Centennial Coal

MANDALONG SOUTHERN EXTENSION PROJECT

ECONOMIC IMPACT ASSESSMENT

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Prepared by

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EXECUTIVE SUMMARY

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- This Economic Impact Assessment has been prepared as part of the Environmental Impact Statement (EIS) in relation to an application (Application No. SSD 5144) by Centennial Mandalong Pty Ltd (Centennial Mandalong) for development consent in relation to the extension of Mandalong Mine (*Mandalong Southern Extension Project*). The Project is classified as state significant development pursuant to *State Environmental Planning Policy (State and Regional Development) 2011*. As such, development consent is sought pursuant to Part 4, Division 4.1 of the NSW *Environmental Planning & Assessment Act 1979* (EP&A Act). The planning 'window' used in this assessment is based on Centennial's projections for the period December 2014 to December 2037.
- During the construction phase, an average workforce of 35 persons will be directly engaged on the Project for construction activities.
- The proposed mine plan has been developed to maximise resource recovery while minimising the potential for impacts on land in the area, with particular regard to subsidence impacts. Centennial Mandalong has foregone more profitable mine planning options with the aim of ensuring that impacts are minimised and able to be managed to an acceptable level. Surface impacts are predicted to be similar to those currently being experienced by the community and the environment as a result of the existing Mandalong Mine workings.
- The net economic benefit of the Project for the State and regional communities is positive, at a net present value (NPV) of $665 million over the Project forecast period to 2037. The benefit-cost ratio (BCR) for the Project is also positive (Section 3.3:1).
- Under alternative sensitivity testing scenarios based on changes to assumptions on discount rates and Project and operational costs (Section 3.4), the economics of the Project remain robust.
- The Project will sustain the workforce at Mandalong Mine at 420 employees. These positions are chiefly occupied by workers resident in the local region. The resultant incomes and expenditure associated with these employees'

households will contribute to the local economy through consumption and other economic activity.

- Continuing payment of royalties and corporate and income taxes for state and federal governments will also have a positive social impact over the duration of the Project.
- There are a range of external costs and benefits associated with both the construction and operations phases of the Project. There are also some cumulative impacts associated with mining and other industrial activity in the area to the west of Lake Macquarie, in which Mandalong Mine is located. Quantitative assessment of these impacts indicates that the positive aspects of the Project are greater than are the quantified assessments of the potential negative externalities.

- With respect to the external impacts, Centennial Mandalong and its advisers are engaged in a continuous process of stakeholder consultation and development of mitigation programs that will ameliorate impacts to the greatest practical extent. In particular, Centennial Mandalong proposes an agreement to undertake a detailed mine closure and rehabilitation assessment commencing five years from the end of the projected mine life. The aim of this process will be to develop the necessary actions in the context of the greater knowledge of the rehabilitation task that will be available at that time.

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ABBREVIATIONS

ABS:	Australian Bureau of Statistics
BAU:	Business as Usual
BCA:	Benefit-Cost Analysis
BCR:	Benefit-Cost Ratio
CO_2-e:	Carbon dioxide equivalent
DA:	Development Application
DGRs:	Director General's Requirements
DTIRIS:	Department Trade, Investment, Regional Infrastructure & Services
EIS:	Environmental Impact Statement
EMS:	Environmental Management System
EPA:	Environment Protection Authority
EVRI:	Environmental Valuation Reference Inventory
GDE:	Groundwater Dependent Ecosystem
GHG:	Greenhouse Gas/es
GVA:	Gross Value Added
HWC:	Hunter Water Corporation
I/O:	Input/Output
LMCC:	Lake Macquarie City Council
LGA:	Local Government Area
MCDA:	Multiple Criteria Decision Analysis
MMAS:	Mandalong Mine Access Site (existing)
MSSS:	Mandalong South Surface Site (proposed)
Mtpa:	Million tonnes per annum
NPV:	Net Present Value
RDACC:	Regional Development Australia Central Coast
ROM:	Run of Mine ('raw' coal)
SLA:	Statistical Local Area
SSD:	State Significant Development
SSR:	Safe, serviceable and repairable
tpa:	Tonnes per Annum
VAM-RAB:	Ventilation Air Methane – Regenerative Afterburner
WDV:	Written down value
WSC:	Wyong Shire Council

1. ECONOMIC ANALYSIS AND IMPACT ASSESSMENT: PURPOSE AND APPROACH

Centennial Mandalong Pty Ltd (Centennial Mandalong) currently operates the Mandalong Mine, situated in the Mandalong Valley, NSW. The mine is an underground longwall and continuous miner operation. The recoverable resource within the current mining lease areas is expected to be exhausted by 2018. In 2005 Centennial Mandalong obtained Exploration Licence 6317 (EL6317) over an area referred to as the Mandalong Southern Extension Area. The exploration area consists of approximately 4,500 hectares situated immediately to the south of the existing mine area.

The Mandalong Southern Extension Project (the Project) proposes to extend Mandalong Mine's existing underground mining operations into the area covered by EL6317, in order to access, develop and extract the additional coal reserves identified within the West Wallarah Seam and the Wallarah-Great Northern Seam. The resource will be mined at a rate of up to six million tonnes per annum (Mtpa) of run-of-mine (ROM) coal, over a proposed extended mine life of 25 years. The Project also proposes use of existing and proposed new surface infrastructure for coal delivery, handling and transport.

The extension of the mining into EL6317 will require the construction of additional infrastructure (described in Section 2.2) to facilitate operational efficiency. The economic impact assessment presented in this report relates to the new operational and infrastructure components of the Project. It is noted that the Project plan also includes the integration of the extended mining operations with existing mining, transport and logistics infrastructure, in order to maximise use of this infrastructure and promote operational efficiency. In keeping with this operational approach, consent to consolidate all existing approvals in relation to mining and logistics operations at Mandalong Mine with the approval for extension of mining subject of this application is sought.

The *Environmental Planning and Assessment Act 1979 (*EP&A Act) is the principal piece of legislation governing the assessment and determination of development proposals of this nature in NSW. It aims to encourage the proper management, development and conservation of resources, environmental protection and ecologically sustainable development. Mandalong Mine currently operates under

Development Application DA 97/800. The Project is classified as state significant development pursuant to the *State Environmental Planning Policy (State and Regional Development) 2011*. As such, development consent is sought pursuant to Part 4, Division 4.1 of the EP&A Act.

In relation to the development application, presentation of an economic assessment is a provision under Schedule 2 (7) of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation), associated with the EP&A Act, which requires, in particular:

(1)(c) an analysis of any feasible alternatives to the carrying out of the development, activity or infrastructure, having regard to its objectives, including the consequences of not carrying out the development, activity or infrastructure.

(1)(f) the reasons justifying the carrying out of the development, activity or infrastructure in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development set out in subclause (4).

In March 2012, the Director General for the Department of Planning and Infrastructure issued Environmental Assessment Requirements for the Project. Table 1 below details those requirements relevant to this assessment and where they have been addressed in this document.

Table 1 - Mandalong Southern Extension Project – Director- General's Requirements

Requirements	Addressed in this Report
Potential direct and indirect economic benefits of the Project for local and regional communities and the State.	Section 3/4
A detailed description of the measures that would be implemented to minimise the adverse social and economic impacts of the Project including any infrastructure improvements or contributions and/or voluntary planning agreement or similar mechanism.	Section 4/Table 10
A detailed assessment of the costs and benefits of the development as a whole, and whether it would result in a net benefit for the NSW community.	Sections 3-5

This assessment addresses relevant economic impacts of the Project as provided for in these requirements. The approach to this assessment is to estimate the direct economic benefits and costs of the Project. The extended regional economic benefits and costs of the Project are also considered.

In addition to the assessment of beneficial economic outcomes, the benefit or cost to the community of other aspects of the Project, such as social and environmental outcomes, are quantified where practicable. This element of the approach is consistent with the requirements of subclause 7(4) (d), Schedule 2 of the EP&A Regulation.

