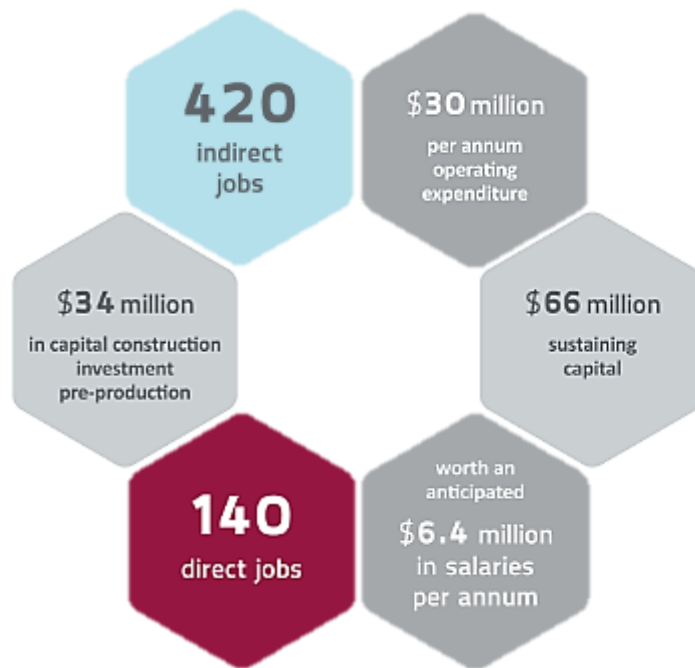


# CHAPTER 24

## ECONOMIC IMPACT AND OPPORTUNITY



## BIRD IN HAND GOLD PROJECT

### MINING LEASE PROPOSAL



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All maps presented in this chapter are in GDA94 / MGA zone 54 (EPSG: 28354) unless otherwise stated.

## 24 ECONOMIC IMPACT AND OPPORTUNITY

This chapter represents an evaluation of the economic contribution of the proposed Bird in Hand Gold Mine (Project) to the regions in which it will operate. At a high level, the project generates:

- Gross revenues of \$300 million, based on the 2017 study assumptions of a gold price of US\$1,062 per ounce and a US/AUD exchange rate of 73¢.
- \$135m in free cash-flow at an NPV of \$101m and an Internal Rate of Return (IRR) of 96% utilising Scoping Study 2018 assumptions of US\$1225 and a US/AUD exchange rate of 72¢.
- The Project will generate a total impact on Gross State Product of an estimated \$220 million over 8 years (excluding the Gross Operating Surplus of the Project itself).
- This includes \$191 million of estimated wages and salaries paid to households. Employment in operating roles reaching 140 persons in 2021 – in total 600 person years of employment, over a 5 year period of 2020-2024.
- Payment of direct taxes of \$37 million and royalties of \$10.5 million and payroll tax of \$2.7 million over the life of the Project.
- 60% of the impact is estimated to occur in the Adelaide Hills Council area, around Woodside (an estimated 1,425 person years of employment and peaking at 330 full time equivalent jobs), and 20% would be expected in the Fleurieu Peninsula, around Strathalbyn (500 person years of employment – and peaking at 126 full time equivalent jobs).

The scope of work was in line with the Ministerial Determination and includes the following aspects of the development in terms of anticipated benefits, with justification where available, for the local, regional and state economy, including:

- revenue to be generated at the mine gate
- the breakdown of capital and operating expenditures (spending in goods and services in local community, state and external to state)
- wages and other employee benefits
- potential for value adding of a mined commodity
- flow-on economic effects
- economic benefits derived from local employment
- forecast royalty payments and other direct state government taxes
- any other potential economic benefits and opportunities proposed during the development of the project, operation of the proposed mine and post mine completion.

Community consultation has raised concern about potential negative economic effects from potential impacts on local businesses, particularly local wineries and cellar doors. Chapter 22 assesses the potential impacts on agriculture as minimal. This chapter considers potential flow on affects to agriculture in this context and addresses a potential worst case scenario.

### 24.1 ABOUT THE AUTHORS

#### 24.1.1 ECONOMIC IMPACT REPORT

This chapter was informed by the report of Professor Barry Burgen. Barry Burgen is Professor of Management and BBT MBA Program Director at Bond University, where he is also a Deputy Dean. He is a member of the Initial Accreditation Committee of the Association to Advance Collegiate Schools of Business. His expertise is in the area of financial, economic and social assessments - with a particular

interest in infrastructure valuation and financing issues. He has broad level experience in public policy valuation (with emphasis on methodologies with respect to project evaluation and cost benefit analysis, distribution of centrally collected taxation revenues, housing economics), the application of microeconomic theory at a managerial level; (particularly in areas of public decision making and pricing) and in applied econometrics (with much of his work in this area dealing with the analysis of regional economies - including regional economic modelling).

#### 24.1.2 PEER REVIEW OF THE ECONOMIC IMPACT REPORT

Jim Hancock is Deputy Director at the SA Centre for Economic Studies (SACES) at the University of Adelaide. He has 25 years of experience in applied economic and statistical analysis, both at SACES and prior to that working as an economist and then manager in South Australian Treasury.

At SACES he has been project manager for assignments in a range of areas, including macroeconomic performance and growth, cost-benefit analysis, econometric analysis of labour market programmes, environmental evaluations, competition policy, program evaluations, regulatory issues and public finance.

At Treasury his work covered a range of areas including macroeconomic monitoring and forecasting, tax policy issues, evaluation methodologies and market structure issues. He has also been lecturer for public finance in the School of Economics at University of Adelaide.

#### 24.2 APPLICABLE LEGISLATION AND STANDARDS

The relevant legislation in relation to the economic environment and the Bird in Hand Gold Project is the *Mining Act 1971* (SA).

The *Ministerial Determination for a Mining Lease Application for the Bird in Hand Gold Project*, authorised by the *Mining Act 1971*, outlines the required understanding of potential economic benefits and impacts relating to the proposed Project.

Potential benefits for the local, regional and state economy must be described such as:

- revenue to be generated at the mine gate
- the breakdown of capital and operating expenditures (spending in goods and services in local community, state and external to state)
- wages and other employee benefits
- potential for value adding of a mined commodity
- flow-on economic effects
- economic benefits derived from local employment
- potential to bring forward development of other mines in the area by utilising this mine's infrastructure
- approximate royalty payments and other direct state government taxes profile
- any other potential economic benefits and opportunities proposed during the development of the project, operation of the proposed mine and post mine completion.

The Ministerial Determination requires that:

- The description of specific elements of the environment (the *environment* including permissible land use that may reasonably be expected to be impacted by the proposed mining operation during construction, operation, and indefinitely post mine completion). Existing or permissible land use includes commercial and community business activities.

- For impact events where the environmental receptor is a permissible land use, the potential for both economic benefits and negative impacts arising from the Project on the identified permissible land use must be quantified.
- The assessment of economic impacts on permissible land use must be developed by a person who is suitably qualified and experienced in economic impact assessment, and must be peer reviewed by a suitably qualified (experienced in economic impact assessment) independent expert.
- The scope of the review, the report arising from the review, and a report of any actions undertaken as a consequence of the findings of that review has been included as an appendix to the mining proposal.

#### 24.2.1 SOUTH AUSTRALIA'S MULTIPLE LAND USE FRAMEWORK

South Australia has established a framework that sets out the approach to be taken to ensure co-existence of different land uses. The following is taken from South Australia's *Multiple Land Use Framework*, released in 2017 after significant community consultation.

Land use in South Australia is varied and includes recreation, conservation, agriculture, fisheries, aquaculture, forestry, biodiversity, minerals and energy exploration, renewable energy production, housing, defence, tourism, manufacturing and infrastructure, to name just a few. Land ownership, environmental protection, native title and Aboriginal and non-Aboriginal heritage are all important considerations. South Australia has an estimated 76,000 hectares under vine. In 2014–15, the industry produced more than 730,000 tonnes of grapes valued at \$470 million. Less than 1% of the State is currently under mineral and petroleum production tenements (SARIG, 2018). Mineral exports accounted for 29% of total State exports for 2015 and production was valued at \$5.4 billion. Together, mining and agriculture comprise 74% of South Australia's exports, underscoring the continued importance of supporting our regional communities.

The Framework has been designed to operate within established regulatory and policy frameworks and provides guidance on how best to engage with stakeholders on land use change projects. The Framework is consistent with many of the principles found in State policies, planning documents and Ministerial Guidelines; the Framework does not replace these, nor does it alter existing land rights or override existing legislation.

#### 24.2.2 COMMERCIAL

Outside the Mining Act, there is no specific legislation regarding negative impacts to commercial businesses. The proposal operates within the general principals of commercial law and common law duties, including tortious negligence that governs cases of breach of a duty of care and impact on others. In South Australia the *Civil Liability Act 1936* (SA) is used to assess the negligence of individuals and the *liability* they face as a result of any negligent acts on their part.

### 24.3 ASSESSMENT

#### 24.3.1 SCOPE

The scope of the Economic Impact Assessment is included as an attachment to the Economic Impact Assessment in Appendix W1.



### 24.3.2 METHODOLOGY

The economic impact of the Project can be considered to be:

- The economic contribution of the Project
- The possibility of offsetting economic contribution linked to negative impacts of the mine development on existing or potential future land uses.

The Economic Impact Report (Appendix W1) and peer review report (Appendix W2) provides modelled projections of both of these aspects of the development – using a commonly used methodology for such analysis.

### 24.3.3 ECONOMIC IMPACT OF THE PROJECT

The analysis of the economic impact of the investment and operating expenditures in developing the Project can be summarised as requiring the following steps:

1. Collation of expenditure by category and employment data
2. Construction of a 20 sector 2016 state and regional input output tables based on the RISE Model of SA (Econsearch, 2013<sup>1</sup>) (“RISE model”) and allowing for inflation and productivity change over time. Productivity changes have been estimated by reviewing the change in turnover per employee for each of the 20 industry sectors in the national input output tables and it is assumed that changes at the national level also apply at the state and regional level. The 20 sector summary table has focussed on sectors that relate to the Project impact.
3. Allocation of expenditures to industry sectors as defined in the input output tables
4. Application of expenditure as a final demand shift to the input-output tables to calculate induced effects of the gold mining operations

The estimates of economic impact, both the direct impacts in the affected sectors themselves, and the flow-on impacts across the broader economy, that are presented in this section are based on the RISE model (as noted above). This is an input output model prepared for the Department of Premier and Cabinet on a regular basis with the last major update being undertaken using 2011 Census data<sup>2</sup>. The tables for the state, and for the Adelaide Hills and Fleurieu Peninsula and Kangaroo Island have been updated for productivity changes over time and for inflation to bring them to a 2016 base for this analysis.

The key indicators of economic impact reported are:

- **Gross State/Regional Product (GSP/GRP)** – which is a measure of the net contribution of an activity to the state economy as defined within the national accounting framework - and is the **value added** created in the economy – the sum of household income with gross operating surplus or other value added.
- **Household Income** – the gross wages generated for the household sector (employees).
- **Employment** - the number of full-time equivalent (FTE) jobs.

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<sup>1</sup> Econsearch, 2013, *Input-Output Tables for South Australia and its Regions, 2011/12 Update: Technical Report*, Report for the Department of Premier and Cabinet

<sup>2</sup> There have been updates in these tables at the state level provided internally to the government, but not at the regional level – with limited data available to do this. The underlying tables have been adjusted for inflation and productivity changes at a macro level. A major update of the tables would be expected in 2017/18 when journey to work data re employment becomes available from the ABS (2016 census).

Estimates of economic impact are presented in terms of:

- **Direct** (employment, incomes and value added) impacts at Terramin,
- **Induced** or flow-on impacts (impacts caused by the supply chain effects), and
- **Total** impacts (the sum of direct and induced).

The use of economic impact assessments based on State and Regional Input Output Tables has been a prominent process for translating directly created expenditure (a final demand stimulus) into jobs and incomes, and for establishing the extent of the flow-on impacts.

The methodology used in this assessment is similar to that used internationally in other jurisdictions to assess the regional economic impacts of major projects and is consistent with that recommended by Pricewaterhouse Coopers in a course presented to the America School of Mines (2012). It has been used in recent times by the South Australian Government to investigate the potential economic impacts of significant economic events such as new defence projects, the closure of Holden and the steel works in Whyalla.

The use of Input-Output Tables allows an assessment of the impact of a certain event or events (in this case the development of the Project) on the incomes (value added or Gross State/Regional Product) and employment of a specified region or regions. This is consistent with national accounting frameworks.

It should be noted that alternative economy wide models are available, including econometric models or Computable General Equilibrium (CGE) models. Input-Output models are general equilibrium models in that the impacts of one sector are considered across the broader economy, but they assume infinite elasticity of supply. Other models may include the impact of resource constraints under varying assumptions. As such the use of Input-Output models is sometimes criticised as overstating the economic impact of a given project or economic event. However, it should be noted that both the theory and the evidence suggests that at the regional and state geographic levels such constraints are minimal in a long run perspective – as capital and labour can flow relatively easily across borders, and as such input output provides an appropriate methodology at the state level (though is more limited for looking at national level impacts).

