Centennial Coal
Mandalong

STATEMENT OF ENVIRONMENTAL EFFECTS

Mandalong Mine

State Significant Development 5144 – Modification 3

September 2016

Mandalong Mine

State Significant Development 5144 – Modification 3

Statement of Environmental Effects

Prepared on behalf of:

Centennial Mandalong Pty Limited

By:

Centennial Coal Company Limited

Level 18, BT Tower, 1 Market Street
Sydney NSW 2000

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Centennial Coal
Mandalong

September 2016

Submission of Statement of Environmental Effects (SEE)

Prepared under Section 96(1A) of the *NSW Environmental Planning and Assessment Act 1979*

SEE Prepared By:

Name:	Iain Hornshaw Approvals Coordinator
Qualifications:	BSc (Hons); MSc
Company:	Centennial Coal Company Limited
Address:	Level 18, BT Tower, 1 Market Street, Sydney, NSW, 2000

Development Application:

Proponent Name:	Centennial Mandalong Pty Limited
Proponent Address:	Level 18, BT Tower, 1 Market Street, Sydney NSW, 2000
Land to be Developed:	Mandalong Mine Kerry Anderson Drive, Mandalong, NSW, 2264 Lake Macquarie City Council Local Government Area Refer to attached Schedule of Land
Development Description:	Modification 3 to State Significant Development SSD-5144 regarding an increase to the annual production limit from 6 million tonnes per annum to 6.5 million tonnes per annum in addition to correcting administrative errors currently attached to the SSD-5144 development consent.

Declaration:

I hereby certify that I have prepared the contents of this document and to the best of my knowledge:

- It contains all available information that is relevant to the environmental assessment of the proposed development to which the document relates; and
- It is true in all material particulars and does not, by its presentation or omission of information, materially mislead.

Name:	Iain Hornshaw (Centennial Coal Company Limited)
Signature:	
Date:	September 2016

EXECUTIVE SUMMARY

Background

Mandalong Mine is an existing underground longwall coal mine operation producing thermal coal that is supplied to domestic and export markets. It is located approximately 35 kilometres south-west of Newcastle near Morisset in New South Wales (NSW). Mandalong Mine is 100 percent owned and operated by Centennial Mandalong Pty. Limited (Centennial Mandalong), a subsidiary of Centennial Coal Company Limited. Centennial Coal Company Limited is a wholly owned subsidiary of Banpu Public Company Limited.

Mandalong Mine operates under Development Consent SSD-5144 which was granted on 12 October 2015 by the NSW Planning Assessment Commission under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), and provided for extension of the mining area with a production limit of 6 million tonnes per annum of thermal coal from the West Wallarah and Wallarah-Great Northern Seams.

The currently approved Mandalong Mine comprises the underground workings and surface infrastructure of the following:

- The Mandalong Mine Access Site, encompassing underground workings and associated surface infrastructure near Morisset.
- Delivery of run-of-mine coal from the underground workings to the Cooranbong Entry Site and Delta Entry Site near Dora Creek. These coal handling and processing facilities are approved under the Northern Coal Logistic Project (SSD-5145).
- Mandalong South Surface Site, which is yet to be constructed, encompassing ventilation shafts, ventilation fans and underground delivery boreholes located approximately 6 kilometres south-west of the Mandalong Mine Access Site.

In March 2016 Centennial Mandalong lodged an application to modify SSD-5144 for the Mandalong Transmission Line TL24 Relocation Project. This was subsequently approved by the NSW Department of Planning and Environment (DP&E) on 14 June 2016. A second Modification to SSD-5144 was lodged on 19 August 2016 regarding extended development of first workings associated with maingates for longwall panels 22 and 23 beyond the current approved mine plan.

This Statement of Environmental Effects (SEE) has been prepared to support an application by Centennial Mandalong seeking to modify its existing development consent under Part 4 of the EP&A Act for the Mandalong Production Tonnage Project.

Proposed Modification

Centennial Mandalong proposes to modify its Development Consent SSD-5144 pursuant to Section 96(1A) of the EP&A Act for the Mandalong Production Tonnage Project (the Modification). The Modification is seeking 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.

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 increase will not affect the delivery limits associated with the Cooranbong Entry Site and the Mandalong Coal Delivery System.

The Modification is further seeking to rectify administrative errors currently attached to Centennial Mandalong's SSD-5144 approval.

No physical changes to the mine's infrastructure (including the ventilation system) or the surface footprint as currently approved under SSD-5144 are proposed.

Potential Impacts

This SEE, which includes relevant technical specialist assessments, documents the various studies that have been undertaken to examine potential impacts that may occur as a result of the Modification.

The assessment of environmental issues has been multi-disciplinary and involved consultation with DP&E. Where a knowledge gap was identified, a technical specialist study was commissioned and appropriate management responses identified.

The Modification is anticipated to pose minimal environmental, social and economic impacts beyond those previously assessed and approved under SSD-5144. While the information presented in this SEE and within the appended technical specialist assessments should be read in their entirety, the following table provides a broad overview of the key outcomes.

Broad Overview of Assessed Environmental Issues

Assessment Issue	Overview of Key Findings
Water Resources	• The updated hydrogeological model supporting the water and salt balance models indicates that the peak discharge volume and salt load (in year 2030) through LDP001 will be less than the predicted discharge and salt load approved as part of the Mandalong Southern Extension Project. • It is now predicted that the average annual discharge through LDP001 will peak in 2030 at approximately 1163 ML/year. • This reduction in discharge is primarily attributable to a reduction in predicted groundwater inflow resulting from the recalibration of the groundwater model.
Air Quality	• Dispersion modelling determined that concentrations of TSP, PM_{10}, $PM_{2.5}$, CO, NO_2 and SO_2 are unlikely to exceed the relevant criterion at any of the identified sensitive receptors around the Mandalong Mine Access Site, approved Mandalong South Surface Site and the Cooranbong Entry Site as a result of the proposed increase in production. • Based on the results, it is concluded that there are no constraints in relation to air quality experienced at nearby residential locations if the total annual coal production rate was increased from 6 Mtpa to 6.5 Mtpa.

Assessment Issue	Overview of Key Findings
Greenhouse	• Revised annual Scope 1, 2 and 3 emission rates have been calculated based on the increased rate of extraction being the subject of this modification. • Whilst the total annual emission rate increased by 8.5 percent the overall life of mine emissions have remained unchanged as the increased annual rate will occur over a shorter period of time. • No additional greenhouse gas impacts are predicted to occur beyond those originally approved.

Modification Benefits

The socio-economic assessment prepared in relation to the Modification has considered the findings from the relevant technical specialist assessments which have assumed a worst case scenario, meaning that potential impacts may be less than predicted.

Overall the Modification results in no long term socio-economic impacts with the increase in the annual production limit being sought to sustain the ongoing efficient operation of Mandalong Mine.

Approval of the Modification will result in greater royalty and tax yields for state and federal governments. This will have a positive socio-economic impact over the life of the mine.

Conclusion

To date, significant effort by Centennial Mandalong has been invested to avoid or minimise potential impacts that could be associated with continued operations. The Modification involves the realisation of operational efficiencies to yield an increased annual production of ROM coal with no physical changes to the mine's infrastructure or the surface footprint as currently approved. An increase in the production rate would lead to a shorter operational mine life, as the available resources would be extracted at an increased rate.

The Modification will allow for continued operations at Mandalong Mine in accordance with the mine plan approved under SSD-5144. This will sustain current employment levels for the life of Mandalong Mine. As a coal mine, Mandalong Mine's challenge is to maximise returns through the mineral wealth within existing lease areas whilst ensuring a minimal environmental impact. Mandalong Mine acknowledges the need to co-exist with its regional community as well as underpin the economic opportunity the mine represents.

Based on the assessment of environmental and socio-economic considerations undertaken as part of this SEE, the Modification is anticipated to pose minimal environmental, social and economic impacts, and as such poses minimal impacts beyond those already approved under SSD-5144.

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APPENDICES

1.0 INTRODUCTION

1.1 Background

Mandalong Mine is an existing underground coal mine operation located in the Lake Macquarie and Wyong Local Government Areas (LGAs). Mandalong Mine is situated approximately 130 kilometres north of Sydney and 35 kilometres south-west of Newcastle near Morisset in New South Wales (NSW). Mandalong Mine operates under Development Consent SSD-5144 which was granted on 12 October 2015 by the NSW Planning Assessment Commission under Part 4, Division 4.1 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act) which relates to State Significant Developments (SSD).

In March 2016 Centennial Mandalong lodged an application to modify SSD-5144 for the Mandalong Transmission Line TL24 Relocation Project. This was subsequently approved by the NSW Department of Planning and Environment (DP&E) on 14 June 2016. A second Modification to SSD-5144 was lodged on 19 August 2016 regarding extended development of first workings associated with maingates for longwall panels 22 and 23 beyond the current approved mine plan. SSD-5144 Modification 2 is yet to be determined.

This Statement of Environmental Effects (SEE) has been prepared to support an application to modify SSD-5144 pursuant to Section 96(1A) of the EP&A Act for the Mandalong Production Tonnage Project (the Modification).

1.2 The Proponent

Mandalong Mine is owned and operated by Centennial Mandalong (the Proponent), a wholly owned subsidiary of Centennial Coal Company Limited (Centennial Coal). Centennial Coal is a wholly owned subsidiary of Banpu Public Company Limited (Banpu). Centennial has over 1,400 employees, with approximately 370 of these making up the workforce for Mandalong Mine; one of the largest underground coal producers in NSW.

Centennial Mandalong is the proponent for the Modification. The relevant address is:

Centennial Mandalong Pty Limited
Level 18, BT Tower
1 Market Street
Sydney NSW 2000

1.3 Document Purpose and Structure

This SEE has been prepared by Centennial Coal to support the application to modify SSD-5144 pursuant to Section 96(1A) of the EP&A Act. It has further been prepared in accordance with the relevant provisions of the *NSW Environmental Planning and Assessment Regulation 2000* (EP&A Regulation).

In addition to describing the Modification, this SEE contains an assessment of the key environmental, social and economic issues.

In summary, this SEE is structured as follows:

Section 1: outlines the Project background, the Proponent, Modification and approval pathway and the Modification need.

