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ECONOMIC IMPACT ASSESSMENT OF THE EAGLETON HARD ROCK QUARRY

REPORT FOR EAGLETON ROCK SYNDICATE PTY LTD

JULY 2017

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General reliance restriction

This report is prepared for the Eagleton Rock Syndicate. The purpose of this report is to provide an economic impact assessment of the Eagleton Hard Rock Quarry to NSW and to the local community. You should not use the advice for any other purpose. This report should not be used or relied upon by anyone else and we accept no duty of care to any other person or entity. Due to the uncertain nature of economic data, Cadence Economics does not warrant the completeness or accuracy of the analysis or estimates provided in this report.

Summary Report

The Eagleton Rock Syndicate Pty Ltd (the Proponent) is seeking approval to establish quarry operations at the Eagleton Rock Quarry (the Project) within the local government area of Port Stephens NSW. The proponent is seeking to extract up to 600,000 tonnes per annum of various igneous and sedimentary hard rocks from the quarry site over a period of approximately 24 years (a consent is sought for a period of up to 30 years to account for reduced market demand). The materials from the hard rock quarry is an input into the construction of infrastructure developments including roads and rail and the construction of commercial, industrial and residential developments.

The Project has been classified as a State Significant Development (SSD) under the *State Environmental Planning Policy (State and Regional Development) Act (2011)*. The Secretary's Environmental Assessment Requirements were issued on 6 November 2015, which included the requirement to provide a "detailed assessment of the costs and benefits of the development as a whole, and whether it would result in a net benefit for the NSW Community."

This report provides an Economic Impact Assessment (EIA) including a Cost Benefit Analysis (CBA) and a Local Effects Analysis (LEA) of the Project, estimating the net benefits of the Project to New South Wales and the local benefits to the Port Stephens region (as defined by the ABS's SA3 Port Stephens (10603) region. The EIA will form part of the Response to Submission seeking approval for the Project through Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

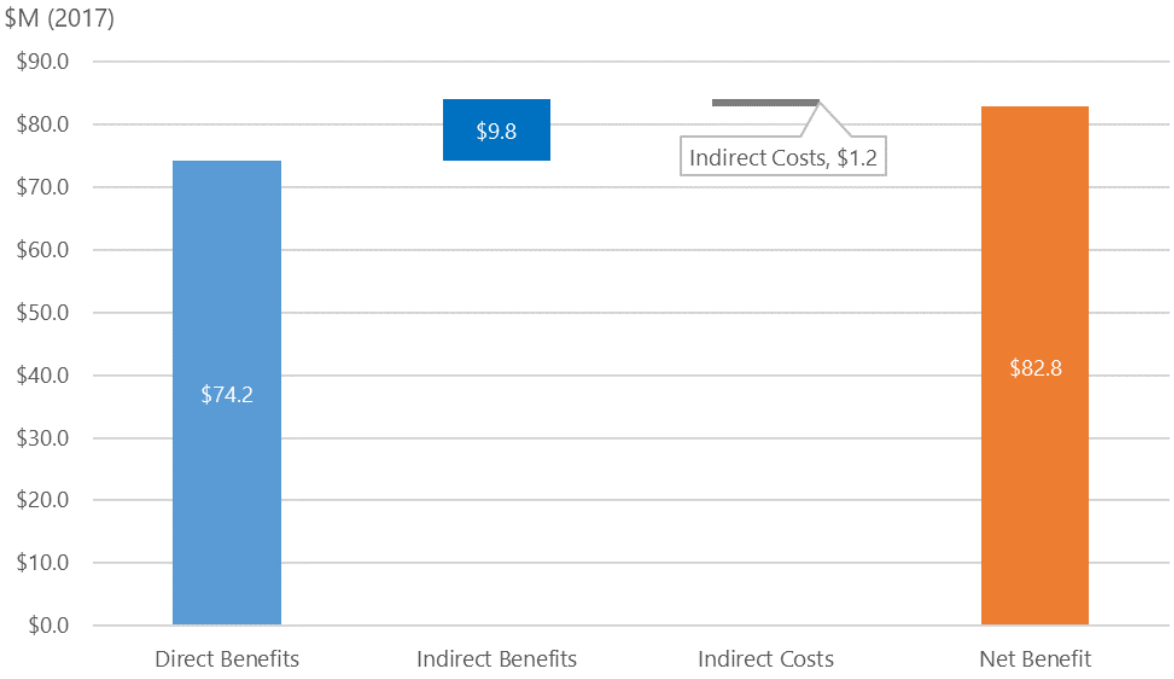
This EIA uses the economic assessment framework set out in the *Guidelines for the economic assessment of mining and coal seam gas proposals* (the Guidelines) released by the NSW Government in December 2015. This assessment has assumed a scenario of capital investment, from 2017 to 2020, and production over a 24-year period from 2018 to 2041.

The Project, based on the assumptions set out in this report, is shown to confer net benefits to New South Wales. Based on the methodology established in the Guidelines the estimated net benefit of the Project to New South Wales is $82.8 million in net present value terms over the life of the Project using a 7 percent real discount rate (NPV terms), see Figure 1. The magnitude of the benefits derived by New South Wales from establishing quarrying operations at Eagleton is driven by:

- The Project proponent is a 100 percent New South Wales based company;
- The rock deposit being economically viable given the relatively high value of the quarry outputs, and relatively low extraction and processing costs; and
- The relatively low environmental impact of the operations as assessed in the EIS. As highlighted in the report:
    - the quarry site is relatively isolated from population centres; and,
    - the Proponent is undertaking numerous mitigation measures, the costs of which are included in either the Project's operational cost or capital expenditure.
        - These measures to reduce the overall environmental impact of the Project and, in total, includes $13.2 million dollars of expenditure.

- For example, these mitigation steps include $2.8 million (in NPV terms) for a dam system to enable management of water up to a 1 in 500-year flooding event and $1.3 million to treat water to ensure a Neutral or Beneficial Effect (NORBE) on water quality in the catchment.

Figure 1: Net benefits of the Eagleton Quarry, NPV, 2017 - 2041



Source: Cadence Economics estimates based on the EIS undertaken by JBA Urban Planning Consultants (2017).and information provided by Eagleton Rock Syndicate.

The net benefits to New South Wales are shown in the report to be robust under systematic sensitivity analysis undertaken (consistent with the Guidelines). Compared with the net benefits of $82.8 million in NPV terms estimated under the central case assumptions presented in the report, the lower bound net benefit is estimated to be $44.1 million in NPV terms (using a 7% discount rate). The upper bound estimate of the net benefits is $121.2 million in NPV terms (using a 7% discount rate).

The economic modelling has been conducted over a 24 year period, consistent with the intending extraction profile of the quarry plan. Approval is being sort to extract rock product over a 30 year period, to allow functional flexibility of the extraction, processing and sales operations. The total resources at the quarry site is 12.87 million tonnes of hard rock product.

Where the Project operates over a 30 year time period (instead of the 24 year period), total hard rock output will remain fixed at 12.87 million tonnes and will result in lower extraction, processing and sales per year and as a result the Project benefits will be delayed over the project horizon and will generate a *slightly lower positive* net benefit to NSW. Underlying these results will be *slightly lower but positive* total direct benefits and total indirect benefits (workers and suppliers) and lower but still negative indirect costs (environmental costs) inline with the lower extraction.

Local Effects Analysis

In terms of local area effect, the Project is estimated to confer a net benefit of $1.6 million to Port Stephens SA3 in NPV terms. This is driven largely by:

- Benefits to employees of which, 80 percent are assumed to be drawn from the local area.
- Benefits to local suppliers of which, is assumed to provide 20 percent of the quarry inputs to production.

Again, the report shows that the estimated local effects are robust under the sensitivity analysis conducted with positive net benefits under both the low and high case scenarios considered. The net benefits to the local region range from $0.9 to $2.6 million in NPV terms on the range of sensitivities considered.

1. Introduction

Cadence Economics was commissioned by Kleinfelder Australia on behalf of Eagleton Rock Syndicate Pty Ltd to undertake an Economic Impact Assessment (EIA) of the Eagleton Hark Rock Quarry Project (the Project). The EIA will form part of the Environmental Impact Statement seeking approval for the Project through Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Project has been classified as a State Significant Development (SSD) under the *State Environmental Planning Policy (State and Regional Development) Act (2011)*. The Secretary's Environmental Assessment Requirements were issued on 6 November 2015, which included the requirement to provide a "detailed assessment of the costs and benefits of the development as a whole, and whether it would result in a net benefit for the NSW Community."

This EIA report provides a description of the cost benefit analysis undertaken for the Project. The EIA uses the framework established in the *Guidelines for the economic assessment of mining and coal seam gas proposals* (the Guidelines) released by the New South Wales (NSW) Government in December 2015 (the Guidelines).[1]

The EIA is based on data inputs for the analysis presented in this report are derived primarily from:

- The *State Significant Development Application Environmental Impact Statement Eagleton Quarry* undertaken by JBA Urban Planning Consultants (January 2017) (the EIS);
    - Including the related Response to Submission
- Various environmental consultant reports including the Air Quality Assessment undertaken by Pacific Environment and the Traffic Assessment undertaken by GHD;
- *Market Analysis & Appraisal Eagleton Quarry – NSW*, Quarry Mining Systems March 2014; and
- Data provided by the project proponents Eagleton Quarry Syndicate.

Cadence Economics has not verified the information in these studies.

A previous Economic Assessment was undertaken by Hunter Research Foundation Centre that focused on the Projects economic impact to value added and employment through the purchase of capital equipment and operational expenditure. This analysis forms no part of this assessment.