## 24.4 RESULTS OF SCOPING STUDY

Terramin released a Scoping Study for the Bird in Hand Gold Project on the 30<sup>th</sup> October 2018.

Financial analysis of the project economics based on precious metal prices of A\$1,700/oz gold and A\$22/oz silver (US\$1,225/oz gold and US\$15.5/oz silver and an AUD:USD exchange rate of 0.72) indicates the base case project generates a strong financial return, with a post-tax nominal NPV (8%) of A\$101m and IRR 96%. The Scoping Study announcement has been included in Appendix W3.

Over the 5 year Life of Mine (LoM) the plant will produce an average of 8,000dmt of concentrate per annum containing, 47,000 ounces of gold (92% recovery, 97% payable) and 22,000 ounces of silver (92% recovery, 97% payable), at 11 g/t gold and 5 g/t in silver by-product credits.

Total pre-production capital for the project is A\$34m. Total LoM capital inclusive of pre-production capital and net sustaining capital is A\$66m.

Operating costs are attractive given the high grade of the deposit and proximity to infrastructure, the C1 cash cost (a specific method adopted in the mining industry and developed by Brooke Hunt), including all operating costs and excluding royalties, rehabilitation and capital expenditure is A\$629/oz payable gold with an All-in Sustaining Cost (AISC) of A\$841/oz.

Key Scoping Study outcomes have been summarised in Table 24-1.

The Scoping Study ASX announcement has been included for reference in Appendix W3.

TABLE 24-1 | BIRD-IN-HAND PROJECT: KEY SCOPING STUDY OUTCOMES

Technical Parameters		Financial Parameters	
Schedule Production <sup>3</sup>	47,000 oz gold in conc. (46,000 oz gold metal)	Commodity Prices <sup>4</sup>	A\$1,700/oz gold A\$22/oz silver
	22,000 oz silver in conc. (21,500 oz silver metal)	C1 Costs (LOM ave) <sup>7</sup>	A\$629/oz
Processed Material	595 kt at 11g/t gold and 5g/t silver	AISC (LOM ave) <sup>8</sup>	A\$841/oz
Mineral Resource	650 kt at 12.6 g/t gold and 5.8g/t silver	Start-up Capital <sup>6</sup>	A\$34M
Conc. Grade (LOM ave) <sup>4</sup>	170g/t gold 80g/t silver	LOM Sustaining Capital	A\$66M
Mine Production Rate <sup>4</sup>	150 ktpa	Free Cashflow (Post-tax nominal)	A\$135M
Life of Mine	5 Years	NPV <sup>8</sup> (Post-tax nominal) <sup>9</sup>	A\$101M
Payback Period	1 Year	IRR (Post-tax nominal) <sup>9</sup>	96%

3. Schedule Production, Mining Rate and Concentrate Grade represent the average values following initial operational ramp up period (approx. 1 year).
4. Commodity prices used in this study are currently at or below spot price at the date of this report (US\$1,225/oz gold and US\$15.5/oz silver). Exchange rate assumption is AUD/USD FX 0.72.
5. Start-up Capital Costs represents pre-production capital requirements exclusive of working capital and sustaining capital.
6. C1 Costs are defined as direct cash operating costs produced, net of by-product credits, divided by the amount of payable gold produced. Direct cash operating costs include all mining, processing, transport, treatment and refining costs and smelter recovery deductions through to refined metal.
7. All-in Sustaining Costs (AISC) includes C1 plus sustaining capital, indirect costs and royalties.
8. NPV has been discounted using a discount rate of 8% and is a post-tax nominal calculation. NPV and IRR are discounted from ramp up of start-up capital.

## 24.5 EXISTING ENVIRONMENT

As discussed in Chapter 22, the BIH Gold Project sits within an agricultural district which includes various land uses. The wineries within the vicinity of the Project include Bird in Hand and Petaluma. According to the census in the broader Lobethal/Woodside area in 2011, the area had a total employment of 110 in wine manufacturing and 56 in grape growing (note this was pre-Petaluma being established). The above wineries bring their grapes in from other locations. As private businesses, there is little publicly available information re the size or level of activity at each winery and in other operations, but employment should still be captured in the census data.

The census employment question (the only real source of small area employment data) solicits a response to the questions about an individual's employment "last week". As such where employment

is seasonal, such as in a winery, the estimate will not reflect casual employment in the summer season, and therefore can understate annual employment outcomes in full time equivalent terms. On the other hand, the employment is nominated in jobs, and as such will overstate full-time employment (ie the 110 employees in the wine industry in the region may not necessarily all be full time).

## 24.6 SENSITIVE RECEPTORS

Sensitive receptors include wineries and cellar door facilities identified in Figure 24-1, as well as vineyard and beef cattle grazing identified in Figure 24-2, and operational wells as identified in Figure 24-3.

TABLE 24-2 | IDENTIFIED SENSITIVE RECEPTORS

Sensitive Receptor	Summary	Impact ID
Bird in Hand Winery	Bird in Hand Winery is located on the western boundary of the proposed Mining Lease - Figure 24-1	PIE_24_01 PIE_24_04 PIE_24_07 PIE_24_10 PIE_24_23 PIE_24_24 PIE_24_32 PIE_24_33 PIE_24_37 PIE_24_40
Petaluma Winery	Petaluma Winery is located within the proposed Mining Lease, however to the north-east of the proposed operating area - Figure 24-1	PIE_24_03 PIE_24_06 PIE_24_09 PIE_24_12 PIE_24_22 PIE_24_27 PIE_24_34 PIE_24_36 PIE_24_39
Artwine Cellar door	Artwine Cellar door is located to the west of the proposed Mining Lease - Figure 24-1	PIE_24_02 PIE_24_05 PIE_24_08 PIE_24_11 PIE_24_21 PIE_24_29 PIE_24_35 PIE_24_38 PIE_24_41
Vineyard Operations (A) - BIHW	Shown in Figure 24-2	PIE_24_23 PIE_24_32
Vineyard Operations (B) – Artwine + Davis	Shown in Figure 24-2	PIE_24_21 PIE_24_29 PIE_24_25 PIE_24_30
Vineyard Operations (C) - Tolley	Shown in Figure 24-2	PIE_24_26
Vineyard Operations (D) - Eureka	Shown in Figure 24-2	PIE_24_28

Sensitive Receptor	Summary	Impact ID
Vineyard Operations (E) - Petaluma	Shown in Figure 24-2	PIE_24_22 PIE_24_27
Beef Cattle grazing (F)	Shown in Figure 24-2	PIE_24_48
Existing groundwater users	Shown in Figure 24-3	
Local hospitality/tourism businesses	Local hospitality/tourism businesses	PIE_24_13 PIE_24_14
Local viticultural businesses	Local viticultural businesses	PIE_24_15
Landholders living in Pfeiffer Road Valley	Landholders living in Pfeiffer Road Valley	PIE_24_43
Landholders in Woodside	Landholders in Woodside	PIE_24_44 PIE_24_45
Neighbouring businesses	Figure 24-1 and Figure 24-2	PIE_24_16 PIE_24_17 PIE_24_42 PIE_24_46 PIE_24_47
Neighbouring cellardoor businesses	Figure 24-1	PIE_24_18 PIE_24_19 PIE_24_20





Figure 2: Project Site

FIGURE 24-1 | OPERATIONAL SITE “GOLDWYN” AND SURROUNDING WINERIES AND CELLAR DOORS





FIGURE 24-2 | SURROUNDING AGRI-BUSINESS LAND USE





FIGURE 24-3 | SURROUNDING AGRI-BUSINESS OPERATIONAL WELLS



## 24.7 POTENTIALLY IMPACTING EVENTS

Potentially impacting events have been selected from other aspects of the MLP, due to their particular agri-business sensitivities. These potentially impacting events have been communicated by business owners in the region, who have expressed their view on which elements of Terramin’s proposed operations could impact their business. For a complete range of potentially impacting events associated with each aspect outside of commercial/economic considerations, please refer to the appropriate chapter.

This list is based on proximal agri-businesses who believe that aspects of the Project could impact their business, and include impacts to groundwater, as well as impacts to amenity, including air quality, noise, vibration and visual amenity.

Source-Pathway-Receptors have been confirmed where there is the potential to impact the proximal agribusiness if the BIHGP is not designed and managed appropriately to mitigate or remove the impact. This is particularly relevant to visual amenity, air quality and noise.

A detailed description of the assessment methodology used to determine whether a credible source-pathway-receptor relationship is located in Chapter 6.

TABLE 24-3 | POTENTIALLY IMPACTING EVENTS

Potentially Impacting Events	Source	Potential Pathway	Sensitive Receptors	Confirmation of S-P-R	
<b>VISUAL AMENITY</b>					
Clearance of vegetation on Goldwyn results in reduced visual amenity for surrounding hospitality/tourism businesses and impacts their through door rate during construction	Vegetation clearance	Ground disturbing activity (GDA)	Bird in Hand Winery	Yes	PIE_24_01
Clearance of vegetation results in reduced visual amenity for surrounding hospitality/tourism businesses and impacts their through door rate during construction	Vegetation clearance	Ground disturbing activity (GDA)	Artwine	Yes	PIE_24_02
Clearance of vegetation results in reduced visual amenity for surrounding hospitality/tourism businesses and impacts their through door rate during construction	Vegetation clearance	Ground disturbing activity (GDA)	Petaluma Winery	No	PIE_24_03
Clearance of pasture grasses during construction and construction earthworks results in reduced visual amenity (fresh earthworks) for surrounding hospitality/tourism while new perennial vegetation establishing on visual amenity bunds	Vegetation clearance	Ground disturbing activity (GDA)	Bird in Hand Winery	Yes	PIE_24_04

Potentially Impacting Events	Source	Potential Pathway	Sensitive Receptors	Confirmation of S-P-R	
Clearance of pasture grasses during construction and construction earthworks results in reduced visual amenity (fresh earthworks) for surrounding hospitality/tourism while new perennial vegetation establishing on visual amenity bunds	Vegetation clearance	Ground disturbing activity (GDA)	Artwine	Yes	PIE_24_05
Clearance of pasture grasses during construction and construction earthworks results in reduced visual amenity (fresh earthworks) for surrounding hospitality/tourism while new perennial vegetation establishing on visual amenity bunds	Vegetation clearance	Ground disturbing activity (GDA)	Petaluma Winery	No	PIE_24_06
View from surrounding hospitality/tourism businesses is changed (after construction has completed) resulting in a long term reduction in through door rate	Altered landscape	Ground disturbing activity (GDA)	Bird in Hand Winery	Yes	PIE_24_07
View from surrounding hospitality/tourism businesses is changed (after construction has completed) resulting in a long term reduction in through door rate	Altered landscape	Ground disturbing activity (GDA)	Artwine	Yes	PIE_24_08
View from surrounding hospitality/tourism businesses is changed (after construction has completed) resulting in a long term reduction in through door rate	Altered landscape	Ground disturbing activity (GDA)	Petaluma Winery	No	PIE_24_09
Failure to fulfil closure requirements results in unsightly landform post-closure	Altered landscape	Ground disturbing activity (GDA)	Bird in Hand Winery	Yes	PIE_24_10
Failure to fulfil closure requirements results in unsightly landform post-closure	Altered landscape	Ground disturbing activity (GDA)	Artwine	Yes	PIE_24_11
Failure to fulfil closure requirements results in unsightly landform post-closure	Altered landscape	Ground disturbing activity (GDA)	Petaluma Winery	No	PIE_24_12
<b>Landuse - Perception</b>					
Mining and hospitality/tourism is seen as incompatible by the wider community and this results in a long term decline in tourism numbers for surrounding hospitality/tourism businesses	Operating mine	Reputation	Local hospitality/tourism businesses	Uncertain	PIE_24_13

Potentially Impacting Events	Source	Potential Pathway	Sensitive Receptors	Confirmation of S-P-R	
Having an operating mine in the local area is seen as incompatible with hosting private events, including bespoke gatherings, weddings, celebrations, etc. resulting in a long term decline of through door rates	Operating mine	Reputation	Local hospitality/tourism businesses	Uncertain	PIE_24_14
Having an operating mine in the local area is seen as incompatible with viticulture and results in reduced saleability of local products (wine sales)	Operating mine	Reputation	Local viticultural businesses	Uncertain	PIE_24_15
Major environmental or perceived environmental incident results in reputational damage to region and loss of 'clean and green' reputation impacting local hospitality/tourism businesses through door rate	Major or perceived major environmental incident	Reputation	Local businesses surrounding BIH Gold Project	Yes	PIE_24_16
Poor management of social media onsite results in damage to regional branding (employees taking photos of unsavoury aspects of both the project and neighbours activities and the risk of social media enhancing issues). This includes our employees taking photos of neighbouring activities such as spray drift, non-compliant waste disposal, rubbish after events, etc.	employees/contractors/visitors	Social media	Local businesses surrounding BIH Gold Project	No	PIE_24_17
<b>Dust Impacts</b>					
Dust created during construction earthworks impacts on neighbouring hospitality/tourism businesses resulting in reduced through door rate	Construction Earthworks	Air	Neighbouring cellar door businesses	Yes	PIE_24_18
Dust created through operations impacts on neighbouring hospitality/tourism businesses resulting in reduced through door rate	Operations and closure	Air	Neighbouring cellar door businesses	Yes	PIE_24_19
Dust created through changed landscape post-closure impacts on neighbouring hospitality/tourism businesses resulting in reduced through door rate	Post-closure	Air	Neighbouring cellar door businesses	No	PIE_24_20

