gliders and squatter pigeon breeding and foraging). This biodiversity offset will be provided on land owned by Bowen Basin Coal.

Advice from Earthtrade (2022) is that an offset management cost of approximately $2,000 per hectare over 20 years should be allowed for the biodiversity offset, reflecting a total offset value of approximately $47.6 million. This value can be considered a reflection of the total environmental/ biodiversity cost of the Project and has been included in modelling in 2023-24 (noting that while the offset management will occur over 20 years, the cost of the Project to biodiversity will be delivered up front).

8.2.1.6 GHG Emissions

Estimates of total greenhouse gas (GHG) emissions generated by the Project are outlined in the Air Quality and Greenhouse Gas Assessment (Katestone Environmental, 2022). The assessment examined GHG emissions from the Project specifically, as well as those associated with existing operations at Lake Vermont.

The timing of emissions from existing operations will differ between the 'base case' and the 'Project case' scenarios based on differences in timing of production for existing operations between these scenarios, however, only the 'Project case' was modelled by Katestone Environmental (2022). To understand the incremental change in emissions due to the Project, the estimates of GHG emissions for the Project and existing operations between Year 1 and Year 35 in the Katestone Environmental (2022) assessment were converted to estimates of emissions per tonne of coal produced and applied to annual production in the 'base case' and the 'Project case' scenarios over these years. Emissions associated with construction activities (Year -1 and Year 0 in the Air Quality and Greenhouse Gas Assessment) of 19,261 t CO_2-e (Year -1) and 27,261 t CO_2-e (Year 0) were then added to the 'Project case' scenario as occurring in 2023-24 and 2024-25, respectively.

Emissions are expressed as tonnes of carbon dioxide equivalent (t CO_2-e). Scope 1 and 2 emissions have been included in this assessment (but Scope 3 emissions have been excluded).

Based on the analysis by Katestone Environmental (2022) the following emissions per tonne of coal produced were used:

- Project: 0.1225 t CO_2-e per tonne of coal produced.
- Existing operations: 0.0923 t CO_2-e per tonne of coal produced.

The above rates of GHG emissions per tonne of coal produced were applied to coal production in the 'base case' and the 'Project case' scenarios to provide an indicative estimate of incremental additional GHG emissions produced per annum. While it is acknowledged actual timing of emissions will include other factors than production rates, for the purposes of approximating annual incremental additional emissions this basis was considered appropriate.

In valuing the cost of emissions, the spot price for Australian Carbon Credit Units (ACCUs) was used, from the Clean Energy Regulator (2022). As of March 2022, the spot price of ACCUs was estimated at $30.50 per t CO_2-e. This price was used in this assessment, applied to annual incremental t CO_2-e (as calculated above) to provide the total value of additional GHG emissions resulting from the Project each year.

8.2.1.7 Costs of Increased Travel

A Transport Impact Assessment was undertaken by Stantec (2022) which included an assessment of the additional traffic movements that would be generated by the Project. In undertaking the assessment of traffic generated, Stantec examined:

- Traffic generation related to Project workforce vehicle movements, including private vehicle (car) and bus movements.
- Heavy vehicle traffic generation for the transport of goods to and from site.

In examining workforce related traffic, select years of Project activity were examined covering construction and operations activities. Relevant assumptions used are outlined below:

- Construction:
  - Based on 200 workers in Year -1.
  - 50% of the workforce travel to site by car, 50% by bus.
  - 80% of workforce works day shift, 20% works night shift.
- Operations:
  - Based on 410 workers (peak operations production years), with 205 workers rostered on at any one time.
  - 5% of the workforce travel to site by car, 95% by bus.
  - 55% of the workforce works day shift, 45% works night shift.

Using the above assumptions Stantec estimate the following level of vehicle movements per day on average for the workforce, including inbound and outbound trips as separate vehicle movements (Table 8.1). For inclusion in the CBA, average daily vehicle movements for construction and operations were converted to a per worker estimate and then applied to estimates of annual employment for the Project case and base case, to estimate the incremental additional vehicle movements related to the workforce due to the Project. An average travel distance of 20 kilometres (km), approximately equivalent to the distance between the mine site and Dysart, was assumed to estimate the total incremental additional travel distance.

Table 8.1. Project Workforce Related Traffic

Time Period	Workers		Vehicle Movements (In + Outbound Trips)	
	Car	Bus	Car	Bus
Construction (Year -1)				
Day	80	80	160	18
Night	20	20	40	6
Operations (Peak)				
Day	6	107	12	28
Night	4	88	8	26

Source: Stantec (2022).

Heavy vehicle movements were estimated annually for Year -1 to Year 3 and assumed to thereafter remain at approximately Year 3 levels (Stantec, 2022). A summary of heavy vehicle movements (including inbound and outbound trips as separate vehicle movements) by year and class of vehicle is presented in Table 8.2.

For inclusion in the CBA:

- Construction-related heavy vehicle movements were included as per presented by Stantec (2022), with Year -1 included as occurring in 2023-24 and Year 0 included as occurring in 2024-25. For Year 1 (2025-26), it was also assumed that 916 of the Class 5 movements reflect construction-related activity (i.e. the difference between Year 1 and Year 2 Class 5 movements).
- Operations-related vehicle movements were converted to a per tonne of coal produced basis in order to develop indicative estimates of the incremental change in heavy vehicle movements in the Project case relative to the base case. This was done using the Year 3+ heavy vehicle estimates and dividing by 4.5 Mt (approximate average annual production from the Project during peak production years). The heavy vehicle movements per tonne of coal produced was then applied to total coal production in the Project case and base case to identify an indicative incremental difference in heavy vehicle movements.
- Incremental additional Saraji Road vehicle movements were converted to total vehicle kilometres travelled based on an assumed travel distance of 90 km per vehicle movement.
- Incremental additional road vehicle movements to Mackay were converted to total vehicle kilometres travelled based on an assumed travel distance of 180 km per vehicle movement (noting the travel distance between the mine site and Peak Downs Highway for these movements is already captured in the Saraji Road segment).

Table 8.2. Heavy Vehicle Movements (In + Outbound Trips)

Vehicle Class	Year -1	Year 0	Year 1	Year 2	Year 3+
Saraji Road					
Class 4	0	0	208	208	300
Class 5	1,736	2,022	1,020	104	104
Class 9	458	208	368	738	328
Class 10	7,072	7,072	156	156	156
Mackay					
Class 4	0	0	208	208	300
Class 5	1,736	2,022	1,020	104	104
Class 9	458	208	368	738	328
Class 10	0	0	52	52	52

Notes: Class 4 = 3-axle trucks; Class 5 = 4-axle trucks; Class 9 = 6-axle articulated vehicles; Class 10 = B-Doubles.
Source: Stantec (2022).

In valuing the costs of increased travel due to the Project, three components were examined:

- Additional fuel and other vehicle operating costs.
- Additional road maintenance costs (due to increased road damage).
- Additional risks and costs related to vehicle crashes and safety.

The valuation approaches for these are examined below.

Fuel and Other Vehicle Operating Costs

Estimated fuel costs for road traffic were based on an average price in Moranbah on 10th June 2022 for unleaded fuel of 195.50 cents per litre (c/L) and of diesel of approximately 211.50 c/L (PetrolSpy, 2022). GST of 10% and fuel excise rate of 44.20 c/L (ATO, 2022) were subtracted from these prices to provide the resource cost for diesel and unleaded petrol. Average kilometres travelled per litre of diesel were estimated at 0.12 litres per kilometre for cars, 0.22 litres per kilometre for buses and 0.41 litres per kilometre for heavy vehicles (ABS, 2020).

Additional maintenance costs for road vehicles were estimated based on data from ATAP (2016) and accounting for inflation (ABS, 2022b) as per below, with the following rates applied to the travel distances estimated above:

- 7.36 cents per kilometre (c/km) for cars.
- 15.31 c/km for buses.

- 16.36 c/km for Class 4 heavy vehicles (3 axles).
- 22.33 c/km for Class 5 heavy vehicles (4 axles).
- 26.65 c/km for Class 9 heavy vehicles (6 axle articulated vehicles).
- 30.98 c/km for Class 10 heavy vehicles (B-Doubles).

Road Maintenance Costs

Additional road damage costs were estimated based on road damage costs from Transport for NSW (TfNSW, 2020) inflated to 2022-dollar terms (ABS, 2022b), with the following rates applied to the travel distances estimated above:

- 4.60 cents per kilometre (c/km) for cars.
- 8.64 c/km for buses.
- 15.86 c/km for Class 4 heavy vehicles (3 axles).
- 15.61 c/km for Class 5 heavy vehicles (4 axles).
- 20.23 c/km for Class 9 heavy vehicles (6 axle articulated vehicles).
- 26.42 c/km for Class 10 heavy vehicles (B-Doubles).

Road Safety Cost

The increase in travel can be expected to provide an increased risk of road crashes. Data from ATAP (2016) provides average crash rates on non-urban roads per 100 million vehicle kilometres travelled for a range of road types and widths.

