COMMERCIAL IN CONFIDENCE

REPORT

Review of economic assessment supporting Bowdens Silver Mine project

Peer review

Prepared for
Department of Planning, Industry and Environment

10 February 2020

THE CENTRE FOR INTERNATIONAL ECONOMICS
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Contents

BOXES, CHARTS AND TABLES

Summary

About the project

The Bowdens Silver Project (the Project) involves the recovery of silver, zinc and lead minerals from defined ore reserves within a proposed open cut pit. The mine site is located approximately 2 to 3 kilometres northeast of Lue and 26 kilometres each of Mudgee within the Mid-Western Regional Local Government Area.

Key features of the project include:

- a main open cut pit and two satellite open cut pits, collectively covering approximately 52 hectares
- a processing plant and related infrastructure, including administration, workshop and laydown area, covering approximately 22 hectares
- a waste rock emplacement covering approximately 77 hectares
- a low grade ore stockpile covering approximately 14 hectares
- an oxide ore stockpile covering approximately 8 hectares
- a tailing storage facility covering approximately 114 hectares; and
- the southern barrier to provide a visual and acoustic protection to properties south of the mine site covering approximately 32 hectares.[1]

The total life of the project is expected to be 23 years and incorporate:

- Site establishment and construction stage of 1.5 years
- Mining stage of 15.5 years
- Processing stage of 15 years
- Final rehabilitation and maintenance stage of 7 years following completion of the mining stage.

Summary of Gillespie economic analysis

In accordance with the NSW Guidelines, Gillespie Economics attributes the total costs and benefits to the NSW community. The key production benefits quantified in the Economic Assessment that are attributable to the NSW community are royalties, company tax and residual producer surplus. There are also non-production benefits assessed.

The Economic Assessment estimates global net production benefit of $89 million initially to Australia and then subsequently apportions it to NSW. The net production benefit of

1 Gillespie Economics, 2020, *Bowdens Silver: Part 15 Economic Assessment.*

the Project to Australia is estimated to be $89 million after accounting for benefits which accrue to foreign owners.[2] Of this $89 million net production benefit to Australia, $44 million is attributed to NSW based on the attribution factors outlined in table 3.3.

1 Benefits and costs to Australia and NSW – Gillespie Economics

Benefit/cost categories	Australia	Proportion attributed to NSW	NSW
	$m, PV	Per cent	$m, PV
Production benefits			
Government royalties	21	100	21
Australian third party royalties	11	32	4
Company tax	48	32	15
Residual producer surplus	9	45	4
Total production benefits	**89**		**44**
Public impacts			
Wage benefits of employment			25
Non-market benefits of employment			78
Greenhouse gas emissions			0
Total public impacts			**103**

Source: Gillespie Economics, 2020, *Bowdens Silver: Part 15 Economic Assessment.*

There are also a number of indirect benefits described as 'wage benefits of employment' and 'non-market benefits of employment'. Based on Gillespie's analysis these items generate the largest benefits (totalling $103m in PV terms), over double the direct benefits from mining.

On the cost side, the key negative impacts quantified are the greenhouse gas emissions. Other potential negative impacts are managed by the company, resulting in a small 'unmanaged' risk.

CIE's review of economic assessment

The CIE's review has been undertaken based on relevant guidelines including:

- NSW Government's December 2015 *Guidelines for the economic assessment of mining and coal seam gas proposals* (referred to as NSW Guidelines)
- NSW Government's April 2018 *Technical notes supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals* (referred to as NSW Technical notes).

2 It is stated that Bowdens Silver is 7 per cent foreign owned.

2 Benefits and costs to NSW - CIE revised value of resource

Benefit/cost categories	CIE revised
	$m, PV
Production benefits	
Royalty payment to NSW	17 – 24
3rd party royalties, company tax, residual producer surplus	18 – 26
Public impacts	
Wage benefits of employment	0
Non-market benefits of employment	0
Greenhouse gas emissions	- (9 to 36)
Net benefits	**0 to 41**

Source: Gillespie Economics, 2020, *Bowdens Silver: Part 15 Economic Assessment.*

The key findings are:

- **Regarding net production benefits:**
  - **The royalty estimate relies on global commodity prices forecasts and the AUD/USD exchange rate (both which are uncertain).**

    Price information from sources such as the World Bank indicates that expected commodity prices are around 20% below forecasts utilised by Gillespie Economics. More recent market forecasts are in line (or higher) than forecasts assumed by Gillespie Economics.

    The AUD/USD exchange rate is highly volatile and has ranged from 0.56 US cents to 0.81 US cents over the past 2-3 years.

    While there is uncertainty regarding the different parameters, Gillespie Economics' estimate of $21m is reasonable and in line with NSW Government estimates of $24m. A range of between $17-$24m (in present value terms) in royalty benefits to the NSW Government is appropriate, although more recent price projections would suggest that royalties at the upper-end of this range are more likely.
  - **The three other items (third party royalties, company tax and residual producer surplus) should be viewed together:**
    - **Based on information provided it would appear that the third party royalties is a profit-sharing arrangement between different shareholders/investors**
    - **Therefore, an increase in third party royalties would reduce the 'residual producer surplus' and vice-versa.**
    - **The company tax estimate is also subject to commodity price and exchange rate volatility. Further, tax paid varies significantly between companies and depends on the deductions that reduce the taxable income. Any increase in taxes would reduce residual producer surplus and vice-versa.**
    - **While it is challenging to estimate precisely each of these items, given the interrelationship between them, the items need to be viewed in aggregate.**

In aggregate, Gillespie's estimate of $23m (in present value terms) is reasonable. Assuming alternative commodity prices (similar to that used for royalties estimates, discussed above), it is reasonable to assume a benefit range of around $18m-$26m associated with these three items.

- Regarding non-production benefits:
  - The inclusion of the wage benefits of employment is allowed for under the CBA Guidelines, although the Guidelines suggest that a value of zero is appropriate in most cases. In quantifying the wage premium, Gillespie Economics includes a range of unsubstantiated assumptions. Further, the estimates do not account for factors such as skill level, which is likely to explain wage differences between different occupations. Without more robust information/analysis, a value of close to zero is more appropriate.
  - The inclusion of the non-market values for unemployment is contentious. Gillespie Economics recognise this and report the results 'with and without' this benefit category. Similarly, BDA Group (the Proponent's CBA reviewer) recognise the estimates of this item to be contentious. There are also concerns regarding the results from the earlier choice modelling surveys which the study relies on. In our view, this item should be assumed as zero.
- Regarding greenhouse gas emissions, Gillespie Economics' approach of valuing 0.35% of emissions is inconsistent with the Guidelines which require attribution of 100% of the emissions from the mine, resulting in a cost of between $9 million and $36 million in present value terms.
  - We recognise that the final Guidelines do not provide a detailed spreadsheet for calculating the impact, however, these are included in the draft guidelines which require 100% of the emissions to be included.
  - Further, assuming that only 0.35% of emissions should be of importance to NSW is inconsistent with the NSW Government's Climate Change Framework which includes a "goal to reach net zero emissions by 2050".
- Overall, the Project is estimated to deliver net benefits to NSW. At the upper end of the range, the benefits (associated with royalties, tax and residual producer surplus) is estimated at $50m in present value terms. This would be partially offset by greenhouse gas emissions valued at between $9m-$36m. Commodity prices would need to fall by over 20% (compared to that assumed by Gillespie Economics) for the Project to result in net costs to NSW. This is unlikely based on current prices and available market forecasts over the next few years.