Section 2: provides an overview of the Project Application Area (PAA), including land ownership, existing land uses and sensitive receptors.

Section 3: describes the existing approved Mandalong Mine operations.

Section 4: describes the proposed Modifications being sought for approval.

Section 5: describes the approval pathway and environmental legislative framework for the Modification.

Section 6: contains an analysis of socio-economic factors.

Section 7: outlines the stakeholder consultation activities undertaken to identify and prioritise the issues to be addressed within the SEE.

Section 8: outlines the key issues identified for assessment within the SEE.

Section 9: contains an assessment of the potential environmental and socio-economic implications of the Modification, including cumulative impacts.

Section 10: provides a justification for the Modification and outlines ecologically sustainable development considerations.

Section 11: lists the reference documents referred to within the SEE.

Section 12: lists the abbreviations used within the SEE.

1.4 Overview of the Modification

Centennial Mandalong proposes to modify its Development Consent SSD-5144 pursuant to Section 96(1A) of the EP&A Act for the Mandalong Production Tonnage Project. The Modification is seeking an increase in the annual production limit from 6 million tonnes per annum to 6.5 million tonnes per annum of ROM coal. 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 increase will not affect the delivery limits associated with the Cooranbong Entry Site and the Mandalong Coal Delivery System.

The Modification is further seeking to rectify administrative errors currently attached to Centennial Mandalong's SSD-5144 approval. This is outlined in **Section 4.10** with a copy of the marked up changes included as **Appendix 1**.

No physical changes to the mine's infrastructure (including the ventilation system) or the surface footprint as currently approved under SSD-5144 are proposed.

1.5 Modification Need

The increase in the annual production limit to 6.5 Mtpa is required due to the mine optimising the production process, both in terms of mechanical improvements and through the continued development

and training of underground operators. The increased rate of production will enable operational efficiencies to be realised within the existing approved extraction area.

The alternative of not increasing the annual production limit, which is currently 6 Mtpa, will result in the mine either slowing production or having scheduled outages to avoid exceeding the production limit during high yielding years. Such outages affect the mine's ability to maintain continuity and would likely involve employees being temporarily stood down.

2.0 SITE DESCRIPTION

2.1 Site Location

Mandalong Mine is an existing underground longwall coal mine located in the Lake Macquarie and Wyong Local Government Areas (LGAs). Mandalong Mine is situated approximately 130 kilometres north of Sydney and 35 kilometres south-west of Newcastle near Morisset (**Figure 1**).

The nearest major population settlements to the Mandalong Mine Access Site (MMAS) are Morisset 2.5 kilometres to the east, Wyee 6.5 kilometres to the south-east and Cooranbong 4.5 kilometres to the north. The Sydney-Newcastle M1 Motorway and the Main Northern Railway Line both traverse through the Mandalong Mine Development Consent boundaries on a north-south alignment.

In addition to many private land owners, the Development Consent boundary covers parts of the Olney State Forest and exists within the Lake Macquarie and Wyong River catchment areas.

2.2 Project Application Area

The Mandalong Southern Extension Project (SSD-5144) Project Application Area (PAA) is applicable to this Modification and comprises of the existing MMAS, Mandalong South Surface Site (MSSS), Cooranbong Entry Site, underground workings and associated surface infrastructure. The PAA encloses approximately 13,467 hectares and, is illustrated on **Figure 2**.

2.3 Land Use and Ownership

The predominant land uses within the PAA include rural-residential, utility easements, underground mining and surface operations associated with the Mandalong Mine, cattle grazing and production and transport corridors.

The land within the PAA exists over privately-owned freehold (including residential and commercial areas) and land owned by the NSW State Government. A Schedule of Land indicating land ownership within and surrounding the PAA appears in **Appendix 2**.

2.3.1 Sensitive Receivers

The population settlements of Morisset and Dora Creek are located within the PAA approximately 2.5 kilometres to the east and 5 kilometres of the north-east, respectively, of the existing MMAS. Wyee is also a population settlement and is located outside of the PAA approximately 6 kilometres to the east of the proposed MSSS. There are numerous small settlements within and surrounding the PAA.

The nearest privately-owned residences to the existing MMAS exist to the east of the site on Gimberts Road, which is on the eastern side of the M1 Pacific Motorway and to the south and west of the site on Mandalong Road.

Sensitive receivers applicable to the modification are illustrated in **Figure 3**.

2.4 Geology, Topography, Hydrology and Soils

The PAA is located in the south-western part of the Newcastle Coalfield, which occupies the north-eastern portion of the Sydney Basin. The target coal seams are the West Wallarah seam and the Wallarah-Great Northern seam, which together form the upper part of the Permian Newcastle Coal Measures. Above the West Wallarah and Wallarah-Great Northern seams lies the Narrabeen Group, which are comprised of variable sequences of interbedded claystones, siltstones and fine to coarse-

grained sandstones. The Munmorah Conglomerate is a sandstone-dominated formation within the Narrabeen Group, which typically occurs between 60–140 m above the Newcastle Coal Measures.