2. PROJECT BACKGROUND AND JUSTIFICATION

2.1 Mine production data

Underground longwall and continuous mining operations commenced at Mandalong Mine in January 2005. As is noted in Section 1, the proposed extension of mining into the Southern Extension Area (EL6317) will permit continued and similar levels of coal production from the West Wallarah and Wallarah – Great Northern Seams upon exhaustion of the resources currently being mined under DA 97/800. Current mine planning aims to commence longwall production from the Southern Extension Area in 2018.

Current and planned coal production from the Mandalong Mine is sold and delivered to the Vales Point Power Station (Delta Electricity) and Eraring Power Station (Eraring Energy), with the remainder sold into export markets. This export coal will be railed from the Newstan Colliery Surface Site to either the Port of Newcastle or Port Kembla for shipping.

The Mandalong Southern Extension Project, in conjunction with Centennial's Newstan Extension of Mining Project and Northern Coal Logistics Project, stems from the long-term strategy Centennial has developed for its future operations in the Newcastle Coalfield to provide the infrastructure and flexibility required to meet future opportunities in both the domestic and export coal markets.

2.2 Description of proposed Project

The objectives of the Project include:

- Develop the ongoing underground mine operations with a focus on maximising resource recovery and maintaining continuity of coal production beyond the currently projected life of the mine;
- Maximise the use of existing underground and surface infrastructure and equipment;
- Secure increased employment and socio-economic flow-on benefits; and
- Continue to conduct mining at Mandalong Mine in an environmentally responsible manner to ensure the potential for impact is minimised.

The primary components of the Project are to:

- Continue the Mandalong Mine underground mining operations into the area covered by EL6317 using a combination of continuous miner and longwall mining methods;
- Extract up to six (6) Mtpa of ROM coal from the West Wallarah and Wallarah-Great Northern Seams within the current mining lease areas and the area covered by EL6317;
- Deliver ROM coal from the underground workings to the Cooranbong Entry Site at a rate of up to six Mtpa and to the Delta Entry Site at a rate of up to six Mtpa;
- Continue to utilise the existing surface infrastructure of the Mandalong Mine Access Site (MMAS) and Delta Entry Site;
- Install and operate additional surface infrastructure (Mandalong South Surface Site) for mine ventilation, storage and underground delivery of stone dust, concrete and ballast, hydrocarbon storage, electrical reticulation, water reticulation, water management, communications and other ancillary services and activities;
- Increase manning up to 420 full-time employees and up to 50 contractors during longwall relocations;
- Undertake ongoing exploration drilling activities within the bounds of Centennial Mandalong's mining leases and exploration licences;
- Increase the life of the mine to 25 years from the granting of a mining lease(s) over EL6317; and
- Continue to operate 24 hours per day, seven days per week.

3. PROJECT ECONOMIC ANALYSIS

3.1 Focus of analysis

The critical focus of these analyses is on the economic impacts of the project for the State and parts of the Lake Macquarie and Wyong Local Government Area (LGA) communities. As may be expected, Centennial Mandalong has carried out a comprehensive internal financial appraisal of the Project. The financial appraisal process and its outputs are highly commercially sensitive. As such this material is unsuitable for presentation in a document which is intended for public exhibition and is excluded from this Economic Assessment on that basis. The economic aspects assessed in this report are those that allow the community to consider the project in the context of socioeconomic and environmental factors that are relevant to them.

Initially, there will be effects resulting from direct and derived economic activity associated with the development of Mandalong South Services Site. This program of works is planned to extend over the period 2016 to 2018. The principal economic impact of this element of the Project relates to providing employment of relevant contractors.

There will also be ongoing direct economic effects associated with continued operation of Mandalong Mine. Prominent among these effects is the impact of additional consumption activity induced by the incomes of new employees, and commercial transactions between the mine and suppliers and other businesses. The economic stimulus provided by these activities also results in the flow of further activity in the regional, state and national economies, as the goods and services required to support mining activity are produced and supplied. A further major economic outcome is the flow of royalties and various taxes into relevant government incomes, and their subsequent application to provision of public goods and services.

Centennial Mandalong has conducted internal analyses in order to determine the financial and economic feasibility of several project options, particularly different mine plan options. The proposed Project represents the best of the alternatives considered from the perspective of economic efficiency and commercially and environmentally sustainable operations.

The economic analysis presented in this assessment provides an overview of the conclusions of the comparative approach adopted by Centennial Mandalong in

respect of the most feasible Project options. The analysis requires certain assumptions to be made in relation to the expected outcomes of the Project, which are detailed in the appropriate sections of this report.

It should be noted that in developing the economic assessment of the Project, certain information has been used which Centennial Mandalong considers to be commercially sensitive. Centennial Mandalong is in a position to provide this information on a confidential basis, as is provided for in the Planning NSW draft guidelines (2002) should this be required. Accordingly, this Economic Assessment presents the costs and benefits to the State and regional communities, with corporate financial outcomes excluded.

3.2 Analysis of project alternatives

Numerous mine plan options and variations were considered for extraction of the coal resource present within EL6317. The proposed mine plan was developed and selected as the optimal option in view of the following constraints:

- The structural geology of the West Wallarah and Wallarah – Great Northern Seams identified during the exploration drilling program;
- Alluvial and subsurface groundwater sources;
- The Wyong Shire Council's Buttonderry Waste Management Facility;
- The existing surface environment, including creeks, ecology and Aboriginal heritage items;
- The location of privately owned residences;
- The alignment of major service infrastructure, including TransGrid's 330kV power lines; and
- Mining efficiency, operational and economic considerations.

As a result of Centennial Mandalong's assessment of the various mine plan options, two alternatives were subjected to detailed financial analysis. The options are essentially two different methods of longwall extraction for the preferred mine plan. Briefly, these are;

  - 300 metre longwall widths; and alternatively,
  - A combination of 200 metre, 180 metre and 160 metre longwall widths, determined on the following bases:

- 200m wide longwalls – located where there are minimal dwellings, creeks and heritage items (i.e. south-western and north-eastern domains)
- 180m wide longwalls – located in the north-west to minimise the connection between the mine and the alluvial groundwater aquifer associated with Moran's Creek;
- 160m wide longwalls – located in the east where dwellings are concentrated along Wyee Creek and Mannering Creek.

In assessing the mine plan with 300 metre longwall widths, it was identified that this would require fewer development roadways. This maximises resource recovery and provides a better financial result for Centennial Mandalong. However, initial subsidence assessments showed that with this layout:

- A large number of dwellings and associated building structures would exceed safe, serviceable and repairable (SSR) criteria stipulated by the Mine Subsidence Board;
- Watercourses traversing the Southern Extension Area would see moderate levels of erosion and increased ponding. It was deemed likely that Groundwater Dependent Ecosystems (GDEs) would be impacted;
- In shallower depths of cover there would be connective cracking between the mine workings and the alluvial groundwater aquifers;
- Tilts and strains above SSR for houses would also cause moderate levels of damage to the heritage items located within the Southern Extension Area.

This material demonstrates that the impacts of the mine plan with 300 metre longwall widths, do not meet the aim of continuing to conduct mining at Mandalong in the most environmentally responsible manner possible in the context of continued operation of the mine.

3.3 Project-related economic evaluation

The benefit – cost analysis (BCA) data presented in this section are net present values (NPV), at an assumed discount rate of 7 per cent, except as otherwise noted[1].