Potentially Impacting Events	Source	Potential Pathway	Sensitive Receptors	Confirmation of S-P-R	
Heavy metals in dust report to surface of grapes and are incorporated in Artwine wine	Altered landscape	Ground disturbing activity (GDA)	Artwine	Yes	PIE_24_21
Heavy metals in dust report to surface of grapes and are incorporated in Petaluma wine	Altered landscape	Ground disturbing activity (GDA)	Petaluma Winery	Yes	PIE_24_22
Heavy metals in dust report to surface of grapes and are incorporated in Bird in hand wine	Altered landscape	Ground disturbing activity (GDA)	Bird in hand winery	Yes	PIE_24_23
Heavy metals in dust report to surface of grapes and are incorporated in wine made from Sam Virgaras grapes	Altered landscape	Ground disturbing activity (GDA)	Bird in hand winery	Yes	PIE_24_24
Heavy metals in dust report to surface of grapes and are incorporated in wine made from Kym Davis grapes	Altered landscape	Ground disturbing activity (GDA)	Kym Davis	Yes	PIE_24_25
Heavy metals in dust report to surface of grapes and are incorporated in wine made from Simon Tolley grapes	Altered landscape	Ground disturbing activity (GDA)	Simon Tolley vineyard	Yes	PIE_24_26
Dust (TSP) on vineyards/agricultural activities reduces productivity (reduces yield) - Petaluma	Altered landscape	Ground disturbing activity (GDA)	Petaluma Winery	Yes	PIE_24_27
Dust (TSP) on vineyards/agricultural activities reduces productivity (reduces yield) - Eureka vineyard	Altered landscape	Ground disturbing activity (GDA)	Eureka vineyard	Yes	PIE_24_28
Dust (TSP) on vineyards/agricultural activities reduces productivity (reduces yield) - Artwine	Altered landscape	Ground disturbing activity (GDA)	Artwine	Yes	PIE_24_29
Dust (TSP) on vineyards/agricultural activities reduces productivity (reduces yield) - Kym Davis	Altered landscape	Ground disturbing activity (GDA)	Kym Davis	Yes	PIE_24_30
Dust (TSP) on vineyards/agricultural activities reduces productivity (reduces yield)- Simon Tolley	Altered landscape	Ground disturbing activity (GDA)	Simon Tolley vineyard	Yes	PIE_24_31
Dust (TSP) on vineyards/agricultural activities reduces productivity (reduces yield)- Bird in hand Winery	Altered landscape	Ground disturbing activity (GDA)	Bird in hand winery	Yes	PIE_24_32
<b>Noise</b>					
Noise created during construction earthworks impacts on neighbouring hospitality/tourism businesses resulting in reduced through door rate - Bird in Hand winery	Soil earth works	Atmosphere-sound wave	Bird in hand winery	Yes	PIE_24_33

Potentially Impacting Events	Source	Potential Pathway	Sensitive Receptors	Confirmation of S-P-R	
Noise created during construction earthworks impacts on neighbouring hospitality/tourism businesses resulting in reduced through door rate - Artwine Winery	Soil earth works	Atmosphere-sound wave	Artwine	Yes	PIE_24_34
Noise created during construction earthworks impacts on neighbouring hospitality/tourism businesses resulting in reduced through door rate - Petaluma Winery	Soil earth works	Atmosphere-sound wave	Petaluma Winery	Yes	PIE_24_35
Noise created through operations impacts on neighbouring hospitality/tourism businesses resulting in reduced through door rate - Bird in Hand winery	Mining activities	Atmosphere-sound wave	Bird in hand winery	Yes	PIE_24_36
Noise created through operations impacts on neighbouring hospitality/tourism businesses resulting in reduced through door rate - Artwine winery	Mining activities	Atmosphere-sound wave	Artwine	Yes	PIE_24_37
Noise created through operations impacts on neighbouring hospitality/tourism businesses resulting in reduced through door rate - Petaluma winery	Mining activities	Atmosphere-sound wave	Petaluma Winery	Yes	PIE_24_38
Blasting impacts through construction and operations impacts on hospitality/tourism businesses resulting in reduced through door rate - Bird in hand winery	Soil/rock excavation	Atmosphere-sound wave	Bird in hand Winery	Yes	PIE_24_39
Blasting impacts through construction and operations impacts on hospitality/tourism businesses resulting in reduced through door rate - Artwine	Soil/rock excavation	Atmosphere-sound wave	Artwine	Yes	PIE_24_40
Blasting impacts through construction and operations impacts on hospitality/tourism businesses resulting in reduced through door rate - Petaluma winery	Soil/rock excavation	Atmosphere-sound wave	Petaluma Winery	Yes	PIE_24_41
<b>Landuse - Land Value</b>					
Changed landuse results in reduction in land values for direct neighbouring properties	Operating mine	Reputation	Landholders neighbouring operation	Uncertain	PIE_24_42
Changed landuse results in reduction in land values for local area (Pfeiffer Road, Bird in Hand Road region)	Operating mine	Reputation	Landholders living in Pfeiffer Road Valley	Uncertain	PIE_24_43

Potentially Impacting Events	Source	Potential Pathway	Sensitive Receptors	Confirmation of S-P-R	
Changed landuse results in reduction in land values in Woodside region	Operating mine	Reputation	Landholders in Woodside	No	PIE_24_44
Changed landuse results in increase in land values in Woodside region	Operating mine	Reputation	Landholders in Woodside	No	PIE_24_45
Changed landuse results in reduction in business value and saleability of neighbouring business	Operating mine	Reputation	Neighbouring businesses	No	PIE_24_46
<b>Employees</b>					
No/poor management of employee and contractor behaviour results in unscrupulous characters in local area turning tourists away from area	Employees	Behaviour	Local businesses surrounding BIH Gold Project	No	PIE_24_47
<b>Weeds And Pests</b>					
Introduction or spread of weeds and/or pathogens as a result of the mine development impacts neighbouring agricultural businesses	Weeds and seeds carried on mining equipment and vehicles	Vehicles and other mining equipment	Surrounding agricultural land	Yes	PIE_24_48
<b>Water</b>					
Lowering of groundwater table (reducing ability to access water) results in inability to irrigate agricultural property causing vineyard/agricultural holding to buy in water to irrigate	Operating mine	Groundwater flowpaths	Existing groundwater users	Yes	PIE_24_49
Increasing salinity of groundwater which impacts vineyard/agricultural productivity results in inability to irrigate agricultural property causing vineyard/agricultural holding to buy in water to irrigate	Operating mine	Groundwater flowpaths	Existing groundwater users	Yes	PIE_24_50
All groundwater potential impact events have been included in Chapter 10					
All surface water potential impact events have been included in Chapter 11					

## 24.8 SUMMARIES OF ASPECTS AND CONTROL MEASURES

Control measures associated with each aspect of the project are located in the chapters outlined below in Table 24-4:

TABLE 24-4 | PROJECT ASPECTS

Chapter Number	Description
8	Chapter 8: Traffic
9	Chapter 9: Visual Amenity
10	Chapter 10: Groundwater
11	Chapter 11: Surface Water
12	Chapter 12: Soil and Land Quality
15	Chapter 15: Air Quality
16	Chapter 16: Noise
17	Chapter 17: Air-overpressure and Vibration
18	Chapter 18: Native Fauna and Pest Species
19	Chapter 19: Vegetation and Weeds
22	Chapter 22: Agricultural Impacts
23	Chapter 23: Social Environment

A summary of control measures for each aspect is provided below.

### 24.8.1 VISUAL AMENITY

VISUAL AMENITY HAS BEEN A SIGNIFICANT PART OF THE DESIGN OF THE BIRD IN HAND GOLD PROJECT. LANDSCAPE ARCHITECTS OXIGEN WERE ENGAGED TO DESIGN THE SITE. THE SITE HAS BEEN SPECIFICALLY DESIGNED TO INTEGRATE WITHIN THE EXISTING BROADER ONKAPARINGA VALLEY LANDSCAPE AND OF WHICH THE FORM, CONTRASTING ASPECTS AND REFLECTIVE ASPECTS OF MINING STRUCTURES ARE VISUALLY SOFTENED TO BLEND IN WITH THE SURROUNDING LANDSCAPE. THIS INCLUDES VIEWPOINTS FROM NEIGHBOURING COMMERCIAL CELLARDOOR BUSINESSES, INCLUDING BIRD IN HAND WINERY, PETALUMA AND ARTWINE. NO COMMERCIAL BUSINESS IS ABLE TO VIEW THE OPERATIONAL AREA OF THE SITE DUE TO EXISTING VEGETATION, TOPOGRAPHY, INFRASTRUCTURE PLACEMENT, LANDSCAPE BUNDING AND NEWLY PLANTED VEGETATION. SEE



Figure 24-4, Figure 24-5 and





Figure 24-6.

More detailed information on Visual Amenity Control Measures is located in Chapter 9: Visual Amenity.

FIGURE 24-4 | VIEW OF BIHGP FROM BIRD IN HAND WINERY CELLARDOOR



FIGURE 24-5 | VIEW OF BIHGP FROM REAR OF PETALUMA BOTTLING FACILITY





FIGURE 24-6 | VIEW OF BIHGP FROM ARTWINE CELLARDOOR CARPARK



#### 24.8.2 GROUNDWATER

All agricultural businesses use groundwater within the vicinity of the BIHGP. Extensive groundwater studies have been completed between 2014 and 2019, including extensive Managed Aquifer Recharge Test-work in 2019.

Design measures are proposed to limit or prevent groundwater level reduction as well as maintain groundwater quality, as a result of mining activities. These measures are discussed below and include

- Mapping of water bearing zones and ongoing refinement of the geological model
- Design mine plan to avoid known water bearing zones
- Probe drilling to assess ground conditions ahead of excavation
- Pre-excavation grouting
- Treatment and reinjection of mine inflows into the surrounding FRA through MAR

All of the proposed mitigation methods are used and consist of well-proven techniques throughout the mining and civil industries in the management of groundwater.

Design and management strategies for the protection of groundwater have been modelled utilising numerical modelling, and have subsequently been peer-reviewed against the *Australian Groundwater Modelling Guidelines* (Barnett et al, 2012), as required by the Ministerial Determination for the Project.

The results of the Groundwater Impact Assessment demonstrate, that by utilising Grouting, MAR, and the Water Treatment Plant, both ability to access licenced water and water quality will be maintained.

More detailed information Groundwater Control Measures are located in Chapter 10: Groundwater and Chapter 3: Mining Operations.

### 24.8.3 SURFACE WATER, SOIL AND LAND QUALITY AND GEOCHEMISTRY

Terramin acknowledges that there are vineyards downslope of drainage lines which exit the proposed ML to the west. Design measures are integral in preventing water erosion, water quality impacts, and sedimentation of surface waters which can impact both surface water and soil quality downslope. The Goldwyn site is divided up into specific catchments, with specific areas which have run off directed to the water treatment plant via a network of sumps and pumps. Areas which report to the water treatment plant include run off from the IML, workshop and cement batching plant. This negates the risk of runoff from identified potentially acid forming (PAF) mullock and/or hydrocarbons and/or cement from the workshop and cement batching plant entering into the surface water drainage.

The IML has been designed to be encapsulated within landscape amenity bunding (retaining walls on the inside), and a drainage system which reports to the water storage dam prior to undertaking water treatment. This ensures all sedimentation from the IML is captured within the water treatment system, preventing it from entering stormwater runoff and into the riparian areas.

Collection sumps and gross pollutant traps have been integrated into the stormwater management site design to reduce the risk of hydrocarbons and sedimentation exiting site, as well as the construction of a surface water retention dam (detention basin) to allow sediments to drop out naturally before entering the surface drainage system.

A conceptual diagram of the proposed Surface Water Control Measures are included in Figure 24-7.

Primary design methods incorporated into the landscape design include testing soil characteristics and utilising erosion modelling during the design process of the landscape amenity bunds to determine appropriate slope characteristics, as well as cover management strategies. Design options include reducing slope angles, hyperbolic bund slopes and contour lines on bund slopes.