The Project

The proposed Project includes the development of a greenfield quarry site to extract various hard rock commodities, including conglomerate, rhyodacite and rhyolite. The Project site is located on the southern extent of the locality of Balickera, to the north and east of the Eagleton and East Seaham communities respectively. The Project is adjacent to the current Boral Seaham Quarry and the Project site takes in the land used for the Port Stephens Gardenland landscape supplies facility.

[1] New South Wales Government (2015).

Figure 2: Eagleton Quarry site

Source: EIS undertaken by JBA Urban Planning Consultants (2017).

The operations at the site are to include:

- Quarrying operations that include, drilling and blasting of hard rock formations to be hauled for further processing;
- Materials processing that will include a staging area, jaw crushing hard rock material and various screening processing; and,
- Sales activity and site administration and transportation of processed hard rock material.

The operations are planned to begin in 2018 and run for a total of 24 years to 2041. The 24-year period assumes the maximum extraction rate is achieved, an approval is sought for a duration of 30 years to account for variable market demand. Operations are planned to ramp up from 350,000 tonnes of hard rock at the start of operations, then grow steadily to 600,000 tonnes from 2028 onwards. Over the life of the Project the quarry is projected to extract just over 12.8 million tonnes of hard rock in total, as outlined in the EIS:

> *The Eagleton Quarry proposal is for the extraction of a hard rock reserve that is a mixture of various igneous and sedimentary rock formations. The proponent, Eagleton Rock Syndicate Pty Ltd (Eagleton Rock), has identified rock formations suited to local and regional construction markets and therefore the project will contribute to satisfying an identified demand.*

The materials from the hard rock quarry will form an input into infrastructure developments including roads and rail and the construction of commercial, industrial and residential developments. As outlined

in the EIS the quarry output will service customers in Newcastle, the Central Coast and the Lower Hunter and potentially Sydney. In addition, the EIS highlights, there are several Projects that require significant volumes of hard rock including:

- Newcastle Airport/ RAAF expansion;
- Road Projects including the M1 to Raymond Terrace, the Singleton Bypass, Jesmond to Ranking Park, the Tourle Street Bridge duplication and Local government road maintenance works;
- Newcastle Portside land redevelopment;
- New Maitland Hospital;
- Commercial and employment lands developments; and,
- Residential developments.

Table 1: Summary of operations at the Eagleton Hard Rock Quarry

	Description of operations
Resource Tonnes	12.87 million tonnes of hard rock
Mining Methods	Open cut quarry operations
Product output	Conglomerate, Rhyodacite and Rhyolite
Mining Rate	Up to 600,000 Tonnes of hard rock
Price	Economic assessment has been undertaken using a constant hard rock price of $28 a tonne for all quarry products
Quarry Life	Up to 30 years from date of approval
Disturbance Area	Approximately 33.7ha, that includes quarrying, processing, sales and administrative areas and access roads
Operational Workforce	Approximately 20 full time personnel.
Hours of operations	Proposed processing and extraction activities are proposed – 7:00am – 6:00 pm Monday to Friday and 7:00am to 4:00pm Saturdays Scheduled maintenance would generally be limited to processing hours (However, in the event of urgent unscheduled maintenance that cannot be completed within this period, maintenance works may need to be undertaken anytime 7 days per week). Sales activities would be 5:00am to 10pm Monday to Friday and 5am-4pm Saturdays
Blasting	It is proposed that the Eagleton Quarry would require approximately 1 blast per month (up to 12 per year). Blasting will take place during regular operating hours and only occur during favourable weather conditions to minimise impacts. Blasting would not take place on weekends or during the night time or evening periods (including early mornings).
Transport	Estimated 192 Vehicle movements, including 20 staff movements, 2 supply trucks and 170 movements from trucks carrying various rock materials.
Mitigation Measures	The quarry operations include several mitigation measures (included in the Project's operational or capital expenditure), detailed in Appendix A of this report. These mitigation measures include direct actions by the proponent to reduce potential environmental impacts, like: Surface Water controls and treatments Constructing sealed roads, use water carts on dirt roads and set up a weather station to monitor wind to reduce both noise and dust Undertake hollow tree clearing to reduce habitation away from quarrying activities Set up and maintain a number of management plans (i.e. for traffic, ecology, air quality) to monitor and report on performance.

Source: Based on information provided in the EIS undertaken by JBA Urban Planning Consultants (2017).

2. Cost-Benefit Analysis

The Guidelines released by the NSW Government in December 2015 set out the cost-benefit analysis (CBA) framework to measure the net benefits to the NSW community. This approach has been adopted in the economic analysis outlined in this report. Table 2 provides a summary of how these net benefits are measured.

Table 2: Cost Benefit Analysis framework as defined in the Guidelines

Direct Benefits	Indirect Benefits	Indirect Costs
The net benefits that accrue to NSW from the direct operations of the proposed mine	The net benefits that are generated for parties that economically interact with the proposed mine	Social costs generated by the proposed mine, borne by the NSW community
Includes: • Net producer surplus attributable to NSW • Royalties payable • Company tax attributable to NSW	Includes: • Net economic benefits to landowners • Net economics benefits to NSW employees • Net economic benefits to NSW suppliers	Includes: • Net environmental, social and transport-related costs • Net public infrastructure costs • Loss of surplus to other industries

Source: NSW Government (2015).

The direct benefits are those that accrue to the project proponent and payments made to government. The indirect benefits are those that accrue to economic agents that engage with the project proponent. These include employees, suppliers and land owners. The indirect costs are the costs borne by the community of NSW, through environmental and social impacts or public infrastructure costs.

A major emphasis of the Guidelines is on transparency of assumptions made. The remainder of this section describes in detail the assumptions underpinning the CBA.

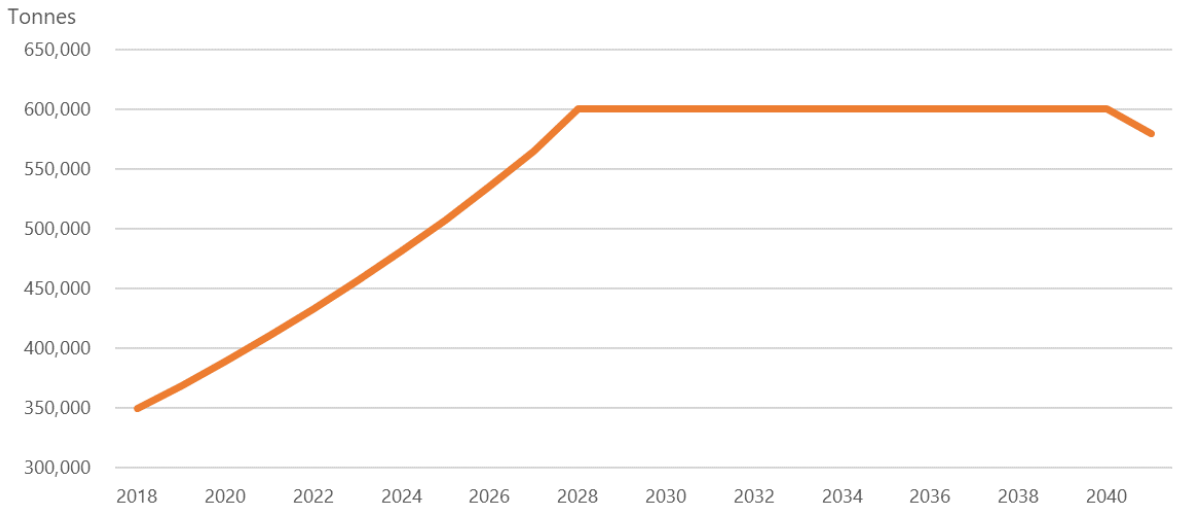
Baseline case

The starting point for any CBA is the base case, or counterfactual. This scenario considers all costs and benefits if the Project does not proceed. As the Project site is a greenfield development with no obligations for rehabilitation, no quarry operations that are in care and maintenance, no grazing or other agricultural activities on the land, or other economic activities that take place in the base case – i.e. without approval. In other words, under the base case, there are no direct benefits, indirect benefits or indirect costs that are required to be considered in the context of this assessment.

Project case – central case assumptions

Under the assumption that the Project goes ahead, the Eagleton Quarry will produce an additional 12.88 million tonnes of hard rock over the 24 year period 2018 to 2041 as summarised in Figure 3. Operations at the Eagleton Quarry are planned to begin in 2018 with 350,000 tonnes of hard rock output in that calendar year. Over the next 10 years, output from the quarry increases steadily to 600,000 tonnes by 2028. Output is maintained at this level for the next 13 years, with 580,000 tonnes in the final year of operation.

Figure 3: Eagleton Quarry, output of hard rock, tonnes, 2018 to 2041



Source: Eagle Rock Syndicate

The real hard rock price over the life of the Project is assumed to be $28 per tonne. This is based on the existing (2017) price of hard rock prices. For the purposes of this CBA, these prices represent the 'central case' assumptions underpinning the analysis.

Based on the production and real price assumptions, the Project will generate real revenue of $160.5 million real revenue in NPV terms through the sale of hard rock as shown in Table 3.

Table 3: Central case – hard rock, real price and revenue

	Total Project	2018	2023	2028	2041
Output – Saleable hard rock (Tonnes)		350,000	456,569	600,000	580,000
Real price reference ($2017)	28.0	28.0	28.0	28.0	28.0
Project revenue (NPV*) ($M2017)	160.5	9.8	12.8	16.8	16.2

Source: Cadence Economics estimates based on the EIS undertaken by JBA Urban Planning Consultants (2017).and information provided by Eagleton Rock Syndicate.

* NPV in 2017 dollars based on a 7 percent real discount rate.

