APPENDIX O

ECONOMICS ASSESSMENT REPORT

Holcim Salt Ash Sand Operations
Economic Assessment

Prepared for

Holcim (Australia) Pty Ltd

By

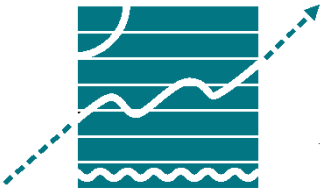

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TABLE OF CONTENTS

TABLES

FIGURES

ATTACHMENTS

EXECUTIVE SUMMARY

Introduction

Holcim (Australia) Pty Ltd (Holcim) owns and operates the Salt Ash Sand Operations (the 'site' or the 'quarry'), a long-standing quarry at 8 Oakvale Drive, Salt Ash, New South Wales (Lot 4 DP 774726) that extracts, processes, and transports sand products for use in the production of industrial and construction materials, such as glass and concrete.

Holcim is seeking State Significant Development approval to extract and process an estimated minimum of 10 million tonnes of sand from the quarry at a rate of up to 550,000 tpa (the 'project'). Additionally, the importation of up to 200,000 tpa of sand from Anna Bay, Tanilba Bay, Cabbage Tree Road Quarry, and other local extractive operations as required will continue for the project. This sand would be processed at the site and dispatched as per the existing operations. As such, the project will seek to process and dispatch up to 750,000 tpa of sand products from the quarry.

The Economic Assessment of the project provides:

- A cost benefit analysis (CBA), which is the primary way that economists evaluate the net benefits of projects and policies, provide economic justification for a project, and address the public interest.

- A local effects analysis (LEA) using a methodology developed by the NSW Government (2015), to assess some of the impacts of the project in the locality, specifically:

    - net employment to existing residents.
    - non-labour project expenditure.
    - environmental and social impacts on the local community.

    Local effects were also estimated using traditional input-output (IO) analysis to assess the broader economic activity project footprint in relation to output, value-added, income and employment.

Cost Benefit Analysis

A CBA of the project indicated that it would have net production benefits to NSW of $9 million (M) (present value at 7% discount rate), comprising $4M in quarry benefits and $5M in benefits from transporting quarry products to market.

Provided the residual environmental, social, and cultural impacts of the project that accrue to NSW are considered to be valued at less than the level of net production benefits, the project can be considered to provide an improvement in economic efficiency and hence is justified on economic grounds.

The above estimate of the NSW net production benefits of the project includes the costs of implementing a groundwater management strategy, purchasing additional allocations under water access licences (WALs), biodiversity offsets and payments to Port Stephens Council for local road maintenance.

Impacts of the project, which have not already been incorporated into the estimate of net production benefits, relate to greenhouse gas (GHG) emissions (valued at $0.01M), and the opportunity cost of WALs already held by Holcim (valued at $0.1M). Consequently, the project is estimated to have net social benefits to NSW, and hence is desirable and justified from an economic efficiency perspective.

Local Effects Analysis

The local area used for the LEA comprises the Port Stephens local government area (LGA). The project will provide direct economic activity, including jobs, to the local area economy, and indirect economic activity to the local area via both wage and non-wage expenditure. A summary of local economic effects of the project is provided in **Table ES1**.

The project will provide a total of 73 direct jobs during peak years of production and processing, comprising 21 quarry jobs, and 52 transport jobs. Relative to the employment under the existing approval this is an additional 6 quarry jobs and 28 transport jobs during peak years of production and processing. Focusing only on those people that already reside in the region and assuming these people would have already been employed at an average regional wage, and that job vacancies created by these people filling the project jobs remain unfilled (as conservatively required by NSW Government 2015), the disposable wages accruing to existing residents of the region would be $0.3M. This is equivalent to 5 **direct** full time equivalent (FTE) jobs.

Standard regional economic impact assessment using IO analysis is not restricted to a focus on the existing labour force in the local area and does not assume an absence of job chain effects. In this framework, the project is estimated to provide the following annual **direct and indirect** annual effects to the local economy:

- $48M in output;
- $17M in value-added;
- $4M in gross wages; and
- 109 jobs.

Table ES1 - Summary of Effects on the Local Community

Total Local Effects (2023-31)	**Direct Total**	**Direct Total - Already Resident in the Local Area**	**Direct Total Net**
Annual Employment FTE	73	41	10
Annual Income ($M)	4.5	2.5	0.6
Annual Non-labour Expenditure in Local Area	16.6		
Incremental Local Effects (2023-31)	**Direct Incremental**	**Direct Incremental – Already Resident in the Local Area**	**Direct Incremental Net**
Annual Employment FTE	34	18	5
Annual Income ($M)	2.1	1.1	0.3
Incremental Annual Non-labour expenditure in the Local Area	10.9		
Incremental Regional Impacts (2023-31)	**Direct**	**Flow-on**	**Total**
Output ($M)	27	20	48
Value-added ($M)	8	9	17
Income ($M)	1	3	4
Employment	34	75	109
Other Local Economic Impacts			
Contraction in other sectors	No material impact*		
Displaced activities	No material impact*		
Wage rise impacts	No material impact*		
Housing impacts	No material impact*		
Demand for local infrastructure	Increased local road use but compensated for		

Local Environmental Impacts	No material impacts

The main local environmental impacts are internalised into the production costs of Holcim via mitigation, offset and compensation costs. Residual local environmental impacts after mitigation, offset and compensation are likely to be immaterial.

1 INTRODUCTION

1.1 Overview

Holcim (Australia) Pty Ltd (Holcim) owns and operates the Salt Ash Sand Operations (the 'site' or the 'quarry'), a long-standing quarry at 8 Oakvale Drive, Salt Ash, New South Wales (Lot 4 DP 774726) that extracts, processes, and transports sand products for use in the production of industrial and construction materials, such as glass and concrete.

The quarry, which has been in operation since 1980, produces a variety of dry form and wet processed sand for glass and construction applications.

Holcim propose to meet part of the increased forecast demand in natural sand in the Hunter and Greater Sydney regions by maximising the extraction of remaining sand resource from the quarry through a State significant development (SSD) application.

The proposed development involves the extraction and processing of up to 550,000 tonnes per annum (tpa) of sand at the site using both dry extraction and dredging techniques. Holcim also propose to import up to 200,000 tpa of sand from their Tanilba Bay and Anna Bay operations, as well as other local extractive operations for processing at the site, resulting in a total of up to 750,000 tonnes of sand products processed and dispatched from the site per year (the 'project'). The project will operate for up to 30 years.

The proposed disturbance footprint of the project covers an area of approximately 35.4 hectares (ha) and encompasses all areas to be disturbed by sand extraction (dry extraction and dredging), internal access roadways (including slope batters) and processing operations and encompasses all areas of vegetation clearing.

1.2 Assessment Approach and Requirements

Economic Assessment requirements arise from the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and the Secretary's Environmental Assessment Requirements (SEARs). While there are no specific economic assessment guidelines for extractive industries, the *Guidelines for Economic Assessment of Mining and Coal Seam Gas Proposals* (NSW Government, 2015) and the *Technical Notes Supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals* (NSW Government, 2018), provide guidance on the economic assessment techniques that are appropriate for addressing the requirements under the EP&A Act. The requirements are briefly outlined below.

NSW Environmental Planning and Assessment Act 1979

Section 4.15 of the EP&A Act requires the following two matters to be taken into consideration by the consent authority in determining a development application:

- the public interest (taken as the collective public interest of households in NSW); and
- the likely impacts of the development, including environmental impacts on both the natural and built environments, and social and ***economic impacts in the locality***.

Economic Assessment Guidelines

The NSW Government (2015) Guideline provides information to assist proponents with providing the necessary economic information to meet the abovementioned requirements of section 4.15 of the EP&A Act. The Guideline identifies that:

- Cost Benefit Analysis (CBA) is used to assess the public interest by estimating the net present value of the project to the NSW community.
- Local Effects Analysis (LEA) is used to assess the likely economic impacts of the development in the locality. The Guideline identifies a specific method for assessing the direct local effects of a mining project. However, it also states that "*a range of techniques are available for estimating second round or flow-on effects. These include CGE (computable general equilibrium) modelling, Input-Output (IO) or multiplier analysis.*"

The NSW Government (2018) Technical Notes provides guidance on including environmental, social, and cultural impacts in the CBA.

Secretary's Environmental Assessment Requirements

The SEARs for the project, issued on 23 December 2020 require:

"a detailed assessment of the likely economic impacts of the development, paying particular attention to:

- *the significance of the resource.*
- *the costs and benefits of the project; identifying whether the development as a whole would result in a net benefit to NSW, including consideration of fluctuation in commodity markets and exchange rates.*
- *the demand on local infrastructure and services."*

Proposed Economic Assessment Methods

To meet the above requirements, two types of economic assessment of the project are needed:

- a CBA.
- a LEA.

The remainder of this report comprises of the following sections:

- a description of the project and its local setting.
- a discussion of the significance of the resource.
- a CBA of the project.
- a description of the regional economy.
- a local effects analysis, including an input-output analysis of the project.

The individual SEARs requirements relevant to this Economic Assessment and where they are addressed in this report are provided in Table 0.1.

Table 0.1 SEARs Relating to the Economic Assessment

Assessment requirement from SEARs	Section of report where addressed
• the significance of the resource;	Section 3.0
• the costs and benefits of the project; identifying whether the development as a whole would result in a net benefit to NSW, including consideration of fluctuation in commodity markets and exchange rates	Section 4.0
• the demand on local infrastructure and services	See the Social Impact Assessment

2 PROJECT DESCRIPTION AND SETTING

2.1 The Site

The quarry is in Salt Ash, approximately 20 kilometres (km) northeast of Newcastle and is in the Port Stephens local government area (LGA).

Access to the site is via Nelson Bay Road and Oakvale Drive. Oakvale Drive is a local roadway which terminates at the entrance to private property at 4 Oakvale Drive (Lot 8 DP833768). A private road then runs south through the property to the entrance of the quarry. Nelson Bay Road is a major arterial road which links the Newcastle central business district to Newcastle Airport, Nelson Bay, and the wider Port Stephens area to the north.

The project is in the central portion of the site and contains all areas to be disturbed by project operations and covers an area of approximately 35.4 ha.

The site is zoned RU2 – Rural Landscape under the Port Stephens Local Environmental Plan (LEP) 2013 and extractive industries are permitted with consent. Land to the north of the site to Nelson Bay Road is also zoned RU2, whilst land to the south of the site is zoned C1 – National Parks and Nature Reserves and is associated with the Worimi Conservation Lands. A portion of land adjacent to the east of the site (Lot 220 DP 1049608) is also zoned C3 – Environmental Management.

The quarry is positioned within a rural residential area, which comprises a mix of residential properties, commercial, agricultural, tourism and extractive industry premises. The main access for these properties is via Oakfield Road, David Drive and Oakvale Drive to and from Nelson Bay Road.

The majority of residential properties are separated from the quarry by agricultural operations and Tilligerry Creek. To the south of Tilligerry Creek are scattered residential properties of large rural lots, with the closest resident approximately 465 metres (m) northwest of the quarry. Two additional dwellings, inhabited by employees of the adjoining quarry operation are also located approximately 75 m and 430 m west of the quarry respectively.

The Oakvale Wildlife Park ('the Park') is a prominent tourist attraction for the Port Stephens region. The Park is located approximately 540 m north of the quarry, with the access route to and from the quarry running along the northern boundary of the Park to Oakvale Drive.

The environmental conservation areas to the south of the site extend along the Stockton Bight beach and dune system, which is predominantly utilised for recreational purposes including fishing, four-wheel driving, quad bike riding, hiking and horse riding.

Figure 2.1 Local Context

Source: Element 2020, p. 6.

2.2 Project Description

Sand from the site is currently extracted to 5 m Australian Height Datum (AHD) under existing development consents. Significant sand resource remains below 5 m AHD.

Holcim is seeking SSD approval to extract and process an estimated minimum of 10 million tonnes of sand from the quarry at a rate of up to 550,000 tpa. Additionally, the importation of up to 200,000 tpa of sand from Anna Bay, Tanilba Bay, Cabbage Tree Road Quarry and other local extractive operations as required will continue for the project. This sand would be processed at the site and dispatched as per the existing operations. As such, the project will seek to process and dispatch up to 750,000 tpa of sand products from the quarry.

Given the existing operations, infrastructure and services at the site, there will be little work required to establish the project, with existing fixed and mobile plant and equipment continued to be used.

Where additional infrastructure or establishment works are required, this will be delivered as part of the initial stages of the project and may include:

- relocation and upgrade of utility infrastructure;
- construction of new internal haul roads, and/or reconfiguration of existing internal haul roads;
- upgrade of existing processing plant and associated infrastructure;
- establishing a diesel-powered dredge; and
- construction of processing plant for the dredge, and associated diesel generators to power the plant.

Similar to existing operations, sand extraction will first involve clearing and grubbing of vegetation and stripping and stockpiling of topsoil for later reuse in rehabilitation. The sand will be extracted by front-end loader to a nominated depth, followed by an excavator above and below the water table within its reach. The excavated sand will then be transferred by front-end loader and/or dump trucks to the existing processing plant.