Based on the crash rates corresponding to the types of roads outlined in the Transport Impact Assessment (Stantec, 2022), the following average estimated crash rates per 100 million vehicle kilometres travelled were used:

- 1.06 crashes resulting in a fatality.
- 20.19 crashes resulting in serious injury.
- 24.75 crashes resulting in minor injuries/ property damage.

The following values per crash type were used, based on value estimates from ATAP (2016) inflated to 2022-dollar terms (ABS, 2022b):

- Fatal crashes (including medical costs, insurance, workplace production losses, legal costs, vehicle and property repair costs, and other costs such as travel delays and emergency service provision): approximately $2.81 million per crash.
- Serious injury crashes: approximately $625,500 per crash.
- Minor injury / property damage crashes: approximately $10,800 per crash.

These crash rates and values per crash were applied to the travel distances estimated above.

8.2.2 Benefits

8.2.2.1 Value of Production/ Revenue

Incremental additional annual revenue is as per production and price estimates outlined in sections 3.2.4.1 and 3.2.4.2, based on the estimated production for the overall Lake Vermont Mining Complex in the Project case the estimated production for the overall Lake Vermont Mining Complex without the Project (base case).

8.2.2.2 Benefits to Labour

While expenditure on employees represents a cost (and is included in the operating costs in section 3.2.4.3), employment also represents a social benefit to those employed through a number of avenues, including the

provision of incomes (and thereby providing higher standards of living), a sense of identity, self-worth, and satisfaction. Employment has also been linked with a number of positive mental and physical health benefits.

Labour benefits are often excluded from CBA. The primary reason for this exclusion is due to the use of "shadow wages"[5] in estimating operating costs, or the use of a highly conservative assumption that the labour would otherwise be employed elsewhere with minimal difference in compensation. However, for simplicity and consistency with the modelling of Project impacts in section 5, this CBA has used a market wage in estimating operating costs and an assumption that labour would otherwise be employed elsewhere with minimal difference in compensation is considered inappropriate where labour would not otherwise be gainfully employed.

COVID-19 has had a significant impact on the national and Queensland labour markets, and research in both Australia and overseas suggests the economic ramifications of COVID-19 may be felt for decades. The Project will deliver an important continuation of employment opportunities at the Lake Vermont Mining Complex. It is therefore considered appropriate to consider the employment supported by the Project as a benefit to those employed.

Employment can be valued in terms of the wages and salaries labour receives less income tax and the opportunity cost to these individuals for their time. The opportunity cost is often valued based on the alternative income they would receive without the Project, either through alternative employment or through social security payments. For the purposes of this assessment it was assumed that 25% of the wages and salaries paid to operations staff represents a net benefit to these individuals compared to the base case. Estimated labour and labour compensation was included as per modelled estimates in the Regional Impact Assessment (see section 5.2).

8.2.3 Impacts That Have Not Been Quantified/ Valued

The CBA includes consideration of environmental impacts of the Project in terms of impacts on biodiversity and GHG emissions. Other potential environmental impacts were not quantified or valued for inclusion in the CBA on the basis that studies undertaken to support the EIS indicate such impacts are not anticipated to be significant in consideration of mitigation strategies to be adopted.

Potential impacts on grazing activities were also not quantified and valued for inclusion in the CBA on the basis that as the Project's impacts on grazing activities are anticipated to be minor (see section 5.3.3).

8.3 CBA RESULTS

8.3.1 Summary of CBA

Table 8.3 below outlines the present value (PV) of the incremental additional costs and benefits associated with the Project case relative to the base case, between the financial year ended June 2022 and financial year ended June 2061, at discount rates of 4%, 7% and 10%.

The CBA modelling for the Project at a discount rate of 7% is economically desirable, with the following results:

- Net Present Value (NPV) of $968.2 million over the assessment period with total PV benefits of approximately $4.48 billion compared to an aggregated PV costs of approximately $3.52 billion.
- A Benefit Cost Ratio (BCR) of 1.28, highlighting that the Project is estimated to return $1.28 for every dollar cost.

The CBA identifies that at a 7% discount rate the Project is economically desirable with the benefits outweighing the costs. The Project returns a desirable result across each of the discount rates examined, with the BCR ranging between 1.23 (10% discount rate) and 1.29 (4% discount rate). The CBA is insensitive to the discount rate used with minimal change in BCR across discount rates examined. The Project has an IRR of 18.2%.

[5] The shadow wage refers to the opportunity cost of labour. Where a shadow wage (rather than market wage) is used in estimating operating costs, the labour benefit is inherently captured in the CBA and should not be measured separately.

Table 8.3. Summary of CBA Results

Impact	PV ($M) – 4% Discount Rate	PV ($M) – 7% Discount Rate	PV ($M) – 10% Discount Rate
Costs			
Initial Capital Expenditure	$631.8	$561.5	$501.3
Replacement Capital Expenditure	$154.8	$99.7	$65.7
Operating Expenditure	$4,746.0	$2,677.4	$1,597.1
Decommissioning/ Rehabilitation Expenditure	$15.9	$5.2	$1.8
Biodiversity Offset	$44.0	$41.6	$39.3
GHG Emissions	$196.6	$121.3	$78.6
Cost of Increased Travel	$12.1	$8.7	$6.7
Total Costs	***$5,801.1***	***$3,515.3***	***$2,290.6***
Benefits			
Value of Production/ Revenue	$7,249.7	$4,343.5	$2,729.9
Benefits to Labour	$247.9	$140.0	$84.8
Total Benefits	***$7,497.6***	***$4,483.5***	***$2,814.8***
Summary			
Net Present Value (NPV)	**$1,696.5**	**$968.2**	**$524.2**
Benefit Cost Ratio (BCR)	**1.29**	**1.28**	**1.23**

Source: AEC.

8.3.2 Sensitivity Analysis

The sensitivity analysis was undertaken using a Monte Carlo analysis (refer to Appendix D) across the benefits and costs examined in the CBA modelling (the assumptions used are outlined in section 8.2).

The sensitivity of the CBA was tested across defined ranges for the benefits and costs examined (ranges examined outlined in the table note under Table 8.4), with the results reported in Table 8.4 in terms of the modelled change in NPV (7% discount rate) resulting from the variance in each benefit and cost. The final row of the table provides a "combined" or overall sensitivity of the model findings to the tested ranges for each benefit/ cost in combination. The table also outlines the distribution used allowing for a 10% confidence interval, with the "5%" and "95%" representing a 90% probability that the distribution and NPV will be within the range outlined in the table.

The table shows that, at a discount rate of 7%, there is a 90% probability the Project will provide an NPV between $120.5 million and $1.81 billion. The NPV is most sensitive to the net operating result (i.e., difference between value of production/ revenue and operational expenditure in the table below); the larger the net operating result the larger the NPV. Sensitivity testing returned a positive NPV across 96.9% of the 5,000 iterations run in Monte Carlo analysis.

Table 8.4. Sensitivity Analysis Summary, Discount Rate 7%

Variable	NPV ($M)	
	5%	95%
Costs		
Initial Capital Expenditure	$824.6	$1,052.8
Replacement Capital Expenditure	$899.0	$984.5
Operating Expenditure	$523.7	$1,459.9
Decommissioning/ Rehabilitation Expenditure	$923.4	$992.1
Biodiversity Offset	$927.8	$1,000.6
GHG Emissions	$912.1	$990.4
Cost of Increased Travel	$912.2	$1,012.9
Benefits		
Value of Production/ Revenue	$195.4	$1,713.4
Benefits to Labour	$933.9	$984.0
Combined	**$120.5**	**$1,810.3**

Notes: The percent distributions used for each variable are provided below:
- Initial Capital Expenditure: maximum 30% higher, minimum 20% lower.
- Replacement Capital Expenditure: maximum 30% higher, minimum 20% lower.
- Operating Expenditure: normally distributed with standard deviation of 0.1.
- Decommissioning/ Rehabilitation Expenditure: normally distributed with standard deviation of 0.1.
- Biodiversity Offset: normally distributed with standard deviation of 0.2.
- GHG Emissions: normally distributed with standard deviation of 0.2.
- Cost of Increased Travel: normally distributed with standard deviation of 0.2.
- Value of Production/ Revenue: normally distributed with standard deviation of 0.1.
- Benefits to Labour: normally distributed with standard deviation of 0.1.

Source: AEC.

REFERENCES

AARC Environmental Solutions (2021). *Lake Vermont Meadowbrook Project Introduction.* Brisbane, Queensland.

ABS (2012). *Census of Population and Housing 2011 – Employment by Place of Work*. Cat. No. 2068.0. Australian Bureau of Statistics, Canberra.

ABS (2017). *Census of Population and Housing 2016*. TableBuilder. Australian Bureau of Statistics, Canberra.

ABS (2020). *Survey of Motor Vehicle Use, Australia, 12 Months Ended June 2020*. Cat. No. 9208.0, Australian Bureau of Statistics, Canberra.

ABS (2021a). *Australian National Accounts: Input-Output Tables – Electronic Publication, 2020-21 tables*. Cat. No. 5209.0.55.001, Australian Bureau of Statistics, Canberra.

ABS (2021c). *Wage Price Index, Australia*. Cat. No. 6345.0, Australian Bureau of Statistics, Canberra.