Under the central case assumptions, from the real revenue of $160.5 million in NPV terms, operating costs are estimated to be $115.2 million in NPV terms, as summarised in Table 4. The Project proponent will also incur $2.8 million of water mitigation costs and biodiversity offset charges of up to an estimated $4.5 million in NPV terms.

Table 4: Central Project case – Summary of Project financials ($ million)

	Project (NPV*)	2018	2023	2028	2041
Operational revenue	160.5	9.8	12.8	16.8	16.2
Asset Sales Revenue	2.8	-	-	-	-
Residual Value of Capital	1.1	-	-	-	5.4
Total Revenue	164.3	9.8	12.8	16.8	21.6
Operating Costs ($m)	41.9	3.7	3.5	3.8	3.8
Biodiversity - Offsets	4.5	4.8	-	-	-
Water Mitigation	2.8	3.0	-	-	-
Net revenue ($m)	115.2	-1.7	9.2	13.0	17.9
Depreciation	8.6	0.0	1.0	1.0	1.0
Total Profit	106.6	-1.7	8.3	12.1	16.9

Source: Cadence Economics estimates based on information provided by Eagleton Rock Syndicate.

* NPV in 2017 dollars based on a 7 percent real discount rate.

Direct Benefits

Based on the Guidelines, the direct benefits to NSW of the Project are derived from three elements:

- The net producer surplus generated by the project that is attributable to NSW.
- The share of company tax payments that are attributable to NSW.
- Other tax payments such as royalties and payroll tax that are paid to the NSW and local government.

Based on the revenue and cost data, the Project is estimated to generate $74.2 million in total Direct Benefits to NSW in NPV terms, as outlined in Table 5. These benefits are comprised of $63.2 million of producer surplus, $10.4 million in company tax attributable to NSW and $0.5 million in NPV terms paid to the NSW Government in payroll tax.

Table 5: Summary of the direct benefits of the Project ($ million)

Net financial benefit	NPV*
Net producer surplus attributable to NSW	63.2
Company income tax attributable to NSW	10.4
Payments to the NSW and local Government	0.5
Total financial benefit attributable to NSW	74.2

Source: Cadence Economics estimates based on information provided by Eagleton Rock Syndicate.

* NPV in 2017 dollars based on a 7 percent real discount rate.

To model these Direct Benefits, we have considered that the Quarry proponent is 100% Australian and NSW owned and payments to the NSW and the Port Stephens Governments is limited to payroll tax.

Net producer surplus

Consistent with the Guidelines, the net producer surplus of the Project are the private benefits, or profits, generated that are attributable to NSW. In this case the total net producer surplus generated is attributable to NSW as the project proponent Eagleton Rock Syndicate is 100 percent NSW-owned. This is estimated to be $63.2 million in NPV terms as summarised in Table 6.

Table 6: Estimate of net producer surplus ($ million)

Net producer surplus	NPV*
Net revenue (sales revenue and asset revenue, minus operating costs)	$115.2
Payroll tax	$0.5
Company tax	$32.5
Capital costs	$19.0
Residual value of land	$0.0
Net producer surplus	$63.2
Net producer surplus attributable to NSW	$63.2

Source: Cadence Economics estimates based on information provided by Eagleton Rock Syndicate.
* NPV in 2017 dollars based on a 7 percent real discount rate.

Company tax (NSW share)

The company tax payments made to the Australian Government are levied on the profits generated by the Project as summarised in Table 7. It is estimated the Project will generate $106.6 million in total profit in NPV terms over the period 2017 to 2041. At a company tax rate of 30 percent and a depreciation rate of 7.5 percent, the company tax estimate is $32.5 million in NPV terms, of which $10.4 million is attributable to NSW (based on a NSW population share of 32% which is consistent with the Guidelines).

Table 7: Company income tax attributable to NSW ($ million)

Corporations tax paid to NSW	NPV*
Net revenue (sales revenue and asset revenue, minus operating costs)	$115.2
Depreciation	$8.6
Total profit	$106.6
Corporations tax	$32.5
NSW Share	$10.4

Source: Cadence Economics estimates based on information provided by Eagleton Rock Syndicate.
* NPV in 2017 dollars based on a 7 percent real discount rate.

Indirect Benefits to NSW

Consistent with the Guidelines, the indirect benefits of the Project accrue to, Employee, Supplier and Land owners. As summarised in Table 8, the total indirect benefits are estimated to be $9.8 million in NPV terms. The main source of these benefits is the $9.3 million in benefits to suppliers and $0.55 million in benefits to employees in NPV terms. There are no anticipated benefits to land owners as a result of the Project.

Table 8: Summary of indirect benefits, ($ million)

Indirect benefits	NPV*
Employee benefits	$0.55
Supplier benefits	9.27
Land owner premiums (Land sales made above market rates)	-
Total Indirect Benefit	$9.8

Source: Cadence Economics estimates based on information provided by Eagleton Rock Syndicate.
* NPV in 2017 dollars based on a 7 percent real discount rate.

Benefit to employees

Consistent with the Guidelines, a key factor in determining the benefit to employees centres on assumptions based on the employment conditions of those employees that are employed under the Project. For example, those persons employed under the Project scenario that are drawn from the existing pool of employed labour, with comparable employment conditions, would receive no net employee benefits. On the other hand, those employees at the Project who were unemployed would generate a net employee benefit.

Based on information provided by the Eagleton Rock Syndicate the project will employ 20 staff per year over the life of the Project, as outlined in Table 9, including four administration and sales staff and 16 production staff.

Table 9: Direct staff requirement, Southern Extension Project, 2018 to 2041

Employees	Production	Administration	Total
Full-time Equivalent	16	4	20

Source: Eagleton Rock Syndicate

To determine the economic benefits to employees, the following assumptions have been made:

- Administration and sales employees are assumed to be drawn from existing employment in the mining sector because of their specialised skills including mine planning engineers and management. As such, it is assumed that these employees do not generate a net employee benefit as they were previously employed under similar conditions.
- The additional 16 production staff for the duration of the project will be drawn from the ranks of the Port Stephens labour market and the surrounding region. As discussed below, the Port Stephens region has comparable average unemployment rates compared with NSW.
- Where we assume an unemployment rate of 5.8% (the average quarterly unemployment for the Port Stephens SA3 between December 2010 to March 2017), suggesting 0.93 of an employee is drawn from the unemployed pool in Port Stephens. For the purposes of the analysis below we have assumed that one employee was previously unemployed.

The estimated employee benefits that accrue to these production staff is therefore the difference between the wage they receive and the Newstart Allowance, as summarised in Table 10.

In real terms, one production staff will earn wages of $65,700 per annum over, in wages and superannuation, or $0.75 million in in NPV terms. This compares with the Newstart Allowance of $0.20 million in NPV terms resulting in a $0.55 million in NPV terms net employee benefit.

Table 10: Summary of real net employee benefits, 2018 – 2041 and NPV*

Indirect benefits –Employee	NPV*	2018 – 2041
Total production (Employees)		16
Unemployment rate (%)^		5.8
Previously unemployed (Employee)		1
Real Newstart Allowance income^^ ($)	$0.20	$17,363
Real average wage^^^ ($)	$0.75	$ 65,700
Real net employee benefit	$0.55	$49,337

Source: Cadence Economics estimates. Based on information provided by the Eagleton Rock Syndicate, Department of Employment, *Data Tables – Small Area Labour Markets – March Quarter 2017 (Table 1 SA2)*

* NPV in 2017 dollars based on a 7 percent real discount rate.

^Average unemployment for the Port Stephens SA3, December 2010 to March 2017

^^ Newstart Allowance for a single person with no children and includes Rent Assistance

^^^ Real average wage include a wage of $60,000 per annum and a superannuation guarantee of 9.5% of wage.

Benefit to suppliers

Consistent with the Guidelines, the economic benefit to suppliers is estimated as a producer surplus generated from goods and services from NSW firms servicing the Project. As summarised in Table 11, based on the quarry cost data provided by Eagle Rock Syndicate, the Project is estimated to require $23.35 million in NPV terms in intermediate inputs over its life-cycle.

The estimated economic benefit to suppliers (producer surplus or value added) is based on the Cadence Economics Regional Input-Output Model (CERIOM). This model was customised to generate a NSW-specific Input-Output table so as to not include benefits generated in other Australian states. For the first two years of operation, 2018 and 2019, electricity supplied to the quarrying operations will use a portable diesel generator, from 2020 operations will be switch to grid-supplied electricity. As electricity generation has a higher share of New South Wales-based activity, the value added ratios increases from 0.361 to 0.404 from 2020.

The producer surplus estimates are based on Type I multipliers which only relate to direct value added generated by NSW suppliers. This methodology does not account for second round, nor induced consumption, effects. Using this relatively conservative technique, the total supplier benefits are estimated to be $9.27 million in NPV terms.

Table 11: Summary of benefits to suppliers, Indicative years, 2018 to 2041 and NPV

Indirect benefits –suppliers	NPV*	2018	2023	2028	2041
Real intermediate inputs ($m)	$23.35	$2.06	$1.92	$2.14	$2.14
Value added ratio		0 .361	0 .404	0.404	0.404
Real supplier benefits ($m)	$9.27	$0.74	$0.78	$0.86	$0.86

Source: Cadence Economics estimates based on information provided by Eagleton Rock Syndicate.

* NPV in 2017 dollars based on a 7 percent real discount rate.

Indirect Costs to NSW

Consistent with the Guidelines, the indirect costs of the Project are classified as:

- Net public infrastructure costs,

- Estimated loss of surplus to other industries,
- Net environmental, social and transport-related costs,
- Net environmental costs.