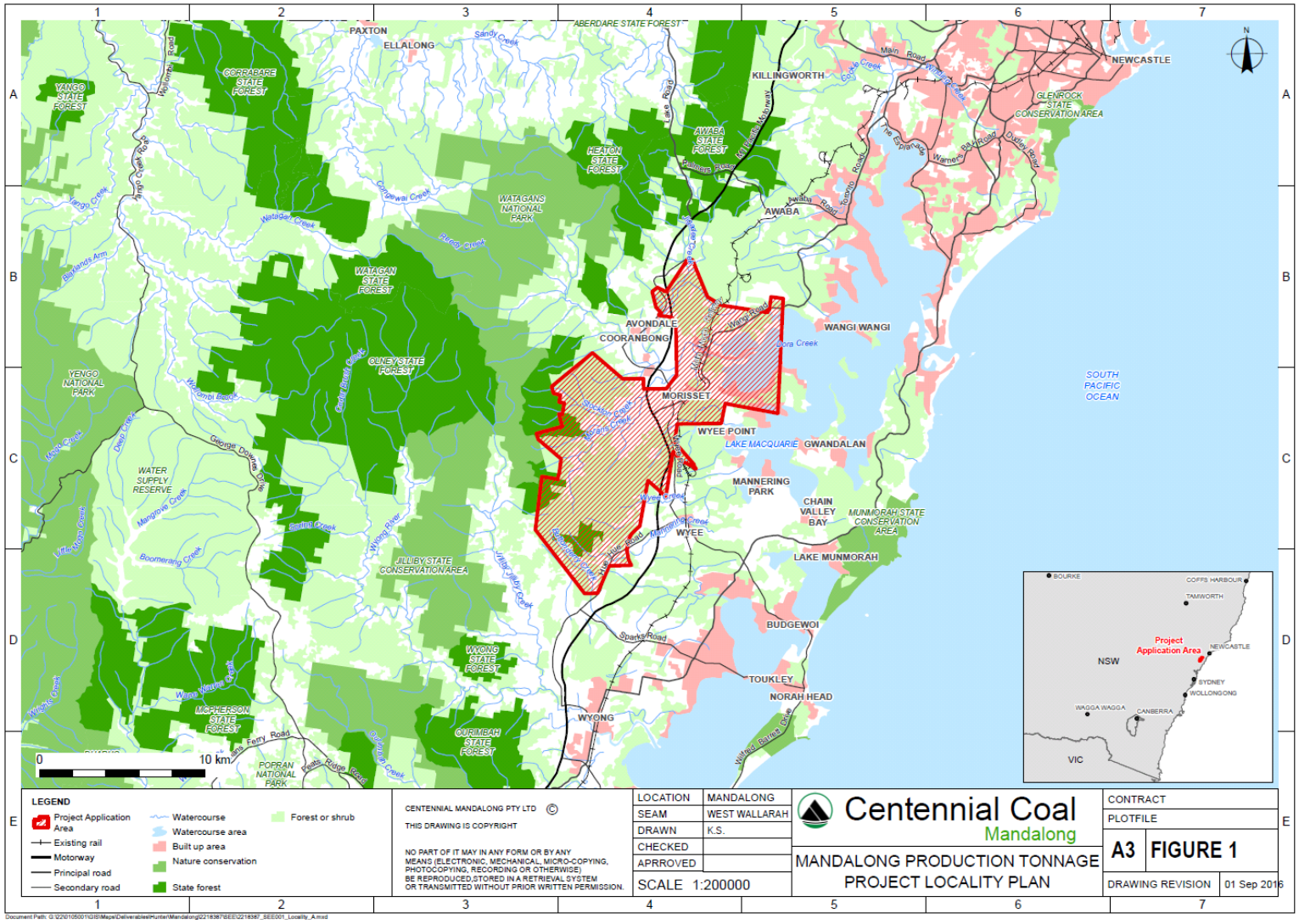

Figure 1 - Project Locality Plan

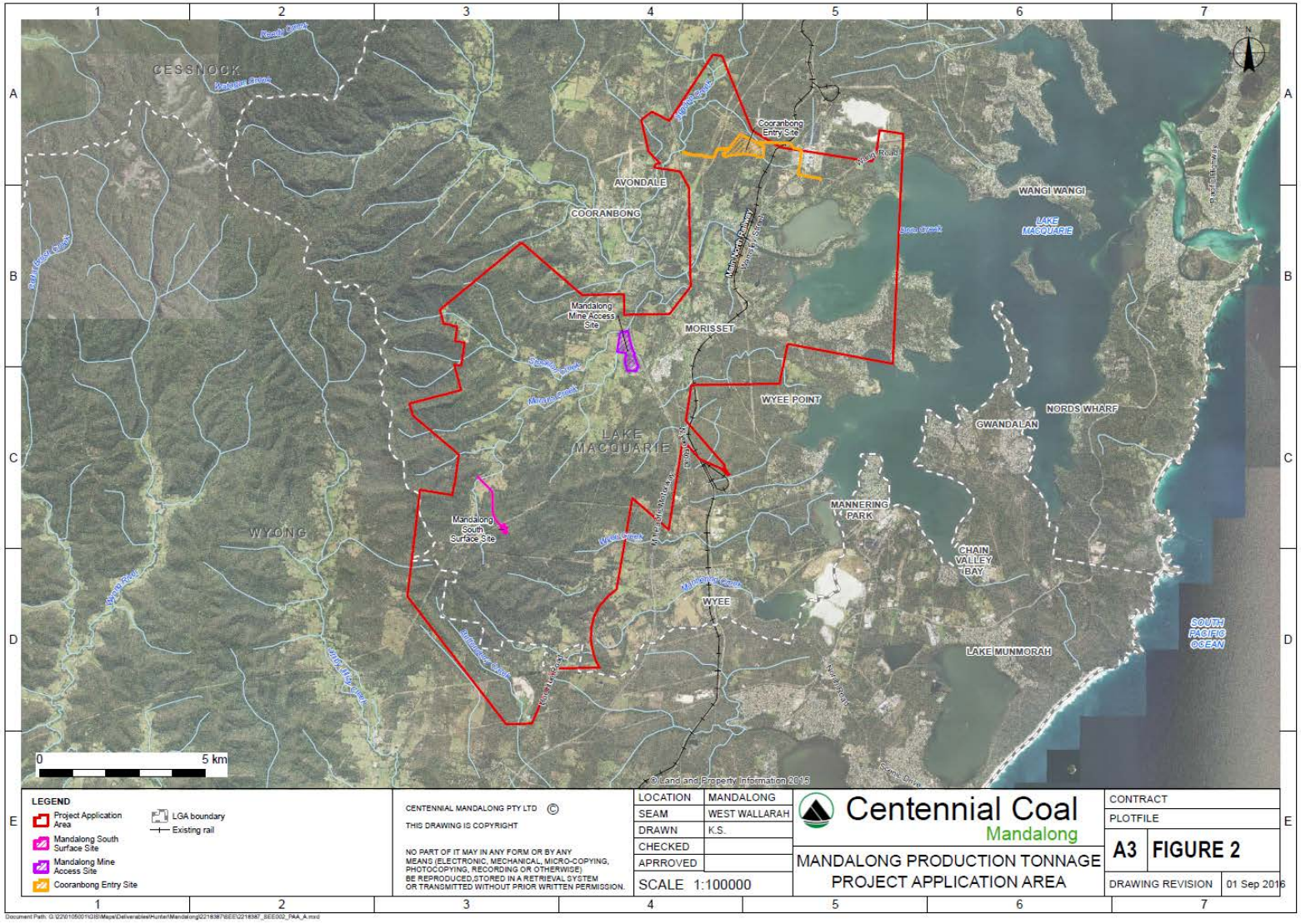

Figure 2 - Project Application Area

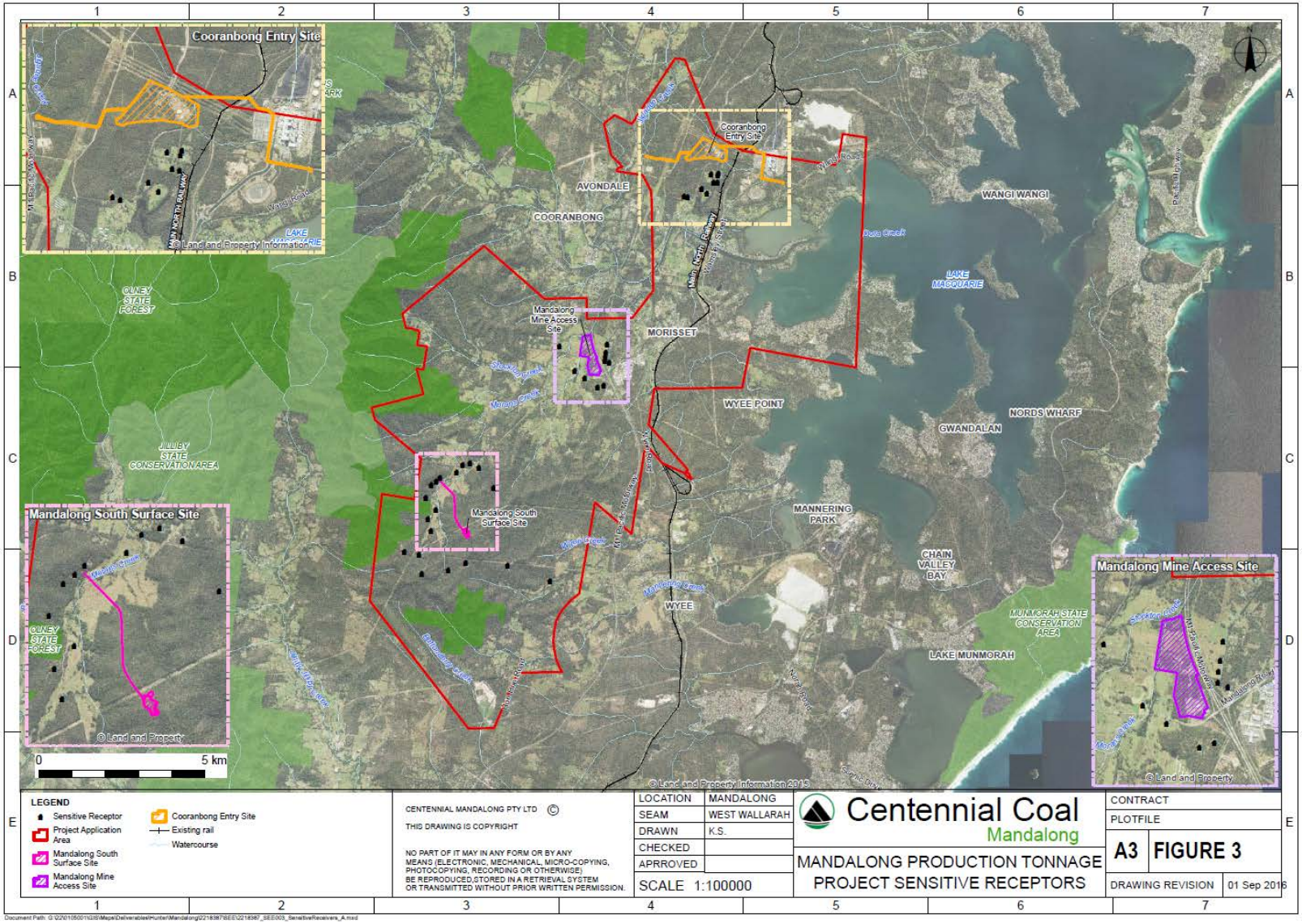

Figure 3 - Sensitive Receptors

Lake Macquarie, being the dominant natural feature in the area, extends into the north-eastern extent of the PAA. Dora Creek, which is a major tributary of Lake Macquarie, also flows into the north-eastern extent of the PAA.

The PAA is located in the Mandalong Valley. Diverse landforms are present, including broad flat floodplains of the Stockton Creek and Morans Creek catchment, and undulating hills and rugged ridgelines associated with the surrounding Watagan Mountain range.

The PAA is dominated by two densely timbered ridgelines which trend generally north-west to south-east and from the south to the north-east corner. Elevations on these ridgelines can exceed 200 metres Australian Height Datum (AHD). Spurs from these ridgelines descend toward drainages lines in relatively flat areas to the north, east and south of the ridgelines, some of which have been cleared or partially cleared for rural production. These valleys are relatively low lying with surface elevations generally less than 50 metres AHD.

The Mandalong soil landscape unit is the dominant unit within the PAA followed by the Gorokan soil landscape unit.

2.5 Climate

The meteorology data presented in this section has been sourced from long-term data collected at the Bureau of Meteorology's (BoM) nearest operational weather stations, along with information provided in recent assessment reports commissioned by Centennial Mandalong.

2.5.1 Temperature

From SLR (2013), the PAA is located in a temperate climate zone with no designated wet season, although the area can be susceptible to occasional heavy showers and thunderstorms due to easterly troughs during warmer months. The local climate is characterised by warm to hot summers and cool to mild winters. Based on the long-term climate statistics sourced from the BoM between 1994 and 2012, mean monthly maximum temperatures in the area range between 15.1 degrees Celsius (^{0}C) in July to 26.9 ^{0}C in January. Mean monthly minimum temperatures range between 6 ^{0}C in July to 17 ^{0}C in February. Autumn and spring are generally mild with sporadic temperature fluctuations.

2.5.2 Rainfall and Evaporation

GHD (2013) obtained a continuous daily rainfall dataset as SILO Patched Point Data, using SILO data from the BoM Cooranbong (Avondale) weather station (station number 061012) with missing data "patched" in from interpolations from nearby stations. The available rainfall data extended from January 1889 through to December 2014, with the representative statistics reported as:

- Minimum annual rainfall – 531 millimetres (in 1944).
- Average annual rainfall – 1,106 millimetres.
- Median annual rainfall – 1,041 millimetres.
- Maximum annual rainfall – 2,040 millimetres (in 1990).

The average annual evaporation total was approximately 1,187 millimetres, compared to the annual average rainfall of 1,106 millimetres. This gives an annual deficit (difference between annual rainfall and annual evaporation) of approximately 81 millimetres.

2.5.3 Wind

SLR (2013) has developed a three-dimensional prognostic meteorological dataset for the region surrounding the PAA using the CALMET meteorological model. A summary of the annual wind behaviour predicted by CALMET for the year 2010 is presented as wind roses in SLR (2016). These wind roses indicate that the area predominantly experiences light to moderate winds (between 1.5 and 8 metres per second), with high-speed winds (greater than 8 metres per seconds) prevailing for a low fraction of time. Wind direction is seasonally dependent.

While winds occur reasonably evenly from all quadrants, based on the modelled wind roses for 2006 to 2010, summer winds appear to be generally from the east-northeast and winter winds appear to be predominately from the west-northwest. Calm wind conditions (less than 0.5 metres per second) were predicted to occur just over 1 percent of the time during each year.

2.5.4 Atmospheric Stability

Using the CALMET model, SLR (2013) predicted the frequency of each stability class within the area over the five years between 2006 and 2010, with the results indicating a high frequency of conditions typical to Stability Class F. Stability Class F is indicative of very stable night time conditions, conducive to a low level of pollutant dispersion due to mechanical mixing (SLR 2013). In 2009 and 2010 a higher percentage of Stability Class D was predicted, which is indicative of neutral conditions, conducive to a moderate level of pollutant dispersion due to mechanical mixing (SLR 2013).