3.3.1 Estimation of economic benefit

The key economic benefits that accrue to the local and State communities, as distinct from the proponent corporation, are:

- Salaries and wages paid to contract workers in the construction phase of the Project. These incomes then support additional activity in other sectors of the economy;
- Salaries and wages paid to full time employees at Mandalong Mine, with similar flow-on effects to those noted above;
- Royalties on product coal which are remitted to the State. These are then redistributed across the State community in the form of publicly-provided goods and services;
- A range of federally-levied taxes, a proportion of which is similarly redistributed across the State community. These taxes include provision for the carbon tax. As liability for the Mineral Resources Rent Tax (MRRT) is contingent on market demand, the prospect of incurring the tax is acknowledged, but no reliable quantified estimate can be made;
- Various State (e.g. payroll tax) and Local Government (e.g. council rates) taxes, rates and charges.

The construction of the MSSS will support an average of 35 contract employees over the period. Extended mining operations resulting from the Project ensure the continued employment of the current 420 persons employed at the mine. These effects are the source of significant direct and derived economic benefits and also have positive social and welfare benefits for the local communities in which these employees reside and spend much of their incomes.

In addition to these household income-related benefits, the royalties and taxes generated are also a source of benefit. Table 1 shows the valuation of these benefits, and the bases of the valuation for each.

[1] The economic appraisal principles employed herein are consistent with relevant parts of NSW Treasury/Planning NSW Cost Benefit Analysis for mining and coal seam gas proposals (2012) and NSW Treasury TPP07-6 Economic Appraisal Principles and Procedures Simplified.

Table 2: Estimate of economic benefit – Mandalong Southern Extension Project

Economic Benefit	Estimation assumptions	Estimate
Construction-phase contractor incomes	Average 35 contract personnel @ ≈ $65K.	Assessed NPV ≈ $5 million
Mine operation-stage additional/sustained employment	Direct operations employment sustained: 420 FTE positions. Contractors (longwall moves etc.) 12 FTE positions[2].	Assessed NPV ≈$442 million. Assessed NPV ≈$75 million.
Coal royalties (State Government)	Based on assessed output over 25 year mine life, and royalty rate of 7.1%[3]	Assessed NPV ≈ $229 million
Other State taxes/Local Government rates & charges	E.g. Payroll tax; council rates	Assessed NPV ≈ $62 million
Federal taxes (e.g. Corporate income taxes, MRRT)	Based on assessed corporate income & corporate tax rates	Return to NSW at 30.1%, assessed NPV ≈$ 136 million[4]
Carbon tax (Federal Government)[5]	Estimate of net carbon costs including offsets and trading for life of mine	Return to NSW at 30.1%, assessed NPV ≈ $9 million
Total economic benefit		**≈ $958 million**

3.3.2 Estimation of economic costs

The Director General's Requirements (DGRs) issued by the DP&I for the Project identifies key issues that the EIS prepared for the Project must address. These relate to:

- Subsidence;
- Land resources;
- Water resources;
- Biodiversity;
- Heritage;
- Air quality;
- Greenhouse gases (GHG);

[2] Estimated as: two to three longwall moves p.a. (average 2.5) with an average 50 contractors per move. Therefore: (number moves [assumed as 2.5] x 5 weeks)/52 weeks x 50 contractors ≈ 12 FTE.
[3] Deep underground coal (+400m) 6.2 per cent; **other underground coal 7.2 per cent**, open cut coal 8.2 per cent. The variance from these standards relates to the mining of coal at various seam depths.
[4] Commonwealth of Australia (2012): Budget 2012-13 Budget Paper No 3, Part 3, General Revenue Assistance. Table 3.2 General revenue assistance by State.
<http://www.budget.gov.au/2012-13/content/bp3/html/bp3_04_part_3.htm >
[5] Carbon tax is separated from other Federal taxes, as it is also adopted as a measure of impact with respect to Greenhouse Gas (GHG) emissions.

- Noise;
- Traffic and transport;
- Visual;
- Waste;
- Hazards;
- Social and economic; and
- Rehabilitation.

Each of these matters is addressed within the EIS prepared for the Project, and the majority are the subject of specialist assessment reports appended to the EIS. A qualitative and quantitative analysis of these aspects of the Project is included in Table 9. The table also details mitigation strategies proposed by Centennial Mandalong for addressing these impacts.

In order to estimate the net cost or benefit of the project, it is necessary to provide a monetised estimate of these impacts, based on specialist assessments of their magnitude, and relevant valuation methodologies, which are displayed in Table 3.

In relation to these valuations, two key points must be observed:

- Where possible, valuation methodologies are derived from studies accessed through relevant government bodies. This may be considered as placing some greater level of reliability on these studies;
- The identified valuation methodologies have been selected to as closely represent similar existing conditions *for this Project* as was achievable. However, in some instances the valuation methodologies are either more general, or related to projects of a different nature that retain some level of comparability. In this regard, it is important to emphasise that the present Project relates to the development of industrial infrastructure on a site, and in a geographic area that already features some existing, similar infrastructure and activity. This fact of itself may be considered as a significant mitigating factor in terms of valuing the extent of impacts on social amenity in this area.

Table 3: Valuation methods – socio-economic and biophysical impacts

Description	Methodology/Source of Valuation mechanism	Valuation measure/unit[6]	Comment on application
Land resources	Streever WJ, Callaghan-Perry M, Searles A, Stevens T & Svoboda P (1998): "Public Attitudes and Values for Wetland Conservation in New South Wales, Australia" – simulated market price/WTP EVRI reference number 02309-0732	$153/household per annum	Applied to assessments for subsidence, soil and water impacts. Census 2011 data enumerates the number of households in Lake Macquarie (West) SLA, Dooralong and Jilliby as 20,346.
Water resources	Not separately estimated	Not separately estimated	Refer to 'Land Resources'
Biodiversity	Land & Water Australia (2005): *Making Economic Valuation Work for Diversity Conservation:* Australian Government Department of Environment & Heritage: - simulated market price/ WTP	$149/household per annum (preservation of 700 species –flora & fauna - VIC)	Implied cost of $0.21 per species. Applied to species (total 45 species/ecological communities) identified on Project site that may be affected, total $9.45 per household p.a. 20,346 households (refer to commentary in 'land resources' estimation methodology).
Heritage	Allen Consulting Group (2005): "Valuing the Priceless: The Value of Heritage Protection in Australia" – choice modelling/WTP	$7.00 per capita p.a. for each 1,000 places protected	Assumes Census 2011 population count (Lake Macquarie West, Dooralong and Jilliby [54,551]), 113 identified Aboriginal and six [6] European heritage sites (total 119 'places'). Implied cost $0.12 per capita per annum
Air quality	DEC NSW (2005): "Health Costs of Air Pollution in the Greater Sydney Metropolitan Region" - cost of injury/replacement; WTP EVRI reference number: 07200-41439	$243 - $1,131 per capita per annum (upper bound assumed for estimation)	260 identified residential properties, assumed population of 754 individual residents[7] 80 industrial receivers (mainly small enterprises, assume 5 persons for each[8]), 400 receivers. Assumes 2.9 persons per household (Mandalong State Suburb – ABS 2011 Census).

[6] All values adjusted by three percent per annum to allow for inflation.
[7] ABS 2011 Census data: Persons per household for Mandalong State Suburb: 2.9 persons/household.
[8] This estimate also accounts for visitors to these businesses, in the context that no persons are present at the relevant business sites for the majority of each day.