Net public infrastructure costs

As outlined in the EIS two upgrades are required to the roads within the vicinity of the Project to manage access and traffic. These upgrades relate to Barleigh Ranch Way and the Italia Road intersection adjacent to the site. The cost to upgrade these two sites has been included in the capital costs for this project.

As outlined in the EIS Eagleton Rock Syndicate will pay Port Stephens Council a Heavy Vehicle Haulage Levy of 4c per tonne per km for transportation of quarry products on Italia Road – a distance of about 450 metres. At peak production of 600,000 tonnes this equates to $24,000 payment to Council to contribute to the up-keep of Italia Road. These costs are included in the Project's operational costs.

Loss of surplus to other industries

Consistent with information outlined in the EIS, it is assumed that no losses will be generated in other industries in NSW as a result of Project approval.

Net environmental, social and transport-related costs

Table 12 provides a summary of the environmental impacts generated by the Project. A number of these impacts have been measured quantitatively, such as greenhouse gas emissions and traffic impacts from temporary road closures. Some of these environmental impacts have been included in the operating costs of the proponent as either management costs in the case of biodiversity or mitigation measures, as in the case of water impacts. Some are discussed in qualitative terms such as visual amenity and Aboriginal heritage.

Table 12: Summary of environmental impacts

Scope of environmental costs	Assessment type	Discussion
Greenhouse gas emissions	Quantitative	Based on scope 1 and 2 emissions
Air quality	Quantitative	Measured as the reduction in a statistical life
Residual value of land	Qualitative	Measures the value forgone from society's potential value for the use of the quarry area.
Biodiversity impact	Quantitative	Measured as the likely Biodiversity costs to be incurred by Eagleton Quarry.
Transport/ traffic impacts	Quantitative	Measured as the increase in travel times associated with increase traffic
Ambient noise impact	Quantitative	Measured as the increase in Project decibels.
Visual amenity	Qualitative	No visual impacts associated with quarry operations and processing.
Water impact	Quantitative	No impacts on other groundwater water users. Water discharge quality and quantity managed to avoid negative impacts on downstream environment and users. The Proponent will incur costs to mitigate against the impact of a flood event.
Aboriginal cultural heritage	Qualitative	Nil impacts
Non-Aboriginal heritage	Qualitative	Nil impacts

Source: Based on information provided in the EIS undertaken by JBA Urban Planning Consultants (2017) and Eagleton Rock Syndicate.

Greenhouse gas emissions

The greenhouse gas assessment is summarised in the *Eagleton Quarry Production Increase – Air Quality and Greenhouse Gas Assessment*, (Air Quality Assessment) by Pacific Environment Limited published on 25 January 2017 and used as the basis of the deriving the indirect costs shown in Table 13.

The Air Quality Assessment states that the Project will generate 33,806 tonnes of Scope 1 and 30,240 tonnes of Scope 2 greenhouse gas emissions. The real economic cost per tonne of these emissions has been priced at $12.36 which is the current average price paid for emissions reductions under the Australian Government's Emissions Reduction fund. This price is a market-based mechanism of carbon abatement prevailing in May 2016.[2]

It is noted that 100 percent of the costs have been apportioned to NSW for the purposes of the assessment however it is widely acknowledged that climate change is a global issue and different parts of Australia and the world are predicted to experience different levels of impacts. Apportioning all the costs of climate change impacts associated with the Project's greenhouse gas emissions overstates the cost of these impacts to NSW.

[2] Department of the Environment (2016).

Table 13: Greenhouse gas emissions

	NPV*	2018	2023	2028	2041
Scope 1 (tonnes)		620	1,527	1,527	1,527
Scope 2 (tonnes)		1,260	1,260	1,260	1,260
Real price ($ per tonne)		$12.36	$12.36	$12.36	$12.36
Real costs ($m)	$0.365	$0.02	$0.03	$0.03	$0.03

Source: Cadence Economics estimated based on information provided in the Air Quality Assessment. * NPV in 2017 dollars based on a 7 percent real discount rate.

Air quality

The air quality assessment is based on information contained in the Air Quality Assessment. The Air Quality Assessment includes an impact assessment for 75 household receptors surrounding the Project site. The Project will produce particulate matter of less than 10 micro metres in diameter (PM_{10}) and less than 2.5 micro metres in diameter ($PM_{2.5}$) during the operational phase of the Project.

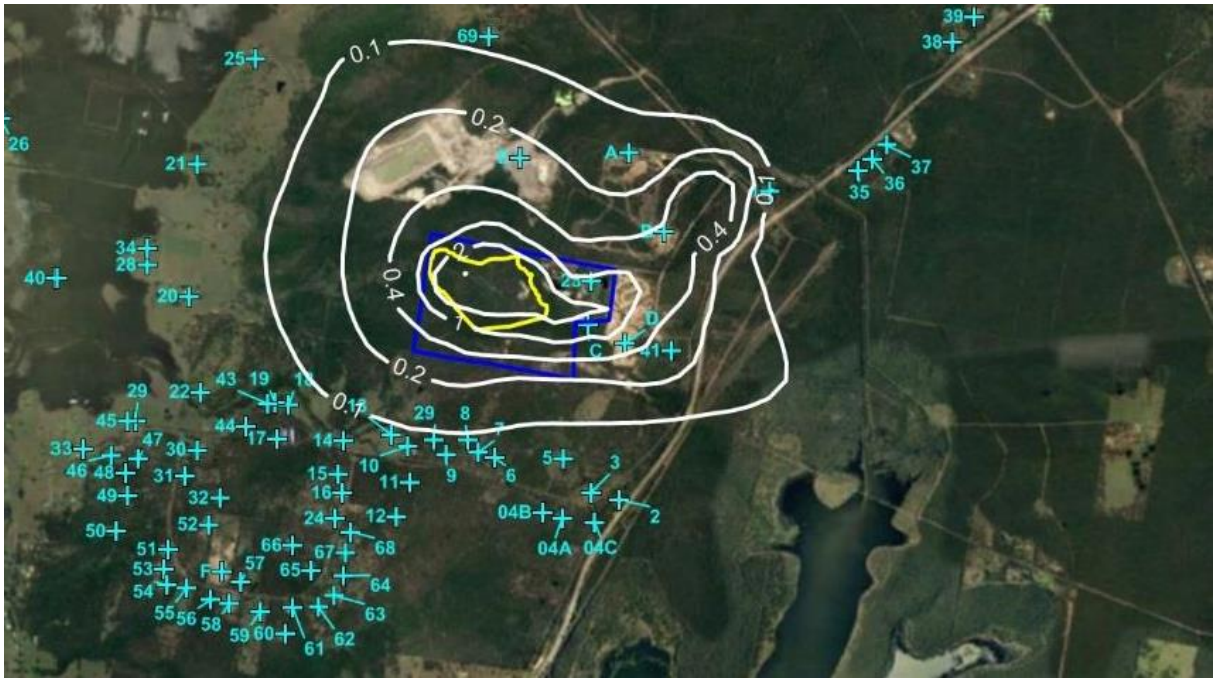
The Air Quality Assessment is based on "worst-case" conservative assumptions including throughput of 600,000 tonnes of hard rock and the processing plant will operate on diesel power for the entire quarry life. In addition, the Air Quality Assessment states,

The dispersion modelling competed was based on the assumption that all activities at the site are occurring simultaneously, when in reality they will not be continuous at all times. It is therefore considered the predicted concentrations represent a conservative assessment and it is unlikely that any of the relevant impact assessment criteria will be exceeded at any of the nearby receptors due to the Project.

This economic impact assessment accounts for the *incremental* impact of $PM_{2.5}$ emissions against current background levels 7 µg/m^3. In addition, the impacts are measured at the maximum throughput rate of 600,000 tonnes per annum over the life of the whole project, even though this throughput level is not reached until 2028 and diesel plant operations throughout. As a result of measuring the incremental impacts and measuring the impacts at maximum throughput, the economic analysis below is a highly conservative estimate of the economic impacts generated by particulate matter.

Figure 4 provides $PM_{2.5}$ concentration contours at maximum production throughput and operations of diesel processing plant. Receptor 23 (R23) is a house located on the current Gardenland site, the Air Quality Assessment indicates that the levels of $PM_{2.5}$ for this household increase from a background level of 7 µg/m^3 to 8.1 µg/m3 at maximum throughput, an incremental impact of 1.1 µg/m^3.

Figure 4: Predicted Air Quality Impact, incremental annual average $PM_{2.5}$ concentration contours at maximum production (600,000 tpa throughput)



Source: Pacific Environment (2017)

For all other receptors that a modelled in the Air Quality Report, the incremental impacts range from 0.1 to 0.3 µg/m^3 for an average incremental impact of 0.0467 µg/m^3.

Table 14: Particulate Matter impacts, at maximum throughput

	NPV*	2018	2023	2028	2041
Background level $PM_{2.5}$ µg/m^3		7.00	7.00	7.00	7.00
Average level during operations $PM_{2.5}$ µg/m^3		7.05	7.05	7.05	7.05
Increment $PM_{2.5}$ µg/m^3		0.0467	0.0467	0.0467	0.0467
Real costs	$31,040	$2,706	$2,706	$2,706	$2,706

Source: Cadence Economics estimated based on information provided in the Air Quality Assessment and Eagleton Rock Syndicate. * NPV in 2017 dollars based on a 7 percent real discount rate.

To estimate the economic impacts of $PM_{2.5}$ the impact pathway approach methodology as originally outlined in Pacific Environment (2016) was applied. To monetise the externalities generated the analysis was based on several steps:

1. Estimate the baseline incidence of all causes of mortalities for those aged 30+ years;
2. Apply a Concentration Response Function (CRF), using the 'Beta Co-efficient' from Jalaludin and Cowie (2012) and the population estimates for the exposed population centres;
3. Monetise the incremental projected premature mortalities using a Value of a Statistical Life, based on Boulter and Kulkarni (2013); and
4. Apply an uplift to account for morbidity impacts based on the analysis by Boulter and Kulkarni (2013).