2 Features of a CBA

A CBA framework is a widely used tool for deciding *ex-ante* between alternative options (policies or projects). It allows decision makers to consider trade-offs arising from different options in order to assist decisions of whether the community as a whole is better off or worse off by adopting an option.

A CBA framework is focused on the aggregate welfare of the community, rather than the welfare of individual groups. It should take account of the full range of potential benefits and costs of the options, including environmental, health and other social impacts as well as the economic impacts. Where benefits exceed costs, the options are deemed to deliver a net benefit to the community as a whole. Where costs exceed the benefits, then the options should be rejected as society is worse-off if the options were implemented. Where there are a number of options, all of which deliver net benefits (i.e. benefits exceed costs), then the option that generates the highest net benefit is preferred.

Impacts are often not known with certainty. In these circumstances the CBA needs to be presented as an 'expected value' taking account of the range of possible outcomes (each with a known probability of occurrence). In some circumstances, not all impacts can be readily quantified and valued in a robust manner. Decision makers will need to draw on other information to complement the result of the CBA and to assist in deciding on whether society is better off from adopting an option.

In conducting this peer review, we have relied on the Government's *NSW Guidelines for the economic assessment of mining and coal seam gas proposals* (December 2015). Technical notes also support the guidelines and outline methodologies, parameters and assumptions for the economic assessment. The NSW Guidelines specifies the key features of a CBA in mining and coal seam gas proposals, as summarised in Box 2.1.

2.1 Key features of a CBA

- Scope – A CBA should include all first round (primary) impacts both direct and indirect but not secondary impacts.
- Discount rate - A discount rate of 7 percent per annum with sensitivity testing at 4 per cent and 10 per cent per annum.
- Timeframe - A term that reflects the time horizon of the impacts of a proposal. Long-term mining projects should use a 30-year timeframe from when the mine became operational and where applicable a residual value beyond that timeframe.
- Risk and Uncertainty - A 'risk neutral' approach to expected costs and benefits.
- Unquantified factors – Decisions based on the quantified expected net benefits in conjunction with information on any impacts that cannot be valued.

3 Economic Assessment of Bowdens Silver Mine

The benefits of the Project arise from the quantity of saleable product and the price of this product. The NSW Government has established Guidelines for undertaking Cost Benefit Analysis. For a CBA, this provides benefits attributable to NSW in the form of royalty payments, company income tax, net producer surplus, economic benefits to existing landholders, economic benefits to workers and economic benefits to suppliers.[3]

This chapter discusses the estimates presented by Gillespie Economics and the CIE's review of the individual elements.

Global net benefit of the Project

Gillespie Economics estimated the total costs and benefits of the Project. The Project is estimated to have global net social benefits of:

- $78 million (present value) excluding employment benefits
- $181 million (present value) including employment benefits (table 3.1).

3.1 Global net benefit of project

Cost item	Cost	Benefit item	Benefits
	PV, $m		PV, $m
Production costs			
Opportunity cost of land	14	Value of silver, zinc and lead concentrate	1 033
Opportunity cost of capital	0	Residual value of land	0
Development costs (incl. sustaining capital and mitigation, compensation and offset costs)	264	Residual value of capital	0
Operating costs (excl. royalties)	657		
Rehabilitation and decommissioning costs	0[a]		
Production costs sub-total	*935*		*1033*
Net production benefit			***98***
Public impacts			
Greenhouse gas emissions	20	Wage benefits of employment	25
		Non-market benefits of employment	78

3 NSW Government (2015), Guidelines for the economic assessment of mining and coal seam gas proposals, December. https://www.planning.nsw.gov.au/~/media/Files/DPE/Guidelines/guidelines-for-the-economic-assessment-of-mining-and-coal-seam-gas-proposals-2015-12.ashx

Cost item	Cost	Benefit item	Benefits
	PV, $m		PV, $m
Net public impacts	***20***		***103***
Net social benefits (excl. employment benefits)			**78**
Net social benefits (incl employment benefits)			**181**

[a] Rehabilitation and decommissioning costs are included in the operating costs.

Note: Present values applying 7 per cent discount rate.

Source: Gillespie Economics, 2020, *Bowdens Silver: Part 15 Economic Assessment.*

Attributing net production benefit to NSW

In accordance with the NSW Guidelines, Gillespie Economics attributes the total costs and benefits to the NSW community. The key impacts quantified in the Economic Assessment that are attributable to the NSW community are royalties, company tax, residual producer surplus and greenhouse gases. Table 3.2 outlines the attribution method for these key impacts.

3.2 Attribution of key production impacts to NSW

Impact	Attributed to NSW
Government royalties	100 per cent attributed to NSW
Australian third party royalties	Based on NSW population as proportion of Australian population
Company tax	Based on NSW population as proportion of Australian population
Residual producer surplus	Attributed based on percentage of shareholders that are from NSW

Source: Gillespie Economics, 2020, *Bowdens Silver: Part 15 Economic Assessment.*

The Economic Assessment apportions the global net production benefit of $98 million initially to Australia and then subsequently to NSW. The net production benefit of the Project to Australia is estimated to be $89 million after accounting for benefits which accrue to foreign owners.[4] Of this $89 million net production benefit to Australia, $44 million is attributed to NSW based on the attribution factors outlined in table 3.3.

3.3 Net production benefits to Australia and NSW

Net production benefits	Australia	Proportion attributed to NSW	NSW
	$m, PV	Per cent	$m, PV
Government royalties	21	100	21
Australian third party royalties	11	32	4
Company tax	48	32	15
Residual producer surplus	9	45	4
Total production benefits	**89**		**44**

Source: Gillespie Economics, 2020, *Bowdens Silver: Part 15 Economic Assessment.*

4 It is stated that Bowdens Silver is 7 per cent foreign owned.

Royalty estimates

The primary benefit of the Project is the value of the resources, estimated to be over $1.0 billion in present value terms. Gillespie Economics notes that the estimated net present value of the Project is based on a range of assumptions which there is some level of uncertainty, including future commodity prices. The estimated value of resources is based on assumptions regarding future commodity prices and exchange rates, as well as, the assumed production from the mine.

The royalties received by the NSW Government in the future depends on the value of the resources from the mine. A proportion of this future value is received by the state as a royalty payment. In this instance, a 4% ex mine value (value less allowable deductions) is assumed.

The future production profile from the mine is largely determined by a range of physical factors (e.g. the location of the resource) as well as other factors such as the demand and the expectations of future commodity prices.

Production profile

We have not reviewed the expected production profile from the mine and take this is a 'given'. However, we note that in its July 2020 review of the EIS documentation, the NSW Mining Exploration & Geoscience (MEG) unit within Regional NSW stated that

> MEG is satisfied that, should the operational outcomes be achievable, the proposed mine design and mining method submissions adequately recover mineral resources and will provide an appropriate return to the state.

Regional NSW's submission also notes that

> MEG has estimated that if the Project is approved, around 30 Mt of ore resulting in around 48 million oz of silver, 75 kilo tonnes (kt) of lead and 92 kt of zinc would be able to be economically mined from the Project over its nearly 17 years.