As groundwater is encountered, a pond would be created immediately south of the processing area and will be made large enough to float a dredge.

The project involves progressive extraction of sand over seven operational stages. The dredge would commence immediately south of the processing area of the quarry and will then progressively extract sand in a southerly direction away from the processing plant in a staged process.

The dredge will move backwards and forwards across the dredge pond, vacuuming (dredging) the underwater sand resource. A slurry containing a mixture of sand and water will be pumped from the dredge via a floated pipeline to a processing plant. The dredge will manoeuvre around the pond and will be secured to the pond banks by wires.

Once the dredge pond is formed, as the dredge vacuums away the underwater sand resource, surface sand would slump into the dredge pond at the natural angle of repose and be captured by the dredge. It is envisaged that this process would reduce the need for manual handling of material, however if required sand adjacent to the pond edges may also be placed into the dredge pond by excavator or front-end loader to then be captured by the dredge.

Sand may be extracted within the entire project site via a combination of dry extraction and dredging operations to a maximum depth of 30 m below the water table.

During the initial stage of the project, until dredging operations are established, sand extracted by front-end loader or excavator will be transported to the in-feed plant for processing as per existing operations.
A processing plant and stockpile area will be established for the dredging operations in the processing area within the northern portion of the site. Depending on the desired particle sizing, the sand will be pumped

through a cyclone and stockpiled for directly loading into trucks for dispatch off site, or further processed and dispatched as per existing operations.

The importation of Virgin Excavated Natural Material (VENM) and/or Excavated Natural Material (ENM) (hereafter referred to as 'fill') by road would be required during the project on an as required basis to aid in batter stabilisation, ground stability and backfilling of the dredge pond to shape the final landform.

The project will provide continued direct employment for existing employees and provide additional employment opportunities, including flow on employment opportunities for numerous Holcim and customer truck drivers and service personnel.

The project is summarised in **Table 2.1**.

Table 2.1 - Project Summary

Project component	Summary of the project
Extraction method	Sand may be extracted within the entire project site via a combination of dry extraction and dredging operations to a maximum anticipated depth of 35 m below the water table.
Resource	Approximately 10,062,723 tonnes of sand will be extracted.
Project site	The proposed disturbance footprint of the project covers an area of approximately 35.4 ha and comprises all areas to be disturbed by sand extraction operations (dry extraction and dredging) and supporting processing infrastructure.
Transport (dispatch) limit	Up to 750,000 tonnes of sand products processed and dispatched from the site per year.
Project life	30 years for sand extraction, processing, and dispatch. Ongoing for rehabilitation.
General infrastructure	A depot was previously established in the northern part of the site and includes the following ancillary infrastructure: ▪ An amenities/office building providing an office, lunchroom, laboratory, toilet, and shower. ▪ Weighbridge. ▪ Designated parking area for employees and visitors. ▪ Various processing plant and infrastructure. ▪ Vehicle wash down bay. ▪ Storage sheds for dry sand products. ▪ Bunded fuel storage facilities, oil storage shed and dedicated liquid petroleum gas (LPG) supply. ▪ Various maintenance sheds and workshops. ▪ Waste receptacles such as dumpsters and skip bins. Where additional infrastructure or establishment works are required, this will be delivered as part of the initial stages of the project and may include: ▪ relocation and upgrade of utility infrastructure; ▪ construction of new internal haul roads; ▪ upgrade of existing processing plant and associated infrastructure; ▪ establishing a diesel-powered dredge; and ▪ construction of processing plant for the dredge, and associated diesel generators to power the plant.
Water use	Water will be supplied as follows: ▪ Water used for dust suppression purposes will be supplied via a water cart contractor from the potable water supply, or via water extracted from the dredging process; ▪ Rainwater will continue to be stored in a 5,000 L tank and used for on-site ablutions. It will be supplemented with purchased water supplied in bulk, as required; and ▪ Drinking water will be imported to site in 20 L containers. A 20,000 L tank will be installed to provide water for firefighting.
Operational workforce	Sixteen full time and five casual employees.

Project component	Summary of the project
Hours of operation	The proposed operating hours for the project are: ▪ Monday to Friday – 24 hour operations; ▪ Saturday – 6 am to 6 pm; ▪ Sunday – 7 am to 6 pm (for deliveries, service and maintenance only); and ▪ no operation on Public Holidays. Holcim proposed to operate three shifts on Monday to Friday; 6 am to 2 pm; 2 pm to 10 pm; and 10 pm to 6 am. There would be a single day shift between 6 am to 6 pm on Saturdays. Site management and office personnel work a standard 8 am to 5 pm work day during weekdays.

2.3 Mitigation Measures

Holcim aims to maximise the benefits of the project to the region while minimising adverse impacts, as far as possible.

In this respect, a range of general and specific economic impact mitigation and management measures are proposed and would include:

Potential Environmental, Cultural and Social Impacts

- A range of measures to mitigate, offset and compensate for potential environmental, cultural, and social impacts of the project. A full outline of these is provided in the EIS.

Potential Workforce Impacts

- Employment of regional residents preferentially where they have the required skills and experience and demonstrate a cultural fit with the organisation;
- Participating, as appropriate, in business group meetings, events or programs in the regional community.

Potential Business Impacts

- Purchasing local non-labour inputs to production preferentially where local producers can be cost and quality competitive, to support local industries.

3 SIGNIFICANCE OF THE RESOURCE

Demand for sand is a derived demand. That is, demand for sand is dependent on there being a demand for some other product, such as glass, concrete, cement, asphalt, and construction materials, which in turn is dependent on demand for construction and population growth. With the significant increase in approved infrastructure projects in Sydney and other parts of NSW, the leading suppliers of sand are under pressure to meet this increased demand.

While there is strong and growing demand for sand products, their supply is limited to locations close to market, in specific areas where the required geological formations exist, and it is economic to extract. The Salt Ash Sand Quarry is one of these locations.

A shortage in the supply of construction sand for the Sydney market has been predicted for many years as access to local onshore sources of construction sand has become increasingly difficult through resource depletion e.g. Penrith Lakes, and increasing land use constraints surrounding potential alternative sources. In the short term, demand for construction sand can be met by increasing production from existing sources, including the Salt Ash Sand Quarry (NSW Department of Trade and Investment, 2016).

Holcim proposes to meet part of this increased demand in natural sand by increasing production of sand from its existing consent area. The available resource from this project is estimated at a minimum of 10 million tonnes. Without the project the sand resource from the site would be around 180,000 tonnes.

Annual demand in the Greater Sydney Region (GSR) for natural sand in 2018 was estimated at approximately 5.9 Mt, with in the order of 38% produced from quarries located in the Stockton/Salt Ash/Williamstown area and Central Coast (Corkery, 2019). Proposed annual production from the project is approximately 9% of this annual demand, although part of production also services local/regional markets.

4 COST BENEFIT ANALYSIS

4.1 Introduction

CBA of the project involves the following key steps:

- identification of the "with" and "without" project scenarios.
- identification and valuation of the incremental benefits and costs.
- consolidation of value estimates using discounting to account for temporal differences.
- application of decision criteria.
- sensitivity testing.
- consideration of non-quantified benefits and costs; and
- consideration of the distribution of costs and benefits.

What follows is a CBA of the project based on the production, financial, technical, and environmental advice provided by Holcim and its specialist consultants. An explanation of CBA is provided in Attachment 1.

4.2 Identification of the "Without" Project Scenarios

A starting point for CBA is to establish the "without" project scenario for the land impacted by the project. This becomes the base case against which to assess the potential economic, social, and environmental impacts of changes due to the project. Without the project, extraction under the existing development consents is assumed to continue (no time limit) as follows:

- An average of 20,000 tpa of onsite extraction and processing until 2032 when available onsite resource is exhausted.
- Continue processing an average of 160,000 tpa of imported sand (though the site has previously processed up to 200,000 tpa in times of peak demand).
- An average of 180,000 tpa in total processed on site until 2032 when this reduces to an average of 160,000 tpa.
- 15 people onsite (including 5 contractors).
- 24 people transporting sand to market.

4.3 Identification of the "With" Project Scenario

The project is seeking approval for the following:

- a 30-year consent assumed to commence in 2023 and cease in 2052.
- 550,000 tpa onsite sand extraction and processing.
- processing of 200,000 tpa imported sand until 2041 when availability of imported sand ceases.
- 750,000 tpa in total process onsite until 2041, with 550,000 tpa processed onsite from 2042 to 2052.
- 21 people onsite (including 5 contractors).
- 52 people transporting sand to market.

Figure 4.1 illustrates the indicative incremental onsite sand production of the project relative to the base case.

Figure 4.2 illustrates the indicative incremental onsite sand processing with project relative to the base case.

Figure 4.1 – Indicative Incremental Onsite Sand Production from the Project Relative to the Base Case

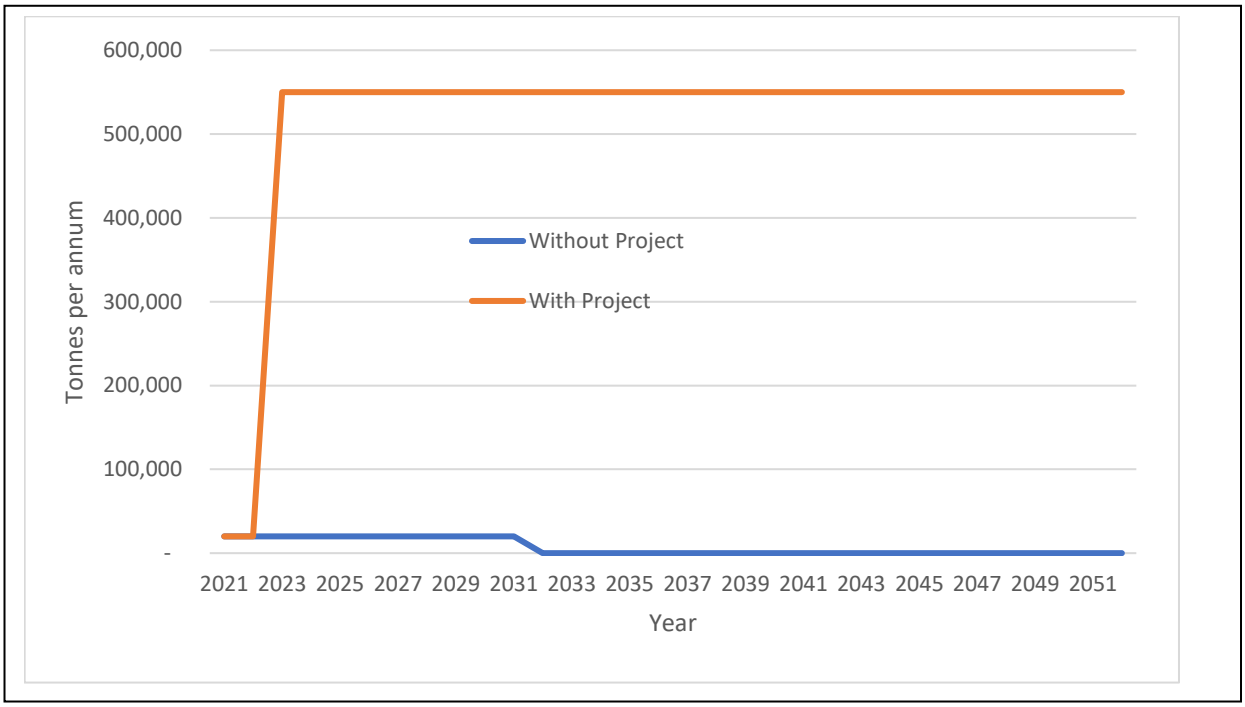
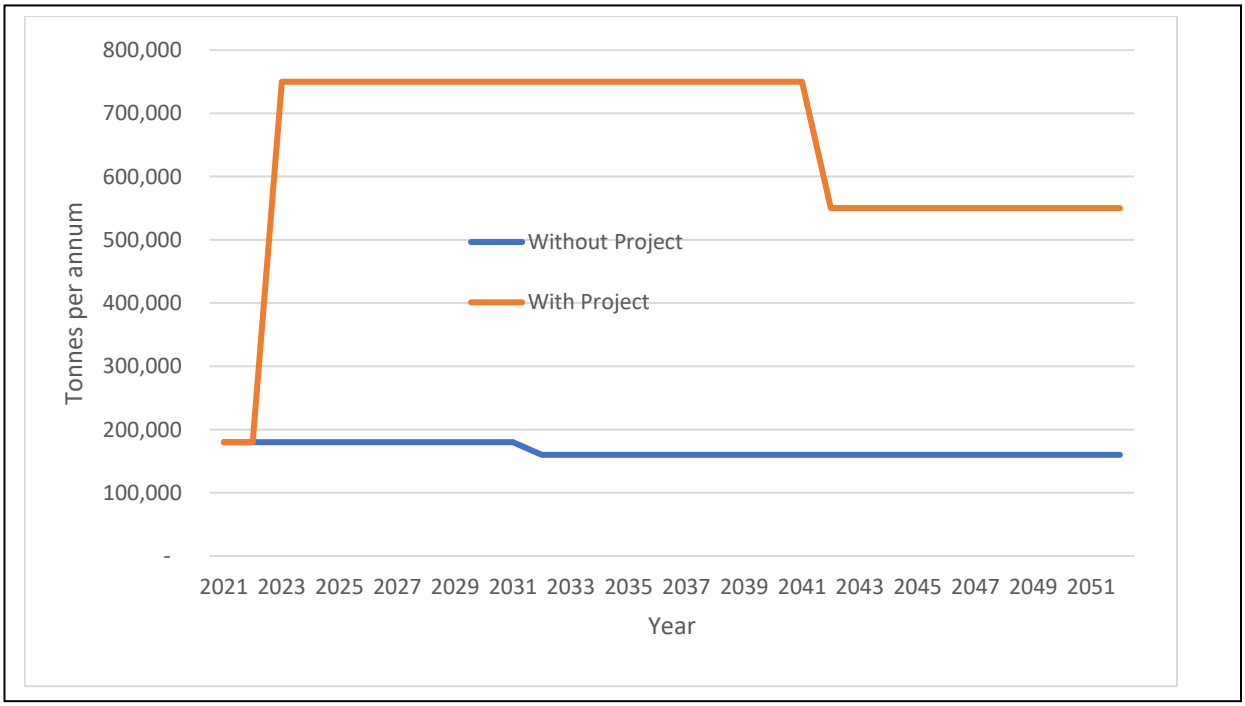


Figure 4.2 – Indicative Incremental Onsite Sand Processing with the Project Relative to the Base Case



4.4 Identification of Benefits and Costs

Relative to the base cases, or "without" project scenarios, the project may have the potential incremental economic benefit and cost categories shown in Table 4.1.