Table 15 outlines how impact pathway approach was applied and the workings to estimate real cost estimate of $2,706 per annum. Applying the steps outlined in Pacific Environment (2016), the baseline mortality of the region is 1.3%, or 1.3 persons per year. Applying the CRF function $PM_{2.5}$ contributes 0.03% increase to overall mortality or an uplift in the mortality rate by 0.0004, from a baseline of 1.3. Finally, applying the value of a statistical life of $7.43 million and the uplift in mortality rate of 0.0004, the annual cost of particulate matter is $2,706.

Table 15: Particulate Matter Costs

	Source	Estimate
Persons		
Households	Response to Submission	75
Persons per household	ABS (Census 2016)	1.35
Persons	Based on number of dwellings identified for assessment in the Response to Submissions	101.3
Mortality Rates		
Mortality rate	HealthStats NSW	1.3%
Mortality		1.3
Impact of PM2.5		
$PM_{2.5}$	EIS	0.0467
Beta co-efficient	Jalaludin and Cowie (2012), as applied in Pacific Environment (2016)	0.0060
$PM_{2.5}$ Contribution to Mortality	As applied in Golder Associates (2013)	0.03%
Increase in Mortality		0.0004
Value of a Statistical Life ($m)	Boulter and Kulkarni (2013), as applied in Pacific Environment (2016) – updated to 2017	7.43
Annual cost ($)		$2,706

Source: Cadence Economics estimated based on information provided in the Air Quality Assessment and Eagleton Rock Syndicate. * NPV in 2017 dollars based on a 7 percent real discount rate.

The Project Proponent is undertaking a number of mitigation measures to reduce the community impacts associated with air quality, these are highlighted in Appendix A of this report. These measures include, establishing an Air Quality Management Plan that will set up a community engagement process and to monitor dust for reporting. The operations will employ ejector trucks, where feasible (that slide the rock off the tray rather than using a tipping motion) that reduces the impacts of materials handling and use water carts on internal roads. In addition, the site manager will be provided with live wind information that may prompt several actions including running the water cart or changing quarrying operations to reduce community impacts.

Residual value of land

The residual value of land captures its economic value in its alternate use, and the value placed on that use by society. In its current form, the harsh slopes and the rocky topology of the land makes it unsuitable for agricultural use or residential development. Given the current rural zone, without further planning approval, the only permitted use is agriculture. Without further approvals, the harsh slopes and rocky topology suggest the land will remain unused and will not generate significant levels of revenue.

As such, we have assumed the residual value of land to be zero.

Biodiversity and ecological impacts

As outlined in the EIS, a Biodiversity assessment has been carried out in accordance with the *Framework for Biodiversity Assessment* which has determined that the proposed development will require a total of 1,920 credits (subject to final agreement with the Office of Environment and Heritage) to be retired under the NSW Biodiversity Offsets Policy for Major Projects. It is anticipated each biobanking credit will cost $2,500 each, or $4.8 million will be expensed in 2018, or $4.5 million in NPV terms.

To establish the Project quarry, processing and sales operations will require the clearing of 32.03 ha of Spotted Gum, Broad-leaved Mahogany and Red Iron Bark shrubbery open forest. In addition, two threatened species, the Koala and Southern Myotis has been identifies as being potentially impacted.

The Biodiversity assessment has concluded that no referral to the Commonwealth is required.

The Project will also include a number of mitigation measures to reduce the impact of quarry operations on local fauna, these are outlined in detail in Appendix A. These measures include preparing a Flora and Fauna Management Plan to manage pests and weeds and provide for a hollow tree clearing process that will relocate fauna from quarry disturbance area, reducing the likelihood of injury to fauna.

Transport/traffic impacts

The EIS includes a Traffic Assessment undertaken by GHD. As outlined in the EIS, the anticipated traffic will not create any unreasonable impacts on the traffic flow on Italia Road and Barleigh Ranch Way and will continue to operate safely and at a satisfactory level of service during the lifetime of the Project. Included in the capital costs of the quarry is $1.35 million to upgrade the Italia Road Intersection and sealing the relevant sections of Barleigh Ranch Way to Council's standard for private rural roads.

The Project itself will contribute an increase of 192 Vehicle movements, including 20 staff movements, 2 supply trucks and 170 movements from trucks carrying various rock materials along the quarry access roads. As a result GHD has modelled a marginal increase in wait-time along Italia Road and the Pacific Highway during both morning (7am to 10am) and afternoon (3pm to 6pm) peak times.

During the initial phase of the development 2018 – 2025 the increased traffic is modelled to generate $21,283 per year in travel wait times during peak hours, this increases to $115,844 per year over the period 2026 – 41 (see Table 16), or an incremental cost of $0.76 million (in NPV terms) over the life of the Project.

Table 16: Traffic Impacts, 2018 – 2025 and 2026 – 2041

	Vehicle per hour	Incremental wait time (seconds)	Delays per Session (Hours)	Delay per year (Hours)	Cost ($)
Post development - AM Peak	1,519	0.4	0.51	132	5,506
Post development - PM Peak	1,741	1	1.45	377	15,777
Total Annual Cost (2018 - 2025)					21,283
10 years Post development - AM Peak	1,825	0.7	1.06	277	11,577
10 years Post development - PM Peak	2,092	5.5	9.59	2,493	104,267
Total Annual Cost (2026 - 2041)					115,844

Source: Cadence Economics estimated based on information provided in the Traffic Assessment and Eagleton Rock Syndicate.
* NPV in 2017 dollars based on a 7 percent real discount rate.

To model this impact we have used an average hourly wait time for a rural vehicle of $41.82, based on Transport for NSW principles and guidelines (Transport for NSW 2013) updated to 2017 values.

To enhance safety on site and on the surrounding roads the Project operations include both a Traffic Management Plan and additional traffic controls. More details on these mitigation measures are outlined in Appendix A.

Visual amenity

As outlined in the EIS, it has been concluded that dense wooded vegetation cover the slopes surrounding the site, and therefore provide a level of screening. Significant view corridors and views from surrounding residential properties will not be adversely impacted by the proposed quarry due to the location of the site beyond existing sight lines, and the existing environmental factors such as the ridge line and trees.

In addition, the Project Proponent is also establishing a number of mitigation steps to reduce the impacts of noise generated on-site effecting the surrounding community, these measures will also reduce the visual amenity impacts. These mitigation measures include, progressive revegetation of quarry benches, which will have the associated impact of enhancing visual amenity.

As a result, it not expected the Project will generate significant visual amenity impacts.

Ambient noise impact

The Noise Impact Assessment has been undertaken by Spectrum Acoustics in accordance with the EPA's *Industrial Noise Policy*. As discussed in the Noise Impact Assessment.

The study provides an account of the noise impacts (measured in decibels (dB)) for 81 receptors, including 75 residential households and six businesses and recreational facilities that operate in the area including the Boral Seaham Quarry and the MG Car Club Hill Climb Track. For the purposes of this analysis we have measured the economic cost of noise to residential households only. The study is based on maximum throughput and usage of the processing equipment on the project site, as a result is considered a conservative assessment of the noise impacts.

The Noise Impact Assessment is based three scenarios to take into account the location of quarrying and processing operations and exposure of activity, as outlined in Table 17. After the first two years of operations the quarrying operations are undertaken behind a 5m bench to reduce noise impacts.

Table 17: Noise Impacts – Description of the Modelling Scenarios

	Description	Years applicable
Scenario 1	Operations undertaken at ground level, at the north-western sector of the Project Area,	Year 1 – 2 (2018 – 2029)
Scenario 2	Extraction areas at the west and central sectors of the Project area, operations take place behind a 5m bench	Year 2 – 5 (2020 – 2022)
Scenario 3	Extraction areas at the southern sectors of the Project area, operations take place behind a 5m bench	From year 6 onwards (2023 – 2041)

Source: Spectrum Acoustics (2017), *Noise Impact Assessment Proposed Quarry Eagleton NSW*

To measure the incremental impact of the noise generated by the Project we have applied a monetary value of the additional noise borne by exposed households (as measured on a logarithmic scale). Table 18 outlines how we have measured the incremental cost of noise generated by the Eagleton Quarry.

The Quarry operations will impact a total of 75 households at an average increase in decibels of between 0.15dB to 0.21dB per annum. To monetise this impact this study uses $81.90 per household per dB, this is the upper-bound of a range of estimates recommended by Navrud (2002), converted from Euro updated to Australian 2017 prices.

Table 18: Noise Impacts

	2018-2019	2020-2022	2023-2041
Number of households	75	75	75
Average decibel (dB) increase*	0.16	0.15	0.21
Decibels (dB) above background	12.3	11.1	15.7
Cost per dB per household per year	$81.90	$81.90	$81.90
Cost per year	$1,009	$910	$1,289

Source: Cadence Economics estimated based on information provided in Spectrum Acoustics.* As measured using a logarithmic base 10 scale, changes in noise levels of 2dB or less are inaudible to the human ear.

In total the Project is estimated to generate noise pollution costs between $910 and $1,289 per year, or $13,406 (in NPV terms).

The Noise Impact Assessment provides the additional decibel levels, for each scenario, measured in dB. Where it is assessed that a receptor is impacted from the Project by less than 20dB (as measured on a linear scale), the Noise Impact Assessment does not granulate the actual noise impacts. This economic assessment assumes those receptors are impacted by 20dB, as a result the noise impacts are conservative.