Commodity prices

The weighted average real commodity prices used in the economic assessment are:

- USD 20.91 per ounce of silver
- USD 2 756 per tonne of zinc,
- USD 2 205 per tonne of lead.

These commodity prices are based on consensus forecasts from major financial institutions are outlined in the Marketing and Product Handling chapter of the Project Feasibility Study.[5] The weighted average real commodity price is based on the forecast price over the three years of 2019, 2020 and 2021 (table 3.4).

5 GR Engineering Services (2018), *Bowdens Silver Project Feasibility Study*, prepared for Bowdens Silver Pty Ltd.

3.4 Commodity prices

Commodity	Unit	2018	2019	2020	2021	2022
Consensus reported in economic assessment (nominal dollars)						
Silver	USD/oz	19.75	21.42	21.5	22.0	22.5
Zinc	USD/lb	1.4	1.31	1.25	1.29	1.17
Lead	USD/lb	1.08	1.04	1.03	1.03	0.98
World Bank forecast (nominal dollars)						
Silver	USD/oz	15.7	16.2	16.8	17.0	17.1
Zinc	USD/lb	1.33	1.16	0.86	0.91	0.93
Lead	USD/lb	1.02	0.91	0.77	0.82	0.83
Difference between forecasts						
Silver	per cent	-20	-24	-22	-23	-24
Zinc	per cent	-5	-12	-31	-30	-21
Lead	per cent	-6	-13	-25	-21	-15

Note: World Bank's commodity price for silver is based on troy ounces (toz).

Source: Gillespie Economics, 2020, *Bowdens Silver: Part 15 Economic Assessment* and World Bank Commodities Price Forecast released April 23 2020..

The average commodity prices for silver, zinc and lead based on the World Bank's commodity price forecasts (released April 2020) over the three years 2019, 2020, 2021 are lower than the consensus forecasts used in the Economic Assessment, being on average 23 per cent lower for silver, 24 per cent lower for zinc, and 20 per cent lower for lead.

The International Monetary Fund's (IMF) *World Economic Outlook* report published in April 2020 reviewed the impact of the COVID-19 Outbreak on commodity prices. The report noted that prices have decreased sharply since the release of the October 2019 *World Economic Outlook.* With respect to the three base metals relevant for Bowdens project, the IMF estimated prices for silver, lead and zinc declined by between 20 and 25 per cent decline.[6]

Applying a 20 per cent decline in the value of silver, zinc and lead in US dollar terms (consistent with the World Bank forecasts) would reduce the "value of silver, zinc and lead concentrate" from $1,033m to $826.4m in present value terms. A 20 per cent lower commodity price estimate would imply royalty payments to NSW of around $17m (in present value terms) over the life of the project.

Having said this, recent forecasts predict prices higher than those assumed in the Gillespie Economics' forecasts.[7] Further the current prices for silver (reported by the World Bank) are around USD$26/oz, substantially higher than their previous forecasts.[8]

6 Based on commodity price movements between January 17, 2020 (pre-outbreak) and February 7, 2020.

7 For example, some analysts predict silver prices to be closer USD$30/oz https://goldsilver.com/blog/silver-price-forecast-predictions/

8 http://pubdocs.worldbank.org/en/804991612306143358/CMO-Pink-Sheet-February-2021.pdf

Exchange rate

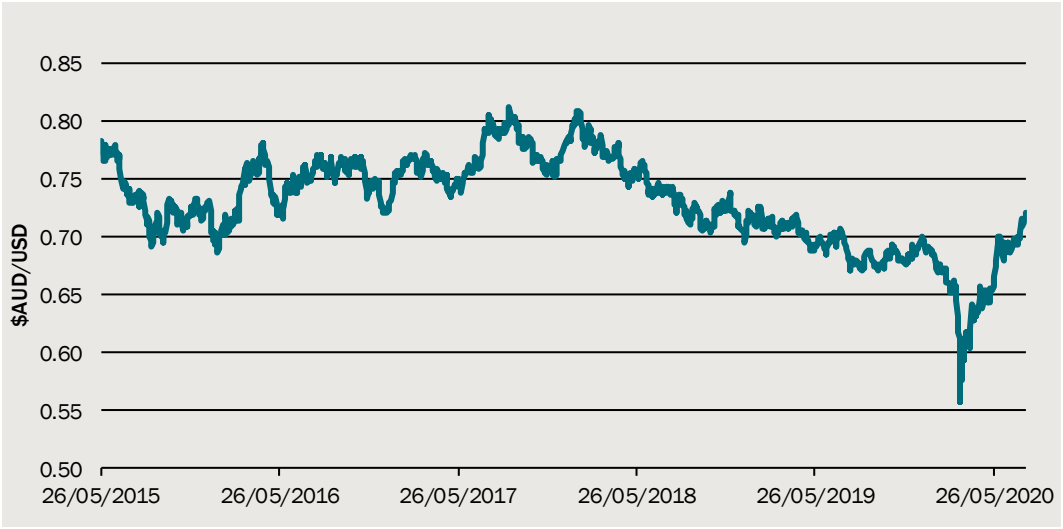
The value of the product is also dependent on the AUD:USD exchange rate. In regards the exchange rate, Gillespie (p.15-42) notes that

> As with all projects that produce products sold in USD, the exchange rate can have a significant impact on project metrics. Bowdens Silver sought forecast of the AUD:USD exchange rate from a number of major financial institutions, as shown in Table 4.7. An exchange rate of USD0.75 to AUD1.0 was adopted for the study based on this analysis (GRES, 2018).

In the Risk and Sensitivity Analysis section (p.15-70), Gillespie states that "the USD price of silver was assumed at 20.91/oz with an AUD:USD exchange rate of 0.75".

Commodity prices are subject to further variation caused by movements in the AUD/USD exchange rate. Over the two and a half years, the Australian dollar traded at a low of 0.56 US cents on 19 March 2020 and a peak of 0.81 US cents on 29 January 2018, as shown in figure 3.5. Movements in the exchange rate are difficult to predict with any degree of accuracy due to the multitude of influencing internal and external factors.

3.5 AUD/USD Exchange rate



Data source: Reserve Bank of Australia, Exchange Rate Historical Data (2020).

Royalty payments to the state

The results of the economic analysis significantly depend on the value of the commodities (in AUD terms). While there is inherent uncertainty regarding future commodity prices, the results presented in the Gillespie Economics analysis appear to be around 20% higher than other estimates currently available.

There are a wide range of factors that could impact on the exchange rate. Gillespie's assumption of AUD/USD of $0.75 appears reasonable and is in line with the current exchange rate of $0.72.

This is also consistent with the estimates from Regional NSW which states

MEG has used around A$23.50 per troy ounce for silver, A$2920 per tonne for lead and A$3550 per tonne for zinc for its royalty calculation, all prices are real and have been used for every year over the life of the Project. A long term exchange of 0.70 has been used to convert US$ prices to A$ prices…….

Using the above parameters, MEG has calculated that the State will receive around $50 million in current dollars over the project lifetime, and around $24 million in NPV terms (real discount rate of 7 percent) in royalty from the Project.