It should be noted that the potential environmental, social, and cultural costs listed in Table 4.1 are only economic costs to the extent that they affect individual and community well-being through direct use of resources by individuals or non-use. If the potential impacts do not occur or are mitigated, compensated or offset to the extent where community wellbeing is insignificantly affected (i.e. costs are borne by the proponent), then no environmental, social or cultural economic costs should be included in the project CBA apart from the mitigation, compensation or offsetting costs.

Table 4.1 - Potential Incremental Economic Benefits and Costs of the Project

Category	Costs	Benefits
Net Production Benefits from Quarrying	• Opportunity cost of land • Opportunity cost of capital • Capital costs • Operating costs at quarry gate • Decommissioning costs at cessation of the project	• Any avoided decommissioning and rehabilitation costs • Sale value of quarry product at quarry gate • Residual value of capital and land at the end of the project
Net production benefits from ex-quarry transport	• Capital and operating costs	• Revenues
Potential environmental, social, and cultural impacts of extraction, processing and transportation, after mitigation, offsetting and compensation	• Greenhouse gas generation • Operational noise impacts • Road transport impacts • Air quality impacts • Groundwater impacts • Surface water impacts • Biodiversity impacts • Aboriginal heritage impacts • Historic heritage impacts • Visual impacts • Net public infrastructure costs • Loss of surplus to other industries	• Wage benefits to employment • Economic benefits to existing landholders • Economic benefits to suppliers

Framed in another but equivalent way, the potential incremental costs and benefits of the project are as per Table 4.2. No royalties accrue to the NSW Government from quarrying and hence these are omitted from the estimation of net production benefits.

Table 4.2 - Alternative Frame of Potential Economic Benefits and Costs of the Project

Costs	Benefits
Direct costs	***Direct benefits***
Nil	Net production benefits from quarrying • *Company tax* • *Net producer surplus*
	Net production benefits from ex quarry transport • *Company tax* • *Net producer surplus*
Indirect costs	***Indirect benefits***
Environmental, social, and cultural impacts of extraction, processing, and transportation, after mitigation, offsetting and compensation	Wage benefits to employment
Net public infrastructure costs	Economic benefits to existing landholders
Loss of surplus to other industries	Economic benefits to suppliers

4.5 Quantification/Valuation of Benefits and Costs

Consistent with NSW Government (2015), the CBA was undertaken in 2022 real values, with discounting at 7 percent (%) and sensitivity testing at 4% and 10%.

The analysis period is 31 years, coinciding with the proposed life of the project and one year pre-project. Any impacts that occur after this period are included in the final year of the analysis as a terminal value.

Where competitive market prices are available, they have generally been used as an indicator of economic values. Environmental, cultural, and social impacts have initially been left unquantified and interpreted using the threshold value method.[1]

An attempt has also been made to estimate environmental, cultural, and social impacts using market data and benefit transfer[2] and incorporate them into an estimate of the net social benefit of the project. This estimated net social benefit of the project provides another threshold value that any residual or non-quantified economic costs would need to exceed to make the project questionable from an economic efficiency perspective.

4.5.1 Production Costs and Benefits of Quarrying[3]

Opportunity Cost of Land and Capital

The current approval for the quarry has no expiry, but for the purpose of this analysis the life of operations under the base case are assumed to coincide with the life of operations with the project. Consequently, there are no incremental opportunity costs of capital and land associated with the project relative to the base case.

Capital Cost of the Project

Compared to the base case, the project would require additional capital expenditure primarily associated with the purchase of capital equipment and establishment of site infrastructure. This cost is estimated at $8.8M in the first year of consent, assumed to be in 2023.

[1]The threshold value method uses the value of quantified net production benefits as the amount that unquantified environmental, social and cultural costs would need to exceed to make a project questionable from an economic efficiency perspective.
[2] Benefit transfer refers to transferring economic values that have been determined for other study sites.
[3] All values reported in this section are undiscounted unless specified.

In 2042, there will also be a requirement to relocate surface infrastructure to enable this area to be quarried. An allowance of $0.7M has been included in the analysis.

Annual Operating Costs of the Project

Operating costs of the project are associated with ramping up of onsite quarrying from 20,000 tpa to 550,000 tpa and continuation in processing of imported sand.

The quarry operating costs of the project include those associated with extraction, importing sand from other quarries, onsite processing, general costs (including overheads and administration) and ongoing environmental, social, and cultural mitigation costs. These costs include labour costs, which reflect the value of labour resources in their next best use.

Unit operating costs were provided by Holcim and are commercial in confidence.

Decommissioning and Rehabilitation Costs

With the project, decommissioning and rehabilitation would occur at the end of the proposed project. However, decommissioning and rehabilitation costs would also occur at the end of the activities under the base case. For the analysis, incremental decommissioning and rehabilitation costs are assumed to be zero. Different assumptions regarding incremental decommissioning and rehabilitation costs would have no material impact on the analysis due the effects of discounting.

Economic Benefits

Avoided Decommissioning and Rehabilitation Costs

Given the assumed same operating life of the quarry, "with" or "without" the project, there are no avoided or delayed decommissioning and rehabilitation costs because of the project.

Revenues

The main economic benefit of the project is the economic value of the sand products extracted, processed, and dispatched. Holcim has provided information on average sale price for processed imported sand and processed sand from the quarry. This market price has been used as an indicator of the economic value. It has not been reported for reasons of commercial confidentiality.

However, for a vertically integrated firm such as Holcim, there can be cost savings further along the production chain from having its own sand supply that are not reflected in the market price of sand. These potential benefits to Holcim and consumers are outside the scope of this assessment and have not been quantified.

There is uncertainty around the future economic value of sand and hence assumed values have been subjected to sensitivity testing (see Section 4.8).

Residual Value at End of the Evaluation Period

At the assumed end of the current approval, the land and capital equipment used in operations may have some residual value that could be realised by sale. Similarly, at the end of the project, land and capital may also have some residual value. For this analysis, it is assumed that the residual value of land is the same between scenarios and that any value of capital equipment has reduced to zero. Consequently, there is no incremental residual value of land and capital equipment.

4.5.2 Production Costs and Benefits of Product Transport

The costs and benefits of quarrying considered in Section 4.5.1 include costs and revenues/benefits of activities up to the quarry gate. Since product transport externalities are a consideration of the EIS, economic benefits associated with transportation of quarry product to customers also needs to be considered. These net production benefits essentially relate to the net revenue that accrues to transport providers.

The annual net production benefit of product transport has been estimated based on assumed incremental quarry production, an average per tonne transport cost, and the percentage of total revenue that is net revenue (4%[4]).

4.5.3 External Costs and Benefits

The environmental, social, and cultural impacts of the project are assessed in the EIS. This Section considers these impacts from an economic perspective.

Noise

The impact of the project noise on nearby properties can potentially be valued using the property value method, where the change in property value as a result of the noise impacts are estimated, or the defensive expenditure method where the costs of mitigation are estimated.

The Noise Assessment identified that the predicted noise levels from project operation would comply with the established project noise trigger levels at all assessed receivers for all meteorological conditions throughout all stages of the project. Emissions from transient noise events, construction activities and road traffic would also satisfy relevant criteria.

Hence, impacts are considered to be immaterial from an aggregate economic efficiency perspective. No economic costs are included in the CBA.

Air Quality

The impact of the project dust emissions can potentially be valued using the property value method, where the change in property value as a result of the air quality impacts are estimated, the cost of illness method where changes in health episodes as a result of emissions are estimated and/or the defensive expenditure method and damage cost method where the costs of mitigation are estimated.

The Air Quality Impact Assessment predicted that all the assessed air pollutants generated by the operation of the project would comply with the relevant assessment criteria at all the applicable receptor locations and therefore would not lead to any unacceptable level of environmental harm or impact in the surrounding area. Nevertheless, the site would apply appropriate dust management measures to ensure it minimises the potential occurrence of excessive air emissions from the site. Consequently, impacts are considered to be immaterial from an aggregate economic efficiency perspective and no economic costs are included in the CBA apart from the costs of proposed general mitigation and monitoring measures.

[4] Based on the ratio of gross operating surplus to revenue for the road transport sector in the 2018-19 National Input-Output Table, adjusting for mixed income.

Greenhouse

The Air Quality Impact and Greenhouse Gas Assessment concluded that the project would generate a total of 2,985t CO_2-e per year of Scope 1 emissions, 1,537t CO_2-e per year of Scope 2 emissions and 11,999t CO_2-e per year of Scope 3 emissions (mainly related to transportation of the product sand). The incremental impacts of the project would be lower as emissions would also be generated under the base case.

To place an economic value on CO_2-e emissions, a shadow price of CO_2-e is required. Three shadow prices were used, the Forecast European Union Emission Allowance Units price, the Australian Treasury Clean Energy Future Policy Scenario and the US EPA Social Cost of Carbon. These shadow prices represent the global damage cost of carbon (i.e. the cost of carbon emissions to the population of the whole world).

Consistent with the NSW Government (2015) Guidelines, NSW Government (2018) Technical Notes and the NSW Treasury (2017) Guidelines, the focus of CBA is on costs and benefits to the population of NSW. In the absence of any studies that have focused on the social damage cost of carbon emissions to NSW residents, some means of apportioning global damage costs borne by Australians is required. For the purpose of the Economic Assessment, this has been undertaken using Australia's share of the global population (around 0.3%) and NSWs share of the Australian population (32%). NSW DP&E has previously supported this approach (NSW DP&E, 2017).

On this basis, the present value of the cost of greenhouse gas emissions from the project to Australia is estimated at between $16,200 and $75,900 dollars (present value), with an average value of $40,300. The cost of greenhouse gas emissions to NSW is estimated at between $5,200 and $24,300 dollars (present value), with an average value of $12,900.

Surface Water and Groundwater

Surface water and groundwater are potential inputs into numerous alternative production processes and so its use for extractive industry has an opportunity cost, i.e. its value in the next best alternative use. In NSW the government has established a market framework to facilitate the allocation of surface water and groundwater resources. Water access and use is only permissible with possession of a WAL (except in the case of harvestable rights, native title rights and some stock and domestic rights). Water Sharing Plans that are prepared under the *Water Management Act 2000* set the rules by which water is shared between all users, including the environment, in each water management area in NSW. These plans also set rules for water trading, that is, the buying and selling of water licences and also annual water allocations (Montoya 2010). Consequently, the market value for surface water can be considered to give a reasonable indication of its economic value in alternative uses such as agriculture, i.e. its opportunity cost

The Surface Water Impact Assessment identifies that the site is predominantly sand with high infiltration rates, and additionally the quarry operations are self-contained with no surface discharge. While Holcim currently have water allocations of 174 ML, the project will require an additional maximum of 402.2 ML. The opportunity cost of the already held allocation have been included in the CBA by applying an assumed average market value of water of $500/ML. The cost of acquiring the additional 402.2 ML has been added to the capital cost of the project by also applying a unit cost of $500/ML. This approach reflects the use value of the water. Assuming that the WAL water would otherwise be allocated to other uses, there are no incremental non-use impacts e.g. aquatic ecology impacts, of using this water for extractive instead of alternative uses.

The Groundwater Impact Assessment concluded that the potential for adverse impacts on flow regimes or other groundwater users will be minimal and that the project will not have any significant impacts on terrestrial groundwater dependent ecosystems around the site or aquatic ecosystems. The proposed dredging will potentially result in the exposure of pyritic sulfides to the air resulting in the lowering of water pH within the dredge pond, impacting water quality of the aquifer on site and potentially downgradient if not appropriately managed. Additionally, the dredging process and oxidation of pyritic sulfides can increase the concentration of dissolved metals and salinity within the aquifer.

