



Centennial Coal

Mandalong



SSD-5144 MOD 3

APPENDIX 3

Economic Impact Assessment





Mandalong Mine Production Tonnage Project

Economic Impact Assessment

Section 96(1A) Modification State Significant Development 5144

August 2016



Prepared by

AIGISGROUP



AIGIS GROUP
MARK SARGENT ENTERPRISES
ABN 41317 992 919
13 DEBS PARADE
DUDLEY NSW 2290
P/F: 02 4944 9292
M: 0423 489 284
E: msemarksargent@dodo.com.au



This document does not purport to be all inclusive or contain all information which its recipients may require. The writer accepts no liability for any direct, incidental, consequential or indirect damages resulting from the use of or reliance on the information contained herein except insofar as any such reliance was made known to the writer on or before the publication of this document. This document also includes certain statements that reflect various assumptions, which may or may not prove correct. Any projections presented in this document are illustrative only and should not be taken as a certain indication of possible future events or returns.



EXECUTIVE SUMMARY

- This Economic Assessment forms part of the *Statement of Environmental Effects* (SEE) relating to an application by Centennial Mandalong Pty Ltd (Centennial Mandalong), to modify the State Significant Development (SSD) consent SSD-5144 for the Mandalong Southern Extension Project (the Project), which was granted on 12 October 2015.
- This Economic Assessment has been prepared to comply to the greatest practicable extent with DPE's *Guidelines for the economic assessment of mining and coal seam gas proposals* (December 2015).
- The principal proposed change to the SSD-5144 consent under the Modification is;
 - an increase in run-of-mine (ROM) coal production from the approved 6.0 million tonnes per annum (Mtpa) to 6.5 Mtpa (Schedule 2 Condition 7 of SSD-5144);
- The focus of the assessment is to compare the relative outcomes of continuing the Project under its current consents and under those proposed for the Modification.
- The cost-benefit analysis (CBA) conducted indicates a marginal improvement in the estimated economic outcomes for the mine, as a result of the Modification. The principal source of this benefit is an increase in nominal royalty revenue of approximately \$24 million. Overall, the Modification is estimated to increase beneficial economic and related social effects by approximately \$20 million. The increase is associated with the accelerated mining program assumed for modelling, and the resultant earlier realisation of returns.
- There are no changes to employee numbers required for the Modification and therefore no changes to the economic benefit associated with same.
- Local Effects Analysis (LEA) indicates that there are no changes in the socioeconomic effects in the regional and local economies estimated for the overall Project. Localised environmental/biophysical, public infrastructure and amenity effects remain similar to those for the Project as proposed, and thus have no discernible cumulative impact.
- The Modification returns positive net present value (NPV) and benefit-cost ratio (BCR) returns across a range of modelled possible economic outcomes, as demonstrated through assessments of the current mining schedule, mining at the maximum extraction rate of 6.5 Mtpa, sensitivity testing and application of alternative pricing data, including World Bank price forecasts for the export component of the mine's output. As a result, the Modification is supportable on the basis of its likely positive economic contribution.



TABLE OF CONTENTS

Executive Summary	2
Table of Contents	3
Abbreviations	5
1. Economic Analysis and Impact Assessment: Purpose and Approach	6
2. Project Background and Justification	
2.1 Applicant	7
2.2 Mine consents and related information	7
2.3 Description of proposed Modification	7
3. Project Economic Analysis – Cost Benefit Analysis	
3.1 Focus of analysis	8
3.2 Discussion of approach to CBA	8
3.3 Discussion of alternatives to the Modification	8
3.4 Project-related economic evaluation- Cost Benefit Analysis (CBA)	9
3.4.1 Estimation of economic benefit	9
3.4.2 Estimation of economic costs	11
3.4.3 Physical area applied for estimation of impacts	15
3.4.4: Valuations – environmental effects	15
3.4.5 Comparison of net economic benefit/cost	16
3.5 Sensitivity analyses – alternative project options	17
4. Regional & Local Effects Analysis	
4.1 Approach	20
4.2 Regional Context	20
4.3 Discussion of localised environmental impacts	20
4.4 Discussion of regional economic effects	20
4.4.1 Community consultation	21
4.4.2 Social impacts	21
4.5 Extended economic impacts	21
4.6 Ecologically sustainable development reporting: quantitative and qualitative assessment of social, economic and environmental impacts	21
4.7 Summary	22
5. Additional Requirements	
5.1 Cumulative impacts	22
5.2. Intra-generational and inter-generational equity	22
6. Conclusion	23
Reference List	24
Appendix 1: Treatment of economic effects of taxation components	25
Appendix 2: Additional price-based sensitivity comparison	26
Appendix 3: Example labour surplus estimation using reservation wage (derived from MSEP economic assessment)	28



List of Tables & Figures

Table 1: Estimate of economic benefit – Mandalong SSD-5144 Consent Modification (1) – current price & production assumptions compared	10
Table 2: Valuation methods –biophysical and social/infrastructure impacts	13
Table 3: Comparison of environmental effect assessments: MSEP with and without Modification	16
Table 4: Comparison of MSEP & Modification net benefit/cost	17
Table 5: Sensitivity analysis – project options - adjusted discount rates (NPV)	18
Table 6: Sensitivity analyses - adjusted performance assumptions (NPV)	19
Table A2.1: World Bank thermal coal price forecasts at April 2016: - 2016-2020	26
Table A2.2 Comparison of estimates of NPV: 2015, 2016 and World Bank (2016) price assumptions	26
Table A3.1: Job outlook information – mining industry	28
Figure 1: Lake Macquarie (West) SA3	17



ABBREVIATIONS

ABS:	Australian Bureau of Statistics
BAU:	Business as Usual
BCR:	Benefit-Cost Ratio
CO ₂ -e:	Carbon dioxide equivalent
CPI:	Consumer Price Index (ABS)
CBA:	Cost-Benefit Analysis
DPE:	Department of Planning and Environment (NSW)
EIS:	Environmental Impact Statement
EPA:	Environment Protection Authority
EVRI:	Environmental Valuation Reference Inventory
FTE:	Full Time Equivalent (employment)
GHG:	Greenhouse Gas/es
GVA:	Gross Value Added
I/O:	Input/Output
LEA:	Local Effects Analysis
LGA:	Local Government Area
LMCC:	Lake Macquarie City Council
MSEP:	Mandalong Southern Extension Project (The Project)
Mtpa:	Million tonnes per annum
NPV:	Net Present Value
PM _{2.5} :	Fine air pollutant particles, less than 2.5 micrometres in diameter
PV:	Present value
ROM:	Run of Mine ('raw' coal)
SA3:	Statistical Area Level 3 (ABS statistical geography division)
SEARs:	Secretary's Environmental Assessment Requirements
SEE:	Statement of Environmental Effects
SLA:	Statistical Local Area
SSD:	State Significant Development
tpa:	Tonnes per Annum
WPI:	Wage Price Index (ABS)



1. ECONOMIC ANALYSIS & IMPACT ASSESSMENT: PURPOSE AND APPROACH

This Economic Assessment forms part of the *Statement of Environmental Effects* (SEE) relating to an application by Centennial Mandalong Pty Ltd (Centennial Mandalong), to modify the State Significant Development (SSD) consent SSD-5144 for the Mandalong Southern Extension Project (the Project), which was granted on 12 October 2015. SSD-5144 permits mining operations in respect of the consent until 31 December 2040.