3.0 EXISTING MINE OPERATIONS

3.1 Overview of Operations

Underground longwall mining operations commenced at Mandalong Mine in January 2005. At present, Centennial Mandalong has approval to extract up to 6 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal from the West Wallarah and Wallarah-Great Northern Seams utilising a combination of longwall and continuous mining methods.

3.2 Existing Approvals and Licences

3.2.1 Development Consents

On 12 October 2015 State Significant Development (SSD) 5144 was approved by the NSW Planning Assessment Commission (PAC) for the Mandalong Southern Extension Project. This approval exists as a single new development consent for the Mandalong Southern Extension Project to regulate its approved existing mining operations, extend existing underground mining operations into the Southern Extension Area and utilise existing and proposed new surface infrastructure integral to the mining operation. The primary activities authorised under SSD-5144 are as follows:

- Continue to operate the Mandalong Mine, with the exception of the infrastructure and operations at the surface of the Cooranbong Entry Site (however the mine ventilation shaft, ventilation fan and Borehole Dam at the surface of the Cooranbong Entry Site are part of the Project).

- Extend the Mandalong Mine's underground mining operations into the area covered by ML1722 (Southern Extension Area) using a combination of continuous miner and longwall mining methods.

- Extract up to 6 Mtpa of ROM coal from the West Wallarah and Wallarah-Great Northern Seams within the current mining lease areas.

- Deliver ROM coal from the underground workings to the Cooranbong Entry Site at a rate of up to 6 Mtpa and to the Delta Entry Site at a rate of up to 6 Mtpa.

- Continue to utilise the existing surface infrastructure of the MMAS.

- Install and operate surface infrastructure at the proposed MSSS to service the extended underground mining operation.

- Increase manning to 420 full-time employees and up to 50 contractors during longwall relocations.

- Undertake on-going exploration drilling activities within the bounds of Centennial Mandalong's mining leases and exploration licences.

- Continue to operate 24 hours per day, seven days per week.

In addition to SSD 5144, Development Consent DA 35/2/2004 was granted in July 2004 by the Minister for Planning, approving the construction and operation of the coal handling and clearance system at the Delta Entry Site. This SEE only relates to a proposed modification of SSD-5144.

3.2.2 Approval Under the Environment Protection and Biodiversity Conservation Act 1999

An assessment of whether Mandalong Mine may have a significant impact on any Matters of National Environmental Significance (MNES) or on the environment of Commonwealth land was completed as part of the Mandalong Southern Extension Project. This assessment determined that no aspect of the Project posed a significant impact on any MNES. Mandalong Mine's operations have not been referred under the EPBC Act. As such, Mandalong Mine has no existing approval under the EPBC Act.

3.2.3 Subsidence Management Plan Approvals

Centennial Mandalong has approved Subsidence Management Plans to mine up to and including Longwall panel 21. An Extraction Plan is being prepared regarding Longwall panels 22 and 23.

3.2.4 Environment Protection Licence

Mandalong Mine is a premises-based activity under Schedule 1 of the *Protection of the Environment Operations Act 1997* (POEO Act). On this basis, the occupier of the premises must hold an Environment Protection Licence (EPL) administered by the Environment Protection Authority (EPA) under Section 43(b) of the POEO Act. Mandalong Mine operates under EPL 365, which covers coal mining to a scale of greater than 5 million tonnes produced per annum and coal works to a scale of greater than 5 million tonnes handled per annum.

3.2.5 Water Licencing

Centennial Mandalong currently holds several groundwater monitoring licences under the provisions of the *Water Act 1912* for the purposes of monitoring groundwater levels in the Mandalong Mine Development Consent Boundary.

A groundwater dewatering licence (licence number 20BL173524) is also held by Centennial Mandalong under the Water Act 1912 permitting the extraction of up to 1,825 megalitres per year of groundwater from the coal seam as part of the process of mining (dewatering).

3.2.6 Mineral Authorities

Exploration, mining and mining-related operations at Mandalong Mine occur under the provisions of various mineral authorities as detailed in **Table 1** below.

Table 1: Mandalong Mine's Mineral Authorities

Reference	Title	Description	Expiry Date
CCL 762	Consolidated Coal Lease 762	Title of Cooranbong workings, includes some surface land.	13 Oct 2022
CCL 746	Consolidated Coal Lease 746 (sublease)	Title of Cooranbong workings, includes some surface land.	31 Dec 2028
ML 1722	Mining Lease 1722	Title for Mandalong Mine workings, includes surface mining lease for MSSS.	17 Dec 2036
ML 1443	Mining Lease 1443	Title for Mandalong Mine workings, includes MMAS.	1 Mar 2020
ML 1431	Mining Lease 1431	Title to surface land for proposed shaft at the back of Morisset.	27 May 2019
ML 1543	Mining Lease 1543	Title for Mandalong Mine workings.	25 Nov 2024
ML 1553	Mining Lease 1553	Title for Delta Link Project.	7 Sept 2025
MPL 191	Mining Purposes Lease 191	Title to surface land for water tanks at Cooranbong.	24 Feb 2023

MLA 457	Mining Lease Application 457	Subsurface lease for part of Mandalong Southern Extension Area	Pending
EL 6317	Exploration Licence 6317	Title for exploration activities in the Southern Extension Area.	8 Aug 2019
EL 4443	Exploration Licence 4443	Title for exploration activities over the former Cooranbong Colliery.	23 Oct 2017
EL 4968	Exploration Licence 4968	Title for exploration activities over part of Mandalong Mine.	31 July 2017
EL 4969	Exploration Licence 4969	Title for exploration activities over part of Mandalong Mine.	31 July 2017
EL 5892	Exploration Licence 5892	Title for exploration activities over part of Mandalong Mine.	31 July 2017
A 404	Authorisation 404	Title for exploration activities over part of Mandalong Mine.	31 July 2017

3.3 Life of Mine

Mandalong Mine's current Development Consent will expire in 2040.

3.4 Hours of Operation

Mandalong Mine is approved to operate up to 24 hours per day, seven days per week.

3.5 Employment

Mandalong Mine is approved to employ up to 420 full-time equivalent employees. Up to an additional 50 contractors will be employed during longwall relocations.

3.6 Mining Operations

The approved Mandalong Mine comprises the underground workings and surface infrastructure of the Mandalong Mine, including the MMAS and MSSS, encompassing access to underground workings and associated surface infrastructure. The other operations directly related to the currently approved Mandalong Mine are the two components which comprise the Delta Entry Site and the Cooranbong Entry Site.

Underground longwall mining operations commenced at Mandalong Mine in January 2005. Centennial Mandalong is approved to extract up to 6 Mtpa of ROM coal from the West Wallarah Seam utilising a combination of longwall and continuous mining methods. The primary components of Mandalong Mine are:

- Existing surface infrastructure at the MMAS (ventilation infrastructure, gas drainage, demonstration VAM RAB, administration, workshops and material storage);
- The mine ventilation shaft, ventilation fan and borehole dam at the surface of the Cooranbong Entry Site;
- Mandalong Mine's underground mining operations in existing and future approved mining areas as outlined in SSD-5144;
- Extraction of up to 6 Mtpa of ROM coal from the West Wallarah and Wallarah-Great Northern Seams within the current mining lease areas;
- Delivery of ROM coal from the underground workings to the Cooranbong Entry Site at a rate of up to 6 Mtpa and to the Delta Entry Site at a rate of up to 6 Mtpa; and

- Surface infrastructure at the MSSS (yet to be constructed) to service the extended underground mining operation.

3.6.1 Mine Ventilation

Mandalong Mine is currently ventilated by two surface fans located at the MMAS and Cooranbong Entry Site. One additional fan is approved, but not yet constructed, at the MSSS. These fans are used to ventilate the active mining areas of the underground mine. The fan located at the MMAS currently exhausts approximately 300 cubic metres per second with the ventilation fan at the Cooranbong Entry Site exhausting approximately 140 cubic metres per second.

3.7 Mine Support Facilities

All existing surface and underground infrastructure at Mandalong Mine, including previous surrounding workings (for ongoing ventilation and access), will continue to be relied upon. The existing MMAS is located off Mandalong Road (via Kerry Anderson Drive) west of Morisset. Existing surface and underground infrastructure includes the following:

- Decline tunnel;
- Administration buildings and bathhouse;
- Car parking areas;
- Mechanical workshop and store;
- Mine ventilation and gas drainage infrastructure;
- Water management infrastructure; and
- Pollution control infrastructure.

The MSSS when constructed will comprise of infrastructure to service the extended underground mining operation with key items including:

- Floxal unit and borehole;
- Ventilation fans;
- Hydrocarbon storage;
- Storage and delivery to underground of bulk materials;
- A small administrative office (no personnel will be permanently located at the site);
- Compressor shed;
- Tube bundle gas monitoring equipment;
- Electrical sub-station; and
- Water tanks.

3.8 Coal Handling Transport and Dispatch

Extracted coal is transported from the Mandalong Mine underground workings via underground drift conveyor systems to either the Cooranbong Entry Site at a rate of up to 6 Mtpa or the Delta Entry Site at a rate of up to 6 Mtpa. These conveyors operate 24 hours a day, seven days per week. Centennial's Northern Coal Services Facility is responsible for processing, stockpiling and dispatching product coal at the Cooranbong Entry Site. Coal delivered via the Delta Entry Site is transported to Vales Point Power Station via the Delta Electricity owned overland conveyor belt.

3.9 Water Management

The water demands of the Mandalong Mine are for underground operations, surface facilities (including machinery operation and wash-down), dust suppression, fire-fighting storage and staff amenities. Potable water is obtained via the existing connections to Hunter Water's reticulated water supply infrastructure at the MMAS and Cooranbong Entry Site. Additional water sources comprise mine water and rainfall runoff.

The key functions of the Mandalong Mine water management systems are to:

- Separate clean and dirty water sources, and allow for diversion, collection and treatment as appropriate;
- Minimise discharges by maximising, where practicable, available water storages; and
- Manage water discharge, in terms of volume and quality, to a level that is acceptable for environmental management.

Surface runoff from areas where there is no coal storage, handling, processing or transportation and no equipment servicing is considered to be clean water. It is typically from undisturbed catchment areas and impervious areas such as sealed roads and car parks. This runoff is directed around dirty water catchments to avoid potential contamination and minimise the volume of dirty water required to be managed.