To minimise these potential impacts, a management strategy has been formulated to limit the potential for off-site migration of impacted groundwater and risk to downgradient groundwater users. The estimated costs of implementing this strategy have been included in the capital and operating costs of the project

Ecology

The Biodiversity Development Assessment Report summarised the impact of the project on ecological values of the subject area as follows:

- Direct removal of 1.75 ha of native vegetation, providing habitat for flora and fauna including one threatened flora species and14 threatened fauna species
- Removal of fauna resource features such as ponded areas, hollow-bearing trees and logs
- Indirect impacts to adjacent vegetation/habitat (such as weed incursion, sedimentation/runoff, fragmentation, and light and noise disturbance). Most of these will be managed and mitigated via a series of mitigation measures.

The impacted vegetation, and associated fauna, is likely to have non-use values to the community that would be lost as a result of the project. These values could potentially be estimated using non-market valuation methods. However, it is government policy that biodiversity offsets are provided that improve or at least maintain biodiversity values. The direct loss of flora and fauna habituated associated with the project, that falls outside the previously approved development consents (total of 1.75 ha), would be offset in accordance with the NSW Biodiversity Offset Scheme (BOS). The provision of offsets is also likely to have non-use values to the community that would be gained as a result of the project. Provided the values held by the community for the offsets are equal or greater than values that would be lost then no additional economic costs warrant inclusion in the CBA apart from the costs of providing offsets. These costs are estimated are estimated at up to $1M and have been added to the capital costs of the project.

Road Transport

The Traffic Impact Assessment found that the impact of additional trucks associated with the construction and operation of the project on the adjacent road network, including the principal intersections, as well as the quarry access intersections will be satisfactory. The project is also not expected to have any negative impacts on other road users including pedestrians, cyclists, and public transport vehicles (buses). The project will have some incremental impacts on road maintenance which are internalised into the operating costs of the project via a road levy payment to Port Stephens Council per tonne of sand transported.

Aboriginal Heritage

Impacts on Aboriginal cultural heritage can have use and non-use values to both Aboriginal and non-Aboriginal people that can be potentially estimated used nonmarket valuation methods such as choice modelling.

The Aboriginal Cultural Heritage Assessment Report identified three artefact sites of low scientific value that would be directly impacted by the project. Hence, there are no material economic costs for inclusion in the CBA.

Bushfire Hazard Assessment

The Bushfire Hazard Assessment establishes that the project is capable of complying with the acceptable solutions of Planning for Bush Fire Protection (2019). The cost of compliance is incorporated into the capital and operating costs of the project.

Other Potential Impacts

The project is not considered likely to have any material historic heritage or visual impacts for inclusion in the CBA.

Market Benefits to Workers

The project will result in all existing jobs at the quarry being retained together with an additional six new full-time jobs. In addition, jobs associated with the transportation of quarry material will also be retained and additional transport jobs generated.

In standard CBA, the wages associated with employment are considered an economic cost of production with this cost included in the calculation of net production benefits (producer surplus). This approach assumes labour markets clear, with no involuntary unemployment i.e. full employment, and no other distortions (Bartik, 2012). Conservatively, this approach is adopted in this analysis.

Economic Benefits to Existing Landholders

All land required for the project is owned by the proponent. No benefits to other landholders via land prices in excess of the opportunity cost of the land will occur.

Economic Benefits to Suppliers

The focus of CBA is generally on primary costs and benefits i.e. first round impacts. In competitive markets, there are no real secondary benefits and costs either to suppliers to a project or purchasers of a project's output.[5] Conservatively, this convention is adopted and hence no secondary benefits to the economic are included.

Net Public Infrastructure Impacts

No net infrastructure costs to government are envisaged as a result of the project. Given that additional employment will likely be sourced from existing residents of NSW, no additional demand for community infrastructure is envisaged.

Loss of Surplus to Other Industries

No material externality impacts have been identified that would impact other industries. Consequently, no loss of surplus to other industries is envisaged because of the project.

4.6 Consolidation of Value Estimates

4.6.1 Net Production Benefits

The present value of production costs and benefits, using a 7% discount rate, is provided in Table 4.3.

The project is estimated to have net production benefits of $44M (present value at 7% discount rate), comprising $39M in quarrying net production benefits and $5M in ex-quarry transport benefits.

[5] There are no net benefits to suppliers because in a competitive market, all resources are fully employed so increases in net benefits to suppliers will be offset elsewhere in the economy from the withdrawal of resource that allow the suppliers to increase their production. There are no net benefits to purchasers because in a competitive market, competition in the purchasing of the project output will result in no net income to the purchaser and the project fully capturing the marginal value product (Sinden and Thampapillai, 1995, p. 57).

The net production benefits can be further apportioned to Australia and NSW based on Holcim (Australia) Pty Ltd being 100% foreign owned, an assumption that transport providers are 100% NSW owned, and company tax benefits accruing to NSW based on its population share i.e. 32%. On this basis, the net production benefits of the project that accrue to Australia and NSW are estimated at $18M and $9M (present value at 7% discount rate), respectively.

The estimated net production benefits that accrue to Australia and NSW can be used as a minimum threshold value or reference value against which the relative value of the residual environmental impacts of the project, after mitigation, may be assessed. This threshold value is the opportunity cost to society of not proceeding with the project. It is a minimum threshold value as it does not include any potential wage benefits, any potential benefits to suppliers, any allowance for real price rises for sand as future demand outstrips limited supply.

Provided the value of the residual environmental impacts of the project, to Australian and NSW households, after mitigation, do not exceed the respective net production threshold values, then the project will have net benefits to the Australian and NSW communities.

Table 4.3 - Net Production Benefits of the Project ($M Present Values at 7% Discount Rate)

	Quarrying	Ex Quarry Transport	Total
Costs			
Opportunity cost of land	$0		
Opportunity cost of capital	$0		
Capital costs	$10	$131	
Operating cost	$124		
Incremental decommissioning and rehab costs	$0		
Sub-total	***$134***	***$131***	
Benefits			
Avoided decommissioning and rehabilitation costs	$0		
Revenue	$173	$136	
Incremental residual value of land	$0		
Incremental residual value of capital equipment	$0		
Sub-total	***$173***	***$136***	
Global Net Production Benefits	**$39**	**$5**	**$44**
Company Tax	$12	$2	
Residual Net Production Benefits	$226	$4	
Global Net Production Benefits	**$39**	**$5**	**$44**
Company Tax	$12	$2	
Residual Net Production Benefits	$0	$4	
Australian Net Production Benefits	**$12**	**$5**	**$18**
Company Tax	$4	$2	
Residual Net Production Benefits	$0	$4	
NSW Net Production Benefits	**$4**	**$5**	**$9**

4.6.2 Externalities

Instead of leaving the analysis as a threshold value exercise, an attempt has been made to qualitatively consider and where possible quantify the main environmental, cultural, and social impacts of the project. Table 4.4 summarised the results of the consideration of externalities in Section 4.5.3. Only GHG impacts differ between the Australian and NSW scope.

Table 4.4 – Externality Impacts of the Project ($M Present Values at 7% Discount Rate)

Benefits	**Australia**	**NSW**
Wage benefits to employment	Not quantified – assumed to be zero	
Economic benefits to existing landholders	Not applicable	
Economic benefits to suppliers	Not quantified – assumed to be zero	
Sub-total	**$0**	
Costs		
Greenhouse gas emissions (Scope 1 and 2)	$0.04	$0.01
Noise	Criteria met at all applicable receptors - No material impact*	
Air quality	Criteria met at all applicable receptors - No material impact*	
Surface water	Opportunity cost of holding existing WALs - $0.1. Additional WAL cost included in capital costs	
Groundwater	Impact mitigated. Cost included in capital and operating costs - No material residual impact*	
Ecology	Impact offset. Cost included in capital costs - No material residual impact*	
Road transport	No material impact*	
Aboriginal heritage	No material impact*	
Bushfire hazard	No material impact*	
Historic heritage	No material impact*	
Visual	No material impact*	
Net public infrastructure costs	No material impact*	
Loss of surplus to other industries	No material impact*	

From Section 4.5.3 it is evident that the main potential impacts of the project are internalised into the production costs of the project through mitigation measures, provision/purchase of offsets and purchase of water allocations. Other costs not already included in the production costs of the project are associated with opportunity cost of WALs that are already held by Holcim and greenhouse gas costs, although from Table 4.4 it is evident that these impacts to Australia and NSW are small or immaterial.

4.6.3 Net Social Benefits to Australia and NSW

The main decision criterion for assessing the economic desirability of a project to society is its net present value (NPV). NPV is the present value of benefits less the present value of costs. A positive NPV indicates that it would be desirable from an economic perspective for society to allocate resources to the project, because the community as a whole would obtain net benefits from the project.

The results from Table 4.3 and Table 4.4 are combined in Table 4.5 to estimate the net social benefits of the project to Australia and NSW, relative to the base case.

Table 4.5– Net Social Benefits of the Project (present value @ 7% discount rate)

Benefits	Australia	NSW
Net Production Benefits Quarrying		
Company Tax	$12	$4
Residual Net Production Benefits	$0	$0
Sub-total	**$12**	**$4**
Net Production Benefits Transport		
Company Tax	$2	$2
Residual Net Production Benefits	$4	$4
Sub-total	**$5**	**$5**
Other Benefits		
Wage benefits to employment	Not quantified – assumed to be zero	Not quantified – assumed to be zero
Economic benefits to existing landholders	Not applicable	Not applicable
Economic benefits to suppliers	Not quantified – assumed to be zero	Not quantified – assumed to be zero
Sub-total	***$0***	***$0***
Total Benefits	**$18**	**$9**
Costs		
Greenhouse gas emissions (Scope 1 and 2)	$0.04	$0.01
Noise	Criteria met at all applicable receptors - No material impact*	
Air quality	Criteria met at all applicable receptors - No material impact*	
Surface water	Opportunity cost of holding existing WALs - $1. Additional WAL cost included in capital costs	
Groundwater	Impact mitigated. Cost included in capital and operating costs - No material residual impact*	
Ecology	Impact offset. Cost included in capital costs - No material residual impact*	
Road transport	No material impact*	
Aboriginal heritage	No material impact*	
Bushfire hazard	No material impact*	
Historic heritage	No material impact*	
Visual	No material impact*	
Net public infrastructure costs	No material impact*	
Loss of surplus to other industries	No material impact*	
Sub-total	***$1***	***$1***
Net Social Benefits	**$18**	**$9**

Overall, the project is estimated to have net social benefits to both Australia and NSW relative to both the base case, and hence is desirable and justified from an economic efficiency perspective.

While the major environmental, cultural and social impacts have been quantified and included in the project CBA, any other residual environmental, cultural or social impacts that remain unquantified would need to be valued at greater than $18M and $9M, for the project to be questionable from an Australian and NSW economic efficiency perspective, respectively

4.7 Distribution of NSW Costs and Benefits

CBA is primarily concerned with the single objective of economic efficiency. CBA and welfare economics provide no guidance on what is a fair, equitable or preferable distribution of costs and benefits. Nevertheless, CBA can provide qualitative and quantitative information for the decision-maker on how economic efficiency costs and benefits are distributed.

The costs and benefits of the project to NSW are potentially distributed among a range of stakeholders as identified in Table 4.6.

Table 4.6 - Incidence of NSW Costs and Benefits

BENEFITS AND COSTS	INCIDENCE OF COSTS AND BENEFITS	NSW ($M)
Quarrying Net Production Benefits		
Company tax	NSW Government and NSW households	$4
Transport Net Production Benefits		
Company tax	NSW Government and NSW households	$2
Net producer surplus	Transport providers and their owners/shareholders	$4
Additional benefits		
Wage benefits to employment	Employees of the project who reside in NSW	Not quantified – assumed to be zero
Economic benefits to existing landholders	Local landholders who sell land required for the project including buffer land	Not applicable
Economic benefits to suppliers	Regional and State suppliers of inputs to production	Not quantified – assumed to be zero
Environmental, social and cultural costs*		
Greenhouse gas emissions (Scope 1 and 2)	Local and NSW households	$0.01
Noise	Adjoining landholders	Criteria met at all applicable receptors - No material impact*
Air quality	Adjoining landholders	Criteria met at all applicable receptors - No material impact*
Surface water	Alternative local surface water users	Opportunity cost of holding existing WALs - $0.1. Additional WAL cost included in capital costs
Groundwater	Alternative local groundwater users	Impact mitigated. Cost included in capital and operating costs - No material residual impact*
Ecology	Local and NSW households who value ecology	Impact offset. Cost included in capital costs - No material residual impact*
Road transport	Local residents	No material impact*
Aboriginal heritage	Aboriginal people and other local and NSW households who value Aboriginal heritage	No material impact*
Bushfire hazard	Holcim and its employees	No material impact*
Historic heritage	Local and NSW households who value heritage	No material impact*
Visual	Adjoining landholders and passing motorists	No material impact*
Net public infrastructure costs	NSW Government and NSW households	No material impact*
Loss of surplus to other industries	Local industries adversely impacted by the project	No material impact*

* NSW regulations require many impacts to be borne by the proponent via mitigation, offset and compensation. Where these measures perfectly mitigate, offset, or compensate then no residual impacts occur, and all impacts are borne by the proponent. This table identifies who bears residual impacts where mitigation, offset and compensation are imperfect.