Centennial Mandalong is seeking to modify its existing development consent for the Mandalong Production Tonnage Project (MPTP/the Modification). The MPTP is principally seeking to modify Schedule 2, Condition 7(a) of the SSD-5144 consent, permitting an increase in the annual production limit from 6 million tonnes per annum to 6.5 million tonnes per annum of ROM coal. This increase is required due to the mine optimising the production process, both in terms of mechanical improvements and through the continuing development and training of underground operators.

A secondary purpose of the Modification is to rectify administrative errors present in the Centennial Mandalong SSD-5144 consent.

In order to achieve the operational changes of the increased production limit, it is advised that no physical changes to the mine's infrastructure or the surface footprint as currently approved under SSD-5144 are proposed.

This Economic Assessment has been prepared to comply to the greatest practicable extent with DPE's *Guidelines for the economic assessment of mining and coal seam gas proposals* (December 2015), bearing in mind that:

- The Modification relates only to some limited elements for assessment contemplated by the guidelines.
- Technical Notes supporting the guidelines were not published at the time of preparing this assessment as a result of which some assessments are based on material most recently presented in May 2015 in relation to the SSD-5144 consent, and also guidance extracted from DPE's *draft guidelines for the economic assessment of mining and coal seam gas proposals* (October 2015).
- The Modification does not involve any works that will physically increase the net impacts of operations under the existing SSD-5144 consent. However, changes consequent to the revised mining schedule result in marginal changes to economic assessment outcomes.

In view of these constraints, consistent with the DPE guidelines, the approach to this assessment is to estimate the direct economic benefits and costs of the Modification, as they relate to the State, regional and local communities, employing:



- A Cost-Benefit Analysis (CBA) to assess the impacts of the Modification at State (NSW) level;
- A Local Effects Analysis (LEA) to assess the localised impacts, particularly those relating to certain environmental, social and economic outcomes that may be considered as being concentrated in the local and/or regional community.

This report seeks to address these requirements by providing a ‘triple bottom line’ reporting focus on the social, economic and environmental outcomes of the Modification, based on both quantitative and qualitative assessments of effects, largely based on the approved SSD-5144 Project.

2. PROJECT BACKGROUND AND JUSTIFICATION

2.1 Applicant

Centennial Mandalong Pty Ltd is the Applicant for the Modification and operator of Mandalong Mine under consent SSD-5144.

2.2 Mine consents and related information

As disclosed in Section 1, Modification is sought in respect of the State Significant Development (SSD) consent SSD-5144 for the Mandalong Southern Extension Project (MSEP/the Project).

Thermal coal will continue to be extracted from the West Wallarah and Wallarah Great Northern Seams in accordance with the mine layout and extraction methods approved under SSD-5144 within the current mining lease areas. Schedule 2, Condition 7 of SSD-5144 currently permits the following:

In any calendar year, the Applicant shall not:

- Extract more than 6 million tonnes of ROM coal from the site;*
- Deliver more than 6 million tonnes of ROM coal to the Cooranbong Entry Site;*
and/or
- Deliver more than 6 million tonnes of ROM coal to the Mandalong Coal Delivery System.*

The MPTP seeks to modify Schedule 2, Condition 7(a) of the SSD-5144 consent only. The increase will not affect the delivery limits associated with the Cooranbong Entry Site and the Mandalong Coal Delivery System.

2.3 Description of proposed Modification

The Modification application has been prepared and is submitted under Section 96(1A) of the EP&A Act to seek changes to the consent SSD-5144 to allow for:

- an increase in run-of-mine (ROM) coal production from the approved 6.0 million tonnes per annum (Mtpa) to 6.5 Mtpa (Schedule 2 Condition 7 of SSD-5144);
- rectify administrative errors present in the Centennial Mandalong SSD-5144 approval.



The effect of this is that the current approved timeframe for the mining operations does not change, terminating in 2040. The Modification will allow Centennial Mandalong greater scope to respond to favourable market conditions by taking advantage of production efficiency improvements progressively being realised at the mine. In the event that efficiencies are realised and markets are available to accommodate possible efficiency gains, the life of the mine may be reduced. However, rehabilitation and monitoring works will continue during the remainder of the approved consent period, should this occur.

3. PROJECT ECONOMIC ANALYSIS – COST BENEFIT ANALYSIS

3.1 Focus of analysis

The CBA component of this analysis presents the State-level implications of the Modification. The LEA addresses the qualitative environmental and social impacts, along with key economic aspects of the project, which are largely concentrated in the western area of Lake Macquarie City Council (LMCC) Local Government Area (LGA). The area for assessment is discussed in Section 3.4.3.

3.2 Discussion of approach to CBA

The Modification proposes an increase of approximately eight percent (8%) in the annual production rate for the MSEP. As a consequence, the economic assessment presented in relation to the parent MSEP, most recently updated in May 2015, remains relevant to this Modification, with changes to assessments being proportional to this relatively modest proposed change in annual production rate.

It should be noted that, consistent with the approach adopted in respect of the SSD-5144 Project consent application, Centennial Mandalong maintains that the internal financial appraisal process and its outputs in respect of the overall Project and the Modification are highly commercially sensitive. Furthermore, the output of this modelling is of no consequence to consideration of third-party or externalised effects of the Modification, which are of interest in a public exhibition process. As such, this material is considered by Centennial Mandalong as being unsuitable for presentation in a document which is intended for public exhibition. The publication of such information has the potential to jeopardise commercial negotiations and outcomes in which Centennial Mandalong may be involved at the time of publication of this information, particularly in respect of sales to domestic customers, most notably electricity generators. Publication of this information may also impact on relevant Centennial customers. This information is excluded from this economic impact assessment on that basis, but can be made available to the relevant authorities as required.

3.3 Discussion of alternatives to the Modification

The project alternatives are limited to:

- continuation of the Project under its present consent conditions, and;
- approval of the Modification.