Description	Methodology/Source of Valuation mechanism	Valuation measure/unit[9]	Comment on application
Greenhouse gases (GHG)	Australian Government, Clean Energy Future http://www.cleanenergyfuture.gov.au/clean-energy-future/carbon-price/	Assumed at nominal $17/tonne (Centennial 2017 price estimate allowing for trading & offsets)	Centennial Coal estimation methodology applied to determine 2017 price. Estimate is indicative only, as carbon price liability can be offset through purchase of credits post-2015.
Noise	Day B, Bateman I & Lake I (2010): "Estimating the Demand for Peace and Quiet Using Property Market Data" - Hedonic pricing (impact on dwelling values) EVRI reference number: 06153-105312	$77 - $202/dB per annum (upper bound assumed for estimation)	Based on perceived changes in property valuations. Application contingent on number of affected properties and estimated exceedances of standards.
Visual	Curtis I.A. (2004): "Valuing Ecosystem Goods and Services: A New Approach Using a Surrogate Market and the Combination of Multiple Criteria Analysis and a Delphi Panel to Assign Weights to Attributes – actual market pricing. EVRI reference number: 0663 - 1365	$1,044 - $1,331/Ha per annum (upper bound assumed for estimation)	Estimate of aesthetic impact on residential receptors of new surface infrastructure. Valuation based on MSSS and associated access roadworks. 20Ha area to be impacted. Other works to be conducted in existing Mandalong Mine operations envelope.
Waste/ Hazards	Not assessed	Not assessed	No current or future impact on external parties.

[9] All values adjusted by three percent per annum to allow for inflation.

3.3.3 Physical area applied for estimation of impacts

Although the principal 'community' to be considered in the estimation of impacts is nominally the population of NSW as a whole, it is evident that some impacts will be concentrated on communities in relatively close proximity to the proposed Project.

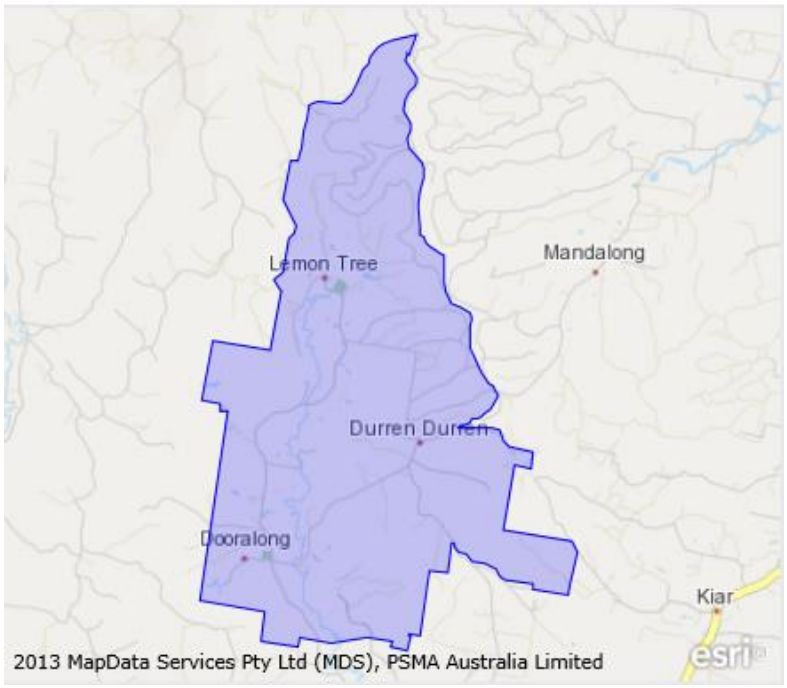
The residential areas (and thus the population) of the Lake Macquarie LGA are distributed around Lake Macquarie itself. The lake has an area of approximately 110 km² and a foreshore of approximately 170 km. As a result, the Lake Macquarie (West) Statistical Local Area (SLA), Code 110054655, is adopted for estimation of most impacts, along with the adjacent Wyong LGA State Suburbs (SSC) of Dooralong (Code 10723) and Jilliby (Code 11183). The remainder of the Lake Macquarie and Wyong LGA communities are significantly physically removed from the location and impacts of Mandalong Mine. The SLA is illustrated in Figure 1.The Dooralong and Jilliby State Suburbs are illustrated in Figures 2 and 3 respectively. These two suburbs are directly adjacent to the SLA.

Figure 1: Lake Macquarie (West) Statistical Local Area

Source: Australian Bureau of Statistics[10]

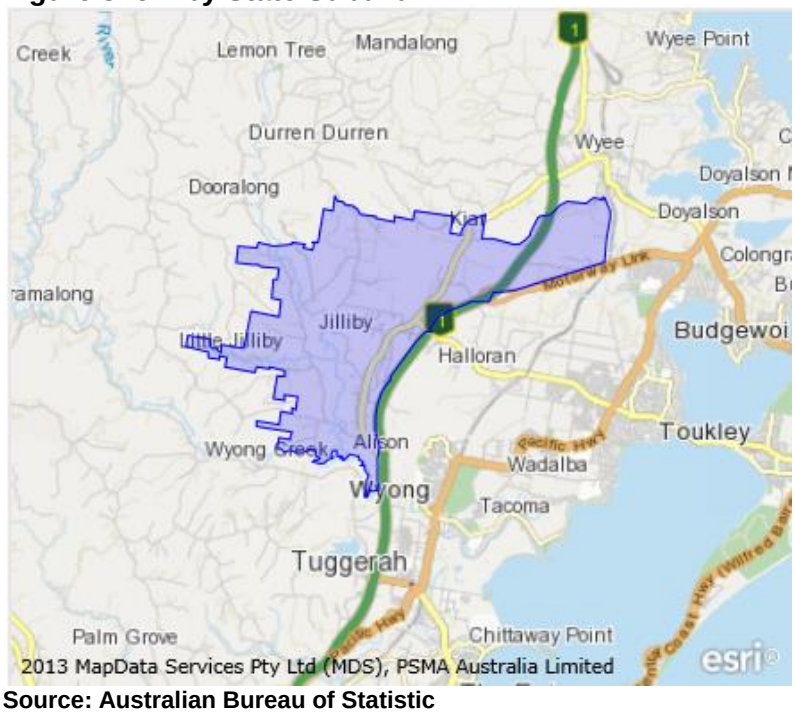
[10] http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/communityprofile/110054655?opendocument&navpos=230

Figure 2: Dooralong State Suburb



Source: Australian Bureau of Statistics

Figure 3: Jilliby State Suburb



Source: Australian Bureau of Statistic

Table 4: Estimate of economic costs of Mandalong Mine Southern Extension Project

Economic cost	Estimation assumptions	Estimate of cost
Noise		Assessed NPV ≈ $638K
Subsidence, soil & water		Assessed NPV ≈ $30 million
Air		Assessed NPV ≈ $11 million
GHG emissions		Assessed NPV ≈ $249 million
Heritage		Assessed NPV ≈ $63K
Biodiversity		Assessed NPV ≈ $1.8 million
Visual amenity		Assessed NPV ≈ $202K
Economic cost		**≈ $293 million**

3.3.4 Estimation of net economic cost/benefit

Table 5 displays the measures of net economic benefit of the Project for the State and regional communities, based on the benefit and cost assessments detailed in Tables 2 and 4.

Table 5: Estimate of Project net benefit

Economic benefit (PV)	**$958 million**
Economic cost (PV)	**$293 million**
Net Present Value (NPV)	**$665 million**
Benefit-Cost Ratio (BCR)	**3.3**

The anticipated outcome of the project in terms of its net economic impacts on the State and regional communities is approximately $665 million dollars. It is noted that this estimate excludes corporate profits accruing to Centennial Coal. As the corporation is foreign-owned, these profits are expatriated and do not further impact Australian and State economies. A further consequence of this foreign ownership is that the capital and operational investment in the Mandalong Southern Extension Project represents new investment into the Australian economy, rather than an allocation of resources that might otherwise be applied to other projects in Australia, as may be the case with domestic investment.

3.4 Sensitivity analyses – alternative Project options

The alternative option based on 300 metre-wide longwalls would result in a superior financial outcome for Centennial than is achievable for the proposed Project. However, Centennial Mandalong's risk assessment of this approach identified that it may ultimately result in additional externality costs associated with subsidence. In

order to ensure that subsidence-related effects are minimised, Mandalong Mine is proposing the less profitable mine layout. The differential may be considered as economic value foregone by Centennial Mandalong in order to achieve a more environmentally sustainable outcome.