4.8 Risk and Sensitivity Analysis

The main areas of environmental risks associated with quarry projects relate to:

- the financial viability of a project from unexpected downturns in prices and any consequent environmental impacts from premature cessation of operations;
- ecological risk associated with whether the biodiversity offsets will adequately compensate for the direct ecological impacts; and
- other environmental, social, and cultural impacts estimations and required mitigation measures.

The Independent Planning Commission has previously identified that the financial viability of projects is a risk assumed by the project proponents. Nevertheless, it should be noted that the project is the continuation of an existing financially viable operation. Holcim is willing to invest in the project and has a fiduciary responsibility to its shareholders. It is highly unlikely that Holcim's investment would take place and then operations would cease, leaving residual environmental impacts at the site. Strong current and foreseeable demand for sand is also likely to underpin the financial viability of the project.

The provision of biodiversity offsets can be associated with a number of risks, including in relation to the biodiversity benefits of additional management of offsets, success in reconstruction of ecological communities, time-lags between impacts and provision of offsets as well as between management actions and achievement of ecological outcomes. These risks are mitigated through offset ratio requirements in the calculation of offsets requirements or fund payments, and commitment to the provision/payment for offset actions prior to the commencement of works under approval.

There is some risk associated with the estimation of environmental, social, and cultural impacts of the project and the level of mitigation measures proposed. However, it should be noted that impacts have generally been assessed based on the maximum annual levels of production and hence are likely to be overstated. Ongoing monitoring will ensure that appropriate mitigation measures are implemented as required.

The net present values (NPVs)[6] of the project presented in Table 4.5 are based on a range of assumptions around which there is some level of uncertainty. Uncertainty in a CBA can be dealt with through changing the values of critical variables in the analysis (James and Gillespie, 2002) to determine the effect on the NPV[7].

In this sensitivity analysis, the CBA results for NSW were tested for changes to the following variables at a 4%, 7% and 10% discount rate:

- Quarry capital costs including offsets and WAL purchase costs;
- Quarry operating costs;
- Value of sand;
- Net transport revenue;
- Opportunity cost of WALs already held by Holcim;
- GHG impacts.

Results are reported in Table 4.7. What this analysis indicates, is that CBA results at the NSW level are most sensitive to increases in operating costs and reductions in the value of sand.

The project is the continuation of an existing quarrying operation and hence operating costs in this location and geological environment are known. Estimates of operating costs of the project are therefore likely to be

[6] NPV is the present value of benefits less the present value of costs. Present values are calculated using a discount rate that reflects peoples time preferences.

[7] Quantitative risk analysis could also potentially be undertaken. However, this requires information on the probability distributions for input variables in the analysis. This information is not available and so the sensitivity testing is limited to uncertainty analysis.

reasonably accurate and a 20% increase that is maintained each and every year of the analysis as reported in the sensitivity analysis is highly unlikely.

The strong demand for sand that underpins the project suggests that sustained reductions in sand value and annual production levels is highly unlikely. Instead, real increases in the value of sand over time is considered more likely.

The sensitivity analysis also indicated that the CBA results are not sensitive to changes in capital costs, opportunity costs of WALs already held by Holcim or greenhouse gas costs. Since mitigation, offset and compensation costs are small components of the capital and operating costs of the project, it is unlikely that large changes in these cost levels would have any significant impact on the CBA results.

Under all scenarios examined, the project has net social benefits to NSW.

Table 4.7 - NSW CBA Results Sensitivity Testing (Present Value $Millions)

	4% Discount Rate	7% Discount Rate	10% Discount Rate
CENTRAL ANALYSIS	**$13**	**$9**	**$7**
INCREASE 20%			
Quarry development costs	$13	$9	$7
Quarry operating costs	$10	$7	$5
Value of sand	$18	$13	$10
Transport net revenue	$15	$10	$8
GHG costs	$13	$9	$7
WAL opportunity costs	$13	$9	$7

	4% Discount Rate	7% Discount Rate	10% Discount Rate
DECREASE 20%			
Quarry development costs	$13	$10	$7
Quarry operating costs	$17	$12	$9
Value of sand	$9	$6	$4
Transport net revenue	$12	$8	$6
GHG costs	$13	$9	$7
WAL opportunity costs	$13	$9	$7

5 THE REGIONAL ECONOMY

5.1 Introduction

The proposal is located in the Port Stephens LGA in NSW. This is the locality/region that has the potential to provide inputs to the proposal and derive economic benefits from the proposal.

5.2 Characterisation of the Region

5.2.1 Residents of the Region

Table 5.1 provides some characteristics of the usual residents of locality based on the Australian Bureau of Statistics (ABS) 2021Census of Population and Housing. In 2021, the region had a population of 75,276 and a labour force of 32,614. In 2021, there were 1,632 people unemployed representing 5.0% of the labour force.

The main occupations of usual residents were *Technicians and Trade Workers* followed by *Professionals*. Twenty per cent of the employed usual residents work outside the region, with the main locations being Newcastle LGA, Maitland, No Fixed Address (NSW) and Lake Macquarie.

Table 5.1 - Characteristics of Usual Residents

	Port Stephens LGA	
	No.	**%**
Demographics		
Population	75,276	
Median Age	47	
In Labour Force	32,614	43.3%
Unemployed	1,632	5.0%
Median household weekly income	1,372	
Unoccupied private dwellings	5,236	15.4%
Median rent	370	
Occupations		
Technicians and Trades Workers	5,310	17.1%
Professionals	4,803	15.5%
Community and Personal Service Workers	4,338	14.0%
Clerical and Administrative Workers	3,840	12.4%
Managers	3,472	11.2%
Labourers	3,381	10.9%
Sales Workers	2,848	9.2%
Machinery Operators and Drivers	2,371	7.7%

Source: ABS, 2021 Census of Population and Housing, Community Profiles

The main industry sectors in which usual residents were employed in 2021 is provided in Table 5.2. *Defence* was the most significant employment sector (reflecting the presence of the Royal Australian Air force military base) followed by *Aged Care Residential Services, Supermarket and Grocery Stores, , Other Social Assistance Services, and Takeaway Food Services.).*

Table 5.2 - Top 5 4-digit ANZSIC Industry Sectors of Employment for Usual Residents

Sector	No.	%
Defence	1,199	3.9%
Aged Care Residential Services	1,062	3.4%
Supermarket and Grocery Stores	1,001	3.2%
Other Social Assistance Services	955	3.1%
Takeaway Food Services	832	2.7%

Source: Australian Bureau of Statistics, 2021 Census of Population and Housing, Community Profiles

An indication of the health of an economy can be gained from population changes. This theory of regional economic growth suggests that places that are able to attract population immigration[8] create increased demand for goods and services and thus more jobs. This growth leads to increasing local multiplier effects, scale economies and an increase in the rate of innovation and capital availability (Sorensen, 1990). Conversely, population losses can contribute to a 'vicious cycle' of decline whereby reduced populations results in closure of services, which in turn makes it difficult to attract new populations (Sorensen, 1990).

Trends in regional economies because of globalisation and associated structural adjustment include:

- loss of significant industries such as abattoirs and timber mills from many rural areas;
- increased mechanisation of agriculture and aggregation of properties, resulting in loss of employment opportunities in this industry;
- growth of regional centres, at the expense of smaller towns;
- preference of Australians for coastal living, particularly for retirement; and
- preference of many of today's fastest growing industries for locating in large cities (Collits, 2000).

The result is that there has been declining population in many rural LGAs, particularly those that are located in non-coastal areas. There has also been a decline in the population of smaller towns even in regions where the population has been growing.

Against this backdrop, it is evident that the population of the Port Stephens LGA has been growing, at a rate of 16.2% since 2011, very similar to the population growth rate for NSW. This reflects its coastal location and proximity to the major urban centres of Newcastle and Sydney.

Table 5.3 - Population Growth

	2011	2016	2021	Growth Rate 2011 - 2016	Growth Rate 2016 - 2021	Growth Rate 2011 - 2021
Port Stephens LGA	64,807	69,556	75,276	7.3%	8.2%	16.2%
NSW	**6,917,658**	**7,480,228**	**8,072,163**	**8.1%**	**7.9%**	**16.7%**

Source: Australian Bureau of Statistics, 2021 Census of Population and Housing, Community Profiles

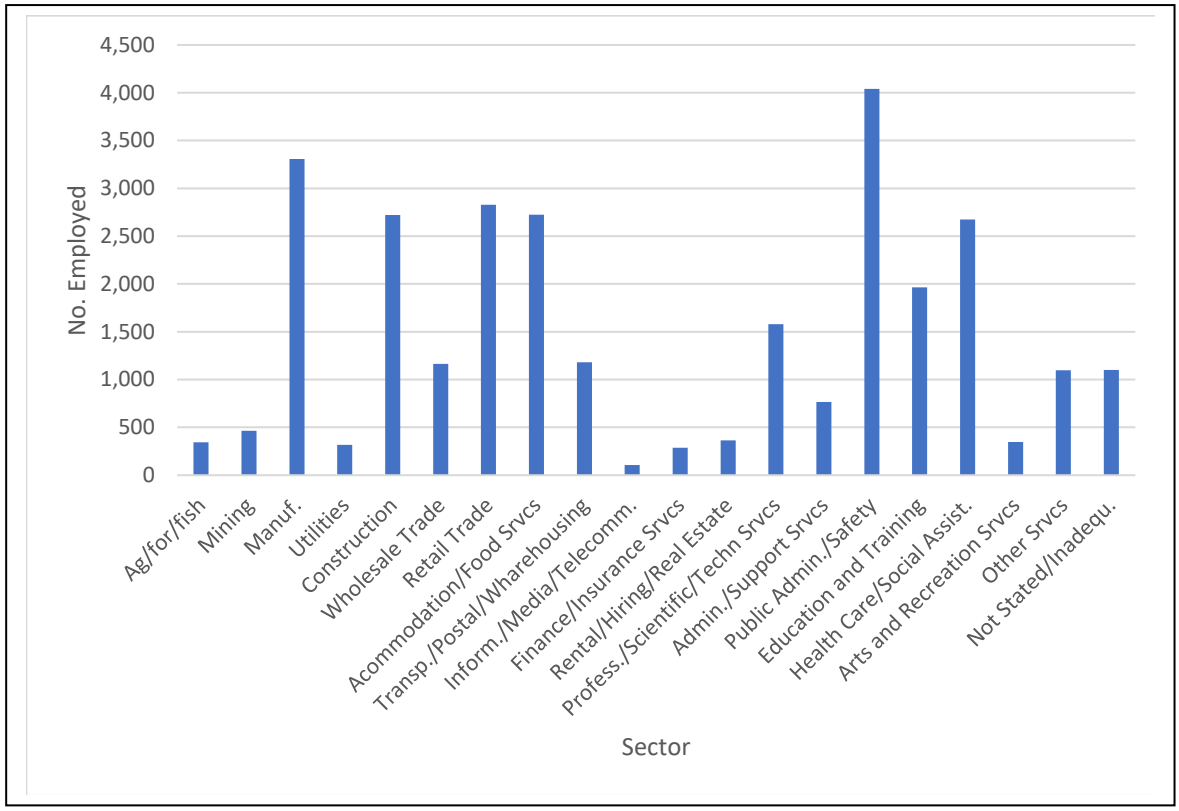
5.2.2 Economic Activity in the Region

An indication of the nature of the regional economy can be gained by examining place of work employment by industry data - refer to Figure 5.1. This indicates the significance of the *Public Administration/Safety,*

[8] This can be considered symptomatic of key drivers in the economy based on the regions natural and manmade endowments that give it a comparative advantage in certain sectors.

Manufacturing, Retail Trade, Accommodation/Food Services, Construction and Health Care/Social Assistance sectors.