All chemical and hydrocarbon storage will be in accordance with AS 1940-2004: The storage and handling of flammable and combustible liquids, AS 1692-2006: Steel tanks for flammable and combustible liquids, relevant South Australian legislation and best practice guidelines. Spill kits will be located both on surface and underground.

The wheelwash and washdown area will be bunded, with wash-water recycled within the washdown area.

In regards to existing site contamination, the Golder Associates site contamination assessment recommended the following steps to reduce the potential for impacts to health:

- Future site works should limit the disturbance of soils near and adjacent to the creek line, and within areas of (known) historic mining activities. This will reduce potential risks (health and environmental) associated with exposure to contaminated soils.
- Any future site works should be completed under the guidance of a site contamination management plan (SCMP).

All exploration works are subject to the Exploration Management Plan in Appendix B7.

More detail on Surface Water Control Measures are located in Chapter 11: Surface Water and the Stormwater Management Plan in Appendix I3.



FIGURE 3.2

FIGURE 24-7 | STORMWATER SITE DESIGN

#### 24.8.4 GEOHAZARDS

Given the information gathered on the existing geotechnical environment of the Project, various design measures have been applied to further manage any potential impacts to the local community and members of the public, as well as other identified sensitive receptors.

These design measures include:

- Confirmation on the mining method selected.
- Location and orientation of underground mine excavations, including portal and raises/shafts;
- Size and shape of underground excavation;
- Sequencing of mining to minimise stresses;
- Angles and orientations of surface excavations to maximise stability.
- Additional ground support requirements to increase factors of safety in the design.

The usual hazards associated with failure of the mine void (caving, excessive settlement) cannot occur because cave propagation is restricted by the presence of the fill, as occurs as part of cut and fill mining.

More detailed information on the Geotechnical Control Measures are located in Chapter 13: Geochemistry and Geohazards.

#### 24.8.5 AIR QUALITY

Specific design measures have been considered through the development of the Project in regard to air quality impacts. The most significant of these include the sealing of the vast majority of internal roads (excluding fire access tracks) and the location of the primary vent rise.

Water truck usage and sprinkler systems through construction will be paramount for construction which occurs through the drier months. Newly constructed landscape/amenity bunding will be spray seeded as soon as practical following earthworks, while asphaltting of roads will be a priority as roads are constructed. The water truck will continue to spray unsealed roads and landforms until asphaltting and spray seeding has occurred. A permanent sprinkler system is being proposed for the IML to reduce dust impacts associated with moving mullock.

The key findings of the Air Quality Impact Assessment completed by AECOM are:

- No exceedances of the Project Objectives were predicted at any offsite sensitive receptors for any of the pollutants of interest.
- All predicted 24 hour average PM<sub>10</sub> concentrations were well below the Project Objective for both construction and operation.
- All predicted 24 hour average and annual average PM<sub>2.5</sub> concentrations were well below the Project Objective for both construction and operation.
- Cumulative dust deposition rates were predicted to remain below the Project Objective (4 g/m<sup>2</sup>/month) in the adjacent vineyards during both construction and operation.
- Cumulative dust deposition rates in a small area of the remnant vegetation to the east of site were predicted to be above the Project Objective (4 g/m<sup>2</sup>/month) during operation.



- Dust deposition rates at nearby discrete sensitive receptors (including all cellardoor locations) were predicted to be below the Project Objectives during both construction and operation.

An Air Quality Management Plan would be developed through the PEPR stage and would cover construction, operations, and any proposed closure earthworks, and include a Trigger, Action Response Plan (TARP). The TARP should the monitoring show particulate concentrations rising towards the Project Objective, Terramin would be able to implement additional mitigation strategies and/or cease certain activities temporarily until particulate concentrations are reduced to a more acceptable level. The location of the monitoring would need to be chosen based on a combination of proximity to particulate sources, and prevailing wind direction. All modelling has been completed with all activities occurring simultaneously and cumulatively as a conservative approach and also without the implementation of the TARP.

Metalliferous dust has been discussed in Chapter 22: Agriculture.

More detailed information on the Air Quality Control Measures are located in Chapter 15: Air Quality.

#### 24.8.6 NOISE

Design measures to limit noise propagation are largely controlled by implementing landscape bunding and shielding around the operating area. Other design measures include constructing infrastructure with insulation around it, for example, insulating sheds around pump stations. The underground ventilation fans are designed to have two silencers installed around them to reduce, if not remove, any continuous hum of the ventilation system. The other significant design measure is the rubber lining of the ore silo to reduce noise associated with filling the silo with ore. The ROM bin and conveyor system design measures includes an enclosure around the truck unloading point and surge bin, and an open-ended enclosure around the haul truck loading area.

Noise impacts have been reduced by considering the types of activities, the noise they can generate, and restricting their operating hours appropriately. This includes restricting the hours of construction between 7am and 10pm in the first instance, as well as ensuring vehicles and mobile equipment is maintained appropriately, and ensuring service and maintenance schedules are adhered to. The ROM silo management plan will include specifications as to the handling of ore in regards to drop/tip heights.

A Noise Trigger Action and Response Plan would be finalised as part of the PEPR. A draft has been included in Appendix O5.

Any exploration works would occur during daytime hours and be communicated effectively with neighbours and the wider community.

Terramin have spent considerable time in determining a noise objective which is considered to be both reasonable to surrounding landholders and achievable. The project area is located within a rural industry area, with pockets of rural living. The Watershed (Primary Production) Zone makes reference to both Rural Industry and Rural Living land uses but the Onkaparinga Valley Policy Area specifically excludes rural living.

Regardless, Terramin understand that due to the pockets of rural living and cellardoor businesses in the area, a project production objective which is lower than the Rural Industry legislative criteria

would be more appropriate, and an early warning, or leading indicator, criteria which aligns with Rural Living would align with the some of the surrounding land use in the area. This also aligns with the current existing noise environment, which has a median daytime range of between 43 and 51 dB(A) and median night time range of 31 and 40 dB(A).

Similarly, although other construction activities are not limited on their noise generation, Terramin are voluntarily choosing to adopt the Rural Industry noise criteria as the project objective through construction.

Noise modelling of the control measures has demonstrated that *even when every piece of equipment is operating*, these noise objectives can be achieved through every phase of the project. This aligns with the South Australian Government's Multiple Land Use Framework.

More detailed information on the Noise Control Measures are located in Chapter 16: Noise.

#### 24.8.7 AIR OVERPRESSURE AND VIBRATION

The critical factors with respect to the control of ground vibration and air overpressure are the amount of explosive detonated per delay and the distance from the blast to the sensitive receptor. A reduction in air overpressure and ground vibration can be achieved by various modifications to the blast design which can include:

- A reduced cut length and/or blast hole diameter
- Lower density explosive products
- Downloading blast holes (decoupled charges)
- The use of electronic detonators to provide greater flexibility and accuracy in initiation timing, minimising the likelihood of vibration enhancement from multiple blast holes
- Increased confinement through increased burdens and/or stemming
- Reduction in the surface area of the free face, charge weights and/or cut length
- Shields at the portal
- Blast curtains
- Physical barriers in the decline
- Insulation

Limits for the project have been set to human comfort levels rather than damage thresholds and, therefore, compliance with the licence conditions will minimise human discomfort. Cellardoor locations are predicted to experience ground vibration through both decline development and ore production, under 1mm/s ground vibration – for human context, this is similar to the vibration experienced from a person walking along side another. Air overpressure through decline development is expected to be eliminated at sensitive receptors entirely once it has progressed 300m laterally. The first 300m is predicted to be approximately 110dB(L). Baseline airoverpressure recorded onsite has consistently been above 116dB(L), for 18 of the 20 months recorded between May 2016 and December 2018. For this reason, Terramin do not believe airoverpressure will credible impact cellardoor businesses.

In regards to potential impacts to stock, BHP's BMA coal operation in the Bowen Basin analysed data from 42 livestock herds. Animal installations were selected for observations on animal behaviour under sonic boom conditions. Sonic booms create sharp releases of pressure, which create air-



overpressure conditions reflective of mining. Numbers of animals observed in this study were about 10,000 commercial feedlot beef cattle, 100 horses, 150 sheep and 320 lactating dairy cattle. Sonic booms were scheduled at varying intervals during the morning hours Monday to Friday of each week. Results of the study showed that the reactions of the sheep and horses to sonic booms were slight. Dairy cattle were little affected (125 dB to 136 dB). Only 19 of 104 events produced even a mild reaction, as evidenced by a temporary cessation of eating, rising of heads, or slight startle effects in a few of those being milked. Milk production was not affected during the test period, as evidenced by total and individual milk yield. This analysis was included and approved by the Queensland Government as part of the project's Environmental Impact Statement (BHP BMA, 2009).

More detailed information on the Air Overpressure and Vibration Control Measures are located in Chapter 17: Air Overpressure and Vibration.

#### 24.8.8 WEEDS AND PESTS

Weeds and Pests will be managed onsite through the site Biodiversity Management Plan, which includes the Weed and Pest Management Plan. This plan works to prevent the spread and/or increase of weeds and pests within the operational area of the ML (Goldwyn), based on active adaptive management of weeds and pests, as is managed on all other properties.

A Phytophthora and Phylloxera Management Plan has been implemented as a precaution due to the sensitive location of the Project and the community expectation that Terramin will not contribute to a viticultural industry problem. This plan aligns with the VineHealth Australia Guidelines.

More detailed information on the Weed and Pest Control Measures are located in Chapter 18: Fauna and Pests and Chapter 19: Vegetation and Weeds.

#### 24.8.9 AGRICULTURAL IMPACTS

During 2017 Terramin commissioned Food And Beverage Australia Limited (FABAL), to consider and review the proposed BIHGP in the context of potential impact events for the surrounding agricultural activities. FABAL completed an Agricultural Impact Assessment (AIA) and associated report (see Appendix U1).

The main objectives for the review undertaken by FABAL were to:

- Advise Terramin of potential impacts associated with agricultural production in relation to their proposed BIH Project.
- Access and consider the relevant reports on the BIH Project in the context of agricultural production.
- Complete an impact assessment review based on confirmed "Potential Impact Events" arising from analytical reports, project designs and impact reports as provided by Terramin.
- Report on potential agricultural impacts with reference to specific Terramin reports and legislation whether impacts are deemed credible or not.
- Consider the potential agricultural impacts in accordance with the Ministerial Determination for BIH Project.

FABAL were provided with analytical reports, project designs and impact reports on a variety of mining disciplines, outlined in the Agricultural Impact Assessment (Appendix U1) and concluded that, overall, Terramin have implemented control strategies in order to reduce or eliminate as many risks to the surrounding agricultural landholdings as is reasonably possible.

More detailed information on the Agricultural Impacts are located in Chapter 22: Agriculture.

## 24.9 IMPACT ASSESSMENT

This section details economic benefits, as well as the potential for any economic benefits and impacts to the local and regional economy as well as neighbouring business.

In summary, based on this combination of data and assumptions the Project has estimated:

- Gross revenues of \$300 million, based on an assumption of a gold price of US\$1,062 per ounce and a US/AUD exchange rate of 73¢.
- The Project will generate a total impact on Gross State Product of an estimated \$220 million over 8 years (excluding the Gross Operating Surplus of the Project itself).
- This includes \$191 million of estimated wages and salaries paid to households. Employment in operating roles reaching 140 persons in 2021 – in total 600 person years of employment, over a 5 year period of 2020-2024.
- Payment of direct taxes of \$37 million and royalties of \$10.5 million (an assumed royalty rate of 3.5¢ per dollar of gross value). There is also an estimated payroll tax amount of \$2.7 million over the life of the Project. This does not include any estimate of corporate income tax – as this is paid to the Commonwealth Government.
- Other operating expenditure is estimated at \$45.7 million over the 5 year operating period, while there will be a total capital expenditure of \$56.6 million, \$29 million in the investment phase (2018 and 2019), and a further net of \$26 million during operation and after operations are concluded.
- 60% of the impact is estimated to occur in the Adelaide Hills Council area, around Woodside (an estimated 1,425 person years of employment and peaking at 330 full time equivalent jobs), and 20% would be expected in the Fleurieu Peninsula, around Strathalbyn (500 person years of employment – and peaking at 126 full time equivalent jobs).
- Minor changes to price, capital and operating assumptions occurred between the 2016 study and the Scoping Study 2018. The most significant change has been the increase in gold price and the price and revenue assumptions quoted in this section can therefore be considered conservative when compared to the current rates and prices used in the Scoping Study 2018.

### 24.9.1 REVENUES AND EXPENDITURES OF BIHGP

Table 24-5 provides the revenues and expenditure associated with Project, based on the base financial scenario<sup>3</sup>. The operating expenditure on wages is estimated by using the operating workforce requirements for the Project as summarised in Table 24-6, again as provided by Terramin and using indicative assumptions for average wages for the various roles identified. Payroll tax returns have been

<sup>3</sup> Given the timing of the report, the base projections have been extended by one year. It is assumed that these are in 2017 dollars.

estimated using the 2017/18 payroll tax rate for businesses with a wage bill of over \$1.5 million (i.e. 4.95%).