The Modification permits additional flexibility to capitalise on efficiency gains being progressively realised in mine production and to improve responsiveness to market conditions and opportunities. This outcome is potentially beneficial to the State, as the ability to increase production and sales in favourable market conditions would result in increased royalty returns to NSW and may also increase tax returns to the Commonwealth. This potential benefit must be balanced against the possibility that accelerated production may result in exhaustion of the resource during a period of market strength. However, as this necessarily involves any marginal reduction being incurred at a later time, the size of any such reduction is notionally mitigated by the lower relative value of the later returns. A comparison between present mining schedules for MSEP and the Modification demonstrates that these are similar at the time of preparing this assessment.

3.4 Project-related economic evaluation – CBA

The cost-benefit analysis (CBA) data presented in this section are present values (PV) and net present values (NPV), at an assumed discount rate of seven percent (7%), except as otherwise noted¹.

3.4.1 Estimation of economic benefit

The analysis assumes the MSEP as approved under SSD-5144 as the base case (alternatively, business as usual or 'BAU' scenario) which would result if the Modification was not to proceed. The assessments in this report differ to some extent from those presented in the MSEP application, reflecting changes in reporting of both benefit and cost associated with the use of constant prices/cost assumptions beyond the mine's mid-term planning cycle. Further changes relating to application of DPE's current guidelines are discussed subsequently.

With respect to the Modification, the key economic benefits that would accrue to the local and State communities, as distinct from the proponent corporation, on approval of the Modification are:

- A notional benefit associated with earlier payment of royalties and taxes accruing to NSW. As noted previously, on the basis of the time value of these economic flows, their notional value is likely to be increased by earlier delivery.
- The potential for increasing production in comparatively favourable markets, resulting in increased royalty and tax returns in such circumstances.

The latter potential outcome needs to be balanced against the effects of a possible associated reduction in the productive life of the mine, which may result in earlier cessation of employment at the mine, however this is not anticipated in current planning. The ability to increase production rates relates to efficiency improvements presently being realised at Mandalong. In order to demonstrate the range of possible outcomes that may eventuate, a

¹ The economic appraisal principles employed herein are consistent with current DPE guidelines (December 2015) and NSW Treasury TPP07-6 Economic Appraisal Principles and Procedures Simplified, to the extent that these documents coincide.



case based on the current mine plan (continuing to 2037) and the case for the maximum rate of resource extraction (with mining ceasing in 2029) are presented. These two alternatives may be considered the lower and upper bounds of possible outcomes associated with the Modification. In practicality, the 'maximum extraction' scenario may not be achievable due to operational constraints. However, for the purposes of these analyses, it illustrates the outcomes of higher intensity production.

Table 1 summarises the valuation of these benefits. The assumptions on which these assessments are based are:

- As discussed in Section 1, the Project consent remains in place until 31 December 2040, allowing scope for change in production planning as required and subsequent decommissioning and rehabilitation at the end of the productive life of the mine.
- In order to ensure comparability, the data for Development Consent SSD-5144 have been revalued at the current price assumptions adopted by Centennial Coal for internal project analyses. Therefore, the assessments differ from those presented in the most recent economic assessment material prepared in relation to the parent project consent.
- Tax effects are excluded from the analysis due to changes in the approach to assessment of various forms of tax, with particular emphasis on the requirements of the DPE guidelines (2015). Explanatory material is provided at Appendix 1.

Table 1: Estimate of economic benefit – Mandalong SSD-5144 Consent Modification (1) – current price & production assumptions compared

Economic Benefit	Estimation assumptions	Approved SSD-5144	Modification	+/- Impact of Modification	Modification at maximum extraction rate
NSW Government royalties	Assumed royalty rate: 7.2% ²	Assessed PV ≈ \$235 million.	Assessed PV ≈ \$259 million	+ ≈ \$24 million	Assessed PV ≈ \$298 million
Labour surplus: – direct employment ³	Refer to Appendix 5	Assessed PV ≈ \$340 million	Assessed PV ≈ \$341 million	+ ≈ \$1 million	Assessed PV ≈ \$285 million
Total economic benefit PV		≈ \$ 575 million	≈ \$600 million	+ ≈ \$25 million	≈ \$583 million

The comparison indicates that the Modification as currently planned would result in a net increase in economic benefit of approximately \$25 million. At the maximum 6.5 Mtpa rate of extraction, the Modification would provide an additional \$8 million economic benefit. The effects are related to the altered timing of production and related employment, and

² Deep underground coal (+400m) 6.2 per cent; **other underground coal 7.2 per cent**, open cut coal 8.2 per cent.

³ The method for assessment of labour surplus from the MSEP consent application (May 2015) is included at Appendix 3 for reference.



differences in the assumed balance between domestic and export production. Given the relatively modest scale of the production increment (approximately 8% by volume), and the progressive productivity improvements noted previously, there are no planned changes to the size of the workforce. The minor increase in labour surplus relates to the current mine plan for the Modification running for one year longer than was the case for the SSD-5144 Project as approved. The differences in valuations related to the timing of benefit flows are also apparent between the maximum extraction and current mine plan scenarios. The significantly shorter production period in this scenario predictably results in a reduction in labour surplus.

3.4.2 Estimation of economic costs – environmental effects

As is the case with the labour surplus component of economic benefit, the bases for valuations of the environmental effects associated with the Modification are assumed to remain the same as for the SSD-5144 Project. Again, this is consequent to the limited scale of the proposed production limit increase, and the similar current assumptions on the likely duration of productive mining on which the Modification is based, the latter factor eliminating any significant change in terms of timing of costs. Conversely, the maximum extraction case demonstrates the effects of more intensive mining and the effect on the valuation of certain environmental effects, particularly greenhouse gas (GHG) emissions (refer to Section 3.4.4).

It is noted that changed valuation methods were recommended in the DPE draft guidelines of October 2015, and may subsequently be promulgated as Technical Notes to the current guidelines, however a proportion of the relevant reports that may be subject of revised valuations do not contain data to which draft recommended valuation approaches can be applied. Those for which amendments were possible have been adjusted. As a result, in the interests of comparability, the majority of the valuations from the most recent version of the SSD-5144 economic assessment (May 2015) have been retained for this assessment, with adjustments made to allow for current mining schedule assumptions. Additionally, population-based estimates have been adjusted to allow for calculations based on the Lake Macquarie (West) Statistical Area Level 3 (SA3), as mandated in the guidelines. This is discussed in detail in Section 3.4.3.

As has been previously identified, an increase in production limit will provide scope for alterations to the current mining plan. Any such changes are indeterminate at present, but may result in changes to economic outcomes due to, for example, timing of production and thermal coal prices realised for domestic and export product. The ‘maximum extraction’ scenario provides an example of such possible variance. The estimated values based on current assumptions are displayed in Table 3.