- **Gillespie Economics' estimates of royalty payments to state Government appear reasonable. However, given the uncertainty in commodity prices and exchange rate, it would be appropriate to present the potential benefits from royalties to NSW as a 'range'. A range of between $17m-$24m (in present value terms) is appropriate, although more recent price projections would suggest that royalties at the upper-end of this range are more likely.**

Other Net Production Benefit

We have aggregated the following benefit categories 'royalty payments to third parties', 'income tax' and 'residual producer surplus' given the linkages between the items. For example, higher income tax payments would lead to lower residual producer surplus. Given the limited foreign ownership it is reasonable to consider the items in aggregate (which total $23m, based on Gillespie Economics' estimates). However, the key influence (in aggregate) is the commodity price forecasts discussed above. If, for example, commodity prices were 20% lower than Gillespie Economics' assumptions then this would reduce the aggregate benefit to $17m. However, if similar price assumptions to that presented above by Regional NSW this would increase Gillespie's benefit estimate for these items by 14% (to around $26m).

Royalty payments to third parties

The Gillespie Economics report also includes an additional benefit described as 'third-party royalties' which are associated with previous owners/investors of the project coming to an arrangement where they take some of their payment in royalty form. The following assumptions are made regarding the calculation of the royalty payments:

- The Australian third party royalty was estimated at 2% of net revenue ex-site (including deductions) for the first nominal $5M of royalty payments and then at 1% of net revenue ex-site (including deductions) thereafter. This equates to $11M in present value terms (at 7% discount rate) to an Australian third party.
- The North American third party royalty was estimated at 0.85% of net revenue ex-site (including deductions). This equates to $9M in present value terms (at 7% discount rate) to a North American third party.[9]

This arrangement can be seen as a profit sharing arrangement between different the different parties. The different parties will contribute capital or in-kind support for the project and will receive the benefits in different forms, based (in part) on the extent of risk

9 See page 15-39 of Gillespie Economics (2020), Bowdens Silver Mine - Economic Assessment.

borne by the different parties. The royalty scheme is a mechanism for sharing the profits and risk to the original owners and investors of the project. Given this, Gillespie Economics has not included this in its resource cost estimate.

From this perspective, we would anticipate that an increase in royalty payments to third parties would result in a reduction in the residual producer surplus paid to Bowdens Silver's NSW shareholders.

- **The royalty payments to third parties is based on commercial arrangements between the investors in the company. Gillespie has only included royalty payments to Australian parties and attributed 32% of this to NSW.**

Income tax payments

The amount of income tax payable is dependent on the estimated taxable income to which the statutory tax rate is applied. Company tax payments are commonly based on an estimate of the net profits from the production, including a straight-line depreciation, and assumed a tax rate of 30 per cent. The income tax to the Australian Government is assumed to be partly distributed to NSW - typically 32 per cent is attributable to NSW based on its population share of Australia.

Estimating the income tax payable is challenging given the complexities of the tax system, particularly with global mining (and other) companies operating in Australia. It is in all companies' self-interest to minimise any tax payments within the 'rules' of the tax system. Mining companies are no different and operate with the interest of their shareholders in mind.

The ATO has presented information on companies' total income and tax payments for the final years 2013/14, 2014/15 and 2015/16, as part of its Corporate Tax Transparency initiative.[10] These reports present information for Australian public and foreign-owned corporate tax entities with a total income of $100 million or more; and Australian-owned resident private companies with a total income of $200 million or more.

From this list we have identified companies which operate in the mining sector. Table 2.4 presents a list of mining companies in the sample.

3.6 Selection of company taxable income

2013/14	2014/15	2015/16
ANGLO AMERICAN AUSTRALIA LIMITED	ANGLO AMERICAN AUSTRALIA LIMITED	ANGLO AMERICAN AUSTRALIA LIMITED
BECHTEL AUSTRALIA PTY LTD	ASHTON COAL MINES LIMITED	BECHTEL AUSTRALIA PTY LTD
BHP BILLITON LIMITED	BECHTEL AUSTRALIA PTY LTD	BHP BILLITON LTD
BHP BILLITON MITSUI COAL PTY LTD	BHP BILLITON LIMITED	BHP BILLITON MITSUI COAL PTY LTD
BHP IRON ORE (JIMBLEBAR) PTY LTD	BHP BILLITON MITSUI COAL PTY LTD	BM ALLIANCE COAL OPERATIONS PTY LIMITED

10 https://data.gov.au/dataset/corporate-transparency

2013/14	2014/15	2015/16
BM ALLIANCE COAL OPERATIONS PTY LTD	BHP IRON ORE (JIMBLEBAR) PTY LTD	CLERMONT COAL MINES LTD
CLERMONT COAL MINES LTD	BM ALLIANCE COAL OPERATIONS PTY LTD	COAL & ALLIED INDUSTRIES LTD
COAL & ALLIED INDUSTRIES LTD	CLERMONT COAL MINES LTD	ENSHAM COAL SALES PTY LTD
ENSHAM COAL SALES PTY LTD	COAL & ALLIED INDUSTRIES LTD	FORTESCUE METALS GROUP LIMITED
FORTESCUE METALS GROUP LIMITED	ENSHAM COAL SALES PTY LTD	GLENCORE INVESTMENT PTY LIMITED
GLENCORE INVESTMENT PTY LIMITED	FORTESCUE METALS GROUP LIMITED	GS COAL HOLDINGS PTY LTD
ILUKA RESOURCES LIMITED	GLENCORE INVESTMENT PTY LIMITED	HVO COAL SALES PTY LTD
MIDDLEMOUNT COAL PTY LTD	GS COAL HOLDINGS PTY LTD	ILUKA RESOURCES LIMITED
MILLER POHANG COAL COMPANY PTY LTD	ILUKA RESOURCES LIMITED	MACQUARIE COAL MARKETING PTY LIMITED
NEWCREST MINING LIMITED	MIDDLEMOUNT COAL PTY LTD	MIDDLEMOUNT COAL PTY LTD
PREMIER COAL HOLDINGS PTY LTD	MILLER POHANG COAL PTY LTD	MILLER POHANG COAL PTY LTD
QCOAL PTY LTD	NEWCREST MINING LIMITED	NEWCREST MINING LIMITED
RIO TINTO LTD	PREMIER COAL HOLDINGS PTY LTD	PREMIER COAL HOLDINGS PTY LTD
SANTOS LIMITED	QCOAL PTY LTD	QCOAL PTY LTD
ULAN COAL MINES LIMITED	RIO TINTO LTD	RIO TINTO LIMITED
WAMBO COAL PTY LTD	SANTOS LTD	SANTOS LIMITED
WARKWORTH COAL SALES LTD	SOUTH32 LIMITED	SOUTH32 LIMITED
WHITEHAVEN COAL LIMITED	ULAN COAL MINES LIMITED	ULAN COAL MINES LIMITED
YANCOAL AUSTRALIA LIMITED	WAMBO COAL PTY LTD	WAMBO COAL PTY LTD
	WARKWORTH COAL SALES LTD	WARKWORTH COAL SALES LTD
	WHITEHAVEN COAL LIMITED	WHITEHAVEN COAL LIMITED
	YANCOAL AUSTRALIA LTD	WONBINDI COAL PTY LIMITED
		YANCOAL AUSTRALIA LIMITED

Source: Australian Taxation Office

More recent data is also available from the ATO on company tax payments for the 2017-18 financial year. The data from the ATO on the total income and tax paid by the mining companies (in table 3.6) provides an alternative approach to estimating potential company tax payments derived from resource production. Using this information, tax paid by these companies can be seen to range from around 2.7% to 6.8% of total income (table 3.7).