Table 24-7 provides the operating estimates of the Project allocated to the two local regions of interest. In providing these estimates it is assumed that mining and processing direct employment occurs within the respective regions, while development, admin and haulage employment is distributed proportionally with respect to the operational employment.

**TABLE 24-5 | ESTIMATED PROJECT REVENUES AND EXPENDITURE (\$MILLION -2017 DOLLARS)**

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
Gross Revenue			\$46.50	\$64.60	\$59.20	\$82.80	\$47.00					\$300.10
Operating Expenditure - Wages												
Mining (inc Fleet leasing)			\$1.27	\$3.44	\$3.78	\$3.78	\$3.78					\$16.05
Development			\$5.76	\$5.28	\$4.21	\$4.21	\$4.21					\$23.67
Processing			\$0.00	\$0.95	\$2.24	\$2.24	\$2.24					\$7.67
Admin			\$1.18	\$1.51	\$1.63	\$1.63	\$1.63					\$7.58
Haulage			\$0.00	\$0.18	\$0.70	\$0.70	\$0.70					\$2.28
Total Operating Wages			\$5.98	\$10.43	\$12.40	\$12.40	\$12.40					\$53.61
Operating Expenditure - Other												
Mining (inc Fleet leasing)			\$1.87	\$0.19	\$0.23	\$0.63	\$0.43					\$3.36
Development			\$2.06	\$4.96	\$6.28	\$6.98	\$3.88					\$24.16
Processing			\$2.50	\$2.61	\$1.25	\$1.25	\$0.05					\$7.65
Admin			\$1.66	\$1.32	\$1.19	\$1.19	\$0.49					\$5.85
Haulage			\$1.00	\$1.22	\$0.67	\$0.67	\$0.17					\$3.71
Total Other Operating			\$9.09	\$10.29	\$9.62	\$10.72	\$5.02					\$44.73
Direct taxes			\$2.60	\$8.40	\$6.80	\$13.10	\$5.70					\$36.60
Payroll tax on operating wages			\$0.30	\$0.52	\$0.62	\$0.62	\$0.62					\$2.68
TC's, RC's, Selling & Marketing			\$0.80	\$1.10	\$1.00	\$1.40	\$0.80					\$5.10
Royalties			\$1.63	\$2.26	\$2.07	\$2.90	\$1.65					\$10.50
Capital Expenditure												
Fleet												\$0.00
Pre-production G&A		\$3.60										\$3.60
Underground Development		\$8.70	\$7.00	\$4.40	\$4.10	\$5.10	\$0.00					\$29.30
Surface Infrastructure	\$4.05	\$12.65	\$1.20	\$0.10	\$0.10							\$18.10
Other Sustaining Capital			\$0.90	\$1.10	\$1.10	\$1.20	\$0.90					\$5.20
Rehabilitation							\$1.00	\$0.80	\$1.30	-\$1.00	-\$1.70	\$0.40
Total Capital	\$4.05	\$24.95	\$9.10	\$5.60	\$5.30	\$6.30	\$1.90	\$0.80	\$1.30	-\$1.00	-\$1.70	\$56.60

Source: Terramin Australia Ltd, and assumptions by the researcher

**TABLE 24-6 | LABOUR FORCE REQUIREMENTS FOR THE PROJECT**

	2020	2021	2022	2023	2024	Assumed Average Wage
Management	2	2	2	2	2	\$150,000

	2020	2021	2022	2023	2024	Assumed Average Wage
Bird in Hand Site						
Management	1	1	1	1	1	\$120,000
Technical	5.5	9	9	9	9	\$120,000
Administration	6.3	7.9	9	9	9	\$90,000
Mining	14.1	38.3	42	42	42	\$90,000
Maintenance	6.3	14	14	14	14	\$90,000
Contractors	0	7	10	10	10	\$90,000
Angas Processing Site						
Administration	2.5	4.7	5	5	5	\$80,000
Process Management	0.8	3.9	5	5	5	\$100,000
Mill Crews	0	11.8	28	28	28	\$80,000
Cleaners	0	1.6	3	3	3	\$50,000
Construction and General						
General	24	5.4	1	1	1	\$90,000
AZM	0	5.2	0	0	0	\$70,000
BIH	1	1	1	1	1	\$70,000
Haulage	0	2.5	10	10	10	\$70,000
<b>Total</b>	<b>63.3</b>	<b>115.3</b>	<b>140</b>	<b>140</b>	<b>140</b>	

Source: Terramin Australia Ltd, and assumptions re average wages

TABLE 24-7 | ESTIMATED EMPLOYMENT BY REGION

Region	2020	2021	2022	2023	2024
Strathalbyn	5.2	29.2	44	44	44
Woodside	54.9	83.9	93	93	93
Adelaide	3.2	2.1	2	2	2
<b>Total</b>	<b>63.3</b>	<b>115.3</b>	<b>140</b>	<b>140</b>	<b>140</b>

Source: Estimates based on Table 3

The expenditure patterns, identified in Table 2 above, are allocated to respective industry sectors as identified in the input output model, based on the nature of the expenditure, and including a proportion of direct imports. Other expenditure is allocated to regions based on the Project components, and proportional to labour distributions. Wages are assumed to be spent based on the average consumption function for each region, along with an allowance for some expenditure by Terramin employees across regions (as they travel between locations). As noted above, this expenditure is then used as a final demand increase and traced through the input output model (with the direct coefficients of the state model presumed to apply at the regional level due to the nature of the project), to provide estimates of induced (both production and induced) impacts – in terms of value added, household incomes and employment that are then added to the project outcomes as described above. The value added estimates do not include the gross operating surplus of the Project, but do include gross operating surplus from suppliers into the Project.

The detailed results of the modelling are provided in the appendix. In summary it is estimated that:

- The Project will generate a total impact on Gross State Product of an estimated \$220 million over 8 years (excluding the Gross Operating Surplus of the Project itself).
- This includes \$191 million of estimated wages and salaries paid to households, and the provision of 2,350 person years of employment (or an average of around 300 full time equivalent jobs per year. As per the detailed modelling in the Appendix, 25% of the jobs created are in Project operations itself, and some 10% by Project investment. The remainder is spread through the rest of the economy and impacts across the board, including on wholesale and retail trade (9% of jobs created), business services (7%), education (8%), health services (9%) etc through a combination of the support spend for the project, but also the on-spend of wages and taxes generated.
- The impact will peak in 2022- 2023
- 60% of the impact is estimated to occur in the Adelaide Hills Council area, around Woodside (an estimated 1,425 person years of employment and peaking at 330 full time equivalent jobs), and 20% would be expected in the Fleurieu Peninsula, around Strathalbyn (500 person years of employment – and peaking at 126 full time equivalent jobs).

#### 24.9.2 POSSIBILITY OF EXTENDED IMPACTS OF THE DEVELOPMENT

While the above considers the modelling of the project itself, there is the potential for additional developments linked to this project proceeding such as beneficiation of the concentrate within the state.

##### 24.9.2.1 POTENTIAL FOR VALUE ADDING OF A MINED COMMODITY

Terramin will produce a gold concentrate from its Angas processing facilities. The gold concentrate is to be packaged into Bulk-a-bags and stacked in sea-containers. The product can be sold domestically or exported via Port Adelaide to an overseas location for further processing into a refined gold product. There is potential for value adding in South Australia with the gold concentrate to be further processed. Such options will be investigated in the future, due to lack of certainty this potential economic benefit has not been quantified.

An additional option is for further processing to produce a refined gold product i.e. dore. The current understanding would be that the percentage gravity gold and additional recovery associated with leaching is not likely to provide for a detailed cost analysis for justifying the additional capital cost, but once the processing performance (i.e. in operations) is better understood there may be justification to install the additional process requirements. Again, given the uncertainty, such a development has not been included in the assessment.

#### 24.9.3 POSSIBILITY OF IMPACT ON EXISTING ECONOMIC OPERATIONS

As set out above, some members of the community have expressed concerns regarding the impact of the Project on existing economic activity in Woodside that might occur. There have been minimal expressed concerns with respect to the proposed recommencement of Strathalbyn ore processing operations, largely because the Project involves the use of an existing processing facility.

Please refer to the specific aspect chapters for a detailed discussion on impacts, as per Table 24-2.

TABLE 24-8 | ASPECT CHAPTERS WHICH INCLUDE DETAILED DISCUSSION ON POTENTIAL IMPACTS

Chapter Number	Description
8	Chapter 8: Traffic
9	Chapter 9: Visual Amenity
10	Chapter 10: Groundwater
11	Chapter 11: Surface Water
15	Chapter 15: Air Quality
16	Chapter 16: Noise
17	Chapter 17: Air-overpressure and Vibration
22	Chapter 22: Agricultural Impacts
23	Chapter 23: Social Environment

In terms of assessing the extent of the impact on agriculture and viticulture activities in Woodside, as many of the sensitive receptors are private entities there is little public data available on the local businesses that might be impacted, including the Bird in Hand and Petaluma wineries. Public statements made by those concerned about the plan suggest there is the potential of up to 150 jobs at risk with annual farm gate turnover of \$50 million per annum, with a stated number of employees of around 40 at Bird in Hand and 40-50 at Petaluma (England, 2016). As noted above according to the census in the broader Lobethal/Woodside area had in 2011 a total employment of 110 in wine manufacturing and 56 in grape growing. The above wineries source much of their grapes from around the district. Orders of magnitude can be indirectly reviewed in that the Bird in Hand Winery is stated as producing some 100,000 cases of wine per year<sup>4</sup> - so the farm gate value can be broadly estimated (assuming an average farm gate value of \$15 per bottle<sup>5</sup>) as \$18 million, and a production volume of 900,000 litres per year. An indicative estimate of events revenue (wedding, birthdays and corporate) could be around \$1 million annually<sup>6</sup>. This would be expected to support directly around 35 FTE jobs in wine production<sup>7</sup>, and 6 FTE in the events (not all of whom would necessarily be employed by Bird in Hand Winery, but rather by catering companies – dependent on how Bird in Hand Winery organises its events)<sup>8</sup>. In summary, this generally confirms the stated level of employment for Bird in Hand Winery

<sup>4</sup> Source: <http://www.birdinhand.com.au/celebrate/news/>

<sup>5</sup> Prices of product vary enormously depending on variety and vintage, with retail prices for Bird in Hand general varieties in the order of \$20-\$40 per bottle (see for example <https://compareclub.com.au/groceries/bird-in-hand-shiraz-146238> or <https://bws.com.au/wine/brand/bird-in-hand>). In 2016 there were 1.3 billion litres of wine produced with a value of sales of \$5.1 billion – or an average of \$4 per litre – but this includes bulk wines and as such is at the lower end of possible value (Wine Australia, 2017)

<sup>6</sup> Assuming an average of 1 event a week, with a venue fee of \$2,500, an average of 100 attendees and a charge per person of \$140.

<sup>7</sup> Bird in Hand would be classified a medium size winery. There is little evidence on production characteristics of medium sized wineries – but Wine Australia undertakes an annual survey of wine producers (Wine Australia, 2017), which illustrates that for wineries producing between 170,000 and almost 300,000 litres annually the average employment is about 11 – or 4.8 jobs per 100,000 litres which would again suggest an employment base of around 40 jobs at Bird in Hand Winery.

<sup>8</sup> Based on the employment multipliers in the RISE input output tables for the Adelaide Hills for the Wine and Spirits manufacturing and the Food and Beverage Services industry sectors (adjusted for inflation and productivity changes).

in the public commentary as noted above. There have been no public references to employment levels for Petaluma and Wicks. In conclusion, the employment at Bird in Hand Winery and Petaluma could be considered to be close to the 80 identified in public statements (as above), and there would be small levels of agricultural employment on other properties.

As required by the SA Government under the project approvals methodology, Terramin has undertaken a detailed analysis on the risks that the Project presents – inclusive the concerns raised by some in the community. A core report in the context of the economic impacts is the Agricultural Impact Assessment report (FABAL Operations Pty Ltd, 2017), which can be summarised in Table 24-9 as concluding:

All control measures to prevent or reduce the potential for impact on existing businesses has been outlined in Section 0.