Generally, the detailed qualitative descriptions of these aspects of the Project, as presented in the consent application for SSD-5144, remain largely valid for this application. This material is significant in the context of the current guidelines, which require qualitative



assessment of certain impacts. The avoidance, management and mitigation strategies for each category of impact also remain relevant for the Modification.

The valuations presented are based on the monetised estimates of these impacts from the MSEP SSD-5144 economic assessment, and were principally estimated using a 'benefits transfer' method based on specialist assessments of magnitude of impacts, and relevant valuation methodologies, which are detailed in Table 2.

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

- Where possible, valuation methodologies were 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 relevant to the Project and the Modification 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 Modification relates only to possible changes to the intensity of presently-approved mining at Mandalong Mine. This fact of itself may be considered as a mitigating factor in terms of valuing the extent of impacts on social amenity in this area.
- The distribution of these impacts varies across communities. For example, some impacts such as those on traffic and air quality will be mainly apparent to residents in the immediate vicinity of operations and are considered further in the LEA. Potential impacts on greenhouse gas emissions on the other hand may notionally be more widely distributed.
- There remains an unquantified element of social impact. This may be described as the 'intrinsic value'⁴ of certain impacts or effects, as attributed by individual stakeholders. This aspect can be highly individualised and subjective and consequently may not be accurately quantified, as the estimation techniques applied, although based on valid methodologies, may not align with individual stakeholders' values.

⁴ James Marshall & Co. (2013), Mandalong Southern Extension Project Social Impact Assessment, James Marshall & Co, March 2013.



Table 2: Valuation methods –biophysical and social/infrastructure impacts

Description	Methodology/Source of Valuation mechanism	Valuation measure/unit ⁵	Comment on application
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	\$97 - \$204/dBA per annum (upper bound assumed for estimation)	32 affected receivers (SLR 2013b, pp 16-17) identified, but no incremental exceedances for operations stage. No estimate calculated in respect of Modification.
Subsidence, soil and water	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	\$172/household per annum	Applied to assessments for subsidence, soil and water impacts combined. Census 2011 data enumerates the number of households in Lake Macquarie (West) SA3, 29,038.
Traffic and transport	Evaluation included under other impact assessments (i.e. air, GHG, noise)	Not applicable	Air quality, noise and GHG emissions considered in relevant evaluations. Traffic volume impacts remain within existing road network capacity.
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)	29 identified residential receivers (SLR 2013 Table 5, p.28), assumed population of 76 individual residents based on 2.6 persons per household. 80 industrial receivers (mainly small enterprises, assume 5 persons for each ⁶), 400 receivers.
Greenhouse gas (GHG)	Australian Energy Market Operator; National Electricity Forecasting Report, June 2016. Proxy emissions abatement cost estimate (2020) ⁷ http://www.aemo.com.au/Electricity/Planning/Forecasting/National-Electricity-Forecasting-Report	\$25 per tonne/CO ₂ -e	Assumes incremental unmitigated Scope 1 & Scope 2 costs as assessed (1,099,015 t/CO ₂ -e p.a. [BDM Resources 2013]). Fixed cost assumed as a consequence of uncertainty regarding future pricing mechanism/s.

⁵ All values adjusted by 2.5 per cent per annum to allow for inflation, with the exception of the unit damage cost metric assumed for air quality and GHG emissions cost as described.

⁶ 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.

⁷ Measure adopted from DPE draft guidelines (2015). Approximates previously adopted measure of \$25/ tonne/CO₂-e (The Garnaut Review (2011:72) <http://www.garnautreview.org.au/update-2011/garnaut-review-2011/garnaut-review-2011.pdf>, Australian Government Treasury modelling estimate of \$24.60/ tonne/CO₂-e (core scenario) (http://carbonpricingmodelling.treasury.gov.au/content/chart_table_data/chapter5.asp and social cost of carbon (escalated by average exchange rate) of \$25.10/ tonne/CO₂-e; <https://www.whitehouse.gov/sites/default/files/omb/infocoreg/scc-ts-d-final-july-2015.pdf>).



Description	Methodology/Source of Valuation mechanism	Valuation measure/unit ⁸	Comment on application
Heritage	1. Allen Consulting Group (2005): “Valuing the Priceless: The Value of Heritage Protection in Australia” – choice modelling/WTP.	\$7.62 per capita p.a. for each 1,000 places protected	Assumes Census 2011 population count (Lake Macquarie West, SA3 [70,005]), 28 identified Aboriginal and one [1] non-indigenous heritage sites (total 29 ‘places’) likely to be affected [RPS 2013b pp x-xi]. Implied cost \$0.22 per capita per annum
Biodiversity	Land & Water Australia (2005): <i>Making Economic Valuation Work for Diversity Conservation</i> : Australian Government Department of Environment & Heritage. Jakobsson K. & Dragun A. (2001) The worth of a possum: valuing species with the contingent valuation method. <i>Environmental and Resource Economics</i> 19, 211-227: - simulated market price/ WTP	\$212/household per annum (preservation of 700 species –flora & fauna - VIC)	Implied cost of \$0.30 per species. Applied to 4 Endangered Ecological Communities (EECs), 3 threatened flora species and 9 threatened fauna species identified in the study area that may be affected (RPS 2013a pp. 2-3). Total \$4.85 per household p.a. 29,038 households (refer to commentary in ‘land resources’ estimation methodology).
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: 06 - 3 -1365.	\$1,137 - \$1,446/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 (approximately 4.4 hectares of cleared / disturbed land and 15.6 hectares of native vegetation RPS 2013a p.3). Other works to be conducted in existing Mandalong Mine operations envelope.

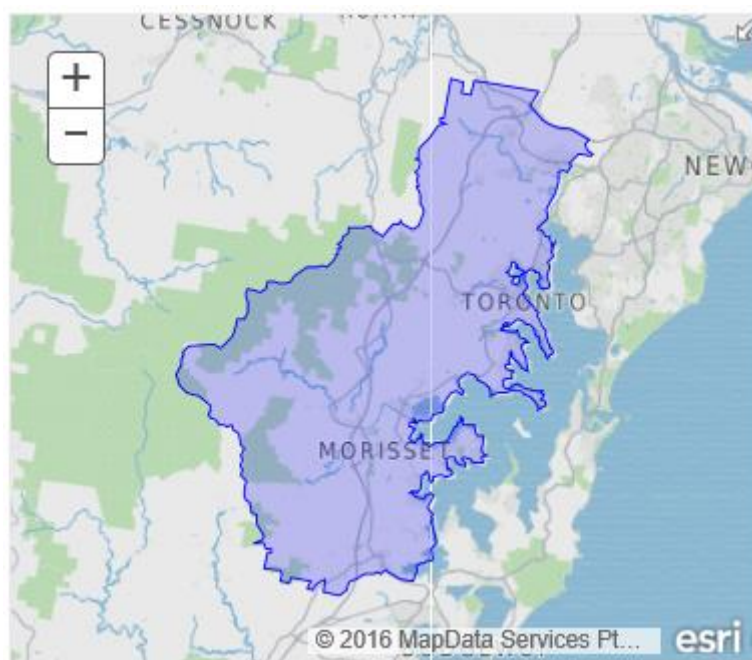
⁸ All values adjusted by 2.5 per cent per annum to allow for inflation, with the exception of the unit damage cost metric assumed for air quality.