ABS (2021d). Catchment Population Growth, Australia, 2020. Cat no. 3218.0. Australian Bureau of Statistics, Canberra. Accessed: 7 February 2022.

ABS (2021e). Building Approvals, Australia, August 2021. Cat no. 8731.0. Australian Bureau of Statistics, Canberra. Accessed: February 10 2022.

ABS (2021g). *Australian Statistical Geography Standard (ASGS): Volume 3 - Non ABS Structures, June 2020.* Cat no. 1270.0.55.003. Australian Bureau of Statistics, Canberra.

ABS (2022a). Taxation Revenue, Australia, 2020-21. Cat. No. 5506.0, Australian Bureau of Statistics, Canberra.

ABS (2022b). *Consumer Price Index, Australia*. Cat. No. 6401.0, Australian Bureau of Statistics, Canberra.

ABS (2022c). *Average Weekly Earnings, Australia*. Cat. No. 6302.0, Australian Bureau of Statistics, Canberra.

ABS (2022d). *Labour Force, Australia, Detailed, Quarterly*. Cat. No. 6291.0.55.003, Australian Bureau of Statistics, Canberra.

ATAP (2016). *Australian Transport Assessment and Planning Guidelines - PV2 Road Parameter Values*. Published by Australian Transport Assessment and Planning Guidelines Steering Committee, Transport and Infrastructure Council, Australian Government, Canberra.

ATO (2022). *Excise on Fuel and Petroleum Products*. Australian Taxation Office. Available from: https://www.ato.gov.au/business/excise-on-fuel-and-petroleum-products/lodging,-paying-and-rates---excisable-fuel/excise-duty-rates-for-fuel-and-petroleum-products/. Accessed: 10 June 2022.

Australian Government (2016). *Mine Closure, Leading Practice Sustainable Development Program for the Mining Industry.* Canberra, Australian Capital Territory.

Bowen Basin Coal (2019). *Draft terms of reference for an environmental impact statement under the Environmental Protection Act 1994.* Brisbane, Queensland.

BBGG (2022). *The Bowen Basin.* Available from: http://bbgg.cqu.edu.au. Accessed: 28 February 2022.

Clean Energy Regulator (2022). *Quarterly Carbon Market Report – March Quarter 2022*. Clean Energy Regulator.

CSQ (2021). *Explore by Project.* Available from: https://www.csq.org.au/major-projects-explorer/explore-by-project/?project=56034. Accessed: 18 November 2021.

Department of State Development (2017). *Economic Impact Assessment Guideline, April 2017.* Brisbane, Queensland.

Department of Resources (2021). *Queensland Production of Saleable Coal by Individual Mine.* Brisbane, Queensland.

DoESE (2022). *Small Area Labour Market Data*. Department of Education, Skills and Employment, Canberra. Accessed: 7 February 2022.

DoR (2021). *Queensland production of saleable coal by individual mines (tonnes) FY2016 to FY 2021*. Department of Resources, Brisbane. Accessed 8 February 2022.

Earthtrade (2022). *Lake Vermont Meadowbrook Project Biodiversity Offset Strategy*. Report prepared for Bowen Basin Coal by Earthtrade, Hervey Bay, Queensland.

Flegg, A.T., Lamonica, G.R., Chelli, F.M., Recchioni, M.C. and Tohmo, T. (2021). *A new approach to modelling the input-output structure of Catchment economies using non-survey methods*. Journal of Economic Structures, 2021, 10:12.

Jellinbah Group (unpublished). *Request for Information.* Brisbane, Queensland.

Katestone Environmental (2022). *Lake Vermont Meadowbrook Project: Air Quality and Greenhouse Gas Assessment*. Report prepared for Bowen Basin Coal by Katestone Environmental, Milton, Queensland.

Petrol Spy (2022). *Petrol Spy Australia.* Available from: https://petrolspy.com.au/. Accessed: 10 June 2022.

QGSO (2019). Population Projections – Catchments. Queensland Government Statistician's Office, Brisbane. Accessed: 8 February 2022.

QGSO (2021). *Residential land and dwelling sales*. Queensland Government Statistician's Office, Brisbane. Accessed: 9 February 2022.

QMCA (2021). *Mackay-Isaac-Whitsundays.* Available from: https://qmca.com.au/advocacy/2021qmppr//. Accessed: 18 November 2021.

QRC (2019). *Queensland Coal Reserves Revised Upwards as Resources Exploration Gets a Boost.* Available from: https://www.qrc.org.au/media-releases/queensland-coal-reserves-revised-upwards-as-resources-exploration-gets-a-boost/. Accessed: 28 February 2022.

Queensland Treasury (2020. *A Study of Long-Term Global Coal Demand.* Brisbane, Queensland.

Stantec (2022). *Lake Vermont Meadowbrook Project Transport Impact Assessment*. Report prepared for Bowen Basin Coal by Stantec Australia Pty Ltd, Brisbane, Queensland.

State Development (2021). *Coordinated Projects Map.* Available from: https://www.statedevelopment.qld.gov.au/coordinator-general/assessments-and-approvals/coordinated-projects/coordinated-projects-map. Accessed: 18 November 2021.

TfNSW (2020). *Transport for NSW Economic Parameter Values in Excel*. NSW Government, Transport for NSW, Sydney.

APPENDIX A: EXISTING ENVIRONMENT DETAIL

The below provides a summary of the existing environment of the Catchment and Queensland, as of March 2022.

Table A. 1. Summary Indicators

Indicator	Catchment	Queensland
Coal Production		
Coal Production (2020-21) tonnes	114,859,821	218,514,474
Coal Production Growth (2015-16 to 2020-21)	-2.4%	-1.9%
Gross Regional Product		
Gross Regional Product ($M) (2020-21)	$28,151.8	$366,237.8
Gross Regional Product Growth (Avg Ann. 2010-11 to 2020-21)	2.6%	2.2%
Gross Regional Product Growth (Avg Ann. 2015-16 to 2020-21)	1.5%	1.7%
Labour Force		
Labour Force (September 2021)	142,822	2,784,043
Labour Force Change (September 2011 to September 2021)	7,234 (5.3%)	388,877 (16.2%)
Labour Force Change (September 2016 to September 2021)	4,830 (3.5%)	265,960 (10.6%)
Unemployment		
Unemployment Rate (September 2021)	4.1%	6.1%
Unemployment Rate Change (September 2011 to September 2021) (ppt)	-0.9	0.6
Unemployment Rate Change (September 2016 to September 2021) (ppt)	-2.2	0.0
Population		
Population (2020)	259,505	5,176,186
Population Growth (Avg Ann. 2001 to 2020)	1.3%	2.0%
Population Growth (Avg Ann. 2015 to 2020)	0.03%	1.6%
Projected Population (2041)	335,631	7,163,672
Projected Population Growth (Avg Ann. 2021 to 2041)	1.3%	1.4%
Projected Population Growth (Avg Ann. 2031 to 2041)	1.3%	1.6%
Property Prices		
Average Attached Dwelling Price (June 2021)	$258,583	$432,000
Attached Dwelling Price Growth (Avg. Ann. 2011 to 2021)	-1.9%	1.8%
Attached Dwelling Price Growth (Avg. Ann. 2016 to 2021)	-1.0%	0.5%
Average Detached Dwelling Price (June 2021)	$363,148	$525,000
Detached Dwelling Price Growth (Avg. Ann. 2011 to 2021)	-0.4%	2.4%
Detached Dwelling Price Growth (Avg. Ann. 2016 to 2021)	1.3%	1.3%
Residential Building Approvals		
Residential Building Approvals (Number) (2020-21)	1,213	41,928
Residential Building Approvals (Value) (2020-21)	$616,497	$16,040,409
Residential Building Approval Growth (Number) (Avg Ann. 2012-13 to 2020-21)	-12.0%	7.8%
Residential Building Approval Growth (Value) (Avg Ann. 2012-13 to 2020-21)	-6.0%	4.0%
Non-Residential Building Approvals		
Non-Residential Building Approvals (Value) (2020-21)	$278,686	$7,812,075
Non-Residential Building Approval Growth (Value) (Avg Ann. 2012-13 to 2020-21)	-7.8%	-1.2%

Sources: ABS (2017), ABS (2021d), ABS (2021e), AEC, (unpublished), DoESE (2022), QGSO, (2019), DoR (2021).