The Project includes a number of mitigation measures that will reduce the overall community noise impacts. These include a Noise Management Plan, noise barriers and site redesign that placed noise-generating equipment behind natural topography to create a noise barrier. Further the trucks that

operate on-site will include "reverse quackers" that replace the factory installed high frequency reversing noise on trucks that are loud and travel long distances to a lower frequency sound that minimises the disturbance area.

Surface Water and Groundwater impact

The EIS contains a detailed surface water and groundwater impact assessment for the Project. The *Groundwater Investigation Report* was undertaken by URS and peer reviewed by SLR Consulting, the Water Resources Assessment was undertaken by Umwelt Australia, and later redesigned as part of the Response to Submissions by SLR.

As outlined in the EIS, the extractive process will result in a drawdown of less than 0.5m within the connected groundwater source. This drawdown will generate only a minor baseflow loss to the Seven Mile Creek of 0.75 m^3/day or 0.27 mega litres per year. A detailed assessment against the Aquifer Interference Policy has been carried out that concludes that the Eagleton Quarry would have a minimal impact on the aquifer at the site, and would have no impacts to any offsite water supply bores or high priority groundwater dependent ecosystems.

To minimise the impacts of surface water runoff the Water Management System is intended to;

- Contain water in events up to 1 in 100-year frequency;
- Manage, treat and discharge waters to a Neutral or Beneficial Effect on water quality from events greater than a 1 in 100-year event; and,
- For events greater than 1 in 500 year frequency the system would overtop.

The Water Management Plan will include diversion of clean water and collection of potentially impacted water in three water management dams. In addition, a detailed predictive site water balance concludes that the quarry could be operated without the need to import significant volumes of water for processing and dust suppression.

The Water Management System includes significant water storage volume and internal treatment systems to contain and treat suspended solids and hydrocarbons. It is concluded that the proposed quarry would have no identifiable potential impact on water quality in Grahamstown Dam and will contain and treat prior to discharge any water on-site to ensure meeting the Neutral or Beneficial Effect on water quality as required by Hunter Water. Further, the direct loss in yield is expected to be negligible, estimated to be less than 0.3% of net runoff into Grahamstown Dam.

To mitigate against impacts to the catchment the Project will include the construction of three large dams in 2018 at the cost of $3.0 million, or $2.8 million in NPV terms. The cost of the construction of these dams has been internalised by the Proponent and is an indication of the potential value the proponent places on water discharge for a 1 in 500 year flooding event.

In addition, the Project will also treat water to the NORBE on Water Quality standards at an estimated cost of $1.2 million over the life of the Project. The cost of operating this water treatment has also been internalised by the Proponent.

Aboriginal cultural heritage

The EIS and Response to Submission provides a comprehensive Indigenous Archaeological Assessment undertaken by McCardle Cultural Heritage Pty Ltd. The assessment identified the potential impacts to aboriginal heritage and the mitigation measures to reduce the archaeological impacts, as discussed in Table 19.

Two Potential Archaeological Deposit (PAD) sites and one isolated find have been identified through the survey undertaken during the Assessment. The assessment determined impacts to these sites are unlikely. A series of measures are recommended to ensure impacts to Aboriginal heritage are avoided, or where unavoidable are adequately managed.

Table 19: Potential Archaeological Deposit – Aboriginal Heritage

Site	Discussion of Impacts
PAD 1 – follows Seven Mile Creek	No impacts considered likely, PAD not present in area of proposed road crossing given disturbance associated with paint ball activities.
PAD 2 – follows the east-west tributary which flows into Seven Mile Creek	The area of PAD 2 will not be impacted by the proposed quarry development, as a 20m vegetated riparian buffer will be provided between the quarry operations and the creek line
Isolated Find	Located outside the disturbance area

Source: McCardle Cultural Heritage Pty Ltd,(2017) *Aboriginal Cultural Heritage Impact Assessment* .

Non-Aboriginal heritage

No items of non-Aboriginal heritage are located within the Project site. As outlined in the EIS, or subsequent Historical Heritage Assessment by Maxim Multicon Pty Ltd, consultation has been undertaken with the Heritage Office there are no State Heritage items near the site.

Heritage items located outside the disturbance area will not be adversely impacted by the Project. The Seaham Quarry (SHR No. 00023) is located over 6km to the west of the Project site, the Clarence Town Courthouse and Site (SHR No. 00558) is located over 11km north.

Given the relative isolation of these sites it is likely the quarry operations will have no economic impacts related to non-Aboriginal heritage.

Impacts on other land users

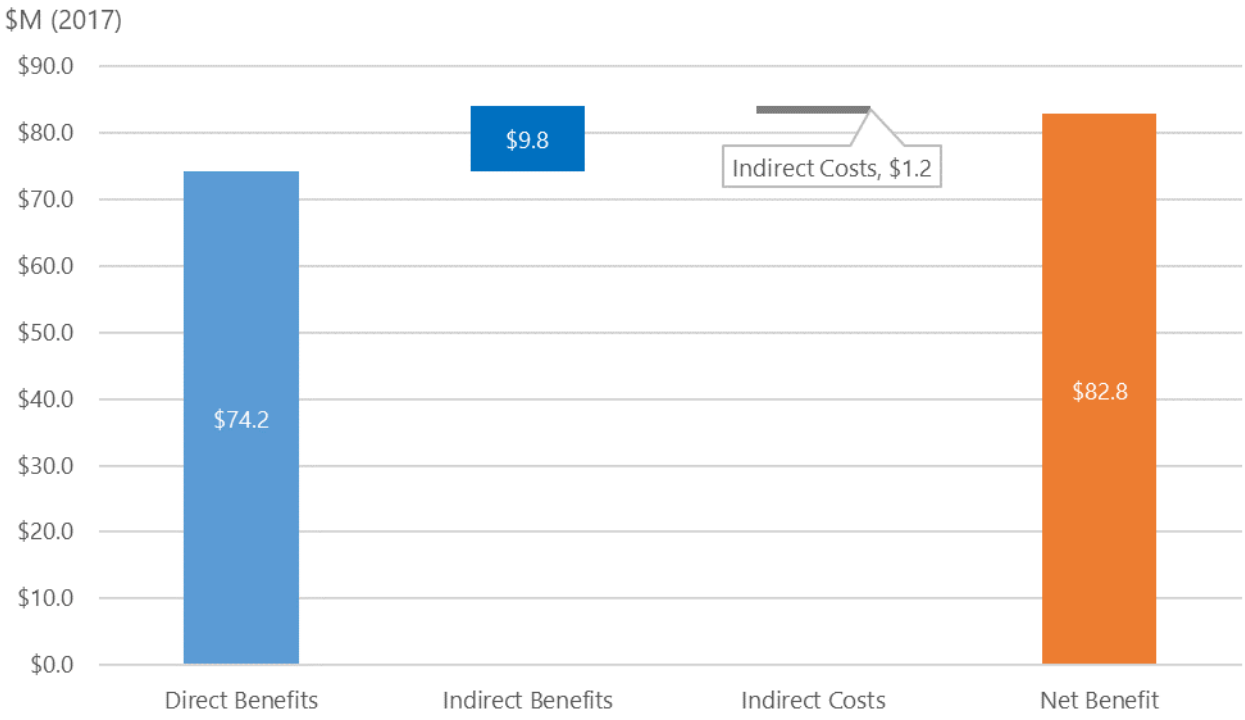
As outlined in the EIS, the Project is site is located within a RU2 zoned Rural Landscape. The surrounding region includes the Boral Seaham Quarry, the Port Stephens Gardenland and recreational activities including the MG Car Club, the Hunter MCC Raceway and the Hunter Valley Paintball site.

While these businesses and recreational users will be potentially impacted through increased traffic, noise and dust, it is not likely that the development will impact on the business operations and the amenity of these site.

Net Benefits Analysis results

Consistent with the Guidelines, the CBA for the Project is based on comparing the net direct and indirect benefits and subtracting the indirect costs of the Project identified above against the baseline scenario. Summarised in Figure 5, the estimated net benefit to NSW is $82.8 million in NPV terms.

Figure 5: Summary of the net benefits of the Project* under central case assumptions ($ million)**



Source: Cadence Economics estimated based on information from various sources. * Estimated as the benefits of the Project less the baseline scenario. ** NPV in 2017 dollars based on a 7 percent real discount rate.

Table 20 details the economic benefits of the Project Case against that of the Baseline scenario. Direct benefits of the Project are estimated to be $74.2 million in NPV terms. The Project is also expected to generate total indirect benefits of $9.8 million in NPV terms, comprised of $0.55 million of worker benefits and $9.27 million of supplier benefits in NPV terms.

The Project is expected to generate modest incremental indirect costs on the NSW community of $1.2 million, including $0.4 million of greenhouse gas emissions and $0.8 million of transport/traffic costs from small delays during peak times. The costs of biodiversity and water have been internalised and are subtracted from the estimated net direct benefits.

Table 20: Estimated net benefits of the Project ($ million)

Benefits	NPV	Costs	NPV
Direct benefits		**Direct costs**	
1. Net producer surplus attributed to NSW	$63.2		
2. Royalties, payroll tax and Council rates	$0.5		
3. Company income tax apportioned to NSW	$10.4		
Total direct benefits	**$74.2**	**Total direct costs**	**-**
Indirect benefits		**Indirect costs**	
1. Net economic benefit to landholders	0.0	1. Air quality	-$0.031
2. Net economic benefit to NSW workers	$0.55	2. Greenhouse gas emissions	-$0.4
3. Net economic benefit to NSW suppliers	$9.27	3. Visual amenity	$0.0
		4. Transport impact	-$0.8
		5. Net public infrastructure cost	$0.0
		6. Surface water impact^	-$1.3
		8. Residual value of land	$0.0
		7. Biodiversity impact^	-$4.5
		8. Noise impact	-$0.013
		9. Loss of surplus to other industries	$0.0
		10. Water^	-$2.8
		11. Aboriginal cultural heritage	$0.0
		12 Historical heritage	$0.0
Total indirect benefits	**$9.8**	**Indirect Costs**	**-$9.7**
Total Project economic benefit	**$84.0**	**Incremental Indirect Cost**	**-$1.2**
NPV of project - ($m)	**$82.8**		

Source: Cadence Economics estimated based on information from various sources. * Estimated as the benefits of the Project less the baseline scenario. ** NPV in 2017 dollars based on a 7 percent real discount rate. Note: ^ Biodiversity impacts, Surface Water and Water mitigation impacts have been internalised. These are included in the operational costs and capital expenditure costs for the mine and netted off the estimated direct benefits.