3.4.3 Physical area applied for estimation of impacts

As is required by the 2015 guidelines, certain impacts assessed in the CBA are necessarily considered in the context of NSW. Furthermore, for the purposes of assessment, the guidelines require the adoption of the relevant ABS Statistical Area Level 3 (SA3) as the locality in which the Project is located. In this instance, the relevant SA3 is the Lake Macquarie – West SA3 (Code 11102), which is illustrated in Figure 1.

Figure 1: Lake Macquarie - West SA3



Source: ABS 2011 Census Data 2016(b).

The LEA guidelines (2015) also provide for the consideration of population groups in assessments, on the following basis; *‘for practical reasons of measurement and identification, the analysis should include local effects that accrue to those people ordinarily resident in the locality at the time of the proposal’* (DPE 2015:5). Although the locality in this instance might be interpreted as the SA3, it is apparent that certain impacts may be concentrated among much smaller population groups. For example, effects such as those on air quality are assessed as being limited to specific receptors such as certain residences in close proximity to operational sites as described in Table 2. These latter impacts remain part of the broader CBA, as they represent the affected part of the NSW community. The assessed impacts are detailed in Table 3.

Section 3.4.4: Valuations – environmental effects

A number of the estimates calculated may not be considered as meeting conventional assumptions of materiality. However, in the context that these estimates involve impacts on the various communities to which they are relevant, and may be subject of individuals’ perceptions based on the intrinsic values described in the Social Impact Assessment MSEP, they may be considered as material to those communities, and thus warrant inclusion in the



assessment process. This approach is consistent with the DPE guidelines (2015), as previously noted.

Table 3: Comparison of environmental effect assessments: MSEP with and without Modification

	MSEP with Modification	MSEP	Differential, Modification: MSEP	Modification at maximum extraction rate
	PV @ 7%	PV @ 7%	PV @ 7%	PV @ 7%
GHG	\$303,911,731	\$297,710,177	\$6,201,554	\$377,590,731
Biodiversity	\$1,808,590	\$1,808,590	\$-	\$1,808,590
Subsidence; soil, land & water (surface water & groundwater)	\$64,139,820	\$64,139,820	\$-	\$51,053,716
Heritage (Aboriginal and historic)	\$197,780	\$197,780	\$-	\$197,780
Air quality	\$7,560,889	\$7,402,256	\$158,633	\$6,408,013
Ambient noise	\$-	\$-	\$-	
Visual amenity	\$358,911	\$352,009	\$6,902	\$309,537
Traffic & transport	\$-	\$-	\$-	\$-
Total PV	\$377,977,721	\$371,610,631	\$6,367,089	\$437,368,367
Total (rounded)	\$378 million	\$ 372 million	\$6 million	\$437 million

The comparison of valuations reported in Table 4 recognises that there is a residual cost with respect to these impacts. This residual cost recognises that there is the risk of some impacts remaining despite avoidance, management and mitigation works and rehabilitation commitments. Furthermore, some effects such as air quality are assumed as remaining to some extent during the decommissioning and rehabilitation process. In order to allow for residual effects, the relevant impacts were calculated at full operational level for the post-mining periods described in Table 3. The valuations for the maximum extraction scenario emphasise the impacts of more intensive mining programs. The difference is most apparent in relation to GHG emissions. As the entire resource would be mined over a shorter period, emissions would increase over that period. Coupled with the effects of a shorter discounting period, the present value of this impact is markedly higher than for the currently planned production schedule under the Modification.

3.4.5 Comparison of net economic benefit/cost

Table 4 compares the measures of net economic benefit of the Project, and the Modification, for the State and regional communities, based on the benefit and cost assessments detailed in Tables 2 and 3 for the two alternatives.



Table 4: Comparison of MSEP & Modification net benefit/cost

	MSEP with Modification	MSEP	Differential (+/-), proposed to approved (MSEP)	Modification at maximum extraction rate
Economic benefit (PV)	\$601 million	\$575 million	\$26 million	\$583 million
Net economic cost (PV)	\$378 million	\$372 million	(\$6 million)	\$437 million
Net Present Value (NPV)	\$223 million	\$203 million	\$20 million	\$146 million
Benefit-Cost Ratio (BCR)	1.53	1.49	-	1.33

The Modification will result in a nominal increase in net benefit of approximately \$20 million when compared with MSEP as approved. As has been previously stated, this is chiefly a function of the changes to the mining schedule consequent to the Modification, and the consequent valuation changes associated with a substantial proportion of production being brought forward. Similar effects reduce the outcome for the maximum extraction scenario by \$57 million, with the reduction in labour surplus and increase in GHG emissions intensity and their timing being the drivers of this change.

As was the case with the assessment for MSEP, the assumptions for the effects of the Modification are conservative. This is particularly relevant with respect to the valuation of environmental impacts, as the conservative approach equates to adopting upper-bound or 'worst-case' estimates based on the methods and data employed. Once again, this recognises the risk that effects may occur, but at unpredictable levels. In general terms however, it remains the case that the risk level would not materially increase as a result of the Modification.

3.5 Sensitivity analyses – alternative project options

Sensitivity analyses outcomes are presented in Tables 5 and 6. The testing is predicated on adjustments to interest rates and financial measures (such as royalties and costs). The nature of the Modification indicates that changes in project timing are also a potential cause of changes in project outcomes, which is in effect the data presented in these sensitivity tests. MSEP (SSD-5144) represents the base case in these analyses.