MINING ACTIVITY

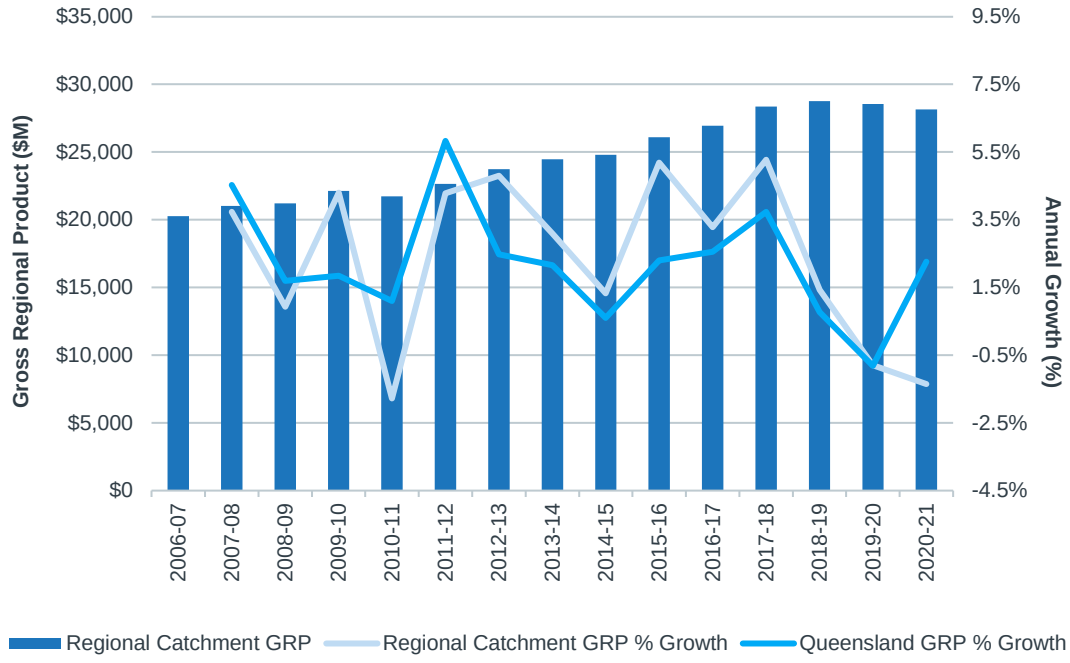
Table A. 2. Mining Activity, Catchment, 2006-07 to 2020-21

Year	Mining GVA ($M)	Mining Employment	Coal Production (tonnes)
2006-07	$6,003.2	9,769	-
2007-08	$6,214.8	9,672	-
2008-09	$6,080.4	12,251	-
2009-10	$6,683.1	14,003	-
2010-11	$5,922.6	15,684	-
2011-12	$5,818.2	15,715	-
2012-13	$6,730.7	17,351	96,068,224
2013-14	$7,168.0	18,151	113,340,935
2014-15	$8,004.4	16,899	128,803,105
2015-16	$9,947.4	16,366	129,446,119
2016-17	$10,718.3	15,731	123,378,212
2017-18	$11,658.6	16,939	137,065,593
2018-19	$12,367.8	19,619	133,338,968
2019-20	$12,543.0	18,418	127,354,062
2020-21	$11,562.7	19,810	114,859,821
Average	**$8,494.9**	**15,758**	**122,628,338**

Source: DoR (2021)

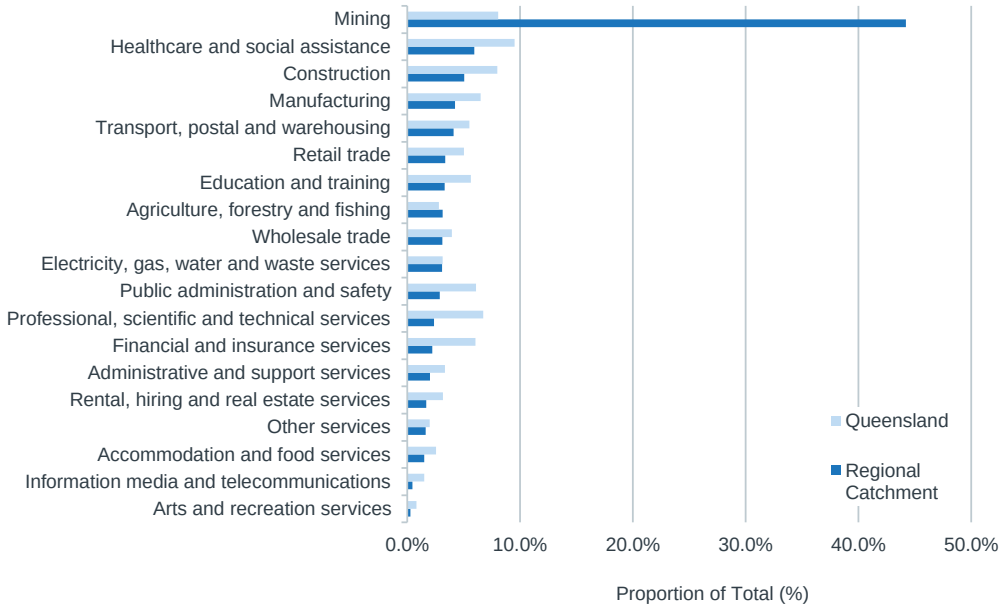
GROSS REGIONAL PRODUCT

Figure A. 1. Gross Regional Product, 2006-07 to 2020-21



Source: AEC (unpublished)

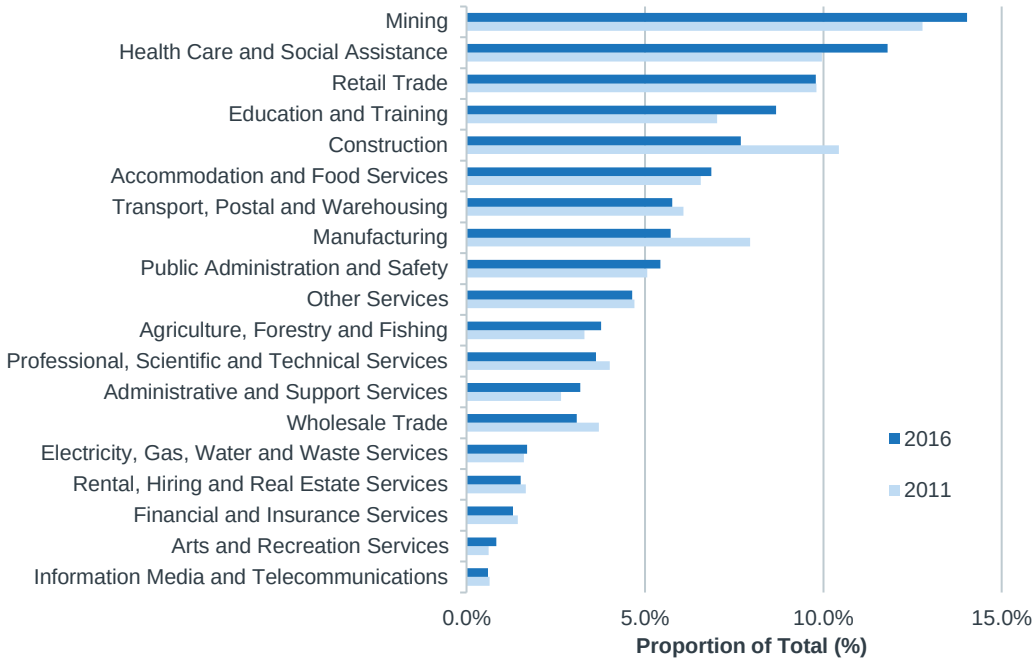
Figure A. 2. Gross Value Added by Industry, 2020-21



Source: AEC (unpublished)