Dirty water is runoff from disturbed areas and areas likely to contain coal, oils, greases and hydrocarbons, including workshop and fuel storage areas. Dirty water is managed and treated to remove sediment and residual hydrocarbons prior to discharge in accordance with the relevant EPL.

3.10 Environmental Management Strategy

Mandalong Mine has an established Environmental Management Strategy (EMS) that has been developed in accordance with the *Centennial Coal Environmental Management System Framework* (2011) and is generally consistent with the elements of ISO 14001. This EMS provides a framework to ensure the effective management of environmental issues and compliance with regulatory requirements for all activities and areas managed by Centennial Mandalong. It also provides a means for continued improvement in environmental performance.

As part of the EMS, a comprehensive set of environmental management plans has been developed and implemented at Mandalong Mine. The implementation of these plans and the integration of the *Centennial Coal Environmental Management System Framework* (2011) is a strong focus at the Mandalong Mine and demonstrates environmental due diligence. These plans are reviewed and updated, as necessary, to reflect operational changes and incorporate additional/amended requirements.

The existing approved environmental management plans include:

Table 2: Mandalong Mine's Existing Approved Management Plans

Management Plan	SSD-5144 Schedule-Condition
Noise Monitoring & Management Plan	S3-4
Air Quality & Greenhouse Gas Management Plan	S3-10
Mine Water Discharges Management Plan	S3-15
Water Management Plan	S3-17
Site Water Balance	
Surface Water Management Plan	
Erosion & Sediment Control Management Plan	
Land Management Strategy	S3-18
Biodiversity Management Plan	S3-19
Centennial Northern Holdings Aboriginal Cultural Heritage Management Plan	S3-22
Construction Traffic Management Plan	S3-27
Rehabilitation Management Plan	S3-33
Surface Infrastructure Management Plan	S3-35
Gas Drainage Management Plan	
Service Boreholes Management Plan	
PED Management Plan	
Exploration Activities Management Plan	S3- 36
Extraction Plan and associated management plans	S4-6
Construction Environmental Management Plan	EIS Statement of Commitments
Waste Management Plan	
Bushfire Management Plan	
Energy Savings Action Plan	
Stakeholder Engagement Strategy	
Emergency Management System	

The environmental management plans are backed by an environmental monitoring network. Monitoring results are reported monthly on Centennial Coal's website and in the Annual Review.

Mandalong Mine has also developed and implemented an Approvals Database which is used as the primary tool for tracking compliance with conditions of consent, licences and leases.

3.11 Rehabilitation and Final Landform

The underground nature of Mandalong Mine's operations means that surface disturbance and the need for progressive rehabilitation and revegetation is relatively minor compared to open cut mining operations.

Regardless, Mandalong Mine does adopt a progressive approach to rehabilitation in accordance with a series of approved management plans; including on-going maintenance of previously rehabilitated areas.

The Mining Operations Plan (MOP) was approved by the Division of Resources and Energy (DRE) on 23 December 2013 for the two year period from 1 January 2014 to 30 November 2015. MOP Amendment A was sought and approved by DRE on 13 October 2015 for an additional 12 month period to 30 November 2016. MOP Amendment B was approved on 19 January 2016 to allow the development of main headings into ML1722.

A new MOP is currently being developed (to also address the Rehabilitation Management Plan requirements specified by SSD-5144) for the Mandalong Mine and will include underground mining from Longwall 22 to 37 under the Development Consent SSD-5144, granted on 12 October 2015 for the Mandalong Southern Extension Project.

4.0 PROJECT DESCRIPTION

4.1 Overview of Modification

Centennial Mandalong is seeking to modify its existing development consent for the Mandalong Production Tonnage Project. The Modification is seeking 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.

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:

a) Extract more than 6 million tonnes of ROM coal from the site;

b) Deliver more than 6 million tonnes of ROM coal to the Cooranbong Entry Site; and/or

c) Deliver more than 6 million tonnes of ROM coal to the Mandalong Coal Delivery System.

The increase will not affect the delivery limits associated with the Cooranbong Entry Site and the Mandalong Coal Delivery System.

The Modification is further seeking to rectify administrative errors current attached to the Centennial Mandalong SSD-5144 approval. This is outlined further in **Section 4.10** with a copy of the marked up changes included as **Appendix 1**.

No physical changes to the mine's infrastructure (including the ventilation system) or the surface footprint as currently approved under SSD-5144 are proposed. **Table 3** provides a comparison between the approved operation and proposed modifications.

Table 3: Comparison of Existing Operation and Proposed Modification

Aspect	Existing Operation	Proposed Modification
Site Access	Access to the MMAS is via Kerry Anderson Drive off Mandalong Road adjacent to the M1 Pacific Motorway. Once constructed, access to the MSSS site will be via the approved MSSS Access Road.	No change.
Underground Mine Access	Access to the underground mine is via mine portals situated at the pit top and via existing headings and roadways.	No change.
Development	Mandalong Mine has an approved underground mining area under SSD-5144.	No change.
Longwall Mining and Production	Mandalong Mine is approved to produce up to 6 Mtpa of ROM coal. Mandalong Mine has an approved underground mining area under SSD-5144.	Increase production to 6.5 Mtpa of ROM coal.

Aspect	Existing Operation	Proposed Modification
Mine Life	Under Development Consent SSD-5144 mining operations are permitted to 31 December 2040.	No change
Underground mine ventilation	Two operating ventilation fans (MMAS and Cooranbong Entry Site) and one approved but yet to be constructed (MSSS).	No change
Hours of Operation	The mine currently operates 24 hours per day, 7 days per week.	No change
Employment	Mandalong Mine currently has provision to employ up to 420 full-time equivalent employees as well as an additional 50 contractors during longwall relocations.	No change
Supporting Surface Infrastructure	Mine supporting surface infrastructure designed to control and manage water, ventilation, materials delivery, equipment maintenance etc. is situated at the MMAS and when constructed at the MSSS.	No change
Coal Preparation and Handling	No coal preparation or handling is undertaken by Mandalong Mine. All ROM coal is delivered to Northern Coal Services for handling and dispatch.	No change
Waste Coal Management	As product coal is not washed at Mandalong Mine, coarse and fine reject material is not generated at the site.	No change
Surface Water Management	Current water management occurs in accordance with the Mandalong Mine Site Water Management Plan.	No change
Land Preparation	Land preparation required to establish the access road and construction area for the MSSS.	No change
Rehabilitation	Given that Mandalong Mine is an underground coal operation, rehabilitation is currently limited to small areas following exploration or construction or when surface infrastructure is decommissioned.	No change

4.2 Project Application Area

The PAA is illustrated on **Figure 2** and comprises of the existing MMAS, MSSS, Cooranbong Entry Site, underground workings and associated surface infrastructure.

4.3 Hours of Operation and Project Life

Mandalong Mine will continue to operate up to 24 hours per day, seven days a week.

The Modification does not seek to change the current limit of being able to undertake underground mining operations on the site until 31 December 2040.

4.4 Mining Operations

Mine planning and design at Mandalong Mine aims to create a safe underground working environment to optimise the extraction of coal. Centennial Mandalong will continue to undertake existing mining operations in accordance with SSD-5144 using longwall mining and bord and pillar extraction methods within the West Wallarah and Wallarah-Great Northern seams. Unless detailed within this SEE, all existing activities at Mandalong Mine approved under SSD-5144 will continue unchanged.

4.4.1 Mine Ventilation

No change is proposed to the current operating speeds regarding the two surface ventilation fans located at the MMAS and Cooranbong Entry Site or the approved but yet constructed surface ventilation fan at the MSSS. As all ventilation fan operations are not proposed to change their associated noise profiles will not change as a result of this modification.

4.5 Coal Handling

Utilising the existing approved coal delivery systems, the Project proposes to continue to transport ROM coal extracted from the existing underground mine workings to either the Cooranbong Entry Site at a rate of up to 6 Mtpa and/or the Delta Entry Site at a rate of up to 6 Mtpa. The underground conveyors will continue to operate 24 hours a day, seven days per week.

4.6 Employment

The Modification will not generate any change to the construction or operational employment numbers approved under SSD-5144.

4.7 Water Management

Based on the minor increase in production limit being sought from 6 to 6.5 Mtpa it is considered that the Modification will have minimal impacts on surface water and groundwater.

4.8 Environmental Management Strategy

Mandalong Mine has an established Environmental Management Strategy (EMS) that has been developed in accordance with the *Centennial Coal Environmental Management System Framework* and is generally consistent with the elements of ISO 14001. The EMS provides a framework to ensure the effective management of environmental issues and compliance with regulatory requirements for all activities and areas managed by Centennial Mandalong. It also provides a means for continued improvement in environmental performance.

As part of this EMS a comprehensive set of environmental management plans have been developed and implemented at Mandalong Mine. These environmental management plans are backed by an environmental monitoring network.

4.9 Rehabilitation and Final Landform

Under SSD-5144, Centennial Mandalong has adopted a progressive approach to rehabilitation. Rehabilitation will continue to occur in accordance with SSD-5144.

4.10 Administrative Changes to SSD-5144

Administrative Text Changes

Following the approval of SSD-5144 on 12 October 2015, Centennial Mandalong has identified several minor administrative errors currently within the Development Consent. Centennial Mandalong is requesting these errors to be amended and has marked up the Development Consent using track changes to highlight these matters for DP&E's consideration (**Appendix 1**). These changes are presented and justified below:

- Schedule 3, Condition 16 Water Management Performance Measures. Table 4 regarding Aquatic and riparian ecosystems. The words *"(including affected sections of LT, Stony and Lords Creeks, unnamed watercourses receiving discharges from Hawkmount Quarry and CEY, Muddy*

Creek and Muddy Lake)" should be deleted as these affected sections of creek lines and waterways are associated with Centennial Coal's Northern Coal Logistics Project SSD-5145 and should be conditioned under that development consent only.

- Schedule 3, Condition 17(d)(ii) Surface Water Management Plan. The words "*downstream watercourse channel stability, particularly for the Fassifern Archery Club section of LT Creek*" should be deleted as these affected sections of creek lines and waterways are associated with Centennial Coal's Northern Coal Logistics Project SSD-5145 and should be conditioned under that development consent only.