Table 5: Sensitivity analysis – project options - adjusted discount rates (NPV)

Project option component	Discount Rate 4% \$M	Discount Rate 7% \$M	Discount Rate 10% \$M
Approved MSEP net (unmitigated) environmental impact cost PV	485	372	295
Approved MSEP total State and community benefit PV	732	575	465
Approved MSEP NPV	247	203	170
MSEP with Proposed Modification net (unmitigated) environmental impact cost	497	378	298
MSEP with Proposed Modification total State and community benefit	762	601	487
MSEP with Modification NPV	265	223	189
Differential (NPV)	18	20	19
Proposed Modification (maximum extraction rate) net (unmitigated) environmental impact cost	531	437	367
Proposed Modification (maximum extraction rate) total State and community benefit	703	583	491
Proposed Modification (maximum extraction rate) NPV	172	146	124
Differential – maximum extraction: MSEP (NPV)	(75)	(57)	(46)

The NPV of the Project with the proposed Modification remains positive under these various discount rate assumptions. Furthermore, as discussed previously, the result is approximately \$20 million more favourable in terms of State returns and economic benefit associated with the labour surplus from mine employment.

There may be any number of possible scenarios that vary from the forecast relativities between revenues and costs. The manipulation of the discount rate within NSW Treasury financial appraisal guidelines provides some indication of the range covered by such possible variances and the associated project risk. The estimates for the effects of the maximum extraction scenario in the analyses above provide an additional form of sensitivity testing. As the material demonstrates, the significantly altered mining program and attendant effects would continue to yield a positive NPV and BCR for the Modification.

A further means of testing the strength of the economic case for the proposal is to adjust certain economic performance assumptions. The test criteria are based on those prescribed in the DPE guidelines (2015:18), to the extent that these can be applied. In respect of the



application of each of the recommended tests, the following comments are included to explain application:

- Royalties +/- 25%: -applied as suggested.
- Company income taxes +/- 50%: - company tax is not included in this assessment (refer Appendix 1).
- Environmental cost (high/low per workbooks⁹): - workbooks had not been issued at the time of preparation of this assessment. High and low estimates from discount rate-based sensitivity testing were adopted as upper and lower bounds.
- Net public infrastructure cost +/- 25%: - no public infrastructure costs are associated with the proposed Modification.

It is noted that the guidelines also require that 'where practicable, sensitivity analysis should identify how much output prices would need to fall for a project to have a zero NPV and report on whether such a scenario is either likely or unlikely' (2015:18). This would require disclosure of commercially sensitive information, which Centennial Mandalong has elected not to publish (as noted in Section 3.2). Based on the assumptions and limitations described above, sensitivity testing outcomes are displayed in Table 6.

Table 6: Sensitivity analyses - adjusted performance assumptions (NPV)¹⁰

Evaluation Element	MSEP \$M	MSEP with Modification \$M	Modification at maximum extraction rate
NPV as assessed	203	223	146
Royalties Δ 25%	262	287	220
Royalties - 25%	157	171	86
Environmental cost (maximum range)	90	104	52
Environmental cost (minimum range)	280	302	216

Sensitivity testing based on adjustments to discount rates and relevant performance indicators supports the conclusions in respect of MSEP. In each scenario, positive NPV and BCR outcomes are maintained. Furthermore, the present analyses demonstrate that the proposed Modification may marginally increase the economic outcomes, particularly from the perspective of royalty returns to the State. Although this analysis examines a limited range of feasible outcomes from among a much broader range of potentialities, the social and economic outcomes are likely to be positive in most foreseeable eventualities. This is evident in the results for the maximum extraction scenario. As was noted in Section 3.4.1,

⁹ It is anticipated that these will form part of the Technical Notes to the guidelines once promulgated.

¹⁰ At 7% discount rate.



operational considerations mean that this scenario may not be achievable. On that basis it can be reasonably concluded that the Modification will result in a beneficial outcome of higher value than this scenario.

An additional form of sensitivity analysis is provided in Appendix 2. This compares the assessments reported in this section with outcomes based on World Bank price forecasts current at April 2016, applied to the minority export volume assumptions for MSEP and the Modification scenarios.

4. LOCAL EFFECTS ANALYSIS (LEA)

4.1 Approach

As is the case with the CBA component of this assessment, the matters discussed in this LEA are based on the assessments reported in relation to MSEP. Similarly, the effects analysed in the LEA may be affected by the altered timeframe for delivery of the Project.

4.2 Regional context

Centennial's operations in the west Lake Macquarie area provide significant employment and other economic stimuli in the LMCC LGA and the broader Lower Hunter regional economy. For the purposes of analysis, the DPE guidelines require consideration of the impacts at the ABS SA3 level. This was discussed in some detail in Section 3.4.3. It is noted however that some impacts require consideration at much more localised level. Such an approach was taken where appropriate, as detailed in Table 2.

4.3 Discussion of localised environmental impacts

Tables 3 and 4 compared the costs of the environmental impacts of the Project with those for the proposed Modification. The quantified assessments of these impacts form part of the overall CBA for the project. Importantly, however, many of these environmental impacts will principally affect the regional and/or local communities, as distinct from broader, less contiguous community groups, such as those resident in other parts of NSW. Recognition of these effects emphasises both financial and experienced materiality in dealing with these impacts, in order to appropriately address stakeholder interests.

Given the limited scope of the changes proposed under the Modification, the local effects are expected to be similar to those estimated for the MSEP, as approved. Appendix 1 presents the summary table included in the EIA for the MSEP. In conjunction with Tables 2 and 3, these describe the risk of local impacts relating to both the Project and this Modification.

4.4 Discussion of regional economic effects

A number of the economic impacts assessed in the CBA are also differentially distributed across local/regional and broader communities. The impacts of royalties and taxes are broadly distributed across the State, whereas the direct and indirect effects of wages earned



by workers in a specific region may be more concentrated in that region. As has been established in these analyses, the labour surplus estimated in relation to employee salaries at Mandalong Mine is considerable, particularly in the context that a proportion of this residual element of employee income is likely to be captured in the regional economy through the consumption activity of employee households.

4.4.1 Community consultation

As was disclosed in relation to the MSEP consent application, Centennial Mandalong has conducted an extensive consultation program in relation to Mandalong Mine's continuing operations. The program commenced in 2009, with the aim of obtaining relevant access permissions and providing information to landholders in relation to the MSEP SSD-5144 exploration and approval processes.

Ongoing monitoring and management of the approved MSEP and the proposed Modification incorporates community stakeholder input. This is achieved principally through continuing engagement with the Mandalong Mine Community Consultative Committee. This program of engagement constitutes an important element of Centennial Mandalong's endeavours in understanding and addressing the effects on households and land users in close proximity to the mine.

4.4.2 Social impacts

The Social Impact Assessment¹¹ in relation to the Project emphasised a limited number of positive and negative aspects of concern to stakeholders, determined through the consultation process. These included landholder concerns regarding subsidence, and contributions to the regional economy, particularly those associated with the ongoing employment of up to 420 FTE employees. The Modification would not materially change the likelihood or magnitude of such effects.