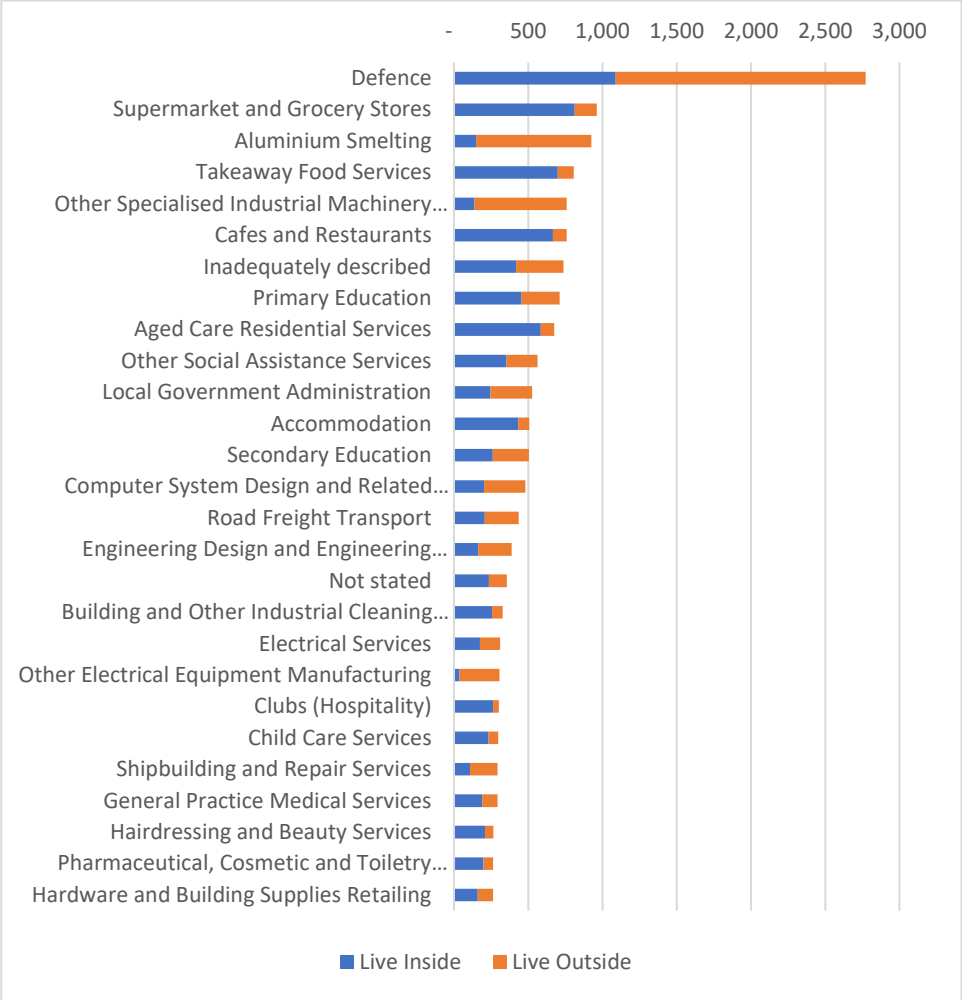
Figure 5.1 - Place of Work Employment by Industry (1-digit ANZSIC Sectors)



Source: Australian Bureau of Statistics, 2021 Census of Population and Housing, Working Population Profiles

A more detailed view can be obtained from 4-digit ANZSIC employment by industry in the Port Stephens LGA provided in Figure 5.2. This clearly shows the importance of the *Defence* sector. Forty per cent of those employed in the Port Stephens LGA reside outside the LGA, mainly in the Newcastle, Maitland, and Lake Macquarie LGAs.

Figure 5.2 – 4 Digit ANZSIC Employment by Industry in the Port Stephens LGA



Source: Australian Bureau of Statistics, 2021 Census of Population and Housing, Tablebuilder

The Gross Regional Product (GRP) of the regional economy is estimated at $5.4 billion. The region is a net exporter, with exports out of the region of $6.2 billion and imports into the region of $4.7 billion (REMPLAN, 2021). The largest exporting 1-digit ANZSIC industries sectors by value are:

- *Manufacturing* ($3,037 million), mainly *basic non-ferrous metal manufacturing*.
- *Public Administration and Safety ($1,664* million), mainly *defence* and *air and space transport sectors*; and
- *Mining* ($436 million), mainly *coal mining* (REMPLAN, 2021).

Exporting sectors are considered to be key drivers of regional economies and reflect a region's endowments and competitive advantages.

6 LOCAL EFFECTS ANALYSIS

6.1 Introduction

The CBA in Section 3 is concerned with whether the incremental benefits of the project exceed the incremental costs and therefore whether the community would, in aggregate, be better off 'with' the project compared to 'without' it. This section examines local effects. It focuses on the operational phase of the project.

The local area is defined as the LGA of Port Stephens, within which the project is located and is the region considered likely to be main local source of labour and non-labour inputs for the project.

6.2 Direct Effects Related to Employment

The project will provide an estimated 21 direct quarrying jobs (comprising 16 employees and 5 contractors) when processing 750,000 tonnes of sand per annum. Eighty percent (17) of these are assumed to reside in the local area,[9] with the remainder commuting from outside the local area.

It will also provide an estimated 52 direct transport jobs (reducing in 2032 to 50 direct transport jobs) when processing 750,000 tonnes of sand per annum. Forty six percent (2) of these are assumed to reside in the local area,[10] with the remainder commuting from outside the local area.

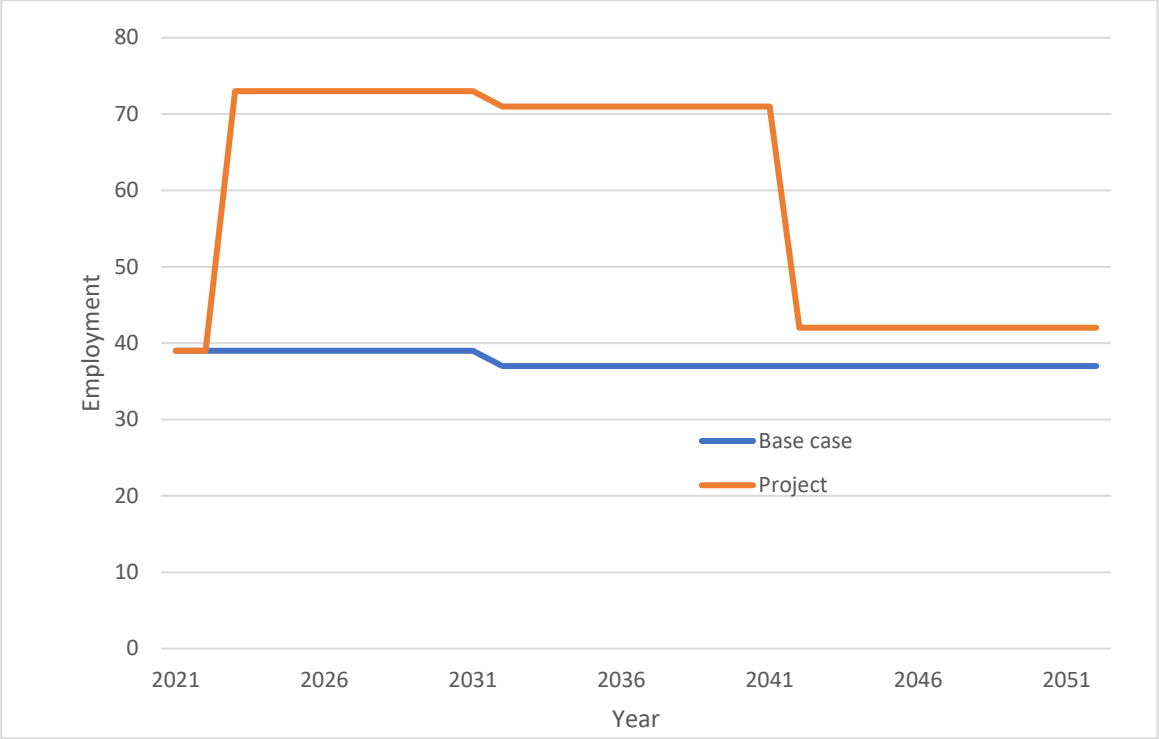
Consequently, the maximum total direct employment provided by the project is 73 jobs.

Under the base case, the quarry will provide 15 direct quarrying jobs (comprising 10 employees and 5 contractors) and 24 transport jobs. Incremental total direct employment provided by the project relative to the base case in indicated in Figure 6.1.

[9] This is based on advice from Holcim.

[10] This is based on ABS Census of Population and Housing, 4 digit employment by industry (working in Port Stephens LGA) by place of usual residence for the road transport sector.

Figure 6.1 – Direct Employment of the Project Compared to the Base Case



In estimating the effects related to local employment, the LEA method focusses on net income (net wages) that a project provides to the local area. It does this by focusing on the projects employment that would ordinarily be resident in the locality and for these people estimating the net increase in income as the difference between income in the project compared to the average level of net income in the local area (i.e. what they might otherwise receive in an alternative job). The increase in net income is converted to net FTE jobs by dividing this incremental net income by the average net wage in the project. This is a minimum estimate as it assumes full employment in the region and hence the jobs from which people come to fill the projects jobs remain vacant. On this basis, the total net income to the local area and total net jobs provided by the total project are summarised in Table 6.1.

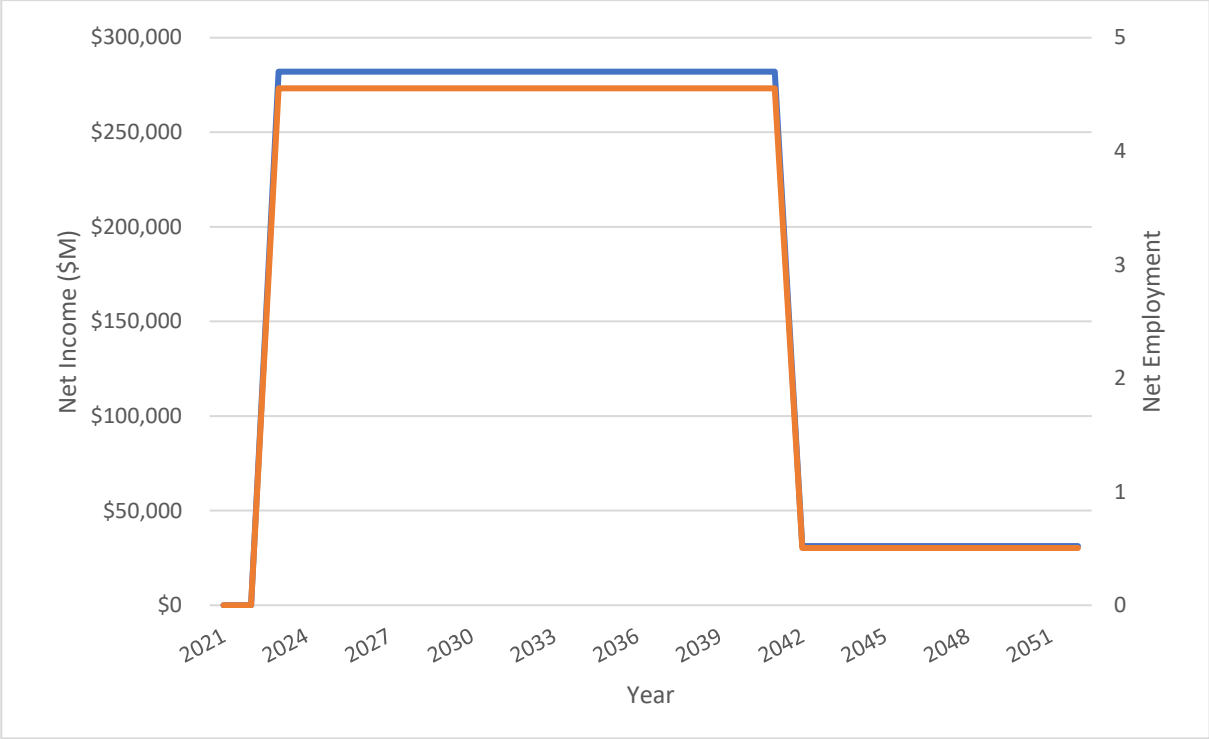
Table 6.1 - Analysis of Total Net Income and Total FTE Job from the Project (2023 to 2031)

Attribute	Quarry	Transport	Total
a) Direct incremental employment	21	52	73
Number that already reside in the region	17	24	41
b) Average net income in mining	$61,933	$61,933	
c) Average net income in other industries*	$45,980	$45,980	
d) Average increase in net income per job (b-c)	$15,953	$15,953	
e) Increase in net income per year due to direct employment	$268,002	$381,584	$649,587
f) FTE (e/b)	4	6	10

*This information is not available from the ABS and hence average income across all sectors is used.

The annual incremental net income to local residents and the incremental net FTE jobs to local residents from the project relative to the base case is represented in Figure 6.2. Incremental net income and incremental net employment to local residents as a result of the project is $282,000 in net income and 5 jobs from 2023 to 2041.

Figure 6.2 – Incremental Net Income and Net FTE Jobs to Local Area Relative to the Base Case



6.3 Direct Effects Related to Non-Labour Expenditure

There is non-labour expenditure in the local area associated with both quarry operations and road transport under the base case and the project. However, not all non-labour expenditure accrues to the local area. The amount accruing the local area is estimated in Table 6.2, based on the relationships in the regional input-output table between imports and intermediate expenditure for relevant sectors (i.e. non-metallic mineral mining sector for the quarry and the road transport sector for ex-quarry road transport. The total annual non-labour expenditure (quarry and ex-quarry transport after subtraction of wages) is $21.0M. Of this total, $10.9M is estimated to accrue to the local area. During the peak period of production i.e. 2023 to 2041.