- Schedule 3, Condition 18 Land Management Strategy. The current date 3 December 2016 appears to be a drafting error as this is a Saturday. Centennial Mandalong believes this date was intended to be Friday 30 December 2016. It is request that the condition be revised accordingly.

- Schedule 3, Condition 30(b) Bushfire Management. There are currently two 30(b)'s due to a drafting error. The condition should be updated to reflect 30(b) and 30(c).

Development Application Area

Centennial Mandalong has identified an administrative figure error regarding SSD-5144 Figure 1 *Development Application Area* of Appendix 2 *Development Layout*. The Development Application Area (labelled *Colliery Holding Boundary*) illustrated in this figure does not align with the approved Schedule of Land included as Appendix 1 of SSD-5144 or the PAA which appears as Figure 2 within the original Environmental Impact Statement. Despite the PAA being adjusted during the Response to Submissions process to excise the Jilliby State Conservation Area in the southwest, the northeast part of the PAA was inadvertently altered to align with mining tenements rather than the Schedule of Land to which it applies. **Figure 4** illustrates this discrepancy in the northeast section of the SSD-5144 PAA. It is requested that the PAA be updated to reflect the Schedule of Land currently attached to SSD-5144.

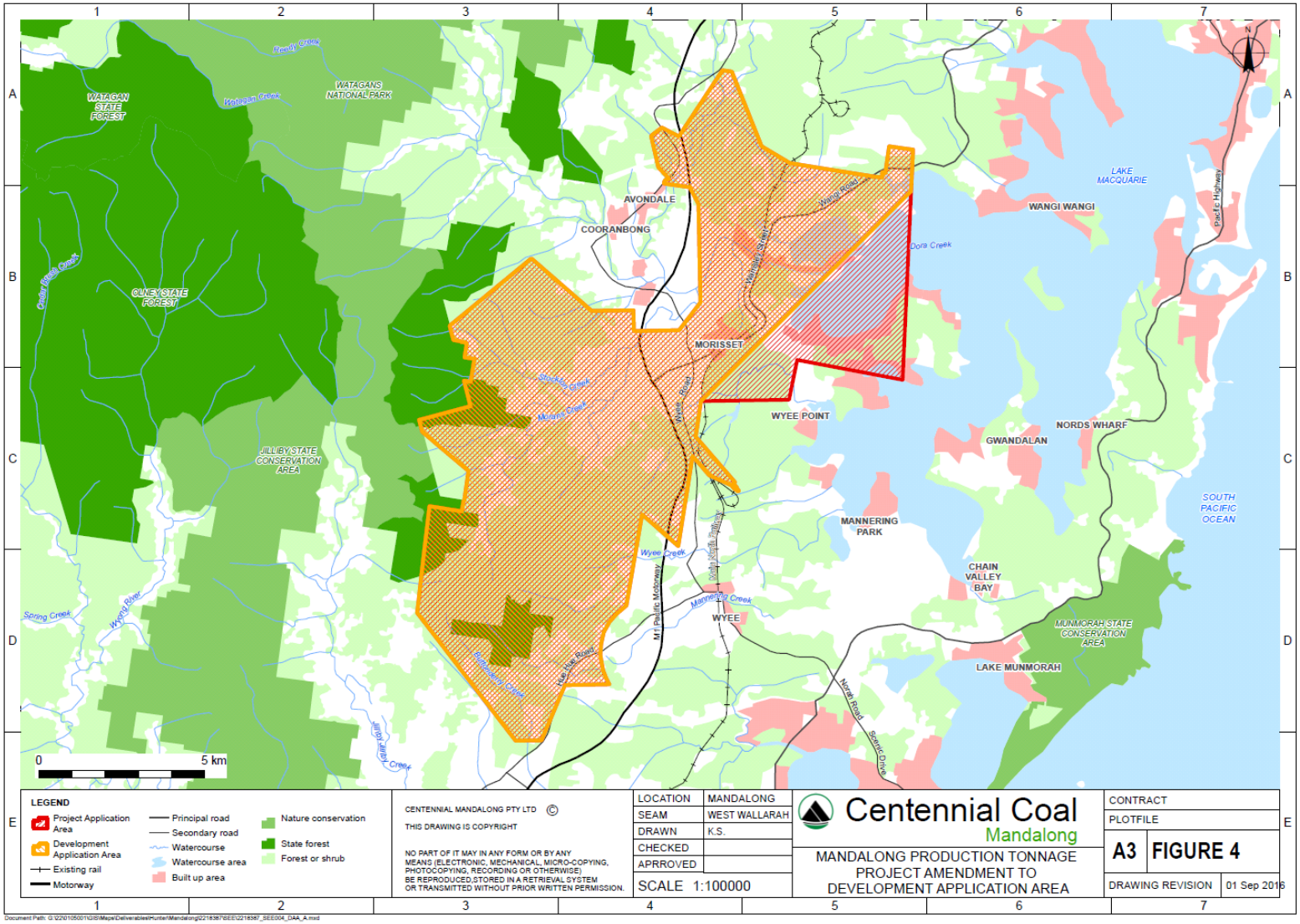

Figure 4 - Amendment to Development Application Area

5.0 REGULATORY FRAMEWORK

The Modification has been assessed with full consideration of the applicable legislative requirements of the Commonwealth and State, along with the local planning and environmental frameworks of the Lake Macquarie City Council and Wyong Shire LGAs, where applicable. This section describes the relevant regulatory framework applicable to the Modification.

5.1 Approval Pathway and Permissibility

Development Consent SSD-5144 was granted to Centennial Mandalong by the Planning Assessment Commission on 12 October 2015 pursuant to Section 89E of the EP&A Act. Centennial Mandalong now seeks a modification to SSD-5144 pursuant to the provisions of Section 96 of the EP&A Act.

Section 96 of the EP&A Act provides the mechanism for modifying State Significant Developments. Specifically, section 96(1A) provides that:

> *A consent authority may, on application being made by the applicant or any other person entitled to act on a consent granted by the consent authority and subject to and in accordance with the regulations, modify the consent if:*
>
> *(a) it is satisfied that the proposed modification is of minimal environmental impact, and*
>
> *(b) it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which the consent was originally granted and before that consent as originally granted was modified (if at all), and…*

In relation to Section 96(1A) (a) and (b) as set out above, it is considered that the proposed Modification to Development Consent SSD-5144 for increased annual production tonnage in addition to the amendment of existing consent errors is:

> (a) of minimal environmental impact as supported by the assessment of relevant environmental matters in **Section 9** of this SEE, and
>
> (b) the proposed modifications will result in substantially the same development as the development for which consent was originally granted being an underground longwall coal mine.

As such, it is considered the consent can be modified pursuant to Section 96(1A) of the EP&A Act.

Clause 115(1) of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) sets out the information which must be contained in an application for modification to a development consent under Section 96. **Table 4** details where in this Statement of Environmental Effects this information has been provided.

Table 4: Section 115(1) Information to be Included in the Statement of Environmental Effects

Section 115(1) Matters	Section of SEE
a. the name and address of the applicant	See Section 1.2 of this SEE
b. a description of the development to be carried out under the consent (as previously modified),	See Section 3.0 of this SEE

Section 115(1) Matters	Section of SEE
c. the address, and formal particulars of title, of the land on which the development is to be carried out,	See Section 2.3 and Appendix 1 of this SEE
d. a description of the proposed modification to the development consent,	See Section 4.0 of this SEE
(i) a statement that indicates either: *(i) that the modification is merely intended to correct a minor error, misdescription or miscalculation, or* *(ii) that the modification is intended to have some other effect, as specified in the statement,*	The Modification is seeking to rectify administrative errors currently attached to Centennial Mandalong's SSD-5144 approval. The modification application is focused on the impacts associated with the increase in annual production tonnage with the Project remaining substantially the same as the development that was originally approved.
(ii) a description of the expected impacts of the modification	See Section 9.0 of this SEE
(iii) an undertaking to the effect that the development (as to be modified) will remain substantially the same as the development that was originally approved	The modification application is focused on the impacts associated with the increase in annual production tonnage with the Project remaining substantially the same as the development that was originally approved.
(iv) if the applicant is not the owner of the land, a statement signed by the owner of the land to the effect that the owner consents to the making of the application (except where the application for the consent the subject of the modification was made, or could have been made, without the consent of the owner)	Landholder consent is not required. SSD-5144 was approved without landholder consent by way clause 49(2)(b) of the EP&A Regulation.
(v) a statement as to whether the application is being made to the Court (under section 96) or to the consent authority (under section 96AA)	Not applicable to the proposal.
(vi) and, if the consent authority so requires, must be in the form approved by that authority	Not applicable to the proposal.

The Minister for Planning (or his delegate) determines development applications for under section 96(1A) of the EP&A Act.

The modification application is focused on the impacts associated with the increase in annual production with the Project remaining substantially the same as the development that was originally approved.

5.2 Commonwealth Legislation

5.2.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Commonwealth Department of the Environment and provides a legal framework to protect and manage nationally important flora, fauna, ecological communities and heritage places defined as matters of

'national environmental significance' (NES). An action that "*has, will have or is likely to have a significant impact on a matter of National Environmental Significance*" may not be undertaken without prior approval from the Commonwealth Minister, as provided under Part 9 of the EPBC Act. Approval under the EPBC Act is also required where actions are proposed on, or will affect, Commonwealth land and its environment.

As the Modification does not involve any impacts to vegetation or water resources is not likely to have a significant impact on matters of NES listed under the EPBC Act. Consequently a referral to the Department of the Environment will not be made.

5.2.2 Native Title Act 1993

The *Native Title Act 1993* recognises that Aboriginal people have rights and interests to land and waters which derive from their traditional laws and customs. Native title may be recognised in places where Indigenous people continue to follow their traditional laws and customs and have maintained a link with their traditional country. It can be negotiated through a Native Title Claim, an Indigenous Land Use Agreement (ILUA) or future act agreements.

An ILUA is an agreement between a native title group and other parties who use or manage the land and waters. The ILUA process allows for negotiation between indigenous groups and other parties over the use and management of land and water resources, and the ability to establish a formal agreement. An ILUA is binding once it has been registered on the Native Title Tribunal's Register of Indigenous Land Use Agreements.

Native Title matters were addressed as part of the larger Mandalong Southern Extension Project (SSD 5144). Centennial Mandalong believes there to be no outstanding Native Title matters in relation to the Modification.