In addition to the alternative mine layouts considered, it is necessary to also consider a further possible outcome, which may be described as the business-as-usual (BAU) case. Under this scenario, expiration of the present development consent and mining leases would result in cessation of mining and closure of the Mandalong Mine (current mining consent expires in October 2019). Consequently, all economic and associated social benefits would cease to be realised beyond this time, with the exception of that associated with a relatively brief period of decommissioning and rehabilitation activity.

Table 6 provides a comparison of the three options. The BAU assessment relates to the period prior to exhaustion of resources within the current mining lease. The two options for the Southern Extension include only preliminary capital works prior to 2018, and subsequently assume full production from that point forward.

Table 6: Sensitivity analysis – Project options - adjusted discount rates (NPV)

Project option component	Discount Rate 4% $M	Discount Rate 7% $M	Discount Rate 10% $M
Option 1 (varied longwalls) total environmental impact cost	455	**293**	194
Option 1 (varied longwalls) total State and community benefit	1,390	**958**	681
Option 1 (varied longwalls) NPV	935	**665**	487
Option 2 (300m longwalls) total environmental impact cost	455	293	194
Option 2 (300m longwalls) total State and community benefit	1,444	969	743
Option 2 (300m longwalls) NPV	989	676	549
Option 3 (BAU) total environmental impact cost[11]	39	34	24
Option 3 (BAU) total State and community benefit	386	349	318
Option 3 (BAU) NPV	347	315	294

As the change in discount rates is proportional for each alternative case, the NPV of the proposed Project and that for the 300m-wide longwall option are superior to the BAU case in each instance. There may be any number of possible scenarios that vary from the forecast relativities between revenues and costs. The manipulation of the discount rate provides some indication of the range covered by such possible variances and the associated project risk.

A further means of testing the strength of the economic case for the proposal is to adjust certain economic performance assumptions. In framing these test criteria, it is considered that capital and operating cost assumptions will behave in a relatively predictable manner, in the context of an assumption for inflation over time. Conversely, the most likely source of variation relates to export prices for coal, which are comparatively volatile. Table 6 displays the output of this analysis, based on price assumptions derived from market data and price adjustments at ten and twenty per cent higher and lower. As is the case with the proceeding analysis, changes in

[11] Assumes baseline costs in proportion to incremental costs of project

revenue associated with price variances are reflected as changes in tax and royalty benefit to NSW.

Table 7: Sensitivity analysis - project options- adjusted price assumptions - (NPV)[12]

Evaluation Element	Option 1 (varied longwalls) $M	Option 2 (300m longwalls) $M	Option 3 (BAU) $M
Base case[13]	665	676	315
Revenue ∆ 10%	679	693	321
Revenue ∆ 20%	692	708	326
Revenue -10%	653	665	311
Revenue -20%	642	654	308

Separate analyses adopting adjustments to discount rates and operating outcomes assumptions demonstrate the positive economic outcomes for the Project. The Project outcomes are significantly greater than for the BAU case, and are likely to be positive in most foreseeable eventualities.

3.5 Direct employment impacts of Mandalong Southern Extension Project

With respect to the employment impacts of the Project, the total number of employees and contractors employed at Mandalong Mine will be maintained at 420 personnel. Centennial Coal reports that at present, 65 per cent of its Northern Region coalfield employees (including those employed at Mandalong Mine) reside in the Lake Macquarie LGA.

An additional 50 contractors would be employed during longwall equipment moves. These occur two to three times per year for the life of the mine (proposed 25 years), and take, on average, five weeks to complete. This equates to a further 12 FTE positions.

Furthermore, the construction program for the proposed Mandalong South Surface Site (including access road) will result in the employment, on average, of 35 contractors over the total 2.5 year construction timeframe.

[12] At 7% discount rate.
[13] Refer to Table 5.

As is the case with the assessment of project economics, the underlying alternative outcome in respect of the Project is the loss of all existing positions, as mine closure would become inevitable on exhaustion of the currently approved resource.

4. EXTENDED ECONOMIC IMPACT ANALYSIS

4.1 Approach

This analysis firstly identifies and where appropriate, quantifies the broader impacts of the Mandalong Southern Extension Project proposal. The effect of the stimulus provided to regional and broader economies by direct construction and operating activity and the associated impacts is then considered. A discussion of the application of multipliers to quantify the extended benefit/cost relativities of the proposal is then undertaken.

4.2 Regional context

As is the case with the contiguous Hunter and Central Coast LGAs, Lake Macquarie is a large and diversified economy. Mining and related industries are important elements of the regional economy. It is noted that these associated industries range from suppliers of goods and services, to the large and specialised transport and logistics sector which services the coal industry.

4.2.1 Lake Macquarie City Council Economic Development Documents

The Lake Macquarie City Council (LMCC) website notes that mining accounts for two (2) per cent of employment in the LGA. This is significantly greater than for the neighbouring Central Coast LGAs (Section 4.2.2). The website also states that mining has historically been a key part of the regional economy and that '*mining and mining-related businesses are still intrinsic to the region's economic strength*'.

4.2.2 Wyong Shire/Central Coast Economic Development Documents

Although the Southern Extension Area is chiefly located in the Lake Macquarie LGA, a part of it extends into the Wyong Shire Council (WSC) LGA. Economic data presented on the WSC website indicates that mining employment is relatively low in the LGA (0.4 per cent of employed residents).

In its Central Coast Regional Plan 2011-2015, Regional Development Australia Central Coast (RDACC) included the results of research conducted by the Central Coast Research Foundation. The findings indicated some ambivalence towards the coal industry, with respondents being divided on 'whether the benefits to the Region

of the coal industry outweigh the negative impacts'. As this evidence relates to the Central Coast region in its entirety, and therefore also includes the Gosford LGA, the influence of the mining industry, in terms of employment contribution and physical presence, are relatively minor and are likely to be contained in the northernmost area of the Central Coast region. It is noted that mining accounts for only 0.2 per cent of resident employment in Gosford (Gosford City Council website).

With respect to the LMCC and Central Coast LGAs (particularly Wyong), the presence of significant coal-fired electricity generation infrastructure (Eraring and Vales Point power stations) and associated distribution infrastructure may be considered as demonstrating the requirement for coal production in order to maintain services.

4.2.3 Community consultation

Centennial Mandalong has conducted an extensive consultation program in relation to the Project. The program commenced in 2009, with the aim of obtaining relevant access permissions and providing information to landholders on the exploration process for EL6317. This consultation process is continuing with respect to the progression towards obtaining development consent for the Project and a mining lease over the Southern Extension Area (EL6317).

A range of direct consultation opportunities has been provided to stakeholders. In the course of these engagements, the main issue raised was in relation to the potential future impacts from subsidence on the area if mining was to proceed. It should be noted that in conducting these engagements, Centennial Mandalong has provided stakeholders with input from, and access to, Mine Subsidence Board (MSB) representatives.

The concerns expressed by stakeholders, and in particular local landowners, along with results of investigations and modelling conducted by Centennial Mandalong, contributed to deciding the proposed design layout of the mine plan. Furthermore, based on concerns raised in relation to the location of Mandalong South Surface Site (MSSS), further investigations were undertaken by the project team to identify alternative locations for those facilities, which would reduce the potential impact on concerned landowners. Consequently, a suitable site location for MSSS was identified, which is more amenable to the relevant landowners.

The Social Impact Assessment (James Marshall & Co. 2013) prepared for the Project also notes that as one of the largest industries in the immediate geographical area, Centennial Coal is also a contributor to a range of community groups and activities. The continuation of operations at Mandalong Mine will support Centennial's ongoing contributions to the local and regional communities.

4.3 Extended economic impacts

An estimate of the extended economic impacts associated with the construction works on the Mandalong Southern Extension Project, and the ongoing operation of the mine, can be derived using input-output (I/O) multipliers. The methodology is a commonly-used approach to providing an approximation of the economic effects of one industry's activities across the rest of the economy[14]. There are certain limitations to the application of I/O multipliers. These are also acknowledged by ABS[15]. The practical effect of these limitations is that the output of multiplier analysis can only be considered as *indicative* of outcomes that may result from economic stimuli.