3.7 Observed tax payments by mining companies

Year	Number of companies	Total income	Implied deductions	Taxable income	Tax payable	Tax as a share of total income
	No.	$m	$m	$m	$m	%
2017/18	35	64 727	55 149	9 578	2 095	3.2
2015/16	28	119 172	105 909	13 263	3 273	2.7
2014/15	27	112 181	94 027	18 154	4 919	4.4
2013/14	24	123 060	93 734	29 325	8 338	6.8

Source: Australian Taxation Office, https://data.gov.au/dataset/corporate-transparency/resource/1e8c8ae0-81d1-4780-a669-9e4a2a6ba1a4

Gillespie Economics' estimates total income of around $826m (in present value terms). This is consistent with the Regional NSW's estimate of $0.8 billion from the sale of the product.[11]

If company tax payable was 2.7% of total income, this implies a tax benefit of $7.1m to NSW (based on apportioning 32% of income tax payments to NSW). If company tax payable was 4.4% of total income, this implies a tax benefits of around $12m. From this perspective, Gillespie Economics' estimate of $15m is at the upper-end of estimates, although still within the range of observed tax payments.

- **While it is challenging to estimate the precise quantum of income tax payable, data on the tax payments from mining companies suggests that the actual tax payments could be significantly lower than estimated. However, this is more likely to be the case with large global mining companies that have greater scope to take actions to minimise tax payments. Given the limited foreign ownership of the Project, Gillespie Economics' estimate is within the range of observed tax payments.**

Indirect benefits

Gillespie Economics makes the following assumptions on the attribution of the social and environmental impacts that have been quantified.

3.8 Attribution of quantified environmental and social impacts to NSW

Impact	Attributed to NSW
Market employment benefits	100 per cent attributed to NSW
Non-market employment benefits	100 per cent attributed to NSW
Greenhouse gases	Based on NSW population as proportion of global population

Source: Gillespie Economics, 2020, *Bowdens Silver: Part 15 Economic Assessment.*

Royalties typically make up the largest share of the benefits categories and can be most readily estimated. Company income tax paid is also another important component. This is more challenging to estimate as it is based on company profits. There are also other

11 Submission dated July 2020, p.7.

components of the benefits stream which are typically smaller than the royalties and income tax streams.[12]

3.9 Estimated total benefits of the Project attributable to NSW (NPV $m, real 2016)

Benefits castegory	DAE 2016	CIE estimate
	$m	$m
Direct benefits		
Net producer surplus	4.6	4.7[a]
Royalties	63.4	57-64
Council rates	2.7	2.7[a]
Local contributions	2.9	2.9[a]
Company income tax apportioned	19.1	6.2-17.5
Total direct benefits	**92.9**	**73.5 - 91.8**
Indirect benefits		
Worker benefits	0	4.3
Supplier benefits	0	2.9
Total Indirect benefits	**0**	**7.2**
Total benefits	**92.9**	**80.7 – 99.0**

Table 3.9 presents Deloitte Access Economics and CIE's estimates for the proposed Rocky Hill coal mine, as an illustration of the types and quantum of the different benefit categories. DAE did not seek to calculate the indirect benefits categories as it believed that these were likely to be non-material. CIE's estimates of these indirect benefits were small (in comparison to the other benefit items).

While the table above relates to coal mining and for a specific mine, it provides some indication of the relative importance of the different benefits categories. Royalties and income tax captures around 80% of the total benefits to NSW that can be expected from the coal production.[13]

- **Based on our experience in evaluating other projects, royalties and company income tax are typically the largest benefit items. Other indirect benefits (e.g. wage premium to workers) are typically small.**

Wage premium to workers

The opportunities for employment in the region depend on the availability of unmet labour demand (i.e. whether there are enough unemployed people looking for work), the skills required for these jobs, and the level of remuneration (which may cause a labour shift from one industry to another).

12 Appendix B provides a list of the mines in the Upper Hunter and the ownership structure.

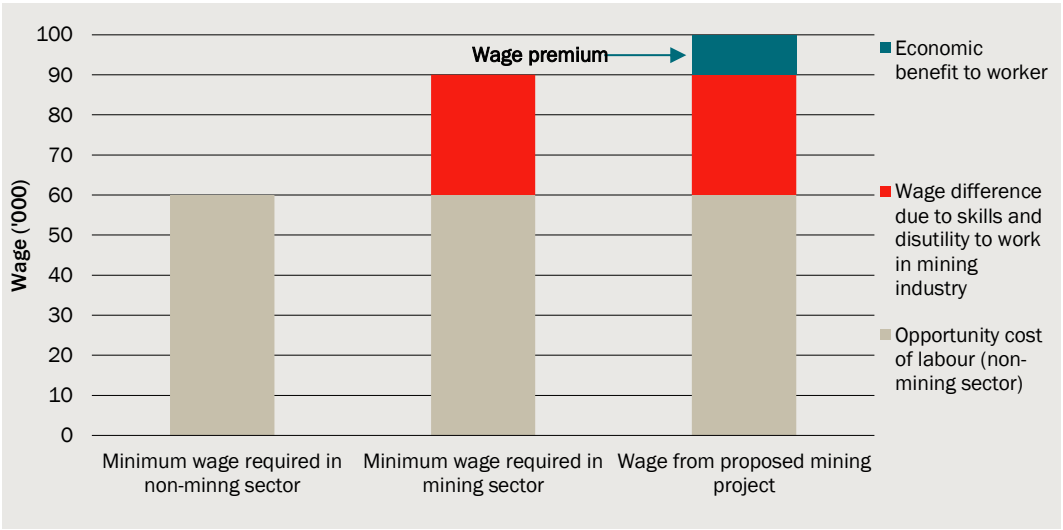
13 Note that there are also costs to NSW of coal production (e.g. air quality impacts) which were not presented in the table.

When a new mine opens in a region, it increases the demand for mining labour. In the absence of an excess supply of suitably qualified labour, the increase in demand will push-up wages in the region which benefits the workers in the mine. The Government would also benefit from receiving additional income tax on the higher wage.

The NSW Guidelines allow for an additional benefit category defined as 'benefits to workers' associated with a wage premium paid to workers as a result of the Project. The benefit to workers is the difference between the wage paid in the mining project and the minimum (reservation)[14] wage that the workers would accept for working elsewhere in the mining sector. The minimum wage reflects the employment opportunity costs (of alternative employment), skill level required and the relative disutility of an employment position. In chart 3.10

- the grey shaded bar, can (broadly speaking) be interpreted as the wage that an 'average' worker in the region *currently* receives;
- the red shaded area represents the additional amount that the 'average' worker could *currently* receive in the mining sector if they had the right skills as well as the additional amount needed to compensate a worker for other factors such as greater hardship for working in a mine compared to their existing job; and
- The teal shaded area is the impact on the mining wage due to the increased demand for labour, if the Project were approved. That is, a Project may increase the mining wage from, for example, $90,000 to $100,000 per year. This is described as the 'wage premium' for inclusion as a benefit in a CBA.