4.5 Extended economic impacts

The Modification effectively represents only a temporal change in the overall economic effects of operations occurring at Mandalong Mine. As a result, downstream economic impacts would be consistent with those identified in relation to the MSEP approval.

4.6 Ecologically sustainable development reporting: quantitative and qualitative assessment of social, economic and environmental impacts

The legislation governing this proposed Modification requires consideration of the principles of ecologically sustainable development in the design and implementation of such a project (refer to Section 1). This report adopts a 'triple bottom line' approach to assessing and reporting these impacts. The approach is intended to provide an integrated assessment of the social, economic and environmental impacts of the Modification, with the interdependencies between each of these aspects taken into consideration. The relevant information for the MSEP and the Modification is included at Appendix 1.

¹¹ (James Marshall & Co 2013)



4.7 Summary

From the operational perspective, the changes to economic outcomes at Mandalong Mine that the Modification would stimulate relate to changes in production schedule assumptions and the timing of realisation of economic benefits. This assessment also incorporates changes associated with the adoption of DPE's new guidelines (2015). The analysis in this economic assessment suggests that the Modification would have a positive effect on the quantum of economic benefits accruing to NSW, which effect is largely consistent with that identified for the MSEP.

5. ADDITIONAL REQUIREMENTS

5.1 Cumulative impacts

There will be no additional cumulative impacts associated with the Modification. The risk of cumulative impacts remains the same as assessed for the SSD-5144 MSEP.

5.2 Intra-generational and intergenerational equity

The MSEP 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 during the Project life. This benefit may be experienced at differing times to MSEP, if the Modification is approved. The broader derived benefits are discussed in preceding sections. These temporal changes may also result in marginal impacts on the extent of intergenerational equity.

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. Centennial Mandalong 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.

As is the case with the economic benefits of the Modification, changes in environmental and social impacts are likely to be a function of any change in the timing of the mining program. For example, an accelerated mining schedule may reduce mine life, possibly resulting in earlier cessation of operations-related impacts (e.g. noise, air quality, GHG). However, this may notionally be offset by the possibility of increased effects during the more concentrated mining operations. The present assumptions in terms of comparative mining programs indicate that any such change would be relatively minor.



6. CONCLUSION

The Modification will allow Centennial Mandalong to improve productivity and efficiency and to respond to market opportunities that may present themselves. This flexibility has potentially positive implications for the State, as the ability to increase production in favourable markets would result in increased royalty returns to NSW in particular. In terms of social and economic impacts, any changes are also assessed as being marginal in scale when compared to MSEP. Furthermore, the socioeconomic benefit accruing to the local and regional economies from the economic labour surplus from mine employment will provide additional benefit. It should be noted that this excludes personal income taxes that would be collected by the Commonwealth. After excluding these taxes and the 'reservation wage' element of employee incomes, the residual component of incomes estimated herein is available for disbursement in the local economies and will support employee households and the economic entities they do business with in the region.

The effects of the Modification have been tested using a variety of measures and alternative scenarios. In each instance such testing has resulted in positive NPVs and BCRs for the proposal. The further positive qualitative socioeconomic effects of MSEP and the Modification have been discussed, with these adding to the overall benefit Mandalong Mine provides in the relevant communities and economies.

The MSEP SSD-5144 received its required approvals on 12 October 2015, at which point the grant of consent recognises the positive contribution of MSEP. Any effect of the Modification is likely to be a marginal increase in benefit of the Project, thus maintaining its suitability for approval.



REFERENCE LIST¹²

ABS (2016b): Census website.

<<http://www.abs.gov.au/websitedbs/censushome.nsf/home/census?opendocument&navpos=10>>

ABS (2016d): Data by Region

< <http://stat.abs.gov.au/itt/r.jsp?databyregion> >

Aigis Group (2013-2015): Mandalong Mine Southern Extension Project Economic Impact Assessment.

NSW Department of Planning and Environment (2015): Guidelines for the economic assessment of mining and coal seam gas proposals – draft for consultation (October 2015).

NSW Department of Planning and Environment (2015): Guidelines for the economic assessment of mining and coal seam gas proposals (December 2015).

Reserve Bank of Australia website 2016 – Historical data

<<http://www.rba.gov.au/statistics/historical-data.html>>

World Bank (2016): Commodity Markets Outlook, April 2016

<<http://pubdocs.worldbank.org/en/173911461677539927/CMO-April-2016-Historical-Forecasts.pdf>>

¹² In the interests of brevity, the extensive list of references in respect of specialist environmental assessments, valuation method sources, etc. Have been withheld from this report. These can be reviewed in the EIA prepared for the SSD5594 consent application (as referenced):

<http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=5144>



APPENDIX 1: TREATMENT OF ECONOMIC EFFECTS OF TAXATION COMPONENTS

As discussed in Section 3.4.1, a comparative assessment of the economic contribution of various Federal, State and Local government taxes, rates and charges is excluded from this analysis. The reasons for this approach essentially relate to changes in methodological assumptions, some of which are necessitated by clarifications provided in the DPE guidelines (December 2015). In essence, the guidelines in particular indicate that tax components be treated separately, whereas they were previously presented on the basis of a combined internal estimate. These are described below.

A1.1 Corporate taxes (Federal)

The DPE guidelines (2015) include provision for reporting of federally-levied corporate income taxes as a component of the economic benefit of projects¹³, which has necessitated a review of method in terms of estimation of assessment of notional tax liability. Tax liability in respect of Centennial Mandalong comprises part of tax assessment by Centennial Coal Pty Ltd at aggregate level for the entire company, and not on the basis of individual operations. Therefore, Centennial Mandalong does not report corporate taxes as a stand-alone operation. Furthermore, given the extent of Centennial Coal's portfolio of operations and their varied performance in any given year, a proportional estimate of entire group tax liability cannot be validly attributed to individual operations. Even less so can a reliable assessment of taxes be made over the life of an individual project in the context of this volatility. As a result, corporate tax is not reported in this assessment. The necessary exclusion of this material will contribute to a conservative estimate of benefit, as ordinarily some component of tax paid by Centennial Coal would be returned to NSW.

A1.2 NSW State Government taxes and Local Government rates, local authority charges etc.

The treatment of State-levied taxes varies. The DPE guideline (2015) notes *'that a new mine will also pay other taxes, such as payroll tax and personal income tax. The majority of these taxes will have been generated without the project, as people would have been employed elsewhere'*. As a consequence, payroll taxes are interpreted as equating to new mining employment. As such they are excluded from the analysis.

Other state taxes and local government rates and charges were based on an aggregated (bundled) basis for the MSEP economic assessment, as provided by Centennial Mandalong. As these are of a relatively minor magnitude, they have been excluded from the analyses in this report.