The NSW Department of Trade, Investment, Regional Infrastructure and Services (Division of Resources and Energy) [16] identified output and employment multipliers for mining and related services. While acknowledging the aforementioned limitations on multiplier analysis, the application of the relevant NSW Government Department's declared multipliers adds validity to the analysis. The relevant multipliers are displayed in Table 8.

Table 8: Type 2A Multipliers – mining and services

Description	Multiplier value
Output Multiplier – mining & services	2.136
Gross Value Added Multiplier – mining & services	4.099
Income Multiplier – mining & services	2.839
Employment Multiplier – mining & services	3.977

The relatively large GVA multiplier in this instance demonstrates the importance of incomes generated by the relevant project. It should be noted that GVA comprises all components of income to labour, plus the gross operating surplus of the corporate

[14] A detailed discussion on interpretation and limitations of multiplier analysis is included in ABS Cat No 5246.0; *Information Paper Australian National Accounts Introduction to Input-Output Multipliers*;
[15] For example ABS Cat No 1301.0, *Year Book Australia, 2002*
[16] *The Contribution of Primary Industries to the NSW Economy, Key Data 2012*: <http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0010/427645/Contribution-of-primary-industries-key-data-2012.pdf >

entity. Due to the foreign ownership of Centennial, the latter will accrue beyond NSW; however, the former would be concentrated in the State and the immediate region. In addition to these mining multipliers, similar multipliers for construction activity were also identified[17]. These are relevant for assessment of the impacts of the initial stimulus associated with the various construction works required for the Project.

Table 9: Type 2A Multipliers – construction

Description	Multiplier value
Output Multiplier – construction	2.694
Gross Value Added Multiplier - construction	4.369
Income Multiplier - construction	2.899
Employment Multiplier – construction	2.727

In this instance the GVA multiplier would have wider geographic impacts in terms of economic activity, as suppliers and contractors may be more likely to originate beyond the immediate region, given the specialised nature of the infrastructure being constructed.

As the stimulus to the economy is equivalent to the additional activity and output associated with both construction and operational phases of the project, the estimated net benefit of the Project ($665 million) would result in extended economic effects of approximately 2.1 to 4.4 times the initial stimulus, dependent on the economic measure being considered. Employment of the magnitude of approximately 2.7 to 4 times the economic stimulus would result. These indirect positions represent employment supported in the broader economy as a result of the demand for additional goods and services related to the Project.

[17] The original source of the DTIRIS multipliers is ABS Cat. No. 5246.0 (as above). GVA multiplier derived from ABS Cat No, 5246.0 & Multipliers for Culture-Related Industries, CMC SWG, Canberra.

4.4 Quantitative and qualitative assessment of economic and environmental impacts

Tables 2 and 3 respectively identified the bases for quantifying the environmental impacts contained in the DGRs, and the relevant estimates for the Project. Table 10 compares the benefit and cost impacts in the context of those quantified assessments and also key qualitative aspects of each impact, with particular emphasis on the matters identified through the community consultation process and local government economic profile documents. In addition, the table also identifies the policies and specific actions employed by Centennial in managing and mitigating the externality impacts of the Project.

Table 10: Economic Impact Assessment – Summary Table

Impact	Environmental Assessment Commentary	Benefits	Costs	Mitigation/treatment
Mandalong Mine Infrastructure construction and commissioning (preferred Project		Actual capital expenditure: $423.0 million (NPV $235.8 million) Direct construction employment: Average 35 contract personnel @ ≈ $65K. Assessed NPV ≈ $4.8 million	Some specialised construction services may be sourced from beyond the local area	Nil required. Local contractors tendering will have the opportunity to identify themselves as being locally based.
Mandalong Mine extended operations	The project will result in an overall positive economic contribution at a State, regional and also to the local community level.	Direct existing positions maintained beyond current mine approval: 420. Assessed NPV (all positions): ≈ $442 million Contractors (longwall moves p.a.) 12 FTE positions[18], Assessed NPV ≈$75 million. NSW Government royalty income from extended production: NPV ≈ $229.3 million Additional state/local government taxes, rates & charges: NPV ≈ $62 million Corporate taxes (federal); return to NSW: NPV ≈ $136 million Economic importance of mining in local economy recognised by LMCC.	Nil	Nil required

[18] Estimated as two to three longwall moves p.a. (average 2.5) with an average 50 contractors per move. Therefore: (number moves [assumed as 2.5] x 5 weeks)/52 weeks x 50 contractors ≈ 12 FTE.

Impact	Environmental Assessment Commentary	Benefits	Costs	Mitigation/treatment
Subsidence	It is concluded that the assessed range of potential subsidence and far-field displacement impacts after the mining of the proposed longwall panels will be manageable for the majority of the site features, based on the analysis outcomes and discussions with the stakeholders. No significant adverse impacts on catchment areas and watercourse alignments are predicted within the Southern Extension Area as a result of the predicted subsidence.	Detailed consultation with landholders in the area has been undertaken. As a result of this engagement, the proposed mine plan is designed to minimise subsidence impacts.	Notional cost to community: $3,608,748 per annum (includes estimate for land resources and water resources impacts, 2018 prices) as per combined estimation methodology in Table 3. NPV: ≈ $29.8 million	Impact management plans and strategies (Section 12 , Subsidence Report) can be developed that allow appropriate Trigger Action Responses and mine planning adjustments or mitigation measures necessary to deliver satisfactory outcomes to the feature and the stakeholders. Surface and subsurface monitoring (Section 13, Subsidence Report).
Land Resources	Potential soil and land resource impacts associated with the proposed Project are anticipated to be relatively minor. The soil resources within the Southern Extension Area are generally stable and require standard erosion and sediment controls for any proposed disturbance areas associated with surface infrastructure or surface cracking as a result of subsidence Impacts will not alter the pre-disturbance Land and Soil Capability classes or Agricultural Suitability classes		Notional cost to the community included in estimate calculated in subsidence section (above), as per combined estimation methodology in Table 3.	Mandalong Mine EMS As proposed by GSS Environmental, management of subsidence cracking, erosion and sediment control, progressive rehab (where needed) to be addressed through disturbance management recommendations (Soil and Land Capability Statement, Section 5.0)

Impact	Environmental Assessment Commentary	Benefits	Costs	Mitigation/treatment
Water Resources	The assessment undertaken identified that no adverse impacts on catchment areas and watercourse alignments are likely within the Southern Extension Area as a result of the predicted subsidence. The assessment of the predicted subsidence identified no significant adverse impacts on the predicted remnant ponding within the Southern Extension Area. Minor changes to the remnant ponding were identified primarily within existing watercourses (i.e. not within pasture areas). Potential for subsidence-related flooding impacts on the agricultural value of the surrounding properties is negligible. Potable water and sewer to be sourced through existing Hunter Water Corporation (HWC) reticulated systems, with the exception of MSSS. This site will have an onsite waste water management system. A regional strategy for water management (for Centennial Coal operations in the area), including treatment and re-use, is being developed in conjunction with the Newstan Extension of Mining Project and Northern Coal Logistics Project.	Economies in water usage associated with Centennial's mining operations to be achieved through implementation of regional water management strategy. Regional water management strategy expected to reduce demand on HWC resources.	Notional cost to the community included in estimate calculated in subsidence section (above), as per combined estimation methodology in Table 10	Mandalong Mine EMS Ongoing monitoring program. If necessary, mitigation works may be implemented to return remnant ponding to the existing condition. Potential for in-channel mitigation works if necessary. Where subsidence rehabilitation works are required, erosion and sediment controls will be monitored during the works period in accordance with the Blue Book (Landcom 2004 and DECC 2008) including regular inspections and inspection after rainfall events causing runoff