5.3 New South Wales State Legislation

5.3.1 Environmental Planning and Assessment Act 1979

Objects of the EP&A Act

The EP&A Act is the principal piece of legislation overseeing the assessment and determination of development proposals in NSW. It aims to encourage the proper management, development and conservation of resources, environmental protection and ecologically sustainable development.

The objects of the EP&A Act generally seek to promote management and conservation of natural and artificial resources, while also permitting appropriate development to occur. The principles of ecologically sustainable development and public participation are also objects of the EP&A Act. The consistency of the Project with these objects is summarised in **Table 5**.

Table 5: Objects of the EP&A Act

Objects of the EP&A Act	Consistency of the Project
(b) to encourage:	
(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,	Specialist consultants have been engaged to assess and report on the potential for the Modification to impact upon the natural and artificial resources within the vicinity of the PAA in addition to socio-economic factors. Notably: • The impacts on the natural environment have been addressed within Section 9.0.

Objects of the EP&A Act	Consistency of the Project
	• A socio-economic analysis is contained in Section 6.0.
(ii) the promotion and co-ordination of the orderly and economic use and development of land,	The orderly and economic use of land is best served by development which is permissible under the relevant planning regime and predominantly in accordance with the prevailing planning controls. The Modification comprises a permissible development which is consistent with the statutory and strategic planning controls. As detailed in this SEE, the proposal will result in positive economic impacts, with improved operational efficiencies. Appropriate mitigation measures and management strategies are examined with regard to adverse environmental impacts.
(iii) the protection, provision and co-ordination of communication and utility services,	Refer to Section 5.3.3.
(iv) the provision of land for public purposes,	Not applicable to the proposal.
(v) the provision and co-ordination of community services and facilities, and	Not applicable to the proposal.
(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and	Where relevant, specialist consultants have been engaged to assess and report on the potential for the Project to impact upon the local environment.
(vii) ecologically sustainable development, and	The proposal is consistent with the principles of ecological sustainable development as outlined in Section 11.4, addressing both this object of the EP&A Act and clause 7(1)(f) in Schedule 2 of the EP&A Regulation.
(viii) the provision and maintenance of affordable housing, and	Not applicable to the proposal.
(c) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and	The SSD proposal is subject to the provisions of Part 4 of the EP&A Act, where the Minister for Planning and Environment is the consent authority.
(d) to provide increased opportunity for public involvement and participation in environmental planning and assessment.	As outlined in Section 7.0, Centennial Mandalong has undertaken consultation in relation to the Modification with relevant stakeholders. This consultation process is continuing with respect to the progression towards obtaining development consent for this modification being Modification 3 to SSD-5144. Any relevant public representations will need to be considered by the Department of Planning and Environment (DP&E) during the assessment of the development application.

Section 79C Evaluation

Section 79C of the EP&A Act applies to the determination of development applications for SSD. In determining the Modification, the consent authority is required to consider the matters listed in Section

79C(1) of the EP&A Act as are of relevance to the development. Each of the relevant matters has been addressed in the SEE and will need to be considered by the consent authority during the assessment of the Modification.

Other Approvals

Pursuant to Section 89J of the EP&A Act, the following authorisations are not required for approved SSD proposals:

- The concurrence under Part 3 of the *Coastal Protection Act 1979* of the Minister administering that Part of the Act;
- A permit under section 201, 205 or 219 of the *Fisheries Management Act 1994*;
- An approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977*;
- An Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974*;
- An authorisation referred to in section 12 of the *Native Vegetation Act 2003* (or under any Act to be repealed by that Act) to clear native vegetation or State protected land;
- A bush fire safety authority under section 100B of the *Rural Fires Act 1997*;
- A water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91 of the *Water Management Act 2000*; and
- An order under Division 8 of Part 6 of the *Heritage Act 1977* restricting harm to buildings, works or relics that are not protected by a heritage listing.

Pursuant to Clause 89K of the EP&A Act, an authorisation of the following kind cannot be refused if it is necessary for carrying out an approved SSD proposal, and must be granted "substantially consistent" with the SSD consent:

- An aquaculture permit under section 144 of the *Fisheries Management Act 1994;*
- An approval under section 15 of the *Mine Subsidence Compensation Act 1961*;
- A mining lease under the *Mining Act 1992*;
- A production lease under the *Petroleum (Onshore) Act 1991*;
- An environment protection licence under Chapter 3 of the *Protection of the Environment Operations Act 1997* (for any of the purposes referred to in section 43 of that Act);
- A consent under section 138 of the *Roads Act 1993;* and
- A licence under the *Pipelines Act 1967.*

The need to obtain any of the above approvals for the Project is outlined in the section below.

5.3.2 Other Key NSW State Legislation

The existing approvals relevant to the Project are described in Section 3.2.

In addition to the requirement for development consent under Part 4 of the EP&A Act, the Project requires approvals, licences and/or authorities under various other pieces of NSW State legislation. **Table 6** lists the key relevant pieces of NSW State legislation and indicates the implications, if any, for the Project.

Table 6: Relevant NSW State Legislation

NSW State Legislative Act	Project Implications (approvals, licences and/or authorities)
Protection of the Environment Operations Act 1997 (POEO Act)	Mandalong Mine is a premises-based "scheduled activity" under Schedule 1 of the POEO Act and currently operates under the provisions of EPL 365. Schedule 1 of the POEO Act lists activities that are scheduled activities for the purposes of the Act. As EPL 365 permits coal works and mining for coal at a scale in excess of 5,000,000 tonnes no variation to EPL 365 will be sought.
Mining Act 1992	Centennial Mandalong currently holds a number of mining leases. No change to existing mining tenements is required.
Water Act 1912	The *Water Act 1912* governs access, trading and allocation of licences associated with surface water and groundwater sources where a Water Sharing Plan is not in place. The *Water Act 1912* applies to groundwater interference, bore installation and extraction of groundwater. No further licenses or allocation are a required as a result of this modification.
Water Management Act 2000 (WM Act)	The WM Act is intended to ensure that water resources are conserved and properly managed for sustainable use benefitting both present and future generations. Water sharing plans prepared in accordance with the WM Act include rules for protecting the environment and administrating water licencing and trading. No water sharing plans are in operation with regard to the PAA. By the operation of Section 89J of the EP&A Act, the Project will not require water use approvals under Section 89 of the WM Act, water management approvals under Section 90 or a controlled activity approval under Section 91.
Work Health and Safety (Mines) Act 2013	Centennial Mandalong currently holds all necessary approvals under the WHS (Mines) Act, which aims to assist in securing and promoting the health, safety and welfare of people at work at coal operations. Gas drainage and management at Mandalong Mine will continue to be regulated under the provisions of the Act.
Mine Subsidence Compensation Act 1961	Whilst the PAA is located within the Mandalong Mine Subsidence Districts no additional infrastructure is required therefore no approval from the Mine Subsidence Board is required.
Dams Safety Act 1978	The Modification does not propose any underground mining or surface disturbance on or in the vicinity of any dams prescribed under the *Dam Safety Act 1978*.
Crown Lands Act 1989	The PAA exists over Private land and Crown roads. The Project will not require a licence to use Crown Land under the provisions of the *Crown Lands Act 1989*.
Roads Act 1993	Section 138 of the *Roads Act 1993* requires consent be obtained prior to disturbing or undertaking work in, on or over a public road. Use of the local road network for site access will be required for the duration of the Project. By operation of Clause 89K of the EP&A Act, consent under Section 138 of the *Roads Act 1993* cannot be refused if it is necessary for carrying out an approved SSD proposal, and must be granted substantially consistent with the SSD consent.

NSW State Legislative Act	Project Implications (approvals, licences and/or authorities)
Threatened Species Conservation Act 1995 (TSC Act)	The TSC Act provides protection for threatened plants and animals native to NSW (excluding fish and marine vegetation) and integrates the conservation of threatened species into development control processes under the EP&A Act. No impacts to vegetation will occur as a result of the Modification.
National Parks and Wildlife Act 1974 (NPW Act)	The NPW Act contains provisions for the protection and management of national parks, historic sites, nature reserves and Aboriginal heritage. By operation of Section 89J of the EP&A Act, the Project does not require any additional approvals under the NPW Act.
Aboriginal Land Rights Act 1983	The *Aboriginal Land Rights Act 1983* provides for the constitution of local, regional and State Aboriginal Land Councils and a mechanism for Land Councils to claim Crown land. There are no known granted claims over Crown Land in the PAA.
Heritage Act 1977	Historical archaeological relics, buildings, structures, archaeological deposits and features are protected under the *Heritage Act 1977*. There are no references to heritage items in the PAA within the World Heritage List, NSW Heritage Register, Australian Heritage Database or the relevant Local Environmental Plans. The Modification will not impact on heritage items. In any event, approval is not required due to the operation of Section 89J of the EP&A Act.
Contaminated Land Management Act 1997	The relevance of this legislation to the Modification is outlined below.
Forestry Act 1916	No permits are required for the Forestry Corporation of NSW regarding the Modification.

5.3.3 State Environmental Planning Policies

State Environmental Planning Policies (SEPPs) are Environmental Planning Instruments prepared by the Minister to address issues significant to NSW. The SEPPs outlined in the below sub-sections contain provisions that are relevant to the Project and therefore are matters to be taken into consideration by the consent authority.

SEPP (State and Regional Development) 2011

SEPP (State and Regional Development) 2011 (SRD SEPP) came into effect upon the repeal of Part 3A of the EP&A Act and identifies development to which the SSD assessment and determination process under Division 4.1 in Part 4 of the EP&A Act applies.

SEPP (Mining, Petroleum Production and Extractive Industries) 2007

SEPP (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP) aims to provide for the proper management and development of mineral, petroleum and extractive material resources for the social and economic welfare of NSW.

Part 3 of the Mining SEPP stipulates matters for consideration by the consent authority before determining an application for consent in respect of development for the purposes of mining. Specifically, Clauses 12 to 17 (inclusive), requires consideration to be given to the compatibility of projects with other surrounding land uses, including the existing and potential extraction of minerals, natural resource management and environmental management, resource recovery, transportation and rehabilitation.