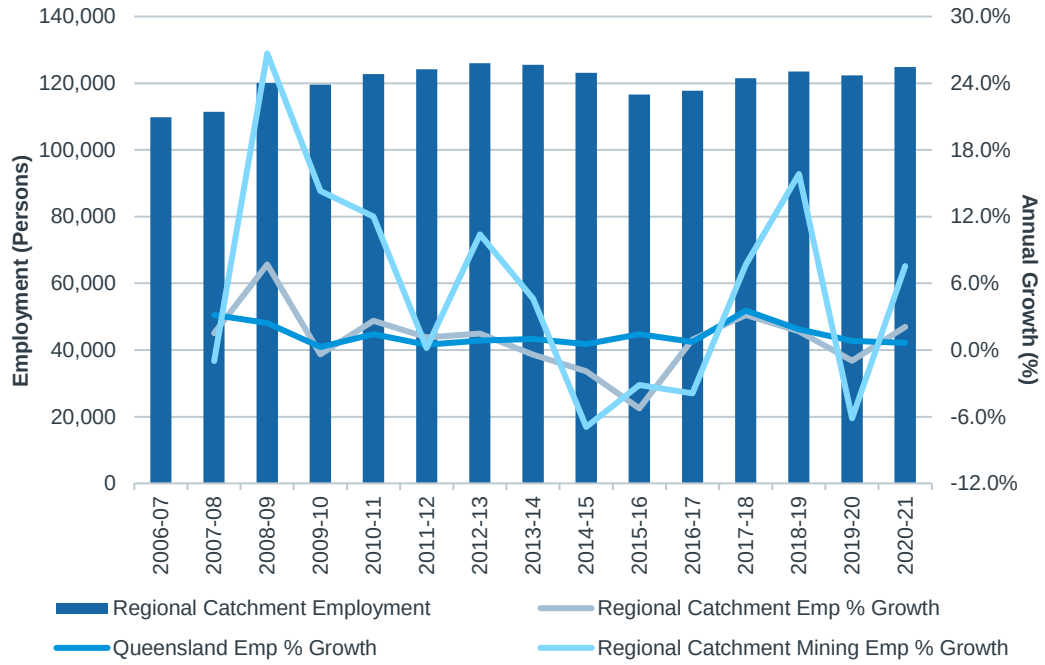
EMPLOYMENT

Figure A. 3. Employment by Industry, Catchment, PoW 2011 & 2016



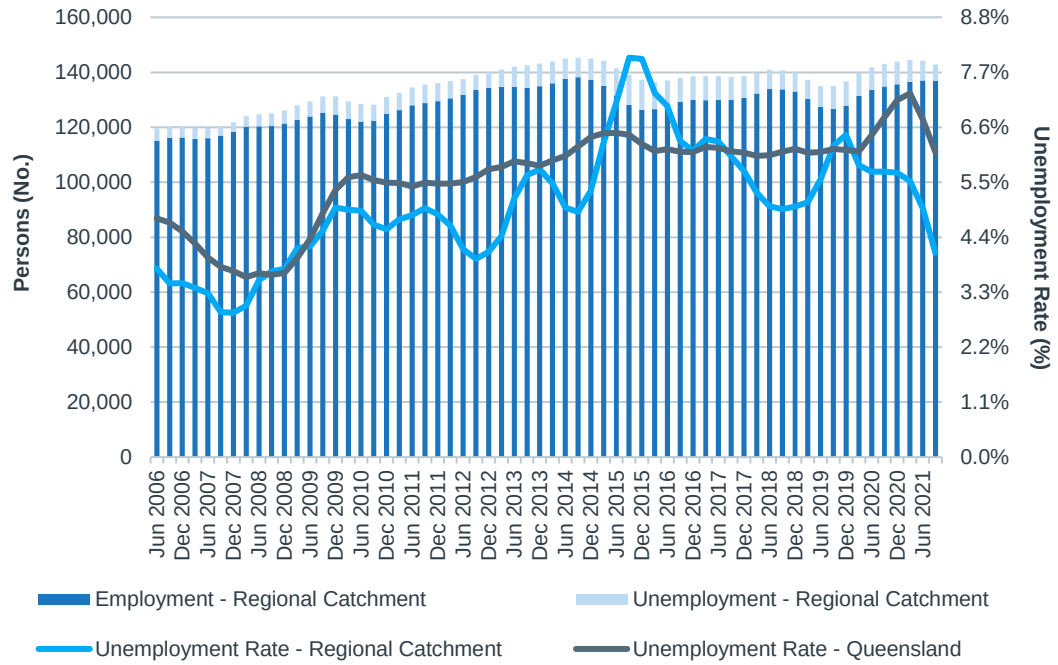
Source: ABS (2012), ABS (2017)

Figure A. 4. Employment, PoW, 2006-07 to 2019-20



Source: AEC (unpublished)

Figure A. 5 Unemployment and Labour Force, 2006 to 2021



Source: DoESE (2022)

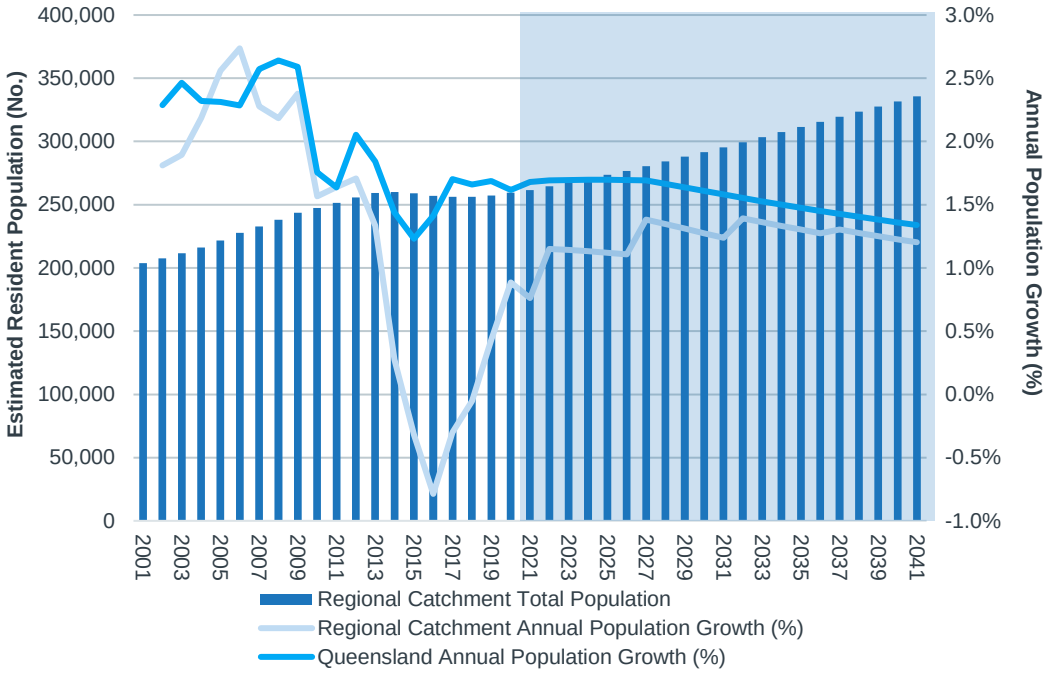
Table A. 3. Imported and Exported Labour by Industry, Catchment

Indicator	Live and Work Local	Imported Labour	Total Local Workers (PoW)	Exported Labour
Agriculture, Forestry and Fishing	3,494	900	4,394	748
Mining	10,951	5,415	16,366	2,107
Manufacturing	4,496	2,174	6,669	1,032
Electricity, Gas, Water and Waste Services	1,528	445	1,973	320
Construction	7,834	1,130	8,964	1,487
Wholesale Trade	2,918	680	3,597	586
Retail Trade	8,666	2,746	11,413	2,002
Accommodation and Food Services	6,762	1,242	8,004	1,431
Transport, Postal and Warehousing	5,721	999	6,720	1,140
Information Media and Telecommunications	493	202	694	97
Financial and Insurance Services	1,051	467	1,518	208
Rental, Hiring and Real Estate Services	1,126	646	1,772	258
Professional, Scientific and Technical Services	3,670	564	4,233	766
Administrative and Support Services	2,934	779	3,713	458
Public Administration and Safety	5,335	997	6,332	1,091
Education and Training	9,440	677	10,117	1,784
Health Care and Social Assistance	12,377	1,391	13,769	2,276
Arts and Recreation Services	663	312	975	127
Other Services	4,506	911	5,417	846
Total	**93,963**	**22,679**	**116,642**	**18,764**

Source: ABS (2017)

POPULATION

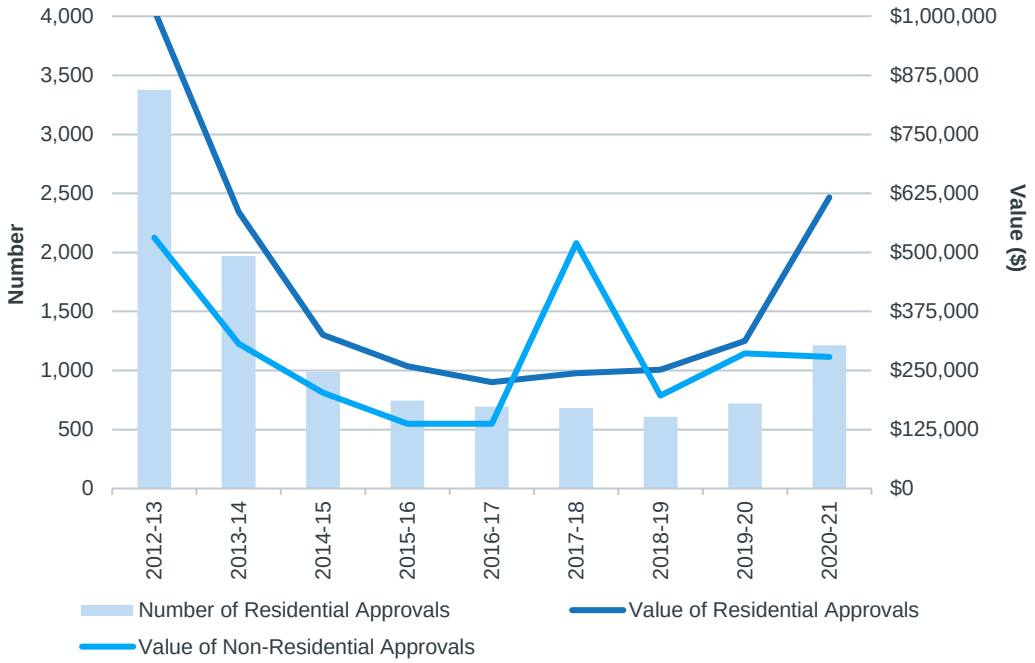
Figure A. 6. Historical and Projected Population Growth, 2001 to 2041



Source: QGSO (2019).