Net Benefits – Sensitivity analysis

Consistent with the Guidelines, Table 21 provides a summary of the systematic sensitivity analysis undertaken for the Project. The sensitivity analysis considers both changes in real discount rates (from a low of 4 percent and a high of 10 percent) as well as revenue and cost assumptions. Under the low case sensitivity, revenue (i.e. hard rock prices) is reduced by 25 percent and costs (operational, labour and environmental) increased by 25 percent. Under the high case scenario, revenue is increased by 25 percent and costs reduced by 25 percent.

The capital cost requirement, of $19.0 million in NPV terms has not been changed for the purposes of the sensitivity analysis, as the bulk of these costs have been planned for and will be incurred in the early phases of the project and are therefore relatively certain.

As the Project is relatively long-lived, the sensitivity of the central case results to changes in the discount rate is significant.

When revenue and cost assumptions are altered, the estimated net benefit of the Project ranges from $29.8 million in NPV terms (Low case assumptions and using a 10 percent real discount rate) to $171.7 million in NPV terms (High case assumptions using a 4 percent real discount rate). The sensitivity analysis shows the robustness of the net benefits generated to the NSW community.

We can also infer from the sensitivity analysis how large the non-quantified negative externalities would need to be before the project is no longer a net benefit to the NSW community. Using the most conservative estimate, the Low Case with a 10 percent real discount rate, these externalities would need to be $29.8 million in NPV terms before the Project would return a net negative return to NSW.

Table 21: Net benefits of the Project – sensitivity analysis ($ million, 2017 dollars)

Scenario	Net benefit of the Project – NPV ($M)		
Discount rate	*7%*	*4%*	*10%*
Central Case	**$82.8**	**$119.4**	**$59.5**
Direct Benefits	$74.2	$107.8	$52.7
Indirect Benefits	$9.8	$13.2	$7.6
Indirect (Environmental costs)	-$1.2	-$1.7	-$0.9
Low Case – higher costs and lower revenue	**$44.1**	**$66.7**	**$29.8**
Direct Benefits	$33.3	$52.3	$21.3
Indirect Benefits	$12.3	$16.6	$9.6
Indirect (Environmental costs)	-$1.5	-$2.1	-$1.1
High Case – lower costs and higher revenue	**$121.2**	**$171.7**	**$88.8**
Direct Benefits	$114.7	$163.1	$83.8
Indirect Benefits	$7.3	$9.8	$5.7
Indirect (Environmental costs)	-$0.9	-$1.3	-$0.6

Source: Cadence Economics estimated based on information from various sources.

The economic modelling has been conducted over a 24 year period, consistent with the intending extraction profile of the quarry plan. Approval is being sort to extract rock product over a 30 year period, to allow functional flexibility of the extraction, processing and sales operations. The total resources at the quarry site is 12.87 million tonnes of hard rock product.

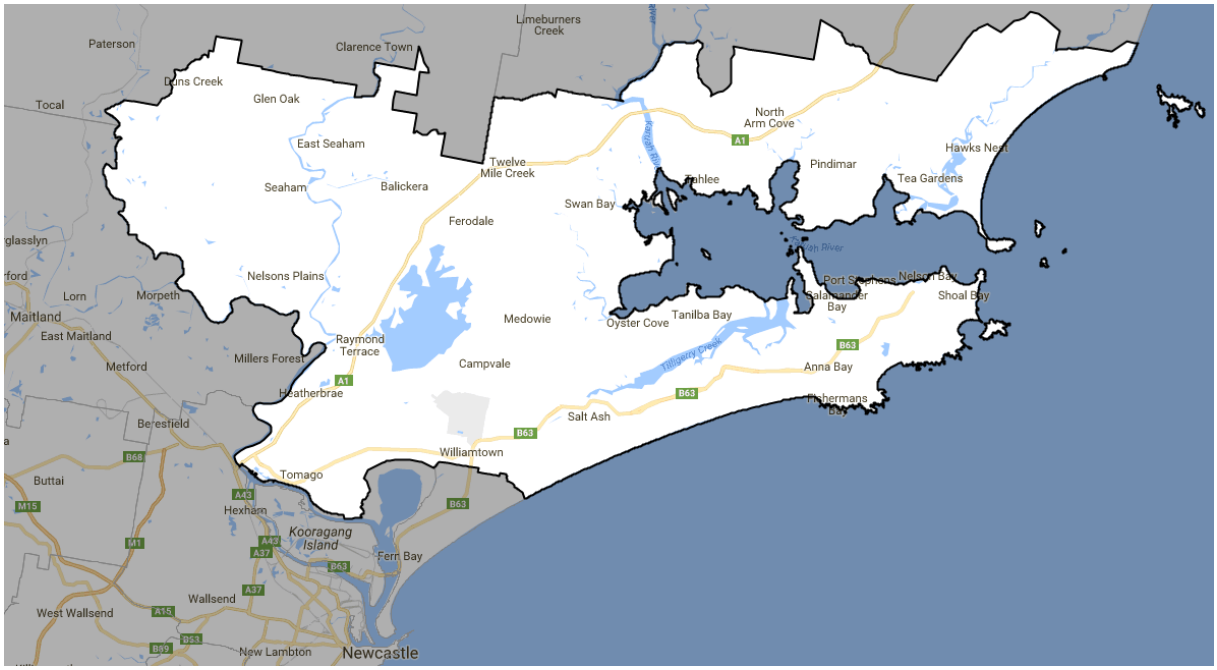
Where the Project operates over a 30 year time period (instead of the 24 year period), total hard rock output will remain fixed at 12.87 million tonnes and will result in lower extraction, processing and sales per year and as a result the Project benefits will be delayed over the project horizon and will generate a *slightly lower positive* net benefit to NSW. Underlying these results will be *slightly lower but positive* total direct benefits and total indirect benefits (workers and suppliers) and lower but still negative indirect costs (environmental costs) inline with the lower extraction.

3. Local Effects Analysis

Consistent with the Guidelines, the local effects analysis (LEA) uses a similar framework to the CBA presented in the previous section, but is focussed on the net economic impacts to the local community. The Guidelines refer to the local area as being consistent with the relevant Statistical Area (SA3) as defined by the Australia Bureau of Statistics. In the case of this Project the Port Stephens SA3 area is used for the LEA.

As shown in Figure 6, the Port Stephens region is located to the north east of the Newcastle local region and to the east of Maitland. The SA3 local area includes the regional centres of Port Stephens and Williamstown including the Newcastle Airport and RAAF Base Williamstown. Most of the region to the east of the SA3 – around Nelson Bay and the Karuah River is relatively populated, including the communities of Port Stephens and Tanilba Bay, moving west within the SA3 there are small communities including Medowie and Raymond Terrace. The Eagleton Quarry is located to the south of Balickera, in a sparsely populated area of the SA3.

Figure 6: Port Stephens SA3 local area



Source: Australian Bureau of Statistics cat. no. 1270.0.55.001, *Australian Statistical Geography Standard Volume 1 – New South Wales Maps (July 2011)* (http://mapbuilder.remplan.com.au/?link=e1f7954ca97943e79af46bd140cddd17)

Underpinning the LEA are the assumptions that:

- No net producer surplus accrues to the region (and that costs biodiversity and Water offsets, being internalised, are met by those outside the Port Stephens SA3).
- No company income tax accrues to the Port Stephens SA3 region.
- We have assumed for the purposes of the LEA that 80 percent of the workforce requirement of the quarry and 20 percent of intermediate inputs will be supplied from the SA3 region.

- As a result of these assumptions, it is expected the Project will generate indirect benefits to local suppliers and employees of $2.4 million in NPV terms over the Baseline case, as outlined in Table 22.

- Transport, particulate matter and noise Indirect Costs are borne by the region.
- No greenhouse gas emissions costs are attributable to the region.

Based on these assumptions, the Project is estimated to confer a net benefit on the Port Stephens SA3 region of $1.6 million in NPV terms.

Table 22: Estimated Local Effects Analysis of the Project

Benefits	NPV	Costs	NPV
Direct benefits		**Direct costs**	
1. Net producer surplus attributed to NSW			
2. Royalties, payroll tax and Council rates			
3. Company income tax apportioned to NSW			
Total direct benefits	**$0.0**	**Total direct costs**	**-**
Indirect benefits		**Indirect costs**	
1. Net economic benefit to landholders	0.0	1. Air quality	-$0.031
2. Net economic benefit to NSW workers	$0.55	2. Greenhouse gas emissions	
3. Net economic benefit to NSW suppliers	$1.9	3. Visual amenity	$0
		4. Transport impact	-$0.8
		5. Net public infrastructure cost	
		6. Surface water impact	
		8. Residual value of land	
		7. Biodiversity impact^	
		8. Noise impact	-$0.013
		9. Loss of surplus to other industries	
		10. Water^	
		11. Aboriginal cultural heritage	
		12 Historical heritage	
Total indirect benefits	**$2.4**	**Indirect Costs**	**-$0.8**
Total Project economic benefit	**$2.4**	**Incremental Indirect Cost**	**-$0.8**
NPV of project - ($m)	**$1.6**		

Source: Cadence Economics estimated based on information from various sources. * Estimated as the benefits of the Project less the baseline scenario. ** NPV in 2017 dollars based on a 7 percent real discount rate. Note: ^ Biodiversity impacts and Water mitigation impacts have been internalised. These are included in the operational costs and capital expenditure costs for the mine and netted off the estimated direct benefits.