Impact	Environmental Assessment Commentary	Benefits	Costs	Mitigation/treatment
Biodiversity	Parts of the Southern Extension Area are a mixture of utility or transport easements and cleared residential or rural-residential area. These areas are highly disturbed, have a high incidence of exotic species or are devoid of native tree or shrub vegetation. Four (4) Endangered Ecological Communities. 32 threatened fauna species. Nine (9) threatened flora species potentially impacted by the Project. It is expected that the subsidence associated with the Project will not significantly remove or alter any habitat within the Study Area. The proposed action of clearing approximately 4.4 hectares of Cleared/Disturbed land and 15.6 hectares (total 20 hectares) of native vegetation for the construction of the surface facilities and associated access is not expected to significantly impact upon threatened species, populations or ecological communities.	Cost estimate is conservative (high) as impacts are not expected to be significant.	Notional cost (upper bound) 2018: $222,893 per annum (Lake Macquarie [West] SLA plus Dooralong and Jilliby State Suburbs). NPV: ≈ $1.8 million	Mandalong Mine EMS
Heritage	Heritage – (Aboriginal and European) – baseline studies have identified 113 Aboriginal and 6 European heritage sites 13 Aboriginal heritage sites are likely to be impacted by the Project, 15 Aboriginal heritage sites are possibly impacted by the Project and 1 European heritage site is likely to be impacted through the construction of the new surface facilities.	Mine plan and MSSS designed to minimise impact and preserve heritage sites/items	Aboriginal grinding grooves and rock shelters can be susceptible to damage from subsidence. Notional cost to community (Lake Macquarie [West] SLA, Dooralong & Jilliby), 2018: $7,589 per annum. NPV: ≈ $63K	Mine layout designed to minimise subsidence impacts, particularly in sensitive areas (refer Section 3.3).

Impact	Environmental Assessment Commentary	Benefits	Costs	Mitigation/treatment
Air	A number of residences are located in the area surrounding the existing and proposed surface facility sites. A list of the nearest sensitive receptors in the immediate vicinity of the sites is presented in the Air Quality Impact Assessment (AQIA) prepared by SLR Consulting. PM2.5 air quality criteria is predicted to be exceeded at three sensitive receptors located around the MMAS. Odour criteria are also predicted to be exceeded at receptors surrounding the existing MMAS.	Estimate is conservative (high). Exceedances of standards not expected.	$1,131 per capita per annum – 260 identified residential properties, assumed population of 754 individual residents[19] 80 industrial receivers (mainly small enterprises, assume 5 persons for each[20]), 400 receivers. Notional cost to community (2018): $1,305,174 per annum. NPV: ≈ $10.8 million	Mandalong Mine EMS Dust Management and Mitigation techniques as prescribed in AQIA prepared by SLR Consulting which includes additional PM2.5 and PM10 monitoring around the existing Mandalong Mine Access Site and implementation of dust management practices during the construction of the MSSS.
GHG	Maximum total emissions relating to the Project are 1,813,664 t CO_2-e pa (scope 1 and 2). This is the maximum GHG emissions per annum, assuming full production of 6 Mtpa and maximum emission. These emissions will be reduced through abatement or avoidance activities. Under Clean Energy Future legislation, Centennial Mandalong is liable for all residual emissions post abatement Calculated liable emissions of CO_2-e can be offset or will be subject to the carbon pricing provisions. Project emissions ≈0.24% of total Australian GHG production. Negligible effect on global climate change.	Centennial recognises that climate change response is an important aspect of its business that presents both challenges and opportunities. Centennial believes GHGs can be reduced, mitigated and offset Centennial Mandalong is hosting a trial of 'VAM-RAB' technology and the use of gas engines for cogeneration as an effective means of reducing fugitive emissions from the Project. Estimated return of carbon tax revenues to NSW: NPV ≈ $9 million	Assumed cost of $17/tonne CO_2-e. Notional cost per annum of liable emissions (2018): $3,475,190 NPV: ≈ $249 million	Mandalong Mine EMS Centennial Coal Climate Change Policy (under development) Centennial Coal GHG Management System (under development)

[19] ABS 2011 Census data: Persons per household for Mandalong State Suburb: 2.9 persons/household.

[20] This estimate also accounts for visitors to these businesses, in the context that no persons are present at the relevant business sites for the majority of each day.

Impact	Environmental Assessment Commentary	Benefits	Costs	Mitigation/treatment
Noise	Predictions indicate that it is likely that some residents will be 'noise affected' during the construction phase of the MSSS. Notwithstanding this, construction noise during recommended standard hours is not predicted to exceed the 'highly noise affected' level at any nearby residence. Results of operational noise modelling indicate that the relevant project specific noise criteria will be achieved at all the nearest residential locations to the Project. Operational and construction-related road traffic noise levels are predicted to meet the relevant criteria at the nearest residences on Mandalong Road during both the day and night-time periods. It is not likely that sleep disturbance would occur as a result of operation of the MSSS.		Nominal total construction period of 41 weeks. Costs therefore relate to a period less than one year, however this will be distributed over a number of years. Notional cost to residential receptors over construction period, based on maximum exceedance (19dBA) over 41 weeks: $77,182. NPV: ≈ $638K No cost attributed to operational impacts, as these are within exceedance tolerances.	Mandalong Mine EMS Impacts are relatively short-term as they relate to the construction phase only. Noted that construction activity is spread over a number of years. Elements of the construction program involve underground mine development activities and therefore will more closely resemble operational noise modelling results. Adoption of mitigation recommendations as detailed in Noise Impact Assessment by SLR Consulting which includes implementing noise management practices during the construction of the MSSS.

Impact	Environmental Assessment Commentary	Benefits	Costs	Mitigation/treatment
Traffic and transport	The increase in traffic on the local road network as a result of construction and operation (increased employment) will not cause the mid-block capacity of the local road network to be reached, therefore subject to satisfactory intersection operation, the Project will not adversely impact on the local road network. All coal extracted from the mine is transported to the Port of Newcastle, Eraring Power Station and Vales Point Power Station via private haul roads, overland conveyors and rail. Therefore the extraction of coal as a result of this Project will not impact on the local road network	Possible sources of impact (intersection design) to be managed in detailed design stage	No costs anticipated in relation to impacts on traffic volumes and road capability. Notional and actual costs to community captured in noise, air, and GHG emissions estimates	Location of access/egress intersection from Mandalong Road to maximise visibility and achieve sight distance requirements. Development and implementation of a Construction Traffic Management Plan.
Visual	The Visual Impact Assessment concludes that overall the Project would have a negligible to low visual impact on people living in or travelling through areas surrounding the site	Cost assessment is considered conservative (high) as impacts expected to be minimal. Stakeholder input considered in decision on site location.	Notional cost to community: $24,380 per annum. NPV: ≈ $202K	Landholder input to location decision for MSSS. Ongoing consultation with stakeholders. Existing landform and tree cover will provide 'screening' of the MSSS.
Waste	There is no mineral processing proposed as part of the Project. Miscellaneous wastes (residual consumables such as lubricants, containers, cartridges, filters and waste oil drums) will be collected on a regular basis by a licensed contractor for off-site disposal within a facility approved to receive such waste. Mandalong Mine Access Site (MMAS) to use HWC system and MSSS sewage managed on-site.	Waste managed in a manner that minimises impact on site users or local communities. All recyclable wastes collected for recycling.	Not further assessed	Mandalong Mine EMS Hazardous Substances Management Plan