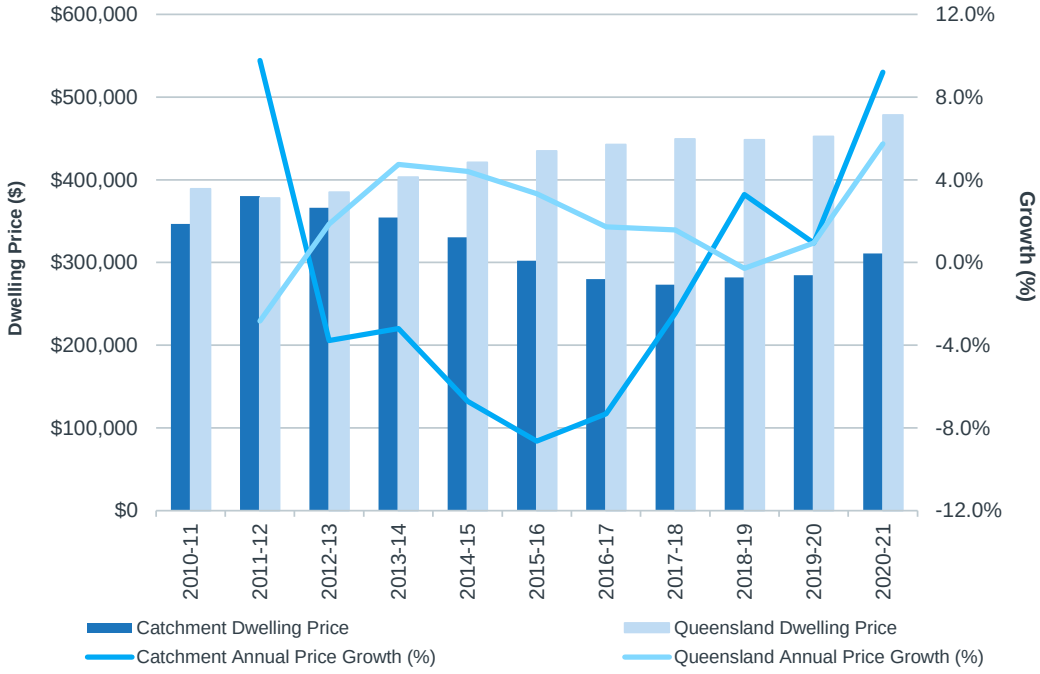
PROPERTY MARKET

Figure A. 7. Building Approvals, Catchment, 2012-13 to 2020-21



Source: ABS (2021).

Figure A. 8. Dwelling Price, 2010-11 to 2020-21



Source: QGSO (2021).

MAJOR PROJECTS

The following table presents a list of identified existing projects with proposed extensions as well as new projects proposed for the Catchment, largely related to mining activity. Key sectors driving growth in the Catchment include coal mining, rail, and renewables.

The projects listed in the below table includes extensions that will replace or augment activities from existing operations that are nearing completion. Where this occurs, these projects will effectively result in a continuation of jobs and economic activity rather than a genuine lift in activity (outside of short-term construction impacts). Where the timing of the project is unknown, it has been assumed the works will not crossover with construction of the Project.

Table A. 4. Major Projects

Project	Description	Cost	Phase/ Timing
Isaac			
Olive Downs Project	Large-scale, greenfield metallurgical coal mine with a yield of up to 15 million tonnes per annum of coking coal for steel production. Anticipated to employ a total of 301 people over the construction period.	$1.0 billion	Q4 2021 to Q3 2024
Winchester South Project	A proposed open cut coal mine and associated infrastructure in the Bowen Basin. The project would extract up to 11 million tonnes of product coal per annum for approximately 30 years, for steel and energy production. The project is anticipated to provide approximately 500 jobs during construction and the same during operations.	Almost $1.0 billion	Commencing 2022-23
Vulcan Complex	Approval has recently been attained for the Vulcan mine complex. The initial lease will unlock the first four years of an expected 15-year plus mine life, providing more than 150 FTE jobs.	$160 million	Two stages of drilling have now been carried out.
Isaac Plains East and Isaac Plains East Expansion	Isaac Plans East is a proposed extension to the existing Isaac Plains East coal mine, that will target the Rangal Coal Measures within the Bowen Basin.	$82 million	Construction commenced in 2021-22
Moranbah Ammonium Nitrate	Ammonium nitrate plant with a production capacity of approximately 360,000 tonnes per annum.	$647.43 million	Feasibility completed
Red Hill Mining Lease Project	A new underground coking coal mine (Red Hill) with a yield of 14 million tonnes per annum; and expansion of two existing coking coal mines (Broadmeadow and Goonyella Riverside).	Unknown	Approved in 2015. Construction unknown.
Byerwen Coal Mine	Open-cut coal mine with a yield of up to 10 million tonnes per annum.	$700 million	August 2017 to November 2023
North Galilee Basin Rail Project	An approximately 300-kilometre standard gauge rail line in Central Queensland, connecting the northern Galilee Basin to the Port of Abbot Point. Approximately 1,374 people are anticipated to be employed for this work.	$2.3 billion	Q2 2022 to unknown
Carmichael Coal Mine and Rail	Open-cut and underground coal mine with a yield of 60 million tonnes per annum and a 189-kilometre railway line.	$2.0 billion	Q2 2019 to Q4 2026
China Stone Coal Project	Large-scale, greenfield coal mine with a yield of up to 38 million tonnes per annum of thermal coal. Anticipated to create up too 3,900 construction jobs and 3,400 operational jobs.	$6.7 billion	Approved, but on hold
Eagle Downs Metallurgical Coal	The Project involves construction, development and operation of an underground longwall hard coking coal mine, Coal Handling and Preparation Plant (CHPP) and associated infrastructure. It is estimated that the mine will produce an average of 4.5Mtpa of product coking coal in the first ten years of full production from one underground longwall. The later years will utilise longwall top coal caving. The mine life is expected to be 45 years.	$988 million	EIS completed. Construction on hold.
Hail Creek Extension – Underground	The Hail Creek Coal Mine Extension Transition Project is an extension to the existing Hail Creek mine, located 120 km south-west of Mackay, Queensland. The proposed project will expand the existing open cut mining activities and transition to an underground mining operation. The proposed project will extend operations to 2048 and will	Unknown	Unknown

Project	Description	Cost	Phase/ Timing
	not alter the currently approved rate of production (i.e., 20 million tonnes per annum run of mine coal).		
Saraji East Coal Mine	This project involves the development of an underground metallurgical coal mine and associated infrastructure, to allow for extraction of up to 11 million tonnes per year of run of mine coal. The project is anticipated to provide up to 1,000 construction jobs and 500 operational jobs.	1,313 million	Proponent responding to EIS submissions
Mackay			
Bruce Highway – Mackay Ring Road Stage 2	This project builds on stage 1, by connecting the Bruce Highway at Glenella, north-west of Mackay, heading east to Harbour Road.	$350 million	Not commenced
Urannah Project	The Urannah Project comprises of a dam on the Broken River (1,500 gigalitres), a water distribution network including connecting water pipelines and instream distribution and storage of water, an irrigation precinct and a pumped hydro-electric power scheme. Anticipated to employ a total headcount of 4,503 people over the construction period.	$2.9 billion	Q3 2022 to unknown
Clarke Creek Wind and Solar Farm	Construction of a wind farm (195 turbines), solar farm (400 mw) and battery energy storage.	$1.5 billion	Q2 2022 to Q4 2024
Walkerston Bypass	Realignment of approximately 13.3 kilometers of Peak Downs Highway commencing at Wollingford Road and finishing at intersection of Stock Route Road with Bruce Highway.	$150.0 million	Q4 2021 to Q3 2023
Bruce Highway – Powell Road North Safety Upgrade	Road upgrades.	$9.3 million	Q1 2022 to Q3 2022
Bruce Highway – Hampden to Kuttabul	Intersections upgrade and road widening.	$37.0 million	Q2 2020 to Q1 2022
Mackay Arena Development	The project will deliver a new covered grandstand, facilities for elite players, match officials and broadcast TV crews, plus room for an additional 10,000 spectators.	$24.2 million	Q4 2021 to Q4 2022
Mackay Waterfront PDA	The Mackay Waterfront PDA was declared on May 25, 2018, to support the masterplan. The masterplan sets the concepts for the Mackay Waterfront development over the next 20 years.	$80.0 million	Unknown
Mackay Northern Access	Roadworks and intersection – widening and upgrade	$120.4 million	Q2 2020 to Q3 2022
East Point Masterplan	Includes construction of a hotel (250 bed), caravan park (238 site), residential units (330) and tourist hub.	$250.0 million	Q2 2020 to unknown
Livingstone			
Yeppoon Homemaker Centre	Retail location for home improvement, hardware, and other complementary large format retail businesses.	$33.0 million	Q4 2020 to Q3 2022
Maryborough Coking Coal Project	Open cut mine – coking coal.	$300.0 million	Q4 2021 to Q4 2022
Shoalwater Bay Military Training Facility	Expansion of the existing training facilities.	$1.1 billion	Q3 2020 to Q4 2024
Stanage Bay Road Upgrade	Widening and sealing approximately 39. Kilometres of unsealed road between the Bruce Highway and the Stevens Road Access Army Gate. Approximately 7 people will be employed for this work.	$21.4 million	Q3 2020 to Q3 2023