3.10 Identifying the economic benefit to workers



Box 3.11 presents an extract from the NSW Government's Guidelines which explains how the wage premium considered to be an economic benefit to workers should be interpreted.

14 The reservation wage is the minimum wage a worker has to be paid to work in a particular industry. In view of the hours of work and working conditions, there is a reasonable possibility that workers' reservation wages in mining are higher than in other industries and take into account hours of work and working conditions.

3.11 Description of NSW Guidelines approach to measuring benefit to workers

In practice, minimum (reservation) wages are not readily observable. The NSW Guidelines note that an appropriate starting assumption should be that workers do not receive a wage premium, even if they will earn more working in the mining sector.[15]

- If workers are already working in the mining sector, it is not generally the case that one mine will pay significantly more than other mines for workers doing a similar job in similar conditions.
- If a mine will employ workers that are currently working locally, but not in the mining sector, a mine may need to offer higher wages to compensate for more physically demanding work, tougher conditions etc. In this case, the benefit to the worker from higher pay will be offset by the costs associated with, for example, greater hardship (referred to as 'disutility').
- If a mine needs to attract workers from other parts of NSW, it may need to pay them more than they are earning in their existing or previous jobs so that they will relocate. For example, a mine that employs truck drivers in a remote area may need to offer a higher wage than is paid to drivers of similar trucks in the city or large towns. If so, the difference between the minimum wage necessary to get a truck driver to relocate and the standard wage in the city or town only reflects the disutility of having to work in a remote area.

The Guidelines note that an appropriate starting assumption should be that workers do *not* receive a wage premium, even if they will earn more working in the mining sector (given the disutility of working in mines and due to differences in skills). The Guidelines, however, also state that

> Although a zero wage premium is a useful starting assumption, the appropriateness of this assumption must be assessed on a case by case basis. This is because benefits to workers can be one of the major economic benefits from a project. If a proponent considers that a project will generate positive benefits for workers, the economic assessment should clearly explain the reasons for this conclusion and present evidence in support of the valuation that has been adopted.

Further, in theory, a CBA for NSW should include the economic benefit to workers already residing in NSW prior to the project (the base case). The economic benefit to workers migrating to NSW should not be included in the CBA for NSW. The estimate should be based on the proportion of NSW resident and non-NSW resident workers to be employed by the project for the purposes of attribution.

Based on the Guidelines, the welfare measure (covering individual and Government welfare) that should be reflected in the wage premium is:

- where a mine worker is previously employed elsewhere — the pre-tax wage in the mine less pre-tax wage employed in the current occupation *less any change in the disutility/skill of work;* and

15 NSW Government (2015), *Guidelines for the economic assessment of mining and coal seam gas proposals*, December, page 13.

- where a mine worker is otherwise unemployed — the pre-tax wage in the mine *less disutility/skill of working in the mine.*

In order to estimate the economic benefit to workers additional information is required to identify the drivers of the changes in mining wages. Information is required to:

- analyse how growth in mining wages is influenced by the remoteness of the mining location;
- understand the relationship between mining employment growth and mining wages growth; and
- understand how other factors such as the unemployment rate and the share of mining employment influence the growth in mining wages.

Gillespie Economics estimates

Gillespie Economics (p.15-59) include this gain and state that,

> Following the general approach of Streeting and Hamilton (1991) if it were assumed that 10% of the direct workforce of the Project (21 out of a total of 210 jobs) would otherwise be unemployed for three years and that the reservation wage for these people was $47,526 compared to a mining wage of $120,000, then the market employment benefit in terms of income would be $3.5M present value, at a 7% discount rate.

Gillespie's assumption that 10% of the direct workforce would otherwise be unemployed is based on footnote 24 (p.15-59) which states that

> This is in the context of a NSW unemployment rate of 4.5% (190,000 people) in March 2019 and a Mid-Western Regional LGA unemployment rate of 5.4% (679 people) in March 2019 (Department of Employment, Skills, Small and Family Business (2019).

Based on this footnote, it would appear that an assumption that 5% of the direct workforce is unemployed is a more appropriate assumption.

Gillespie also assumes that the reservation wage for:

- currently unemployed persons is $47,526 and this is applied to 21 of the mine workers
- currently employed workers is $64,500 (the average wage in NSW) and this is applied to 189 mine workers.

The reservation wage is then compared to the mining wage of $120,000 to estimate the wage premium. The wage benefit is assumed to only apply for 3 years.

Gillespie Economics' analysis makes an assumption that that there is no disutility of working in the mining sector and there are no additional skills needed to work in a mine compared to an 'average' job. He also assumes that the Project will draw its workforce from the 'average' worker (e.g. a barista at a café in the township), not existing mining workers currently employed on another mine. The workforce is predominantly drawn from the region. No evidence is put forward to support these assumptions.

If workers could so readily transition from the 'average' job to a coal mining job then economic theory would suggest that market forces would work to remove the wage differential. For example, a worker currently being paid $50,000 per year would be willing to work for, say, $80,000 in a mine. The mine would not need to pay the average

mining wage of $120,000 to attract the worker and the average mining wage would be 'bid down' substantially. The fact that there remains a substantial wage differential would support the view that there are other factors driving this wage differential. That is, factors such as the additional hardship of working in mines compared to the 'average' job and the additional skills needed to work in a mine would explain the wage differences.

The Guidelines recognise that the estimate of the mining wage premium as a benefit to be included in a CBA, needs to account for these other factors that explain the differences in wages between different types of jobs (in different locations).

For currently employed workers, using the average mining wage is the appropriate reservation wage because it accounts for the other factors that explain the wage differentials.

Gillespie has not indicated that the Project will pay workers an amount greater than the average mining wage. Similarly, Gillespie has not provided any evidence to indicate that the new mine would draw labour from the currently unemployed.

- **For the purposes of the CBA, the wage benefit can be assumed to be zero.**

Non-market value of employment

This particular item relates to the impacts on the unemployed individuals themselves. The rationale for inclusion of this item is that,

> ….there may also be spillover effects and externalities to third parties. These are public good values. Spill-over effects referred to in the literature relate to empathy based losses to family or friends (close associates) of impacted workers because of the workers being unemployed and increased crime and community dislocation (Haveman and Weimer 2015: Streeting and Hamilton 1991). Empathy based impacts may also spill over more broadly into the existence values of others in the community who feel sympathy for the unemployed.[16]

Gillespie Economics estimated the non-market value of employment at the Project to be $78 million (in present value terms).[17] This is based on an average non-market value of approximately $25 000 per employee per year transferred from a choice modelling study conducted by Gillespie Economics in 2009.[18] It is applied to an "average annual 210 direct jobs during operations, approximately 15 years".

The reported values reflect empathy values "because of the workers being unemployed and increased crime and community dislocation". However, as the BDA Group points out, the context of a fully employed economy may not be as pertinent.[19] The Gillespie Economics analysis does not appear that consideration has been given to the existing employment status of the employees, nor the impacts of potential 'crowding out' of existing jobs.

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16 Gillespie Economics (2019), p.15-60.