The combined effect of the exclusion of these items does not negate the fact that they comprise part of the beneficial outcomes of the Modification. Rather, their exclusion should be considered as resulting in a conservative estimate, albeit in the form of a relatively small change.

¹³ Calculated as a population-based proportional return to NSW



APPENDIX 2: ADDITIONAL PRICE-BASED SENSITIVITY COMPARISON

As is noted in Section 3.5, the sensitivity analysis requirements of the DPE guidelines provide for; ‘where practicable, sensitivity analysis should identify how much output prices would need to fall for a project to have a zero NPV and report on whether such a scenario is either likely or unlikely’ (2015:18). As is discussed in Section 3.5 and Appendix 1, such an assessment is not provided in this report. The exclusion of commercially confidential information from the report renders the calculation and reporting of such an analysis impracticable.

However, as also indicated in Section 3.5, in order to provide some further level of validation in respect of the conclusions of this analysis, a comparative assessment of the estimates in this report and estimates based on most recently available World Bank price data (April 2016) is presented below in Tables A4.1 and A4.2. It should be noted that the World Bank pricing is applied only to the export component of Mandalong Mine’s output. Given the contractual basis of Centennial Mandalong’s supply to domestic customers, it was considered appropriate to value that element at the relevant prices advised by Centennial Mandalong.

Table A2.1: World Bank thermal coal price forecasts at April 2016: - 2016-2020¹⁴

Thermal coal	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
USD/mt ¹⁵ (nominal)	50.0	51.0	52.1	53.1	54.2	55.3	56.5	57.6	58.8	60.0
AUD/mt	38.94	39.72	40.58	41.35	42.21	43.07	44.00	44.86	45.79	46.73

Table A2.2 Comparison of estimates of NPV: 2015, 2016 and World Bank (2016) price assumptions

	Approved 2015 \$	Modification 2015 \$	Approved 2016 \$	Modification 2016 \$	Approved WB 2016 \$	Modification WB 2016 \$
PV Benefit \$M	603	613	575	601	562	597
PV Cost \$M	372	378	372	378	372	378
NPV \$M	231	235	203	223	190	219

Discussion

Comparison with World Bank forecasts provides some further validation of the likelihood of positive economic effects arising from the MSEP and the Modification. This would indicate

¹⁴ Data released 19 April 2016. Conversion to AUD based on exchange rate on 19-4-16 of AUD \$1: USD \$0.7788 (RBA 2016).

¹⁵ Metric tonne.



that the likelihood of the scale required to make the Modification not viable from the State's perspective is relatively low.

A further source of mitigation of this risk is that a proportion of Centennial Mandalong's output is committed to stable domestic contracts. This limits the company's exposure to market price variations to some extent, and this consideration is factored into the assessments reported in Table A2.2.



APPENDIX 3: EXAMPLE LABOUR SURPLUS ESTIMATION METHOD USING RESERVATION WAGE (DERIVED FROM MSEP ECONOMIC ASSESSMENT)

Internal employee survey material on the residential status of the Mandalong Mine workforce is discussed in **Section 4.2.1**. This indicates that the workforce is largely resident in the immediate region. As a result, mobility in terms of alternative employment may be somewhat constrained, as transaction costs associated with relocation may be a barrier (e.g. Coulson and Fisher 2009). This being the case, attempts to apply more generalised assumptions to a regional area in relation to which alternative employment is not geographically convenient are problematic and may not effectively capture the effects of these factors. Despite this, it is necessary to assess the extent to which employees of Mandalong Mine might find alternative employment if the consent is not approved and mining subsequently ceased. The approach taken is to adopt a 'reservation wage' and compare this to the assumed wage level for ongoing employment. The reservation wage is derived as:

$$RW = (1 - p)AW + pB$$

Where:

RW = reservation wage;

p = probability of a worker remaining unemployed and thus claiming unemployment (Newstart Allowance) benefit. The Australian Government JobSearch website was referenced to obtain information to inform an assumption on this probability. Findings for relevant occupations for the five-year period 2013 to 2018 are included in Table A3.

Table A3.1: Job outlook information – mining industry

Occupation	Unemployment level (%) ¹⁶	Employment growth	Job openings
Drillers, Miners & Shot Firers	average	declining	average
Mine Deputies ¹⁷	above average	slight growth	average
Mining Engineers	average	relatively steady	low
Other Construction and Mining Labourers	above average	moderate growth	below average
Geologists & Geophysicists	average	declining	low
Production Managers	below average	relatively steady	above average

As the majority of the workforce at Mandalong Mine would fall into the first category (miners) this group is used as a basis for assessing probability of unemployment. As unemployment is assessed as average, the unemployment rate for NSW may be considered

¹⁶ At November 2013

¹⁷ Included in the occupational group 'Other Building and Engineering Technicians'



as reflecting the likelihood of a displaced employee being unable to find work. At December 2014, the unemployment rate for NSW was 5.9 percent. Adopting this rate can be considered as conservative, as it does not allow for the constraints on employee mobility discussed above. It also does not recognise the inherently low labour mobility in the black coal industry reported by the Productivity Commission (1998), which found that voluntary labour turnover rates were less than half the average for all industries, thus indicating scarcity of alternative employment positions.

AW = assumed alternate wage. In this instance the alternate wage is assumed as the median wage for the mining sector (2013) as determined by ABS (2014), which was \$2,071 per week (\$107,692 annualised).

B = Newstart Allowance. The benefit is assumed at partnered level, \$465.50 per fortnight (each)¹⁸ annualised (\$24,206). Therefore the reservation wage would be:

$$(0.941 \times \$107,692) + (0.059 \times \$24,206) \therefore \\ \$101,338 + \$1,428 = \mathbf{\$102,766}$$

The assumed wage rate at the time of preparation of the economic impact assessment was the average wage (including assumed overtime and bonuses) at the mine, which was **\$169,279¹⁹**, therefore the difference, and the value assumed for estimation of the employment effects in the LMCC/WSC LGAs is **\$66,513**. As this estimate is based on 2014 data, it was escalated at by three percent, consistent with Mandalong Mine's assumption of wages growth. As a result, the wage differential (2015) adopted was **\$68,508**. This is approximately 20 percent greater than the estimated average wage and salary income for the LGA (2011) of \$50,831 (ABS 2014), which when escalated to a 2015 estimate (as above) was \$57,211.

¹⁸ Australian Government Department of Human Services website (2015). This assessment is likely to be slightly high as it is a current value, whereas other assumptions are for 2013 pricing, when the initial report was prepared.

¹⁹ Includes budgeted ordinary wages, bonus and overtime.