TABLE 24-9 | FABAL RISK CONCLUSIONS (TAKEN FROM APPENDIX U1)

Risk Source	Core conclusion/statement
<b>Potential airborne agricultural risk sources</b>	
Dust particulates	“No impact on productive capacity via dust deposition is envisaged”. (p8)
Metalliferous contaminants transfer to adjoining agricultural crops and land	“The AECOM (May 2017) report deals with these risks in a detailed manner and, based on modelling results, the residual risk on adjoining agricultural activity or land is low (and indeed the report also identifies the activities in applying copper fungicides and elemental sulphur in grape production).
Chemical Contaminants	RECOMMENDATION: “Terramin become familiar with Australian Wine Research Institute annual registered pesticide guidelines (AWRI Dog Book) and, where applying chemicals adjacent to neighbouring vineyards, attempt to use registered products where possible”. (p10)
Genetically Modified Organisms	Although risk is extremely low, Terramin should be aware of the zero tolerance for Genetically Modified Organisms in the wine industry and consider it in the context of any near boundary activity that could create airborne drift to vineyards. (p10)
<b>Biological agricultural risk sources</b>	
Plant and animal pests	“Biosecurity is the responsibility of all landowners and the BIH Project is located in a high value agricultural landscape. Terramin has a solid understanding of the general biosecurity risks and has put in place controls to modify residual risks to a low level. Ongoing, the risk landscape and potential pathways for the BIH Project and its neighbouring agricultural enterprises are dynamic. It is recommended that Terramin remains abreast of the risk horizon for surrounding viticultural operations and ensure that its current procedures remain appropriate. It is recommended that Terramin familiarises itself with Vine Health Australia as a resource to monitor biosecurity alerts for the surrounding viticultural industry.” (p10)
<b>Hydrological Agricultural Risk Sources</b>	
Surface water	The issues pertaining to surface water risks are detailed in the Storm Water Management Plan (Tonkin 2016) and represent a detailed and comprehensive approach to site issues listed below. The residual risk from surface storm water issues is deemed very low”. (p14)

Risk Source	Core conclusion/statement
Ground water	<p>“There are several key interventions that Terramin intends to deploy to mitigate risks and impact on the groundwater conditions:</p> <ol style="list-style-type: none"> <li>Careful mine design to avoid high water yielding zones;</li> <li>Deploying a technique of probing and grouting (as outlined in Bird-In-Hand Gold Project – Grouting for Groundwater Control - Multigrout 2017); and</li> <li>Depressurising, treatment and Managed Aquifer Recharge (MAR) program.</li> </ol> <p>“It appears from the detailed technical review that, based on deployment of the planned interventions, the potential impact on ground water should be restricted to an area contained within the boundary of the BIH Project site. The key effect is likely to be a localised cone of depression surrounding extraction sites” (p14). It is further recommended that the potential for the MAR program to be extended [be considered] and perhaps [be used] to improve access [to water] for neighbouring operations.”</p>
<b>Commercial/market risk sources for adjoining agribusinesses</b>	
Visual amenity	<p>“The visual amenity of the sites will form part of the value proposition for the agritourism aspects of the surrounding businesses. The draft Strategic Visual Amenity Plan (2017) undertaken by Oxigen Pty Ltd in conjunction with the site plan design undertaken by Tonkin appears to have considered these issues in detail. .... It appears from the draft Oxigen design work that the ore storage silo is likely to be the key material inorganic feature of the mine visible from proximal agritourism facilities. From the modelled imagery the author has been shown, the proposed silo appearance is not inconsistent with the existing Bird In Hand Winery silos immediately adjacent to the site”. (p16/17)</p>
Other Significant incident impact	<p>“The proximity to adjoining agricultural enterprises could impact on brand or reputation value. The most credible pathways of this nature have been considered in this and the other BIH Project risk reports and based on the implementation of the design and regulated controls the residual risks are deemed low”. (p17)</p>
<b>Physical structure risk sources for adjoining agribusinesses</b>	
Perimeter revegetation program	<p>“the principles of Development Controls for Mining under the” Development Plan – Adelaide Hills Council “have been taken into account in the project design” which require the “operations do not unreasonably affect the amenity of the locality” (p17)</p>
Aerial impedance	<p>The conclusion is that planting or site infrastructure will not impede aerial activities by neighbours and there is no compounding risk in this context (p19)</p>
<b>Other agricultural stressors</b>	
Fire risk	<p>“the Australian wine industry is becoming aware of the risks to wine quality posed by smoke taint issues” and the conclusion from a desktop review is that the “company has extensive and detailed emergency response processes in place that assist in mitigating impact emanating from a potential site fire” (p19)</p>
Blasting	<p>“Regulatory compliance limits are based on human comfort levels rather than damage thresholds. As a result, compliance with the licence conditions will minimise human discomfort and prevent any likelihood of damage to neighbouring structures. Based on the assumed compliance with licence conditions the residual risk to surrounding agricultural activities as a result of blasting is very low” (p20)</p>
Post closure considerations	<p>“The BIH Project is subject to a Mine Closure Plan to monitor and consider sources of risk. The nature of the project with offsite processing and no long-term tailings storage facility reduces the complexity of this site” (p20)</p>

The potential impact on surrounding agricultural activities is considered low or negligible and, where the potential is higher, can be managed by appropriate mitigation activity. The residual impacts may present a hypothetical pathway for impact on wine tourism (cellar door) and events income rather than general production (primarily from general industrial noise and perhaps blasting and traffic impacts).

Given this background, a hypothetical worst case potential impact of the Project on surrounding areas can be provided for illustrative purposes. It would be reasonable to consider any impacts could be



slightly higher for Bird in Hand Winery, and somewhat lower for Petaluma (due to the vista from the Petaluma cellar door being more extensive over the Mount Lofty Ranges, not towards the project area, and that Petaluma do not hold events and weddings)). The Small Wine Producers survey indicates that for producers of 170,000 litres up to about 300,000 litres [cellar door] sales make up about 15% of the value of domestic sales, and domestic sales are about 70% of total, or indicatively<sup>9</sup> for these wineries around 10% of revenue from wine sales comes from cellar door (and around 4% possible from events).

In order to provide an indication of a possible impact, it has been assumed that the probability of impact on the wine tourism component has a relatively higher probability of some impact (assumed to have a mean probability of just over 50% - conservative relative to the risk identification discussion above) distributed as a beta probability distribution with a maximum of 100% impact and a minimum of 0% impact. It is assumed that the wine production operations of Bird in Hand Winery are similarly distributed (ie beta distribution) but with a lower mean (assumed to be 25%), and progressively a reduced probability impact for other impacted winery impacts (expected value of 10%) and then other agricultural impacts (expected value of 5%) If it is (again indicatively) assumed that the direct employment base that might face direct impacts is of the order of 100 FTE's (or around 40 FTE's at Bird in Hand Winery, 40 in other wineries, and 20 in other agriculture). Table 24-10 indicates the results of using these assumptions to provide the range of possible outcomes relative to the probability of occurrence. Therefore, an expected worst case outcome on value impact from these assumptions is the loss of 18 FTE jobs and \$1.6 million of value added in affected operations, but it should be noted that the application of risk mitigation measures the probability to a likelihood of no impact at all. The overall conclusion is that the risk to other economic activities in the area is low, and in terms of economic activity the probable outcomes are well below the activity generated through operations at the mine site itself.

**TABLE 24-10 | INDICATIVE PROBABILITY DISTRIBUTION OF POSSIBLE IMPACTS OF DEVELOPMENT ON SURROUNDING ACTIVITIES AND ESTIMATED DIRECT IMPACTS**

Assumed negative outcomes – relative to base	Probability of Occurrence	Employment (FTE's) Direct	Value Added/GRP (\$m) Direct
80-100%	0.00%	90	\$7.70
60-80%	1.90%	63	\$5.40
40-60%	9.80%	45	\$3.90
20-40%	25.80%	27	\$2.30
0-20%	62.40%	9	\$0.80
Probability weighted value	100%	18	\$1.60

Source: Modelled results, assumptions as described above

The following literature also provides some qualitative support to this conclusion:

- The Hunter Valley represents a community where mining (predominantly coal) and agriculture (including wine making) coexist. Therefore, it can be observed that:

<sup>9</sup> The proportion from cellar door decreases with winery size and Bird in Hand is around 4 times the size of the wineries in this group.

- There has over a number of decades been an increasing engagement between mining activities and other areas of community/economy that minimise negative externalities and impact on other activities (Brereton & Forbes, 2004).
- A recent economic development study of the Hunter Valley (Deloitte Access Economics, 2013) sees the wine industry in the region as strong – and the threats to this being the challenges of global market trends – while also seeing substantial growth in mining. Importantly it sees as a strength the ability to have the wine industry “integrate with regional tourism services”.
- Additional to this, the tourism plan (Hunter Valley, 2014) for the region sees the core driver of tourism in the region as enhancing the understanding of its premium food and wine products and, where mining is considered, it is seen as being both a benefit (creating tourism demand in its own right) while recognising the land use conflict as something to be managed.
- The general literature recognises both the positive and negative ways that mining impacts on local or “host” communities, and a consistent theme is the emphasis on processes to mitigate that impact. Examples include:
  - The final report of the Mining, Minerals and Sustainable Development project (International Institute for Environment and Development, 2002) describes the minerals sector and its relationship with concepts of sustainable development, and Chapter 9 of the report deals with relationships with local communities. It concludes that while there are positive benefits (in terms of employment and economic activity) even in the context of potentially serious disruption – consultation with the community, and appropriate action is highly likely to lead to mitigation of the impacts.
  - A World Bank compilation of case studies (World Bank and International Finance Corporation, 2002) of the impact of large mines on local communities concludes that “The general message of the study is a hopeful one: the relationship between mining operations and local communities is undergoing a largely positive evolution. Moreover, there are very practical programs and policies that can be followed to increase the probability of positive experiences”
  - The Project is one of a number of projects occurring in South Australia. The South Australian Centre for Economic Studies reviewed 15 projects on the Eyre Peninsula (Impact of Mining and Resource Development: Case Study for Eyre Peninsula Councils, 2013), and using methodologies similar to this study concluded that they would create over 2000 new jobs in the region – but particularly would produce social benefit such as increased demand for medical services, public safety services and services for an increase in the general population – with increases in land value

#### 24.9.4 ALTERNATIVE USE OF PROJECT LAND

Using the land for the project prevents it from being used for alternative economic activity. The Goldwyn allotment consisted of three parcels of land lot 10, 9 & 21. The whole property was run as a dairy farm and potato producer. It was sold off to a group who were inspired to develop the 3 lots as vineyards. Although there was an application to council, this did not eventuate but over this time the property was leased to a cattle breeder/producer as part of their broader business

The property was subsequently put on the market as three lots. Lot 9 and 21 were purchased by the Adelaide Polo Club and have been reshaped, levelled and set up as sporting grounds. Livestock are used as part of the property management to keep grass down. The remaining Lot 10 was put up for individual sale and was purchased by Terramin. On its own, the property does not represent a sustainable agribusiness but it could be added to neighbouring properties to add value.

Under the possible (based on historical activity/interest) an indicative perspective of the economic value of alternative uses includes:

- Dairy - average revenue per farm is \$706,000, the average capital value per farm is \$4.5 million, and the average value per hectare is \$11,000 – which implies an annual revenue of \$1,765 per hectare (<http://www.agriculture.gov.au/abares>, 2017).
- Potato (or other vegetables) – There are 2300 vegetable farms in Australia, with an average size of 44 hectares, and value of production of \$1.25 million on average per farm (<http://www.agriculture.gov.au/abares/research-topics/surveys/vegetables#farm-financial-performance>, 2017), implying an average value of production of \$32,700 per hectare.
- Grape production – there are 132,500 hectares planted to wine grapes in Australia (Australian Bureau of Statistics, 2015) , with a total production value of \$880.5 million (Australian Bureau of Statistics, 2017, p. 8) – with an implied production value of \$6,650 per hectare.

As such, the annual value of production that would be supported by the property (Lot 10), at 37 hectares – could be expected to be between \$74,000 and \$1.2 million – depending on the use that the land is put to. This does not consider the suitability of the land for the various uses, nor does it consider the profitability of the operations, and therefore the sustainability of the land use (in 2016/17, 65% of dairy farms and 54% of vegetable farms ran at negative cash profit, and the challenges of the wine industry are well understood (see for example (ABC News, 2015))).

#### 24.9.5 POSSIBILITY OF IMPACT ON REAL ESTATE

Current experience with pending mine approvals indicates no reduction in price or decrease in demand for property in region, as various properties have been purchased which either border the proposed Mining Lease or are considerably close during 2016 and 2017, some of which did not need to be publicly advertised prior to being purchased. Woodside broadly continues increasing in house pricing (realestate.com profiles). Substantial expansion plans from local business continue to grow (wineries, polo, housing developments). Local real estate and planning representatives indicated during regional economy focus group discussions that provided potential impacts to amenity were managed, the proposed project would not have an impact on property values.

#### 24.9.6 MODELLING OUTCOMES

##### 24.9.6.1 IMPACT OF THE PROJECT DEVELOPMENT

The expenditure patterns identified in Table 2 above are allocated to respective industry sectors as identified in the input output model, based on the nature of the expenditure, and including a proportion of direct imports. Other expenditure is allocated to regions based on the Project components, and proportional to labour distributions. Wages are assumed to be spent based on the average consumption function for each region, along with an allowance for some expenditure by Terramin employees across regions (as they travel between locations). As noted above, this expenditure is then

used as a final demand increase and traced through the input output model (with the direct coefficients of the state model presumed to apply at the regional level due to the nature of the project), to provide estimates of induced (both production and induced) impacts – in terms of value added, household incomes and employment that are then added to the project outcomes as described above. The value added estimates do not include the gross operating surplus of the Project, but do include gross operating surplus from suppliers into the project. The detailed results of the modelling has been reported above.