17 Based on 300 employees over 25 years

18 Gillespie Economics, 2009, *Bulli Seam Operations: Choice Modelling Study of Environmental and Social Impacts*, Prepared for Illawarra Coal Holdings Pty Ltd.

19 BDA Group (2016), *Economics Peer Review*, p.4.

To put this non-market value into perspective, if the value of $25 000 per mining employee per year was applied to all workers in the mining industry (approximately 40 000 in NSW) [20], the total non-market benefit of employment in the mining industry would be approximately $1 billion per year. It seems unrealistic that NSW residents are willing to pay over $1 billion per year (equivalent to $371 per household per year) to attain the non-market benefit of mining employment. As a comparison, if 20 per cent of mining employees would otherwise have been unemployed, the avoided cost of unemployment benefits, paid indirectly by households through tax revenue, would be equal to approximately $40 per household per year, significantly lower than $371 per household per year.

There are several general points to note:

- Gillespie Economics recognise that the inclusion of this benefit category is contentious and have, therefore, reported the results 'with and without' the inclusion of these benefits.
- This was also recognised by BDA Group who was engaged by the Proponent to review Gillespie's analysis. BDA Group state that "the reported values reflect empathy values because of the workers being unemployed and increase crime and community dislocation. Further, the estimated value of $371,000 per employee NPV over 30 years over and above their wages is contestable, particularly given the implicit assumptions in relation to ongoing employment opportunities".
- The inclusion of this category of benefits is also inconsistent with NSW Government (December 2015) Guidelines.

Further, in a review (commissioned by IPART) of Hunter Water's and Sydney Water's Customer Willingness to Pay Surveys, Gillespie notes that

> Importantly, even the single economic WTP study, which followed many of the best practice principles, did not adequately specify the hypothetical good being valued. ….
>
> In the CIPA Phase 3 Report, the good being valued is 'Limiting release of untreated wastewater at Sydney cliff faces.' ….But the outcome of this for public health risks and ecosystem impacts is not stated. It is left to respondents to infer the outcome. Each respondent will likely infer a different outcome leaving the interpretation of the results compromised.[21]

The same criticism would apply to the 2009 study which Gillespie relies upon for the non-market valuation of employment benefits. That is, the study should value specific outcomes, rather than respondent perceptions of the outcomes from jobs. Gillespie acknowledges that the motivation of respondents to the Bulli Seams choice modelling study is unknown. In other words, it is not known which outcomes the estimated 'willingness to pay' relates to. Respondent perceptions of the outcomes from jobs may be

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20 NSW Mining, *Fast Facts*, http://www.nswmining.com.au/industry/fast-facts

21 See pages 3 and 19. https://www.ipart.nsw.gov.au/files/sharedassets/website/shared-files/pricing-reviews-water-services-metro-water-prices-for-hunter-water-corporation-from-1-july-2020/publications-prices-for-hunter-water-corporation-from-1-july-2019/consultant-report-gillespie-economics-assessment-of-hunter-water%e2%80%99s-and-sydney-water%e2%80%99s-customer-willingness-to-pay-surveys-january-2020.pdf

inaccurate, including in relation to the employment outcomes for workers if the jobs aren't there.

- **Given the highly contentious nature of these estimates and the lack of robust evidence provided to support the estimates, the CIE recommends that the non-market value of employment should be assumed as 'zero' for the economic analysis of the Project.**

4 Environmental and social impacts

There are a range of potential environmental and social impacts identified in the Gillespie study. These are listed in table 4.1.

4.1 Costs and benefits to NSW

Environmental, social and cultural costs	Incidence of benefits and costs	Magnitude of impact
		$m, PV
Agricultural impacts	Impacted famers but compensated via purchase	No material residual impact
Surface water	Local surface water users but compensated via purchase of WALs	No material residual impact
Groundwater	Local surface water users but compensated via purchase of WALs	No material residual impact
Air quality impacts	Adjoining landholders	Cost of acquiring impacted properties or negotiated agreement included in development costs. No material residual impacts.
Noise impacts	Adjoining landholders	Cost of acquiring impacted properties or negotiated agreement, and at receiver mitigation costs included in development costs. No material residual impacts.
Ecology and biodiversity	Local and NSW households	Some loss of values but offset by provision of biodiversity offsets
Aboriginal heritage	Aboriginal people and other local and NSW households	No material residual impact
Historic heritage impacts	Local and NSW households	No material residual impact
Transport and traffic	Local residents	No material impacts. Costs of access upgrade and road relocation included in development costs
Visual amenity	Adjoining landholders	Mitigation measures included in development costs. No material residual impact
Greenhouse gas impacts	Local and NSW households	$0
Net public infrastructure costs	NSW Government and NSW households	No material impacts
Loss of surplus to other industries	Local industries adversely impacted by the Project	No material impacts

Source:

Greenhouse gas emissions

Gillespie Economics has estimated the impact of greenhouse gas emission applying three different shadow prices, consistent with the guidelines:

- Forecast European Union Emission Allowance Units price

- Australian Treasury Clean Energy Future Policy Scenario
- US EPA Social Cost of Carbon.

Based on these prices, Gillespie Economics estimates the present value of the cost of greenhouse gas emissions (Scope 1 and 2) ranges between $9 million and $36 million. This cost is then apportioned to NSW by applying Australia's share of the global population (around 0.31 per cent) and NSW's share of the Australian population (32 per cent), equivalent to:

- a damage cost of between $27 000 and $111 000 (present value) to Australia
- a damage cost of between $9 000 and $36 000 (present value) to NSW.[22]

NSW Guidelines

The NSW Government's April 2018 *Technical notes supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals* outline that analysis include:

- a central estimate of GHG emission output and the expected emissions profile of this central estimate for Scope 1 and Scope 2 emissions
- an estimate of the economic impact of GHG emission output to NSW only
- sensitivity analysis on anticipated project GHG emissions outputs (Scope 1 and 2) at carbon prices below and above the central estimate price.[23]

The Technical notes (page 49) specify:

> The value of the externality is limited to the impact on NSW, consistent with the Guidelines and how other costs/benefits are measured within the CBA. As noted in the Guidelines, the focus is on the costs and benefits of the project as they relate to the community of NSW.

Estimating the impact to NSW

Gillespie's approach of only valuing 0.35 per cent of greenhouse gas emissions (Scope 1 and 2) is based on his interpretation of the phrase in the Guidelines related to "estimating the economic impact of GHG emission output to NSW only".

In our view, this is a misinterpretation of the Guidelines. While it is not explicitly stated, in our view the intent of this clause was to ensure that emissions from using the resource outside NSW were not included in the economic impact to NSW (e.g. emissions from coal-fired generators in India that used NSW sourced coal). In this regard, the Guidelines dedicate substantial discussion to the exclusion of Scope 3 emissions from the CBA which is consistent with the focus on "NSW only".

We recognise that the final Guidelines do not provide explicit step by step 'rule' on how to estimate the impact to NSW, although the draft Guidelines and accompanying technical notes previously provided this in the form of an Excel spreadsheet. Gillespie Economics' approach would be inconsistent with the 2015 draft guidelines, which include a step-by-step guide and require the attribution of the full cost (i.e. $9m - $36m).