Project	Description	Cost	Phase/ Timing
Rockhampton			
Lower Fitzroy River Infrastructure Project	The raising of Eden Bann Weir and construction of a new weir at Rookwood on the Fitzroy River, Central Queensland.	$352 million	Expected Construction 2023
Rookwood Weir	The construction of: • The weir and fishway infrastructure • New river crossings at Riverslea and Foleyvale • New culvert crossing at Hanrahan • Upgrade of the Capricorn Highway and Third Street intersection at Gogango • Upgrade of Thirsty Creek Road from Gogango to the construction site 100 people are employed for this work.	$352.0 million	Q1 2021 to Q4 2023
Rockhampton to Yeppoon Road Duplication	Road duplication.	$80.0 million	Unknown
Alliance Airline – Rockhampton	New aviation maintenance, repair, and overhaul facility. Approximately 76 people will be employed for this work.	$60.0 million	Q3 2022 to Q4 2024
Rockhampton Stadium	Sport precinct redevelopment.	$120.0 million	Unknown
Rockhampton Ring Road	A western link of the Bruce Highway to the west of Rockhampton, with key linkages into the city at several points. Approximately 267 people will be employed for this work.	$1.0 billion	Q1 2022 to Q3 2025
Browne Park Development	Stadium – alterations and additions (approximately 12,000 seats). Approximately 50 people will be employed for this work.	$120.0 million	Unknown

Source: State Development (2021)., QMCA (2021), CSQ (2021),

APPENDIX B: INPUT-OUTPUT METHODOLOGY

INPUT-OUTPUT MODEL OVERVIEW

Input-Output analysis demonstrates inter-industry relationships in an economy, depicting how the output of one industry is purchased by other industries, households, the government and external parties (i.e. exports), as well as expenditure on other factors of production such as labour, capital and imports. Input-Output analysis shows the direct and indirect (flow-on) effects of one sector on other sectors and the general economy. As such, Input-Output modelling can be used to demonstrate the economic contribution of a sector on the overall economy and how much the economy relies on this sector or to examine a change in final demand of any one sector and the resultant change in activity of its supporting sectors.

The economic contribution can be traced through the economic system via:

- **Initial stimulus (direct) impacts**, which represent the economic activity of the industry directly experiencing the stimulus.
- **Flow-on impacts**, which are disaggregated to:
    - **Production induced effects (type I flow-on)**, which comprise the effects from:
        - Direct expenditure on goods and services by the industry experiencing the stimulus (direct suppliers to the industry), known as the first round or direct requirements effects.
        - The second and subsequent round effects of increased purchases by suppliers in response to increased sales, known as the industry support effects.
    - **Household consumption effects (type II flow-on)**, which represent the consumption induced activity from additional household expenditure on goods and services resulting from additional wages and salaries being paid within the economic system.

These effects can be identified through the examination of four types of impacts:

- **Output**: Refers to the gross value of goods and services transacted, including the costs of goods and services used in the development and provision of the final product. Output typically overstates the economic impacts as it counts 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.
- **Gross product**: Refers to the value of output after deducting the cost of goods and services inputs in the production process. Gross product (e.g., Gross Catchment Product) defines a true net economic contribution and is subsequently the preferred measure for assessing economic impacts.
- **Income**: Measures the level of wages and salaries paid to employees of the industry under consideration and to other industries benefiting from the project.
- **Employment**: Refers to the part-time and full-time employment positions generated by the economic shock, both directly and indirectly through flow-on activity, and is expressed in terms of full time equivalent (FTE) positions.

Input-Output multipliers can be derived from open (Type I) Input-Output models or closed (Type II) models. Open models show the direct effects of spending in a particular industry as well as the indirect or flow-on (industrial support) effects of additional activities undertaken by industries increasing their activity in response to the direct spending.

Closed models re-circulate the labour income earned as a result of the initial spending through other industry and commodity groups to estimate consumption induced effects (or impacts from increased household consumption).

MODEL DEVELOPMENT

Multipliers used in this assessment are derived from sub-Catchment transaction tables developed specifically for this project. The process of developing a sub-Catchment transaction table involves developing Catchment estimates of gross production and purchasing patterns based on a parent table, in this case, the 2018-19 Australian transaction table (ABS, 2021a).

Estimates of gross production (by industry) in the study areas were developed based on the percent contribution to employment (by place of work) of the study areas to the Australian economy (ABS, 2012; ABS, 2017; ABS, 2022b; DoESE, 2021), and applied to Australian gross output identified in the 2018-19 Australian table.

Industry purchasing patterns within the study area were estimated using a Flegg Location Quotient approach, as described in Flegg *et al*. (2021), with a fixed degree of convexity applied to the Catchment size scalar. Catchment final demand estimates (except exports) developed based on the Catchment inter-industry sales estimated using the Flegg Location Quotient relative to national inter-industry sales and final demand estimates for each industry (noting Catchment exports are assumed to reflect the remainder of total uses).

Employment estimates were rebased from 2018-19 (as used in the Australian national Input-Output transaction tables) to current year values using the Wage Price Index (ABS, 2021c).

MODELLING ASSUMPTIONS

The key assumptions and limitations of Input-Output analysis include:

- **Lack of supply-side constraints**: The most significant limitation of economic impact analysis using Input-Output multipliers is the implicit assumption that the economy has no supply-side constraints so the supply of each good is perfectly elastic. That is, it is assumed that extra output can be produced in one area without taking resources away from other activities, thus overstating economic impacts. The actual impact is likely to be dependent on the extent to which the economy is operating at or near capacity.
- **Fixed prices**: Constraints on the availability of inputs, such as skilled labour, require prices to act as a rationing device. In assessments using Input-Output multipliers, where factors of production are assumed to be limitless, this rationing response is assumed not to occur. The system is in equilibrium at given prices, and prices are assumed to be unaffected by policy and any crowding out effects are not captured. This is not the case in an economic system subject to external influences.
- **Fixed ratios for intermediate inputs and production (linear production function)**: Economic impact analysis using Input-Output multipliers implicitly assumes that there is a fixed input structure in each industry and fixed ratios for production. That is, the input function is generally assumed linear and homogenous of degree one (which implies constant returns to scale and no substitution between inputs). As such, impact analysis using Input-Output multipliers can be seen to describe average effects, not marginal effects. For example, increased demand for a product is assumed to imply an equal increase in production for that product. In reality, however, it may be more efficient to increase imports or divert some exports to local consumption rather than increasing local production by the full amount. Further, it is assumed each commodity (or group of commodities) is supplied by a single industry or sector of production. This implies there is only one method used to produce each commodity and that each sector has only one primary output.
- **No allowance for economies of scope**: The total effect of carrying on several types of production is the sum of the separate effects. This rules out external economies and diseconomies and is known simply as the “additivity assumption”. This generally does not reflect real world operations.
- **No allowance for purchasers’ marginal responses to change**: Economic impact analysis using multipliers assumes that households consume goods and services in exact proportions to their initial budget shares. For example, the household budget share of some goods might increase as household income increases. This equally applies to industrial consumption of intermediate inputs and factors of production.
- **Absence of budget constraints**: Assessments of economic impacts using multipliers that consider consumption induced effects (type two multipliers) implicitly assume that household and government consumption is not subject to budget constraints.

Despite these limitations, Input-Output techniques provide a solid approach for taking account of the inter-relationships between the various sectors of the economy in the short-term and provide useful insight into the quantum of final demand for goods and services, both directly and indirectly, likely to be generated by a project.

In addition to the general limitations of Input-Output analysis, there are two other factors that need to be considered when assessing the outputs of sub-Catchment transaction table developed using the above approach, namely:

- It is assumed the sub-Catchment has similar technology and demand/ consumption patterns as the parent (Australia) table (e.g. the ratio of employee compensation to employees for each industry is held constant).
- Intra-Catchment cross-industry purchasing patterns for a given sector vary from the national tables depending on the prominence of the sector in the Catchment economy compared to its input sectors. Typically, sectors that are more prominent in the Catchment (compared to the national economy) will be assessed as purchasing a higher proportion of imports from input sectors than at the national level, and vice versa.
- The size of the Catchment economy is assumed to have an inverse relationship with the requirement to import goods/ services to meet its needs (i.e. the smaller the economy, in general the greater the reliance on imports).

APPENDIX C: LIKELIHOOD-CONSEQUENCE FRAMEWORK

Likelihood-consequence impact assessment frameworks are well recognised as an appropriate approach for assessing economic, social and environmental impacts.

The approach is adapted from risk-based assessment approaches, as per the Australian/New Zealand Standard for risk management (Standards Australia, 2018). The framework identifies and ranks the adverse and beneficial impacts into relevant levels (very low, low, medium, high and very high) to compare options.

The assessment examines the likelihood of an effect occurring, and the potential consequences (i.e., a measure of severity/ magnitude of effect) should the effect occur. Table C. 1 contains the descriptors used to classify the likelihood and consequence.