Impact	Environmental Assessment Commentary	Benefits	Costs	Mitigation/treatment
Hazards (Bushfire hazard)	Forest vegetation and terrain within and surrounding the proposed new underground mining area and surface infrastructure have the potential to support maximum fire intensity and put at risk the safety of staff and attending emergency personnel. The most common form of ignition in the area would be sparks generated from hot works and plant/equipment used in construction activity. Recommendations have been provided such that the development would provide protection to human life and minimise impacts on assets from the threat of bush fire.		No cost expected to be imposed on community. Identified hazards principally related to management of bush fire in the context of Centennial employees and contractors and Centennial assets.	Mandalong Mine/ Centennial Coal Bushfire Management Plans. Provision of bush fire treatments, including Asset Protection Zone and landscape management, suitable access and water supplies will assist in protection of life.
Rehabilitation	Landscaping will be undertaken to improve the visual and environmental amenity of the MSSS and access road. Determination of suitable soil to conserve for later use in mine rehabilitation has been conducted. The topsoil and subsoil resources within the Study Area allocated for infrastructure will be stripped and stockpiled separately nearby for the reinstatement of the soil profile upon rehabilitation. These management recommendations are a guide to mitigating the potential soil and land resource impacts associated with the Project, which are anticipated to be relatively minor, and enhancing the success of rehabilitation.	Mine plan designed to minimise impacts. Rehabilitation plan includes pre-emptive mitigation strategies designed to enhance rehabilitation at mine closure and in interim periods (such as post-construction phase).	Pre-rehabilitation impacts estimated in Land Resource impact assessment.	Mandalong Mine EMS Mine closure and rehabilitation strategy for the Project to be developed in the Rehabilitation and Environmental Management Plan under *Mining Amendment Act 2008*, to become effective December 2013. Detailed mine closure plan to be developed within 5 years prior to planned mine closure in consultation with relevant government agencies and stakeholders ($20 million current provision)

4.5 Summary

There are several sources of benefit associated with the proposed Mandalong Southern Extension Project. From Centennial's perspective, there are benefits in terms of continued operation of Mandalong Mine and the associated commercial benefit. Similarly, the current and expanded workforces that will be sustained by the Project will also benefit and the incomes which they derive will result in further induced benefit across the regional community, as a result of the 'pay packet effect' of the consumption activity of these employees in local and regional economies.

A further qualitative benefit of the Project has been the development of productive consultative processes with landowners and other stakeholders. This has resulted in a proposal that permits crucial regional economic development to be delivered, in an environment in which those who may be affected by the development have actively participated in the process of developing strategies to manage any impacts. As a result, the acknowledged negative impacts of the Project have been, or will be, mitigated to the greatest practical extent.

The negative external impacts must also be considered in the context of the existing use of Mandalong Mine and other similar industrial usage in the area. Largely as a result of the detailed preliminary planning process and development of mitigation strategies, the negative impacts associated with the Project proposal are of significantly lesser magnitude than the benefits that will be generated by the Project.

5. ADDITIONAL REQUIREMENTS

5.1 Cumulative impacts

As part of the assessment of such a project, the DGRs require that impacts of the existing regional situation, and in particular any other concurrent expansion or application that may cumulatively increase impacts in the area be considered. In assessing cumulative impacts, it is important to recognise that these principally affect resident persons, households or others accessing the region under observation.

In addition to the Mandalong Southern Extension Project, Centennial Coal is developing the following proposals in relation to its northern operations:

- Northern Coal Logistics Project; and
- Newstan Extension of Mining Project.

The Mandalong Southern Extension Project, in conjunction with Centennial's Newstan Extension of Mining Project and Northern Coal Logistics Project, stems from the long-term strategy Centennial has developed for its future operations in the Newcastle Coalfield, to provide the infrastructure and flexibility required to meet future opportunities in both the domestic and export coal markets.

It is noted that the Northern Coal Logistics Project is focused on improving the efficiency of existing infrastructure and operations. In particular, the project will ensure that coal-handling logistics are conducted in a manner that minimises the effects on public infrastructure, such as local and regional public road and rail networks.

A further underground mining project, the Wallarah 2 Coal Project, is proposed for mining leases to the south of the existing Mandalong Mine and the proposed southern extension. Wallarah 2 Coal Project is operated by the Wyong Area Coal Joint Venture, which consists of several companies; the largest shareholder being Kores Australia Pty Ltd (www.wallarah.com.au). This proposal provides for extraction of coal, described as being at greater depths than are to be extracted at Mandalong and the construction of surface infrastructure on land between the F3 Freeway and the Motorway Link Road. As these operations are similar in character to those proposed for the Mandalong Southern Extension project, there may be some cumulative impact. Centennial Coal is cognisant of its responsibilities with respect to minimising its negative impacts from its operations, and by association limiting the extent of any further cumulative impacts.

The location of the WSC Buttonderry Waste Management Facility in the southern extent of the Project's Southern Extension Area may also be a source of cumulative impacts, such as heavy vehicle traffic. As has been identified in previous material in this assessment, the mine plan layout has been designed to continue to accommodate the unimpeded operation of this facility. Centennial Mandalong's logistics infrastructure and activities are such that these will minimise impact on roads and other transport infrastructure servicing the Waste Management Facility.

Collectively, the existing and proposed infrastructure and operations are consistent with the existing character of the area. The manner in which the Project has been

developed purposively seeks to reduce contribution to cumulative impacts, such as those observed in the material discussing cumulative impacts on air quality. It is submitted that the MSSS and associated access road development will represent a relatively minor contribution to cumulative impacts in the context of the existing environment.

5.2 Intra-generational and intergenerational equity

The Project has direct implications for both intra-generational and intergenerational equity. With respect to the intra-generational benefits, those individuals and households benefitting from direct and indirect effects of Mandalong Mine's operations will continue to do so due to the extension of the mine's life. The increases in the number of employees for the extended operation will also provide benefit to the households of these new employees. The broader derived benefits are discussed in preceding sections.

These socio-economic considerations are also relevant to the issue of intergenerational equity. Clearly, an extension of mine life by 25 years will provide future as well as immediate employment opportunities and the incomes and economic stimulus that these provide. There are also wealth impacts to be considered, to the extent that these can affect the long-term economic stability of employees' households, and have a reductive effect on future reliance on publicly financed welfare structures.

The intra- and intergenerational impacts of the proposal in terms of environmental risks will be actively mitigated by Centennial Mandalong to the greatest practicable extent. This is best evidenced by the consultative approach to mine plan layout and surface facilities location that has been focused on minimising impacts in the immediate and longer terms. As is identified in the assessment of these non-financial impacts, Centennial continues to work on ongoing improvement of policies and procedures in order to ensure that management of impacts takes into account the most current, effective technologies and practices.

6. SUMMARY

The Mandalong Southern Extension Project will provide significant positive direct and derived benefit to Centennial Coal, its employees and contractors, and to the local and broader communities. These benefits are, in summary;

- 420 existing FTE positions and 12 FTE contractor positions (longwall moves) maintained;
- Employment of 35 (average) FTE construction employees over the construction period;
- Economic stimulus provided by continued operations of Mandalong Mine and expenditure of individual employee and contractor incomes in local and regional economies;
- Tax and royalty revenues for federal and state governments and associated benefit of these to communities;
- Continuing opportunities for Centennial Coal to participate in development of environmental impact management strategies, such as the VAM-RAB technology trial.

The Project may also result in some externalised impacts, particularly in relation to a range of environmental factors (as detailed in Table 9). In each instance, Centennial Mandalong has received and will implement appropriate recommendations aimed at mitigating any impacts of these possible outcomes in circumstances where existing management systems and practices could be improved. In particular, Centennial Mandalong is prepared to enter an undertaking to develop a detailed mine closure and rehabilitation plan five years out from the end of the mine's life. This will allow the decommissioning and rehabilitation processes to be developed in the context of the more accurate information that will be available at that time with respect to the required actions.

The results of financially quantifying these impacts indicate that the overall social and economic impact of the Project is positive. As a result, it is concluded that the net impact of the project to the local, regional and NSW communities, and to the national economy, will also be positive.

REFERENCE LIST

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