LEA – Sensitivity analysis

As outlined above the LEA relies on a number of modelling assumptions. Consistent with the Guidelines, Table 23 provides a summary of the systematic sensitivity analysis undertaken for the Project. The sensitivity analysis considers both changes in real discount rates (from a low of 4 percent and a high of 10 percent) as well as revenue and cost assumptions. Under the low case sensitivity, revenue (i.e. the hard rock price) is reduced by 25 percent and costs (operational, labour and environmental) increased

by 25 percent. Under the high case scenario, revenue is increased by 25 percent and costs reduced by 25 percent.

When revenue and cost assumptions are altered, the estimated net benefit of the Project ranges from $0.9 million (high case scenario, in NPV terms using a 10 percent real discount rate) to $2.6 million (low case scenario, in NPV terms using a 4 percent real discount rate). The sensitivity analysis shows the robustness of the net benefits generated to the local community.

We can also infer from the sensitivity analysis how large the non-quantified negative externalities would need to be before the project is no longer a net benefit to the local community. Using the most conservative estimate, the high case with a 10% discount rate, these externalities would need to impose an unquantifiable cost to the Port Stephens community of $0.9 million before the Project would return a net negative return to local region (noting that the high case scenario results in lower benefits to employees and suppliers).

Table 23: Net Benefits of the Project Case – Sensitivity analysis

Scenario	Net benefit of the Project – NPV ($M)		
Discount rate	*7%*	*4%*	*10%*
Central Case	$1.6	$2.1	$1.3
Low Case – higher costs and lower revenue	$2.0	$2.6	$1.7
High Case – lower costs and higher revenue	$1.2	$1.5	$0.9

Source: Cadence Economics estimated based on information from various sources.

The LEA accounts for the economic benefits to the Port Stephens SA3 region only. It does not include any economic benefits that may accrue to the major regional centres that are located adjacent, including Maitland to the west and Newcastle/ Lake Macquarie to the south or the broader Hunter region. Given the nature of quarry operations many of the inputs may be supplied from the broader Hunter region, in addition the proponents of the Projects are located and reside within the broader Hunter region. As a result this project may generate economic benefits to the Hunter region.

References

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APPENDIX A

Aspect	Control	Impact	Cost Description (all values are undiscounted)	Project Cost (NPV)*
Construction Management Plan		Procedural benefit to reduce dust and noise	$10,000 during construction phase	$9,346
Operational Management Plan		Procedural benefit to reduce dust and noise	$20,000 during construction phase, plus two re-writes	$36,250
Traffic	Traffic Management Plan	Procedural benefit to enhance public safety	$6,000 plus two re-writes during operation	$10,875
	Additional traffic control measures	Actual capital work to benefit to enhance public safety	$150,000 during construction phase	$140,187
Ecology	Prepare Flora and Fauna Management Plan	Identify pests and weeds	$15,000 up front	$14,019
	Obtain credits to offset impacts	Biobanking credits to to mitigate against the loss of flora and fauna on the site	1,920 credits by $2,500, at a total cost of $4.8M	$4,485,981
	Delineation of site with fencing	Safety - trespassing - Human and fauna "Signage including warning", assist workers and community	Total area, 3.9km at $10/m, total cost is $39,000 up front	$36,449
	Hollow tree clearing	Reduces birds nest and habitation, moving the hollow logs away from the disturbance area	217 hollows, to be removed and replaced, total project cost $30,380	$28,393
	Pre-clearing surveys	Planning for hollow relocation and fence line	Survey 33.5 hectares – $80,400	$75,140
	Weed and pest management	Reduces the potential for spread of weeds, Lantana	Annual cost of $3,000	$31,604
	Vegetation clearing protocol	Protocol and communication to staff and authorities - safety benefit	Survey 33.5 hectares - $40,200 total project cost	$17,646
Rehabilitation	Rehab plan	Communications to Government and community on the prehab plans	$10,000 during construction phase	$9,346
	Revegetation of benches and floor	Revegetation on the quarry wall - reduced visual impact, dust, benefit for wild life	33.5 ha to rehabilitate, $30,000/ha to rehabilitate, during the operational phase.	$441,143
	Maintenance and monitoring	Communication to authorities and actual pest and weed control	To be undertaken 10 times over the life of the Project, Total cost $150,000.	$65,842
Surface Water	Surface water management plan	Enhances water quality, and reduces the impact on surface water	$25,000 upfront cost	$23,364

Aspect	Control	Impact	Cost Description (all values are undiscounted)	Project Cost (NPV)*
Surface Water (cont.)	Water monitoring plan	Monitoring water impacts	12 times per year at 6 sites at $150 per sample plus $1200/ collect, Total Project cost $25,200	$23,551
	Review and reporting on water	Monitoring water impacts	$5,000 Per year	$52,674
	Dam safety checks	Check on the integrity of the dam walls - monitor leakage	Every two years undertake inspection, plus reporting	$39,505
	Additional costs to retain 1 in 500yr events	Upgrade system, to store 157 million litres on-site to mitigate potential 1 in 500 years flooding event	$3M for the construction of the dam	$2,803,738
Surface Water Treatment	Water treatment to achieve Neutral or Beneficial Effect on Water Quality	NORBE - Water treatment to maintain water quality within the current quality or better within the area (i.e. 6 Mile Creek)	$10,000 per month, over the life of the Project	$1,264,171
Groundwater	Groundwater monitoring	Actual collection of Groundwater data	Collect groundwater data two times a year at six sites	$44,246
	Review and reporting on ground water	Reporting of Groundwater impacts	Write reports on the groundwater impacts	$52,674
Air quality	Air quality management plan	Respond to community comments over dust and monitor progress to ensure community concerns and expectations are met	Initial Air quality report, plus two re-wites over the life of the Project	$13,168
	Sealed access road for Barleigh Ranch Way	Sealing the road has the associated impact of reducing noise and dust		-
	Water carts	Haul road within the quarry will be serviced by a water cart, to reduce noise and air quality	Operation of water cart for life of project, at a cost of $50,000 per annum	$526,738
	Ejector trucks	Reduces both noise and dust and safety (reduces the change of tipping over)	Additional costs of using ejector trucks to reduce drop height. three trucks at $100,000 per truck	$280,374
	Monitoring	Set up 3 monitors and retrieve air quality data, to be communicated on the Project website	Three monitors at $20,000 each plus $10,000 per year in maintenance and rent	$124,039
	Weather station – for live feedback	Site Manager will be informed when the wind is above threshold limit to warn of potential dust and noise, for potential mitigation activity i.e. Run the water cart of potential shutdown of selected quarry activities	$30,000 set-up costs, plus $1,000 per year in maintenance costs and data download	$38,572
Greenhouse Gas Emission	Swap of plant to electric in Year 3	Staged transition to diesel to electric plant, reduced greenhouse, dust and noise	No additional costs	-

Aspect	Control	Impact	Cost Description (all values are undiscounted)	Project Cost (NPV)*
Noise & Blasting	Noise management plan	To communicate noise levels	$10,000 plus 2 full revisions over life	$18,125
	Redesign of layout to screen behind hill plus bund on haul road crest	Move soil to generate a noise void to reduce community noise impacts	$25,000 in fees plus additional $50,000 in cost due to bringing forward excavation	$70,093
	Noise barriers	Metal structure to generate a noise void to reduce community noise impacts	Enclosing of key plant at $30,000 per shed at 10 locations	$280,374
	Noise monitoring	Set up 3 monitors and retrieved noise data, to be communicated	Four times per year at 3 locations at $3,000 per event including letter	$379,251
	Reverse quackers	Change the sound to a lower frequency sound, enhances safety, reduce noise impacts (Traditional sound travels long distances), minimises the disturbance area	$1,000 per plant for 10 vehicles	$9,346
	Blast Monitoring	Tests vibrations to monitor the basting and threshold limits	12 blasts per year two locations at $2000/ blast	$505,668
	Blast design and planning	Planning blasting activity to minimise noise and dust impacts	$5,000 per blast, 12 blasts per year	$632,085
Community Consultation	Newsletters	Reporting to the community the activities on the site, disclose noise, dust and water quality	$1,500 per newsletter four times per year.	$63,209
	Community consultation Forum	Forum for the community to allow them to provide feedback and engagement to improve quarry operations and reduce future impacts	2 times per year, including, hiring a chairman, hiring a venue and other costs, total cost $12,000 per year	$126,417
	Website components for environment	Includes all the data on the website - enhances community access	$5,000 per year	$52,674
	Various management and community funding	Make community improvements, could include, parks, gardens, fences and community bus, to be voted on at the Forum.	$20,000 per year in community funding	$210,695
Annual Reporting	Annual Reporting and review of system	Required reporting on how many tonnes the quarry is producing and the remaining saleable product, to maintain community engagement	$10,000 per year for reporting and $2,000 to review the system	$126,417
	Auditing	Ensures openness and accountability of annual reporting requirement	Performance audit every three years at $15,000	$52,674
Total Project Cost				$13,216,062

Source: Eagleton Quarry Syndicate and Cadence Economics estimates. * NPV in 2017 dollars based on a 7 percent real discount rate