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22 Gillespie Economics, 2020, *Bowdens Silver: Part 15 Economic Assessment.*

23 NSW Government's April 2018 *Technical notes supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals*

Further, if the final Guidelines intended to radically diverge from the approach in the draft guidelines, there would have been a detailed/explicit discussion on the reason for this and the different approaches (e.g. by population share) of apportioning impacts to NSW. The fact that the final Guidelines are silent on the apportionment issue strongly suggests that it assumed the attribution of the full cost to NSW.

Assigning 100 per cent of emissions from the Project is also consistent with *NSW Government Guide to Cost-Benefit Analysis (TPP17-03)* which discuss the approach to including externalities in the CBAs. Box 4.2 presents an extract from Section 7.4 on page 59 of the Guidelines. Given the materiality of the issue, if Treasury believed that only 0.35 per cent of emissions from a Project should be accounted for the CBA Guidelines would make this explicit.

4.2 Valuation of Externalities (NSW Treasury CBA Guidelines)

Externalities can be estimated drawing on market data, where it is available. For example, the valuation of externalities like greenhouse gas emissions is normally examined as part of an Environmental Impact Assessment which follows broadly similar steps:

1 Determine the scope of the impact (e.g. categories of externality and/or geographic coverage).

2 Measure the physical change (i.e. the volume of greenhouse gas emissions relative to the base case).

3 Derive from market data or reasonable proxies a market price or cost in dollars per unit of volume/impact (e.g. market prices of emissions trading certificates).

4 Undertake sensitivity analysis of key parameters.

Further the NSW Government's Climate Change Framework includes a "goal to reach net zero emissions by 2050". This reflects the Government's view of the potentially significant impacts to NSW of not lowering greenhouse gas emissions.[24] Adopting Gillespie's interpretation would mean that there is no value (0.35 per cent) to NSW of reducing greenhouse gas emissions in NSW. This is inconsistent with NSW Government policy position.

The approach of assigning 100 per cent of the emissions from the Project is also consistent with CBA guidelines in other sectors such as AusRoads guidelines for road projects.[25]

- **In our view, the greenhouse gas emissions should be 100 per cent from the Project's GHG emissions, resulting in a cost of between $9m to $36m in present value terms.**

24 https://www.environment.nsw.gov.au/research-and-publications/publications-search/climate-change-fact-sheet-climate-change-in-nsw

25 https://austroads.com.au/publications/economics-and-financing/agpe04-08

Unmitigated environmental impacts

CIE has not verified 'no material impact' – various environmental and social impacts are listed as 'no material impact' (table 4.1). 'No material impact' is defined in the Gillespie Economics' assessment as

- "does not mean that there would be no impacts, but that impacts are not likely to amount to more than 5% in aggregate of the quantified net production benefits of the project"

Uncertainty regarding quality impacts to groundwater. The economic assessment notes that local surface and groundwater users will be 'compensated' via the purchase of Water Access Licences. This accounts for impacts to surface and groundwater that relate to quantity. However, there may also be quality impacts that are currently unforeseen. The Economic Assessment notes that the proponent will prepare and implement a Water Management Plan to:

- monitor groundwater dewatering volumes
- groundwater quality and level monitoring in a network of piezometers within and surrounding the Mine Site which would enable determination of any mine-related impacts on surrounding groundwater users, and
- trigger action response plans to establish what further management actions are required when certain triggers are reached.[26]

The Economic Assessment notes that a final Void Management Plan will also be prepared as part of a Mine Closure Plan prior to the cessation of mining that would detail the intended management of the final mine void over time.

The EIS documentation has been reviewed by the different NSW agencies. The EPA, for example, has considered the proposal in terms of the potential impact to air quality, noise emissions, ground and surface water quality. The EPA has requested a range of additional information to further refinement its assessment of the proposed activities.

In its submission (dated 31 July 2020) the NSW Resource Regulator has also raised points of clarification and sought additional information to assist in its further assessment of the proposed activities.

Similarly, DPIE Water's submission (dated 31 August 2020) has also raised a number of issues which need further clarification in regards to the ability to meet water licensing requirements, the groundwater modelling undertaken and whether a borefield is part of the project.

From our consideration of the submissions, there do not appear to be major concerns raised by the agencies where impacts can't be adequately managed/mitigated. Therefore, unless new information arises following further review by the agencies, it is reasonable for Gillespie Economics' to conclude that there are no additional impacts that need to be quantified for the economic analysis.

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26 Gillespie Economics (2020), Part 15: Economic Assessment p 46.

5 Local Effects Analysis

Gillespie Economics has conducted the Local effects analysis using the standard input-output methodology. The input-output technique is based on strong assumptions about full employment such as use of fixed coefficients implying no structural changes like economies of scale and technological progress, lack of resource constraints and the resultant impact on prices. These assumptions tend to overstate the benefits of a project. Input Output results also provide average responses to a stimuli which tend to be higher than a marginal response as has been acknowledged in Annexure 5 of the report. And as noted by the Productivity Commission

> [Multiplier] Abuse primarily relates to overstating the economic importance of specific sectoral or regional activities. It is likely that if all such analyses were to be aggregated, they would sum to much more than the total for the Australian economy… In particular, these [multiplier] applications fail to consider the opportunity cost of both spending measures and alternate uses of resources and may misinform policy makers.

In other words, by failing to take into account resource constraints and the manner in which an economy adjusts to economic stimuli, multipliers overstate the impacts of economic activities, and potentially overstate the economic impacts.

The degree to which the multiplier analysis overstates the economic impact will be mitigated to some extent by relaxing the full employment assumption.

The CIE has not verified the multipliers used in the analysis. The analysis uses Type 11A (Type II) multipliers which include production and consumption induced impacts of a stimuli. There is a question around the use of Type II multipliers which seem to further exaggerate the issues with the assumption about the lack of resource constraints. Further, the multipliers appear to have been estimated with respect to the net income and employment numbers which is interpreted as for example, additional wages paid in the economy due to the (net) income in the mining sector increasing by $1 million. This is different to the conventional multiplier approach which estimates the additional value-added, output and employment generated by a particular industry increasing its output by $1 million have not been used here. It is also not always clear how the multipliers have been applied to estimate the impact.

Some of the additional, more specific comments are discussed below.

Table 5.1 measures the average increase in net income per job using the difference between the average net income in construction and mining and the average net income in other industries. It is not immediately clear that this is a reasonable assumption. Using 'Average net income in other industries' as the comparator assumes that people employed elsewhere in the region, potentially doing different activities/roles, could gain employment in mine construction or operation. A better comparison, if the data were

available, would be to use average incomes from other heavy construction/mining activities.

Table 6.1 suggests an average income of $106 979 for the mining sector and $73 557 for all industries, which is higher than $91 803 and $46 203 assumed in table 5.1. Estimates given in table 6.2 also implies an average increase in net income per job at $33 422 which is considerably different to $45 600 as noted in table 5.1. These differences are significant and have not been addressed with an explanation.

In section 6.4, the local area impact is estimated based on employment of 131 workers during the construction phase and 210 workers during the operation phase. However, the analysis assumes that "...future employees residing in the local area are already employed and that job vacancies created by these people filling the mining and construction positions remain unfilled." This implies that the flow on impact, especially those driven by consumption, may be overstated. It may be more appropriate to measure the impacts as captured by incremental expenditure in the local economy based on the increase in net income per year or the corresponding FTE estimate.

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