#### 24.9.6.2 POSSIBILITY OF IMPACT ON EXISTING ECONOMIC OPERATIONS

As discussed above, any direct negative impact on existing economic operations would be unlikely. An extreme or maximum negative impact that offsets the positive impact of the mining operations is improbable.

To provide an indicative estimate of the potential extent of the offsetting impact, it is modelled that under a worst case base, an expected value of 18 direct jobs could be lost in surrounding activities (see Table 24-10). Using multipliers from the RISE model for the Adelaide Hills (adjusted as per the Project impacts) for wine manufacturing and agricultural production and for food and beverage services, Table 24-11 indicates the expected results including multiplier or flow through effects (i.e. a consistent basis with the estimation of the Project impact). The likelihood, especially with appropriate management strategies re concerns of impacts in surrounding activities would be a minimal impact. Based on the assumptions listed above the possible worse case base expected value scenario (not probability adjusted) would be an offsetting loss of 42 jobs in total and \$3.4 million of value added.

TABLE 24-11 | POTENTIAL FOR OFFSETTING IMPACTS DUE TO IMPACTS ON SURROUNDING ACTIVITIES – TOTAL IMPACT

Assumed negative outcomes - relative to base	Probability of Occurrence	Employment (FTE's)		Value Added/GRP (\$m)	
		Direct	Total	Direct	Total
80-100%	0.00%	90	208	\$7.70	\$16.70
60-80%	1.90%	63	145	\$5.40	\$11.70
40-60%	9.80%	45	104	\$3.90	\$8.40
20-40%	25.80%	27	62	\$2.30	\$5.00
0-20%	62.40%	9	21	\$0.80	\$1.70
Probability weighted value	100%	18	42	\$1.60	\$3.40

Source: Modelled Estimates

It is finally noted that the alternative uses of the land would, using multipliers from the adjusted RISE model for the Adelaide Hills, and conservatively assuming annual production value of \$1 million, would impute that use of the land for agriculture would contribute around \$0.9 million of Gross State/Regional Product (incomes) and support directly around 2.5 full time equivalent jobs (including induced effects of around 6 FTE's).

## 24.10 ECONOMIC IMPACT PEER REVIEW

The Economic Impact Peer Review was completed by the University of Adelaide *South Australian Centre for Economic Studies*.

## Review Findings:

1. ERC uses an input output (IO) modelling approach to estimate impacts on economic activity. IO models are commonly used in the estimation of sub-national economic impacts from output and final demand shocks.
2. The Project Scenario appears to be reasonable.
3. Given that the impact of the Project on adding value to other commodities or bringing other projects forward is highly uncertain, the decision to omit them from analysis seems reasonable, and adds a degree of conservatism to the impact assessments.
4. ERC has allowed for displaced agricultural activity relating to the mine's use of land for a buffer and found the impact to be small.
5. ERC's estimates of "offsetting" impacts, which effectively is an analysis of spillover impacts on neighbouring businesses, is plausible although unavoidably speculative.
6. Factor markets are likely to exhibit elastic supply for South Australia, the Adelaide Hills and the Fleurieu and KI. This supports the validity of the IO modelling technique for each of these three regions.
7. The IO tables employed by ERC are fit for purpose.
8. ERC has presented both "production" and "production and consumption" impacts which is conventional for IO analysis.
9. While the project has net positive impacts on incomes and employment in each of the regions considered, some of the incremental income and employment may accrue to firms and workers moving in to the regions.

## Key finding:

The conclusion of this Review is that ERC's economic impact assessment has been carried out competently. The assumptions that support the modelling have been based mainly on Terramin's business plan and thus reflect an "operating as intended" scenario. The modelling also includes some potential unintended negative consequences of the mine, as have been raised by neighbouring businesses, on a probability-weighted basis, and this part of the analysis unavoidably is speculative in nature.

The Economic Impact Peer Review is located in Appendix W2.

## 24.11 EMPLOYMENT AND SUPPLY OPPORTUNITIES

Terramin are committed to employing a local workforce where possible.

The BIHGP would offer significant benefits by creating new employment opportunities at the state, regional and local levels. The labour and skills requirements for the BIHGP are outlined in Chapter 3: Proposed Mining Operations. The proposed Project will directly employ approximately up to 140 people during operations. The flow on economic benefits from local and regional job creation are discussed earlier in this chapter.

The skills required for the BIHGP would range from semi-skilled roles to professionals and management. The construction workforce is likely to be made up largely of young men and women

employed as technicians and tradespeople, machinery operators and drivers and labour and related occupations.

Given that the proposed mine will create long-term employment at the local, regional and State level, this is considered to be a **high benefit**.

The BIHGP would provide substantial direct and indirect business opportunities for local, regional and State-wide businesses. Direct business opportunities would relate to the provision of goods and services Terramin staff and Terramin contractors and indirect flow-on effects generated in other sectors of the economy as a result of higher incomes levels and consumer spending in the region, including the provision of goods and services to staff residing in local townships. This could benefit a range of business types from small to large, stimulate growth in the local and regional economy and contribute to the overall well-being of communities.

Business opportunities would change over the construction and operation phases of the project and are likely to include fuel supplies, communications, transport and logistics (including workforce transport), engineering and construction services (such as light earthworks, road maintenance), the supply of services, goods or consumables, catering, training and the provision of materials.

The BIHGP would result in some loss of agricultural land, the project represents an opportunity to diversify the economic base in the Adelaide Hills/Fleurieu, at the same time as maintaining the agricultural and industrial aspects of the local economy.

The assessment of business opportunities shows the project would have a **high benefit**, given the long-term opportunities for local, regional and state businesses.

Terramin are committed to developing employment programs and strategies to increase labour force participation and facilitate the participation of local and regional employment in the BIHGP by:

- Actively working with local and regional employment services and businesses to enhance opportunities and give preference to suitably qualified local and regional workers
- Developing flexible work practices to accommodate neighbouring businesses work as best as practicable, including peak agricultural periods such as harvesting and other seasonal business activities
- Providing family friendly work environments to facilitate women, indigenous and other social groups of focus, entry into the mining workforce
- Maintaining the existing online data base/register of prospective employees.

Terramin will work with business groups to identify local business opportunities; provide information on the BIHGP businesses opportunities, tendering and procurement processes and standards to facilitate the pre-qualification of local and regional businesses as well as work with business groups to identify local business opportunities; provide information on the BIHGP businesses opportunities, tendering and procurement processes and standards to facilitate the pre-qualification of local and regional businesses.

## 24.12 DRAFT OUTCOME(S) AND MEASUREMENT CRITERIA

In summary, proximal agri-businesses have advised Terramin which impacts to address when considering economic impacts on local business. In their view, these include impacts to groundwater, as well as impacts to amenity including air quality, noise, vibration and visual amenity.

Terramin have further identified that weeds and pests could also be a potential impact to their business.

Terramin propose that negligible impacts to proximal agri-business can be measured and is achievable through compliance with proposed measurement criteria associated with groundwater, air quality, noise, vibration and visual amenity. This will demonstrate no negative economic impact on adjoining business due to the development and operation of the project.

In accordance with the methodology presented in Chapter 6, an outcome has been developed for impact events with a confirmed link between a source, pathway and receptor (S-P-R linkage), see Table 24-12.

All outcomes are supported by draft measurement criteria which will be used to assess compliance against the draft outcomes during the relevant phases (construction, operation and closure), and where relevant draft leading indicator criteria.

All Outcomes for the entire project are presented in Appendix D1.

TABLE 24-12 | DRAFT MEASURABLE AND OUTCOME CRITERIA

Draft Outcome	Draft Measurement Criteria	Draft Leading Indicator Criteria
No impact to visual amenity caused by the use of colour and/or materials of built structures related to mining activities	Construct to Design Audit of Strategic Visual Amenity Plan and Construction Plan[1] completed by a suitably qualified and experienced independent party within 3 months of completion of surface construction.  Annual photopoints at viewpoints identified in the Strategic Visual Amenity Plan (SVAP) established and demonstrate that the SVAP is being adhered to.	None proposed
Compliance with Air Quality, Noise, Visual Amenity and Water Outcome Measurement Criteria demonstrates no impact to surrounding business from mining activities	See OMC for Air Quality, Noise, Visual Amenity and Water	None proposed

Draft Outcome	Draft Measurement Criteria	Draft Leading Indicator Criteria
<p>No public nuisance impacts to local residents from dust generated by construction, mining or closure activities.</p>	<p>Dust generated from the mining lease during operation activities, measured live at predefined monitoring points demonstrates average dust deposition at sensitive receivers is in accordance with the Air Quality Impact Assessment using standardised monitoring techniques and demonstrates that annual average does not exceed 4 g/m<sup>2</sup> to ensure no nuisance impacts to local residents from dust generated by construction, mining or closure activities.</p> <p>Dust generated from the mining lease during operation activities, measured live at predefined monitoring points demonstrates average TSP concentrations at sensitive receivers is in accordance with the Air Quality Impact Assessment using standardised monitoring techniques and demonstrates that annual average does not exceed 90 ug/m<sup>3</sup> to ensure no loss of productivity on properties surrounding the mining lease from dust generated by construction, mining or closure activities.</p> <p>If these levels are obtained for 12 months post-closure, monitoring will no long be required.</p> <p>Investigation of all dust related complaints demonstrates that the Mine Operator did not cause or could not reasonably have prevented the incident from occurring; and all dust related complaints were acknowledged within 2 hours and closed out within 14 days to the satisfaction of the complainant or as agreed with the Chief Inspector of Mines. If complaints were not resolved the Mine Operator conducted dust monitoring to demonstrate that dust emissions complied with the outcome achievement values as agreed by the Chief Inspector of Mines.</p>	<p>Monthly dust deposition from mining activities not to exceed 4 g/m<sup>2</sup>/month onsite.</p> <p>TSP concentrations do not exceed 120 ug/m<sup>3</sup> (24 hour).</p>



Draft Outcome	Draft Measurement Criteria	Draft Leading Indicator Criteria
<p>No loss of productivity on properties surrounding the mining lease from dust generated by construction, mining or closure activities.</p>	<p>Dust generated from the mining lease during operation activities, measured live at predefined monitoring points demonstrates average dust deposition at sensitive receivers is in accordance with the Air Quality Impact Assessment using standardised monitoring techniques and demonstrates that annual average does not exceed 4 g/m<sup>2</sup> to ensure no nuisance impacts to local residents from dust generated by construction, mining or closure activities.</p> <p>Dust generated from the mining lease during operation activities, measured live at predefined monitoring points demonstrates average TSP concentrations at sensitive receivers is in accordance with the Air Quality Impact Assessment using standardised monitoring techniques and demonstrates that annual average does not exceed 90 ug/m<sup>3</sup> to ensure no loss of productivity on properties surrounding the mining lease from dust generated by construction, mining or closure activities.</p> <p>If these levels are obtained for 12 months post-closure, monitoring will no long be required.</p> <p>Investigation of all dust related complaints demonstrates that the Mine Operator did not cause or could not reasonably have prevented the incident from occurring; and all dust related complaints were acknowledged within 2 hours and closed out within 14 days to the satisfaction of the complainant or as agreed with the Chief Inspector of Mines. If complaints were not resolved the Mine Operator conducted dust monitoring to demonstrate that dust emissions complied with the outcome achievement values as agreed by the Chief Inspector of Mines.</p>	<p>Monthly dust deposition from mining activities not to exceed 4 g/m<sup>2</sup>/month onsite.</p> <p>TSP concentrations do not exceed 120 ug/m<sup>3</sup> (24 hour).</p>