Table 6.2 – Non-Labour Expenditure in the Local Area During Peak Production

	Total annual non-labour expenditure	**Total annual non-labour expenditure accruing to the region**
Quarry Base Case	$7.5	$3.7
Quarry Project	$19.0	$9.3
Incremental Quarry Non-Labour Expenditure	***$11.5***	***$5.6***
Transport Base Case	$3.6	$2.0
Transport Project	$13.1	$7.3
Incremental Transport Non-Labour Expenditure	***$9.5***	***$5.3***
Total Incremental Non-Labour Expenditure	**$21.0**	**$10.9**

6.4 Second Round and Flow-On Effects

The expenditure by employees who reside in the region, and non-labour expenditure that is captured by the local area, provides flow-on economic activity to the local economy.

Recognised methods for assessing second round and flow-on effects such as input-output analysis (but also computable general equilibrium analysis), do not utilise direct effects of employment and income effects as calculated above in accordance with the Guidelines (NSW Government, 2015). Instead, they use the total employment working in the region, with total wages (rather than net additional wages to existing employed people) divided between those who live in the region and those who reside outside the region. They do utilise estimates of non-labour expenditure, however multiplier effects are not estimate in terms on non-labour expenditure but in terms of how this and labour expenditure contribute to the local area economy in terms of direct and indirect output, value-added, income and employment. This type of assessment is reported in the following section.

6.5 Regional Economic Impact Assessment

6.5.1 Introduction

To undertake a regional economic impact assessment of the project an IO table of the Port Stephens LGA was developed using the Generation of Regional Input-Output Tables (GRIT) procedure developed by the University of Queensland.

6.5.2 Quarry Impacts

For the analysis of the quarry operation, new sectors were inserted into the regional IO table reflecting average base case operations (processing of 180,000tpa) and peak project operations (processing 750,000tpa). The annual revenue, operating costs, and gross profit for the new sectors were obtained from information provided by Holcim. For these new sectors:

- the estimated gross annual revenue from the region was allocated to the *Output* row;
- gross profit was allocated to the *Other Value Added* row;
- the estimated wage bill of employees residing in the region was allocated to the *household wages* row (80% live in the region);
- non-wage expenditure was allocated between *intermediate* sectors in the regional economy and *imports* based on expenditure profile in the *non metallic mineral mining sector*[11] of the regional input-output table; and
- direct employment by the project in the region was allocated to the *employment* row.

The total and disaggregated annual impacts of the quarry and sand processing operation on the regional economy (in 2022 dollars) at two different levels of production i.e. 180,000 tpa and 750,000 tpa are shown in Table 6.3. Incremental impacts are also provided.

In this framework, the quarrying component of the project will provide the following annual direct and indirect annual effects to the local economy of the project:

- $42M in direct and indirect annual business turnover or output;
- $15M in direct and indirect annual value-added;
- $3M in direct and indirect annual gross wages; and
- 72 direct and indirect annual jobs.

[11] This the industry sector that sand quarrying is located.

Table 6.3 – Gross Annual Direct and Indirect Regional Economic Impacts of Quarrying

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
180,000 tpa					
OUTPUT ($M)	11	4	1	5	16
Type 11A Ratio	*1.00*	*0.35*	*0.10*	*0.45*	*1.45*
VALUE ADDED ($M)	3	2	1	2	5
Type 11A Ratio	*1.00*	*0.61*	*0.24*	*0.84*	*1.84*
INCOME ($M)	1	1	0	1	2
Type 11A Ratio	*1.00*	*0.66*	*0.22*	*0.88*	*1.88*
EMPL. (No.)	15	13	5	18	33
Type 11A Ratio	*1.00*	*0.87*	*0.33*	*1.20*	*2.20*
750,000 tpa					
OUTPUT ($M)	26	14	2	16	42
Type 11A Ratio	*1.00*	*0.52*	*0.09*	*0.61*	*1.61*
VALUE ADDED ($M)	8	6	1	7	15
Type 11A Ratio	*1.00*	*0.70*	*0.19*	*0.88*	*1.88*
INCOME ($M)	1	2	0	2	3
Type 11A Ratio	*1.00*	*1.37*	*0.32*	*1.68*	*2.68*
EMPL. (No.)	21	41	10	51	72
Type 11A Ratio	*1.00*	*1.95*	*0.50*	*2.45*	*3.45*
Incremental Impact					
OUTPUT ($M)	15	10	1	11	26
Type 11A Ratio	*1.00*	*0.65*	*0.09*	*0.73*	*1.73*
VALUE ADDED ($M)	5	4	1	5	10
Type 11A Ratio	*1.00*	*0.75*	*0.15*	*0.91*	*1.91*
INCOME ($M)	0	1	0	1	2
Type 11A Ratio	*1.00*	*2.84*	*0.51*	*3.35*	*4.35*
EMPL. (No.)	6	28	6	33	39
Type 11A Ratio	*1.00*	*4.65*	*0.92*	*5.57*	*6.57*

Quarry production at 750,000 tpa relative to 180,000 tpa is estimated to make up to the following incremental contribution to the regional economy:

- $26M in annual direct and indirect regional output or business turnover;
- $10M in annual direct and indirect regional value added;
- $2M in annual direct and indirect household income; and
- 39 direct and indirect annual jobs.

6.5.2 Transportation Impacts

For the analysis of the transportation of quarry products, the revenue accruing to transport operators was estimated based on advice from Holcim. The impact of this level of final demand on the regional economy was then calculated using the *EconImp* program.

The total and disaggregated annual impacts of the transportation of quarry products on the regional economy (in 2022 dollars) at two different levels of production i.e. 180,000 tpa and 750,000 tpa are shown in Table 6.4. Incremental impacts are also provided.

Table 6.4 - Economic Impacts of the Quarry Product Transport on the Regional Economy ($2022)

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
180,000 tpa					
OUTPUT ($M)	6	3	1	4	10
Type 11A Ratio	*1.00*	*0.49*	*0.20*	*0.69*	*1.69*
VALUE ADDED ($M)	2	1	1	2	4
Type 11A Ratio	*1.00*	*0.62*	*0.33*	*0.95*	*1.95*
INCOME ($M)	1	1	0	1	2
Type 11A Ratio	*1.00*	*0.62*	*0.22*	*0.84*	*1.84*
EMPL. (No.)	24	13	5	18	42
Type 11A Ratio	*1.00*	*0.52*	*0.21*	*0.73*	*1.73*
750,000 tpa					
OUTPUT ($M)	18	10	3	13	31
Type 11A Ratio	*1.00*	*0.57*	*0.18*	*0.74*	*1.74*
VALUE ADDED ($M)	5	5	2	7	12
Type 11A Ratio	*1.00*	*1.00*	*0.39*	*1.39*	*2.39*
INCOME ($M)	2	2	1	3	4
Type 11A Ratio	*1.00*	*1.04*	*0.27*	*1.31*	*2.31*
EMPL. (No.)	52	46	14	59	111
Type 11A Ratio	*1.00*	*0.88*	*0.26*	*1.14*	*2.14*
Incremental Impact					
OUTPUT ($M)	12	7	2	9	21
Type 11A Ratio	*1.00*	*0.60*	*0.18*	*0.78*	*1.78*
VALUE ADDED ($M)	3	4	1	5	8
Type 11A Ratio	*1.00*	*1.34*	*0.32*	*1.66*	*2.66*
INCOME ($M)	1	1	1	2	2
Type 11A Ratio	*1.00*	*1.08*	*0.57*	*1.65*	*2.65*
EMPL. (No.)	28	33	9	41	69
Type 11A Ratio	*1.00*	*1.16*	*0.31*	*1.47*	*2.47*

Transportation of quarry product at 750,000 tpa relative to 180,000 tpa is estimated to make up to the following incremental contribution to the regional economy:

- $21M in annual direct and indirect regional output or business turnover;
- $8M in annual direct and indirect regional value added;
- $2M in annual direct and indirect household income; and
- 69 direct and indirect jobs.

6.6 Effects on Other Industries

6.6.1 Regional Economic Impacts of Displaced Agriculture

No agricultural activities will be displaced as a result of the project.

6.6.2 Other Wage Impacts

In the short-run, increased regional demand for labour as a result of the project (relative to the "without project" scenario) could potentially result in some increased pressure on wages in other sectors of the economy. The magnitude and duration of this upward wages pressure would depend on the level of demand for labour, the availability of labour resources in the region and the availability and mobility of labour from outside the region. However, given the scale of the project and the availability of labour inside and outside the region, wage

impacts are likely to be negligible. Where upward pressure on regional wages occurs, it represents an economic transfer between employers and owners of skills and would in turn attract skilled labour to the region leading to future downward pressure on wages.

6.6.3 Housing Impacts

The project is not expected to result in any substantial in-migration of workers and their families and consequently the impact on housing prices in the local region is expected to be negligible.

6.6.4 Demand on Local Infrastructure and Services

Demand for local infrastructure and services arises from the production process as well as demands of the workforce and their families. The project involves an increase in production. However, apart from utilities which are provided on a user pays basis, the main increase in infrastructure and services demand relates to increased use of local roads. However, this impact is compensated for by payments to Port Stephens Council of a road levy payment per tonne of sand transported.

The project will also involve an increase in employment. However, it is envisaged that this will mainly involve employment of existing residents of the region or employment of people who reside outside the region and commute to work. Consequently, not additional consumer demand for local infrastructure and services is envisaged.

6.7 Environmental and Social Impacts on the Local Community (Externalities)

The distribution of costs and benefits of the project are summarised in Table 4.6. After mitigation, offset and compensation measures, no residual material environmental, social, or cultural impacts arise from the project. There will therefore be no material impacts to the local community.

6.8 Summary of Local Effects

A summary of local effects of the project is provided in Table 6.5.

Table 6.5 - Summary of Effects on the Local Community

Total Local Effects (2023-31)	Direct Total	Direct Total - Already Resident in the Local Area	Direct Total Net
Annual Employment FTE	73	41	10
Annual Income ($M)	4.5	2.5	0.6
Annual Non-labour Expenditure in Local Area	16.6		
Incremental Local Effects (2023-31)	**Direct Incremental**	**Direct Incremental – Already Resident in the Local Area**	**Direct Incremental Net**
Annual Employment FTE	34	18	5
Annual Income ($M)	2.1	1.1	0.3
Incremental Annual Non-labour expenditure in the Local Area	10.9		
Incremental Regional Impacts (2023-31)	**Direct**	**Flow-on**	**Total**
Output ($M)	27	20	48
Value-added ($M)	8	9	17
Income ($M)	1	3	4
Employment	34	75	109

Other Local Economic Impacts	
Contraction in other sectors	No material impact*
Displaced activities	No material impact*
Wage rise impacts	No material impact*
Housing impacts	No material impact*
Demand for local infrastructure	Increased local road use but compensated for
Local Environmental Impacts	No material impacts

7 CONCLUSION

A CBA of the project indicated that it would have net production benefits to NSW of $9M (present value at 7% discount rate) comprising $4M in quarry benefits, and $5M in ex quarry transport benefits. [12]

Provided the residual environmental, social, and cultural impacts of the project that accrue to NSW are considered to be valued at less than the level of net production benefits, the project can be considered to provide an improvement in economic efficiency and hence is justified on economic grounds.

The above estimate of the NSW net production benefits of the project includes the costs of implementing a groundwater management strategy, purchasing additional allocations via water access licences (WALs) and biodiversity offsets and payments to Port Stephens Council for local road maintenance. Impacts of the project, which have not already been incorporated into the estimate of net production benefits, relate to greenhouse gas (GHG) emissions (valued at $0.01M), and the opportunity cost of WALs already held by Holcim (valued at $0.1M). Consequently, the project is estimated to have net social benefits to NSW, and hence is desirable and justified from an economic efficiency perspective.

As well as providing net social benefits to NSW, the project will provide direct economic activity, including jobs, to the local area economy, and indirect economic activity to the local area via both wage and non-wage expenditure.

The project will provide a total of 73 direct jobs during peak years of production and processing, comprising 21 quarry jobs, and 52 transport jobs. Relative to the employment under the existing approval this is an additional 6 quarry jobs and 28 transport jobs during peak years of production and processing. Focusing only on those people that already reside in the region and assuming these people would have already been employed at an average regional wage, and that job vacancies created by these people filling the project jobs remain unfilled (as conservatively required by NSW Government 2015), the disposable wages accruing to existing residents of the region would be $0.3M. This is equivalent to 5 **direct** full time equivalent (FTE) jobs.

Standard regional economic impact assessment using IO analysis, is not restricted to a focus on the existing labour force in the local area and does not assume an absence of job chain effects. In this framework, the project is estimated to provide the following annual **direct and indirect** annual effects to the local economy:

- $48M in output;
- $17M in value-added;
- $4M in gross wages; and
- 109 jobs.

The main local environmental impacts are internalised into the production costs of Holcim via mitigation, offset and compensation costs. Residual local environmental impacts after mitigation, offset and compensation are likely to be immaterial.

[12] This estimate of net production benefits of the Project is considered to be conservative. The NSW Government (2015) *Guidelines for economic assessment of mining and coal seam gas proposals*, also allows for potential benefits to suppliers and employment which remain unquantified in this analysis. Also, because of the vertically integrated nature of Holcim there may be additional economic benefits of the Project to Holcim concrete manufacturing and concrete consumers. These potential benefits are outside the scope of this assessment and have not been quantified.