Table C. 1. Descriptors Used to Classify Likelihood and Consequence

Descriptor	Description
Likelihood	
Very High	Is expected to occur
High	Will probably occur
Moderate	Might occur
Low	Unlikely to occur
Very Low	May occur in exceptional circumstances
Consequence	
Very High	• **Adverse Impact**: Extreme permanent loss of human, social, financial or built capital/wellbeing, with anticipated major public outrage • **Beneficial Impact**: Significant permanent enhancement of human, social, financial or built capital/wellbeing
High	• **Adverse Impact**: Substantial loss of human, social, financial or built capital/wellbeing, will attract public concern • **Beneficial Impact**: Substantial enhancement of human, social, financial or built capital/wellbeing
Moderate	• **Adverse Impact**: Moderate and noticeable loss of human, social, financial or built capital/wellbeing • **Beneficial Impact**: Moderate enhancement of human, social, financial or built capital/wellbeing
Low	• **Adverse Impact**: Small but noticeable loss of human, social, financial or built capital/wellbeing, can be easily rehabilitated • **Beneficial Impact**: Small enhancement of human, social, financial or built capital/wellbeing
Very Low	• **Adverse Impact**: Negligible loss of human, social, financial or built capital/wellbeing • **Beneficial Impact**: Negligible enhancement of human, social, financial or built capital/wellbeing

Source: Adapted from Standards Australia (2018).

The level of overall impact associated with each potential impact was then determined by combining likelihood and consequence using the matrix in Table C. 2.

Table C. 2. Impact Summary Table

Likelihood	Consequences				
	Very Low	Low	Moderate	High	Very High
Very High	Low	Medium	High	Very High	Very High
High	Low	Low	Medium	High	Very High
Moderate	Very Low	Low	Medium	High	High
Low	Very Low	Very Low	Low	Medium	High
Very Low	Very Low	Very Low	Low	Medium	Medium

Source: Adapted from Standards Australia (2018).

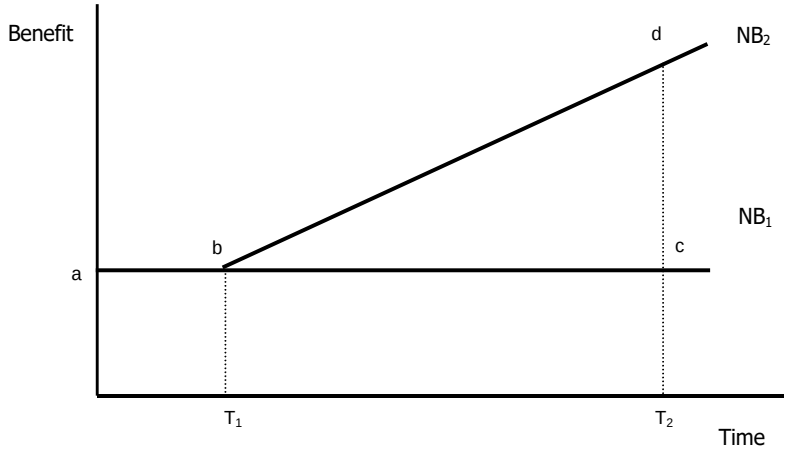
APPENDIX D: COST BENEFIT ANALYSIS METHODOLOGY

STEP 1: DEFINE THE SCOPE AND BOUNDARY

To enable a robust determination of the net benefits of undertaking a given project, it is necessary to specify base case and alternative case scenarios. The base case scenario represents the 'without project' scenario and the alternative or 'with project' scenario examines the impact with the project in place.

The base case (without) scenario is represented by line NB_1 (bc) over time T_1 to T_2 in Figure D. 1. The investment in the project at time T_1 is likely to generate a benefit, which is represented by line NB_2 (bd). Therefore, the net benefit flowing from investment in the project is identified by calculating the area (bcd) between NB_1 and NB_2.

Figure D. 1. With and Without Scenarios



Source: AEC.

STEP 2: IDENTIFY COSTS AND BENEFITS

A comprehensive quantitative specification of the benefits and costs included in the evaluation and their various timings is required and includes a clear outline of all major underlying assumptions. These impacts, both positive and negative, are then tabulated and where possible valued in dollar terms.

Some impacts may not be quantifiable. Where this occurs the impacts and their respective magnitudes will be examined qualitatively for consideration in the overall analysis.

Financing costs are not included in a CBA. As a method of project appraisal, CBA examines a project's profitability independently of the terms on which debt finance is arranged. This does not mean, however, that the cost of capital is not considered in CBA, as the capital expenses are included in the year in which the transaction occurs, and the discount rate (discussed below in Step 5) should be selected to provide a good indication of the opportunity cost of funds, as determined by the capital market.

STEP 3: QUANTIFY AND VALUE COSTS AND BENEFITS

CBA attempts to measure the value of all costs and benefits that are expected to result from the activity in economic terms. It includes estimating costs and benefits that are 'unpriced' and not the subject of normal market transactions but which nevertheless entail the use of real resources. These attributes are referred to as 'non-market' goods or impacts. In each of these cases, quantification of the effects in money terms is an important part of the evaluation.

However, projects frequently have non-market impacts that are difficult to quantify. Where the impact does not have a readily identifiable dollar value, proxies and other measures should be developed as these issues represent real costs and benefits.

One commonly used method of approximating values for non-market impacts is 'benefit transfer'. Benefit transfer (BT) means taking already calculated values from previously conducted studies and applying them to different study sites and situations. In light of the significant costs and technical skills needed in using the methodologies outlined in the table above, for many policy makers utilising BT techniques can provide an adequate solution.

Context is extremely important when deciding which values to transfer and from where. Factors such as population, number of households, and Catchment characteristics should be considered when undertaking benefit transfer. For example, as population density increases over time, individual households may value nearby open space and parks more highly. Other factors to be considered include, depending on the location of the original study, utilising foreign exchange rates, demographic data, and respective inflation rates.

Benefit transfer should only be regarded as an approximation. Transferring values from similar Catchments with similar markets is important, and results can be misleading if values are transferred between countries that have starkly different economies (for example a benefit transfer from the Solomon Islands to Vancouver would likely have only limited applicability). However, sometimes only an indicative value for environmental assets is all that is required.

STEP 4: TABULATE ANNUAL COSTS AND BENEFITS

All identified and quantified benefits and costs are tabulated to identify where and how often they occur. Tabulation provides an easy method for checking that all the issues and outcomes identified have been addressed and provides a picture of the flow of costs, benefits and their sources.

STEP 5: CALCULATE THE NET BENEFIT IN DOLLAR TERMS

As costs and benefits are specified over time it is necessary to reduce the stream of benefits and costs to present values. The present value concept is based on the time value of money – the idea that a dollar received today is worth more than a dollar to be received in the future. The present value of a cash flow is the equivalent value of the future cashflow should the entire cashflow be received today. The time value of money is determined by the given discount rate to enable the comparison of options by a common measure.

The selection of appropriate discount rates is of particular importance because they apply to much of the decision criteria and consequently the interpretation of results. The higher the discount rate, the less weight or importance is placed on future cash flows.

The choice of discount rates should reflect the weighted average cost of capital (WACC). For this analysis, a base discount rate of seven percent has been used to represent the minimum rate of return, which is in line with Queensland and Australian Government guidelines. As all values used in the CBA are in real terms, the discount rate does not incorporate inflation (i.e. it is a real discount rate, as opposed to a nominal discount rate).

To assess the sensitivity of the project to the discount rate used, discount rates either side of the base discount rate (seven percent) have also been examined (four percent and ten percent).

The formula for determining the present value is:

$$PV = \frac{FV_n}{(1+r)^n}$$

Where:

PV = present value today

FV = future value n periods from now

r = discount rate per period

n = number of periods

Extending this to a series of cash flows the present value is calculated as:

$$PV = \frac{FV_1}{(1+r)^1} + \frac{FV_2}{(1+r)^2} + \cdots + \frac{FV_n}{(1+r)^n}$$

Once the stream of costs and benefits have been reduced to their present values the Net Present Value (NPV) can be calculated as the difference between the present value of benefits and present value of costs. If the present value of benefits is greater than the present value of costs, then the option or project would have a net economic benefit.

In addition to the NPV, the internal rate of return (IRR) and benefit-cost ratio (BCR) can provide useful information regarding the attractiveness of a project. The IRR provides an estimate of the discount rate at which the NPV of the project equals zero, i.e. it represents the maximum WACC at which the project would be deemed desirable. However, in terms of whether a project is considered desirable or not, the IRR and BCR will always return the same result as the NPV decision criterion.

STEP 6: SENSITIVITY ANALYSIS

Sensitivity analysis allows for the testing of the key assumptions and the identification of the critical variables within the analysis to gain greater insight into the drivers to the case being examined.

A series of Monte Carlo analyses has been conducted to test the sensitivity of the model outputs to changes in key variables. Monte Carlo simulation is a computerised technique that provides decision-makers with a range of possible outcomes and the probabilities they will occur for any choice of action. Monte Carlo simulation works by building models of possible results by substituting a range of values – the probability distribution – for any factor that has inherent uncertainty. It then calculates results over and over, each time using a different set of random values from the probability functions. The outputs from Monte Carlo simulation are distributions of possible outcome values.

During a Monte Carlo simulation, values are sampled at random from the input probability distributions. Each set of samples is called an iteration, and the resulting outcome from that sample is recorded. Monte Carlo simulation does these hundreds or thousands of times, and the result is a probability distribution of possible outcomes. In this way, Monte Carlo simulation provides a comprehensive view of what may happen. It describes what could happen and how likely it is to happen.

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