Draft Outcome	Draft Measurement Criteria	Draft Leading Indicator Criteria
<p>No public nuisance impacts from construction, operation and closure activities from noise emanating from the operating site</p>	<p>Noise generated from the mining lease during operation activities, measured live at predefined monitoring points demonstrates noise at sensitive receivers is in accordance with the Environment Protection (Noise) Policy 2007, and does not exceed the following noise limit (averaged over 15 minutes):</p> <p>Construction &amp; closure - 57 dB(A) 7am-10pm</p> <p>Underground development - 57 dB(A) 7am-10pm - 50 dB(A) 10pm-7am.</p> <p>Ore production - 52 dB(A) 7am-10pm - 45 dB(A) 10pm-7am.</p> <p>The above noise levels may only be exceeded if the Chief Inspector of Mines: - is satisfied, on the basis of information provided to him by an acoustic engineer, that the noise will not cause an adverse impact at the sensitive receiver due to the existing influence of ambient noise, or the limited duration and/or frequency of occurrence of the activity; and - provides prior approval for the exceedance.</p> <p>Mine records demonstrate all noise complaints (construction, operation and closure) acknowledged within 2 hours and closed out within 14 days to the satisfaction of the complainant or as agreed with the Chief Inspector of Mines.</p>	<p>Noise generated from the mining lease during operation activities, measured at sensitive receivers in accordance with the Environment Protection (Noise) Policy 2007, does not exceed the following noise limit (averaged over 15 minutes):</p> <p>Ore production - 47 dB(A) 7am-10pm - 40 dB(A) 10pm-7am.</p> <p>Demonstrate the Trigger Action Response Plan has been followed.</p>
<p>No adverse impact on public amenity from vibration or air overpressure caused by blasting. Compliance criteria based on protection of personal amenity</p>	<p>In accordance with Australian Standard AS2187.2.2006 Use of explosive:</p> <ul style="list-style-type: none"> <li>• Vibration levels caused by blasting are less than 5mm/s peak particle velocity at the nearest sensitive receptor for 95% of blasts per year, with a maximum of 10 mm/s peak particle velocity for any one blast, or higher limit as agreed with individual sensitive receptors.</li> <li>• Peak air-overpressure level caused by blasting are less than 115 dBL at the nearest sensitive receptor for 95% of blasts per year, with a maximum of 120 dBL or higher limit as agreed with individual sensitive receptors.</li> <li>• Blasts exceeding a charge weight of XXXkg to be conducted between 1.30 pm and 6 pm</li> </ul>	<p>All complaints acknowledged in 48 hours and closed out within 14 days to the satisfaction of the complainant or as agreed with the Director of Mines.</p>

Draft Outcome	Draft Measurement Criteria	Draft Leading Indicator Criteria
No introduction of new species of declared weeds, plant pathogens or pests (including feral animals), nor sustained increase in abundance of existing declared weed or pest species on the mining lease caused by mining activities	Survey demonstrates: - no new species of declared weeds or feral animals have become established on the lease - there has not been a statistically significant increase in abundance of existing weed or pest species in the Project area (Project site), compared to baseline studies and accounting for seasonal variation (regional trends).	An incident register is to be maintained of any new declared weeds or pests identified by site personnel. The register will be reviewed monthly and results will be presented in monthly site management reports prepared by the Mine Manager. The review will include the identification of any procedural changes required.
No adverse impact to the supply or quality of water by the mining operations to existing users and water dependant ecosystems	The Mine Manager will ensure that monthly drawdown (SWL) measurements recorded by site staff in monitoring wells X, Y and Z (installed monitoring piezometers) and private bores A, B and C (shown in Figure X) are compared with dewatering model predictions for the 70% grouting effective groundwater modelling scenario, presented in Table X and are within 2 standard errors of model predictions for two consecutive readings.	Observed drawdown in monitoring wells X, Y and Z (installed monitoring piezometers) falls outside of 2 standard errors of model predictions for one reading.
No adverse impact to the supply or quality of water by the mining operations to existing users and water dependant ecosystems	The Mine Manager will ensure that monitoring of the water quality of the injectant (mine water) from the WTP during re-injection, undertaken on a monthly basis for field parameters TDS, pH and NTU[1] shows that field TDS and pH (and any other parameter of concern as determined by MAR trial) is as per DEW drainage permit conditions, and turbidity is below 5 NTU; or as per DEW drainage permit conditions, confirmed by Laboratory major ion testing of the injectant using a NATA accredited laboratory on a monthly basis.	Field TDS of the blended injectant greater than 2 standard errors of baseline data for each well (mg/L) or as per DEW drainage permit conditions. Field measurement of turbidity is above 5 NTU or as per DEW drainage permit conditions.

## 24.13 FINDINGS AND CONCLUSIONS

This chapter represents an evaluation of the economic contribution of the proposed Bird in Hand Gold Mine (Project) to the regions in which it will operate. It also outlines how specific aspects of the project have been communicated by local business owners as having the potential to impact their businesses, and how each of these aspects is being addressed by the Project, in order to prevent or significantly mitigate any potential impacts to as low as reasonably possible.

For the report Terramin provided details of their expenditure for the respective operations, and of the work force required for the project. The expenditure has been allocated to the respective industries in which it occurs, and then has been modelled in a whole of economy model which traces the induced effect of the expenditure to provide an estimate of the total economic contribution of the Project.

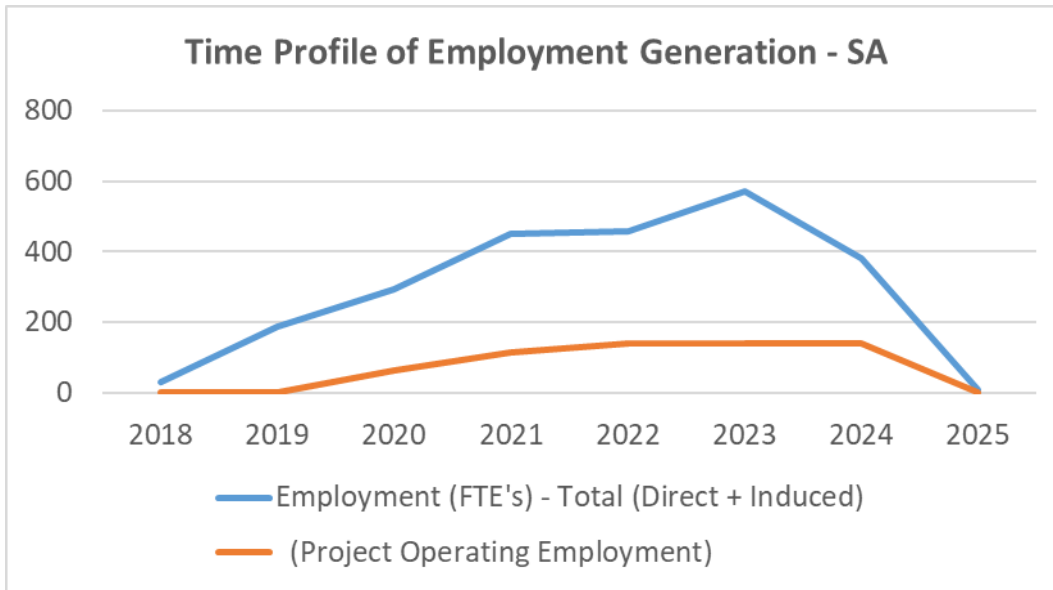
TABLE 24-13 | SUMMARY OF RESULTS – MODELLING OF ECONOMIC CONTRIBUTION OF BIRD IN HAND GOLD MINE

	2018	2019	2020	2021	2022	2023	2024	2025	Total
<b>Impact on South Australian Economy</b>									
Final Demand (expenditure (\$ million))	\$4.10	\$25.00	\$29.50	\$38.60	\$37.80	\$47.40	\$28.10	\$0.80	\$211.20
Project Wages and Salaries (\$million)	\$0.00	\$0.00	\$6.00	\$10.40	\$12.40	\$12.40	\$12.40	\$0.00	\$53.60

	2018	2019	2020	2021	2022	2023	2024	2025	Total
Other Industry Gross Regional Product (\$million)	\$4.00	\$25.60	\$30.20	\$42.20	\$40.60	\$53.20	\$30.30	\$0.90	\$227.10
Gross State Product (excl Terramin GoS) (\$ million)	\$4.00	\$25.60	\$36.20	\$52.60	\$53.00	\$65.60	\$42.70	\$0.90	\$280.70
Total (Direct + Induced) Household Incomes (\$ million)	\$2.40	\$15.30	\$23.80	\$35.90	\$36.60	\$45.00	\$30.40	\$0.60	\$189.90
Employment (FTE's) - Total (Direct + Induced)	30	184	292	445	455	563	375	7	2,350
<i>(Project Operating Employment)</i>	0	0	63	115	140	140	140	0	599
<b>Impact on Adelaide Hills Region</b>									
Final Demand (expenditure (\$ million))	\$2.20	\$13.70	\$18.00	\$23.30	\$22.60	\$27.90	\$17.20	\$0.40	\$125.40
Project Wages and Salaries (\$million)	\$0.00	\$0.00	\$5.10	\$7.80	\$8.60	\$8.60	\$8.60	\$0.00	\$38.60
Other Industry Gross Regional Product (\$million)	\$2.20	\$13.70	\$15.50	\$21.10	\$20.00	\$26.30	\$14.90	\$0.50	\$114.00
Gross Regional Product (excl Terramin GoS) (\$ million)	\$2.20	\$13.70	\$20.60	\$28.90	\$28.60	\$34.80	\$23.50	\$0.50	\$152.60
Household (Direct + Induced) Incomes (\$ million)	\$1.40	\$9.00	\$15.00	\$21.60	\$21.60	\$26.10	\$18.20	\$0.30	\$113.10
Employment (FTE's) - Total (Direct + Induced)	18	112	188	273	272	333	227	4	1,427
<i>(Project Employment)</i>	0	0	55	84	93	93	93	0	419
<b>Impact on Fleurieu Peninsula Region</b>									
Final Demand (expenditure (\$ million))	\$0.70	\$4.30	\$4.50	\$7.20	\$7.90	\$9.60	\$6.20	\$0.10	\$40.60
Project Wages and Salaries (\$million)	\$0.00	\$0.00	\$0.40	\$2.30	\$3.50	\$3.50	\$3.50	\$0.00	\$13.30
Other Industry Gross Regional Product (\$million)	\$0.70	\$4.10	\$4.10	\$6.10	\$6.30	\$7.90	\$5.00	\$0.10	\$34.40
Gross Regional Product (excl Terramin GoS) (\$ million)	\$0.70	\$4.10	\$4.50	\$8.40	\$9.80	\$11.40	\$8.50	\$0.10	\$47.70
Household (Direct + Induced) Incomes (\$ million)	\$0.40	\$2.60	\$3.00	\$6.10	\$7.40	\$8.50	\$6.50	\$0.10	\$34.60
Employment (FTE's) - Total (Direct + Induced)	6	36	44	87	103	120	91	1	488
<i>(Project Operating Employment)</i>	0	0	5	29	44	44	44	0	168

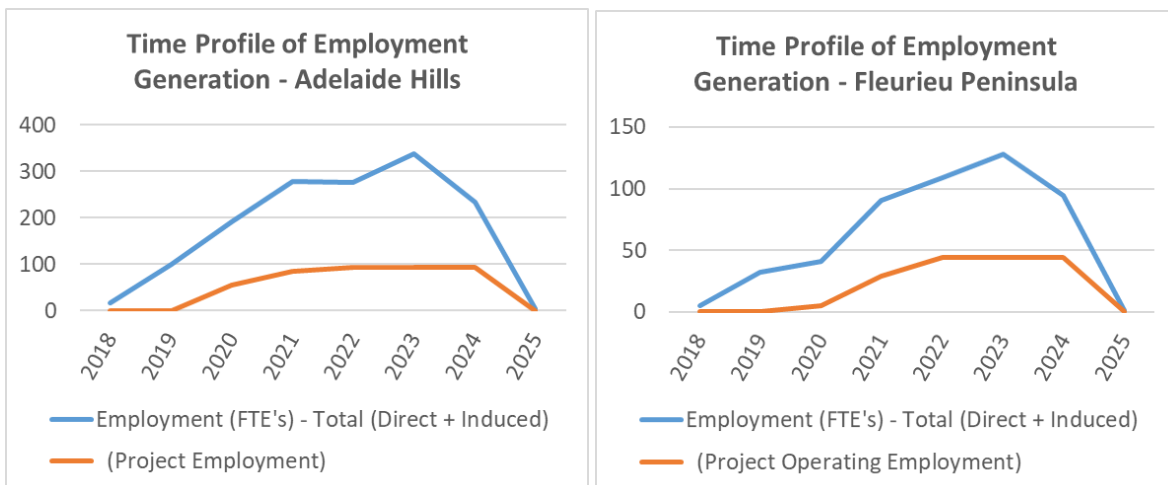
Source: Modelled results

NB: These results and their timing assume regulator project approval in 2018 and do not include expenditure prior to this report.



Source: Modelled results

FIGURE 24-8 | TIME PROFILE OF EMPLOYMENT GENERATION - SA



Source: Modelled results

FIGURE 24-9 | TIME PROFILE OF EMPLOYMENT GENERATION – ADELAIDE HILLS AND FLEURIEU PENINSULA

Some community concerns have been expressed with respect to the negative economic impact on existing businesses in the area. Based on an agricultural impact report, the likelihood - especially with adoption of appropriate management strategies re the concerns would be for a minimal impact. Moreover, indicative probability based modelling suggests a probability adjusted worst case situation would be offsetting loss in potentially impacted activities of (in expected value terms) of 18 direct jobs and \$1.6 million of value added. However, risk mitigation measures increase the probability of no impact at all. The overall conclusion is that the risk to other economic activities in the area is low. The possible impact on existing businesses in the area through the impact on tourism, wineries and events have also been considered by comparing areas sharing similar co-existing land uses like the Hunter Valley.

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