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ATTACHMENT 1 - COST BENEFIT ANALYSIS

Introduction to CBA

Cost Benefit Analysis (CBA) has its theoretical underpinnings in neoclassical welfare economics. Applications in New South Wales (NSW) are guided by these theoretical foundations as well as the NSW Treasury (2017). CBA applications within the NSW environmental assessment framework are further guided by the NSW Government (2015) *Guidelines for the economic assessment of mining and coal seam gas projects* and the *NSW Government (2018) Technical Notes supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals*.

CBA is concerned with a single objective of the *Environmental Planning and Assessment Act, 1979* (EP&A Act) and governments i.e. economic efficiency. It provides a comparison of the present value of aggregate benefits to society, as a result of a project, policy or program, with the present value of the aggregate costs. These costs and benefits are defined and valued based on the microeconomic underpinnings of CBA. In particular, it is the values held by individuals in the society that are relevant, including both financial and non-financial values. Provided the present value of aggregate benefits to society exceed the present value of aggregate costs (i.e. a net present value of greater than zero), the project is considered to improve the well-being of society and hence is desirable from an economic efficiency perspective.

While CBA can provide qualitative and quantitative information on how costs and benefits are distributed, welfare economics and CBA are explicitly neutral on intra and intergenerational distribution of costs and benefits. There is no welfare criterion in economics for determining what constitutes a fair and equitable distribution of costs and benefits. Judgements about equity are subjective and are therefore left to decision-makers.

Similarly, CBA does not address other objectives of the EP&A Act and governments. Decision-makers therefore need to consider the economic efficiency implications of a project, as indicated by CBA, alongside the performance of a project in meeting other conflicting goals and objectives of the EP&A Act and government.

Definition of Society

CBA includes the consideration of costs and benefits to all members of society i.e. consumers, producers and the broader society as represented by the government.

As a tool of investment appraisal for the public sector, CBA can potentially be applied across different definitions of society such as a local area, state, nation or the world. However, most applications of CBA are performed at the national level. This national focus extends the analysis beyond that which is strictly relevant to a NSW government planning authority. However, the interconnected nature of the Australian economy and society creates significant spill-overs between States. These include transfers between States associated with the tax system and the movement of resources over state boundaries.

Nevertheless, "where major impacts spill over national borders, then CBA should be undertaken from the global as well as the national perspective" (Boardman *et al.,* 2001). For mining and extractive industry projects, impacts that spill over national borders include greenhouse gas costs and producer surplus benefits to foreign owners.

CBA at a sub-national perspective is not recommended as it results in a range of costs and benefits from a project being excluded, making CBA a less valuable tool for decision-makers (Boardman *et al*., 2001).

CBAs of mining and extractive industry projects are therefore often undertaken from a global perspective i.e. including all the costs and benefits of a project, no matter who they accrue to, and then truncated to assess whether there are net benefits to Australia. A consideration of the distribution of costs and benefits can then be undertaken to identify the benefits and costs that accrue to NSW and other regions.

However, a project is considered to improve the well-being of society if it results in net benefits to the nation, even if it results in net costs to the local area.

Definition of the Project Scope

The definition of the project for which approval is being sought has important implications for the identification of the costs and benefits of a project. Even when a CBA is undertaken from a global perspective and includes costs and benefits of a project that accrue outside the national border, only the costs and benefits associated with the defined project are relevant. For mining and extractive industry projects, typically only the costs and benefits from mining/extraction and delivering it to Port and or domestic users, are relevant.

The products of mining and extractive industry are intermediate good i.e. it is an input to other production processes. However, these other production processes themselves require approval and, in CBA, would be assessed as separate projects.

Net Production Benefits

CBA of mining/extractive industry proposals invariably involves a trade-off between:

- the net production (producer surplus) benefits of a project; and
- the environmental, social, and cultural impacts (most of which are costs but some of which may be benefits).

Net production benefits can be estimated based on market data on the projected financial[13] value of mining/extractive industry products less the capital and operating costs of projects, including opportunity costs of capital and land already in the ownership of the proponent. This is normally commercial-in-confidence data provided by the proponent. Production costs and benefits over time are discounted to a present value.

Environmental, Social and Cultural Impacts

The consideration of non-market impacts in CBA relies on the assessment of other experts contributing information on the biophysical impacts. The environmental impact assessment process results in detailed (non-monetary) consideration of the environmental, social, and cultural impacts of a project and the proposed means of mitigating the impacts.

At its simplest level, CBA may summarise the consequences of the environmental, social, and cultural impacts of a project (based on the assessments in the relevant assessment document), for people's well-being. These qualitatively described impacts can then be considered alongside the quantified net production benefits, providing important information to the decision-maker about the economic efficiency trade-offs involved with a project.

These environmental, social, and cultural impacts generally fall into three categories, those which:

[13] In limited cases the financial value may not reflect the economic value and therefore it is necessary to determine a shadow price.

- can be readily identified, measured in physical terms and valued in monetary terms;
- can be identified and measured in physical terms but cannot easily be valued in money terms; and
- are known to exist but cannot be precisely identified, measured or value (NSW Treasury, 2007).

Impacts in the first and second category can potentially be valued in monetary terms using benefit transfer or, subject to available resources, primary non-market valuation methods. Benefit transfer involves using information on the physical magnitude of impacts and applying per unit value estimates obtained from non-market valuation studies undertaken in other contexts.

Primary non-market valuation methods include choice modelling and the contingent valuation method where a sample of the community is surveyed to ascertain their willingness to pay to avoid a unit change in the level of a biophysical attribute. Other methods include the property valuation approach where changes in environmental quality may result in changes in property value.

In attempting to value the impacts of a project on the well-being of people there is also the practical principle of materiality. Only those impacts which are likely to have a material bearing on the decision need to be considered in CBA (NSW Government, 2012).

Where benefits and costs cannot be quantified these items should be included in the analysis in a qualitative manner (NSW Treasury, 2007).

Consideration of Net Social Benefits

The consideration of the net social benefits of a project combines the value estimate of net production benefits and the qualitative and quantitative estimates of the environmental, social, and cultural impacts.

In combining these considerations, it should be noted that the estimates of net production benefits of a project generally include accounting for costs aimed at mitigating, offsetting, or compensating for the main environmental, social and cultural impacts. This includes the costs of purchasing properties adversely affected by noise and dust, providing mitigation measures for properties moderately impacted by noise and dust, the costs of providing ecological offsets and the cost of purchasing groundwater and surface water entitlements in the water market etc. Including these costs effectively internalises the respective and otherwise, non-monetary environmental, social, and cultural costs. To avoid double counting of impacts, only residual impacts, after mitigation, offset and compensation, require additional consideration.

Even when no quantitative valuation is undertaken of the environmental, social, and cultural impacts of a project, the threshold value approach can be utilised to inform the decision-maker of the economic efficiency trade-offs. The estimated net production benefits of a project provide the threshold value that the non-quantified environmental, social and cultural impacts of a project (based on the assessments in the relevant assessment document), after mitigation, offset and compensation by the proponent, would need to exceed for them to outweigh the net production benefits.

Where the main environmental, social and cultural impacts of a project are valued in monetary terms, stronger conclusions can be drawn about the economic efficiency of a project i.e. the well-being of society.

Any other residual environmental, cultural, or social costs that remain unquantified in the analysis[14] can also be considered using the threshold value approach. The costs of these unquantified environmental,

[14] Including potential impacts that were unknown at the time of the preparation of the relevant assessment document or arise during the Environmental Impact Assessment process due to differences in technical opinions.

cultural and social impacts would need to be valued by society at greater than the quantified net social benefit of a project to make it questionable from an economic efficiency perspective.

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NSW Treasury (2017) *NSW Government Guide to Cost-Benefit Analysis,* www.treasury.nsw.gov.au.

ATTACHMENT 2 – COMPARISON OF INPUT-OUTPUT ANALYSIS AND THE LOCAL EFFECTS ANALYSIS METHOD

IO analysis begins with identification of the direct gross regional economic activity footprint of a project for the region. If a project provides 100 jobs then all these jobs are counted in IO analysis as a direct effect i.e. direct employment in the region, because the jobs are located in the region. All income paid to employment is also included as it is generated in the economy and IO tables are based on place of work. However, in assessment of the impacts of a project on the regional economy only the income of employees living in the region are counted as direct income effects since it is only wages expenditure of those living in the region that flows through the regional economy. In IO analysis, if 40% of a project's jobs are filled by people who already reside in the region then the **total** wages of these people is counted as a direct regional income effect of the project. Similarly, if 40% of the new jobs are taken by people who migrate into the region this is also counted as direct income for the region, as it is income that will accrue to people living in the region even though they are new residents. In impact assessment using IO analysis, the income of those residing outside the region is excluded as most of their income will be taken home after shift and spent where they live or elsewhere.

These direct employment and income effects for the region are those **associated** with the project i.e. the gross footprint, rather than specifically an assessment of **incremental** effects. This is partly because assessment of incremental effects becomes highly contentious and difficult. However, as will be shown below, these gross direct effects associated with a project can also be a reasonable approximation of incremental effects when "job chain" effects are considered.

However, first is a comparison between how IO analysis treats direct employment and income effects (as explained above) and that in the NSW (2015) guideline.

The guideline splits labour into those ordinarily resident in the region and those not ordinarily resident in the locality. For those ordinarily resident in the region the guideline suggests calculation of incremental income as the difference between the net (after tax) income the person gets from the project and the average level of net income in other industries in the region. Incremental direct employment is then calculated by dividing this incremental net income by the average net wage in the project.

The guideline ignores workers who migrate into the region to work. However, using the rationale of the guideline, workers who migrate into the region to take jobs in a project provide a greater level of incremental income and spending in the region than those who take jobs in a project and who already reside in the region. The entire wage of those migrating into the region is additive to regional income in comparison to wage increments for those already residing in the region.

Table 1 provides an example of incremental wages using the guideline method and when income from those migrating into the region is counted. If only the incremental wages of those who already reside in the region are counted the incremental impact is $1.4M in annual wages. However, if the incremental wages to the region from those who migrate into the region are included, this increases to $5.4M.

Table 1 - Incremental Income when Immigrating Workforce is Included

Categories of Workers	Direct Empl	Current Wages @$65k	New Wages @$100k	Incremental New Wages for Workers	Incremental New Wages to the Region
Already Live in Region	40	2,600,000	4,000,000	1,400,000	1,400,000
Migrate into Region to Live	40	2,600,000	4,000,000	1,400,000	4,000,000
Commute from outside	20	1,300,000	2,000,000	700,000	0
Total Direct Empl	**100**	**6,500,000**	**10,000,000**	**3,500,000**	**5,400,000**

Even for those already living in the region who are already employed, the incremental income estimated using the guideline will substantially understate additional regional income effects. This is because new jobs in a region create a chain of job opportunities (referred to in the literature as the "job chain" - see Persky et al, 2004 What are jobs worth?, Employment Research Vol. 11 , p. 3).

An already employed person in the region moving into a project job, creates a job vacancy, which can be filled by those in the region (already employed, unemployed or attracted into the labour force) or by in-migration. Where this job is filled by those already employed in the region this in turn creates another vacancy etc. Following the entire chain through, the cumulative increase in wages to a region would approach the wages of the total direct project jobs. It would only be discounted if the chain ends with employment of those from local residents in the unemployment pool (who are receiving an allowance and hence already are spending income in the region), if jobs remain unfilled or if jobs are filled by a commuter workforce. The latter is less likely for lower paying jobs down the job chain. In periods of higher unemployment rates, jobs along the job chain remaining unfilled is unlikely. If the chain ends with in-migrating employment or employment of those in the region that are new to the workforce then the incremental wages is equal to the total wages of the new jobs.

Table 2 demonstrates the "job chain" effect in relation to 40 new project jobs filled by already employed local workers. It shows that the total annual wages of the new project jobs is $4M. Under the job chain approach where all jobs are backfilled including ultimately by 40 local residents from the unemployment pool the incremental wages to the region are $3.5M. If some of these jobs filled from the unemployment pool are ultimately filled by in-migration the difference between the incremental wages to the region and the total annual mining jobs wages will lessen.

The guideline does not take account of the "job chain" effect and essentially assumes that the previous jobs of "job movers" in the region remain vacant for the life of the project.

Incorporation of consideration of the "job chain" effect means that the direct incremental income to a region approximates that assumed in IO analysis (i.e. the gross footprint of economic activity estimated using IO analysis is also an indicator of the net effect).

Table 2 - Demonstration of the Job Chain Effect for 40 Jobs Filled by Locals Who are Already Employed in the Region

	Total wages	Increment Wages Gain to Region
1. New project wage for 40 workers @$100k	$4,000,000	$1,400,000 (1-2)
2. Current Wages for 40 workers @$65k	$2,600,000	$1,000,000 (2-3)
3. Wage of people filling above 40 positions @$40k	$1,600,000	$800,000 (3-4)
4. Wage of people filling above 40 positions @$20k	$800,000	$ 255,664 (4-5)
5. Wages of the unemployed filling above 40 positions (Newstart - single no children)	$544,336	
Total		**$3,455,664**