The information presented in this SEE addresses each of the matters for consideration prescribed in the abovementioned clauses, and the assessment undertaken has been multi-disciplinary and involved consultation with relevant stakeholders. Emphasis has been placed on anticipation and prevention of potential environmental and social impacts, with various mitigation measures, management strategies, and monitoring activities proposed to minimise adverse impacts.

SEPP (Infrastructure) 2007

SEPP (Infrastructure) 2007 (Infrastructure SEPP) aims to facilitate the effective delivery of infrastructure across NSW by improving regulatory certainty and efficiency through a consistent planning regime and greater flexibility in the location of infrastructure and service facilities.

This Modification will result in no impact to infrastructure and services under this policy.

SEPP No. 55 – Remediation of Land

SEPP No. 55 – Remediation of Land (SEPP 55) provides for a state-wide planning approach to the remediation of contaminated land in order to reduce the risk to human health or any other aspect of the environment.

Clause 7(1) of SEPP 55 provides that a consent authority must not consent to the carrying out of any development on land unless:

- it has considered whether the land is contaminated, and
- if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and
- if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.

Further, clause 7(2) of SEPP 55 provides that before determining an application for consent to carry out development that would involve a "change of use" in respect of certain land specified in clause 7(4) of SEPP 55, the consent authority must consider a report specifying the findings of a preliminary investigation of the land concerned carried out in accordance with the contaminated land planning guidelines (being the 1998 publication *Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land*).

For the disturbance areas of the existing Mandalong Mine in respect of which the Project does not involve any "change of use", Centennial Mandalong submitted Contamination Notifications to the EPA in February 2012 in accordance with section 60 of the *Contaminated Land Management Act 1997*. In accordance with commitments made to the EPA in the Notifications, Centennial Mandalong has commenced undertaking Phase 2 assessments at both the MMAS and Cooranbong Entry Site. Following the completion of the Phase 2 assessments, remediation plans will be developed and implemented in consultation with the EPA and an accredited contaminated land auditor to address any contamination issues identified. In a letter dated the 6 July 2012 the EPA confirmed acceptance of the approach proposed by Centennial Mandalong.

Finally, Centennial Mandalong will implement best management practices for hydrocarbons, along with the approved EMS and occupation health and safety management systems, at the Mandalong Mine to ensure the potential for contamination and associated issues remains low.

SEPP No. 44 – Koala Habitat Protection

SEPP No. 44 – Koala Habitat Protection provides for the protection of koala habitat by ensuring that areas subject to development proposals are considered for their value as habitat or potential habitat for koalas. The Lake Macquarie LGA is listed under Schedule 1 of SEPP No. 44 as an area to which the SEPP applies.

SEPP No. 33 – Hazardous and Offensive Development

SEPP No. 33 - Hazardous and Offensive Development (SEPP 33) regulates, amongst other things, the determination of development applications to carry out what is defined in SEPP 33 as development for the purposes of a "potentially hazardous industry" or "potentially offensive industry". With the continued implementation of best management practices for hydrocarbons and explosives used within the PAA and the other measures outlined in this SEE to reduce or minimise the impact of the Modification, as well as effective implementation of the approved EMS and occupation health and safety management systems, the Modification would not pose any significant risk, in relation to its locality, to human health, life or property or to the biophysical environment.

The Project is not considered to comprise a "potentially hazardous industry" or a "potentially offensive industry" within the meaning of these expressions in SEPP 33, and therefore a preliminary hazard analysis was not prepared as required by clause 12 of SEPP 33 and nor does clause 13 of SEPP 33 apply to the consent authority's determination of the Modification application.

SEPP No. 14 – Coastal Wetlands

SEPP No. 14 - Coastal Wetlands aims to ensure that the coastal wetlands are preserved and protected in the environmental and economic interests of the State. The provisions of SEPP 14, insofar as they require the consent authority to obtain the concurrence of the Director-General of DP&E, do not apply to the Project by reason of the exclusion for SSD provided for in section 79B(2A) of the EP&A Act.

5.3.4 Local Environmental Plans

Local Environmental Plans (LEPs) are instruments that guide planning decisions for LGAs and allow Councils to manage the ways in which land is used through zoning and development consents.

Lake Macquarie Local Environmental Plan 2014

The objective of the *Lake Macquarie Local Environmental Plan 2014* (Lake Macquarie LEP) is

> (a) to recognise the importance of Lake Macquarie City and its waterways and the coast as an environmental, social, recreational and economic asset to Lake Macquarie City and the Hunter and Central Coast regions,
>
> (b) to implement a planning framework that protects areas of significant conservation importance, while facilitating development and public facilities in appropriate areas, that are accessible to a range of population groups, to accommodate Lake Macquarie City's social and economic needs,
>
> (c) to promote the efficient and equitable provision of public services, infrastructure and amenities,
>
> (d) to facilitate a range of accommodation types throughout Lake Macquarie City so that housing stock meets the diversity of community needs and is affordable to as large a proportion of the population as possible,
>
> (e) to apply the principles of ecologically sustainable development,

(f) to encourage development that enhances the sustainability of Lake Macquarie City, including the ability to adapt to and mitigate against climate change.

The land zonings of the relevant components within the PAA pursuant to the *Lake Macquarie Local Environmental Plan (LEP) 2014* are:

- The existing MMAS is zoned in a mix of E2 Environmental Conservation, RU2 Rural Landscape and SP1 Special Activities (Mine);
- The proposed MSSS is zoned E2 Environmental Conservation; and
- The approved underground mining area is predominantly zoned a mix of E2 Environmental Conservation, E3 Environmental Management, RU2 Rural Landscape and RU3 Forestry.

Clause 8 of the Mining SEPP outlines its relationship to other environmental planning instruments:

The operation of the above provisions in respect of the Project are subject to the application of clause 8 of the Mining SEPP, which provides:

8 Determination of permissibility under local environmental plans

(1) If a local environmental plan provides that development for the purposes of mining, petroleum production or extractive industry may be carried out on land with development consent if provisions of the plan are satisfied:

(a) development for that purpose may be carried out on that land with development consent without those provisions having to be satisfied, and

(b) those provisions have no effect in determining whether or not development for that purpose may be carried out on that land or on the determination of a development application for consent to carry out development for that purpose on that land.

(2) Without limiting subclause (1), if a local environmental plan provides that development for the purposes of mining, petroleum production or extractive industry may be carried out on land with development consent if the consent authority is satisfied as to certain matters specified in the plan, development for that purpose may be carried out on that land with development consent without the consent authority having to be satisfied as to those specified matters.

On this basis, any provision in the Lake Macquarie LEP that would otherwise operate to prohibit the Project has no effect, and accordingly, the Project is permissible with development consent on the land in which the Project will be carried out that is within the Lake Macquarie LGA. Permissibility matters were considered as part of the Mandalong Southern Extension Project which was subsequently granted development consent SSD-5144. This application is seeking to modify this existing development consent pursuant to Section 96(1A) of the EP&A Act.

Notwithstanding the application of clause 8 of the Mining SEPP, the assessment of the Project in this modification and the original EIS:

- Enables the consent authority to have regard to the vision, values and aims of the *Lifestyle 2030 Strategy*;
- Enables the consent authority to be satisfied as to the provision of adequate infrastructure to support the Project; and

- Demonstrates that the Project is consistent with the relevant objectives of the zones within which the Project is located and any special controls that would apply to the Project were it not development for the purpose of mining.

Wyong Local Environmental Plan 2013

As was approved under SSD-5144, the small area proposed for mining within the Southern Extension Area that falls within the Wyong LGA is proposed to be zoned a mix of RU1 Primary Production, E2 Environmental Conservation, E3 Environmental Management and RE1 Public Recreation. Whilst underground mining is a prohibited land use within all these zones, sub-clause 7(1)(a) of the Mining SEPP states that development for the purpose of underground mining may be carried out on any land with developed consent. In relation to any inconsistency between the Mining SEPP and an LEP, sub-clause 5(3) provides that the Mining SEPP prevails to the extent of the inconsistency. On this basis, any provision in the Wyong LEP that would otherwise operate to prohibit the Project has no effect.

5.3.5 Other Considerations

Lake Macquarie City Council's Lifestyle 2030 Strategy

Lake Macquarie City Council's *Lifestyle 2030 Strategy* (LS2030) was adopted by LMCC on 11 March 2013. The LS2030 provides the long-term direction for the overall development of the City and describes LMCC's high level policies for managing private and public development in Lake Macquarie. LS2030 is the primary guiding document for the development of local plans, regulations and guidelines that control development of land. It is anticipated that major reviews of LS2030 will occur every five years.

Draft Central Coal Regional Plan

The *Draft Central Coal Regional Strategy* is the NSW Government's long-term land use plan for the region covering the Gosford City and Wyong LGAs. The Project is considered to be generally consistent with the objectives of the plan and will not adversely impact upon the opportunities identified for rural and resource lands.

5.3.6 Water Sharing Plans

Water Sharing Plans (WSP) prepared in accordance with the *Water Management Act 2000* include rules for protecting the environment, extractions, managing licence holders' water accounts, and water trading within defined areas and specified water sources. The PAA is within an area covered by the three water sharing plans listed below:

- Water Sharing Plan for the Jilliby Creek Water Source 2003;
- Water Sharing Plan for the Central Coast Unregulated Water Sources 2009, and
- Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009.

5.3.7 Strategic Regional Land Use Policy

The NSW Government's *Strategic Regional Land Use Policy* was introduced in September 2012 and sets out a range of initiatives to better balance growth in the mining industry with the need to protect agricultural land and water resources.

The Modification will not result in any impact to BSAL or changes to the land and soil capability classes.

5.3.8 NSW Aquifer Interference Policy

The *NSW Aquifer Interference Policy* (AIP) is a key component of the NSW Government's *Strategic Regional Land Use Policy*. The AIP clarifies the water licensing and approval requirements for aquifer interference activities, including the taking of water from an aquifer in the course of carrying out mining, and defines the considerations for assessing potential impacts to key water-dependent assets.

The AIP indicates that where mining results in the loss of water from an overlying source that is covered by a WSP, a water access licence is required under the WM Act to account for this take of water.

In water sources where WSPs do not yet apply, an aquifer interference activity that is taking groundwater is required to hold a water licence under Part 5 of the *Water Act 1912*. The requirements for proponents detailed in the AIP also apply to applicants for a *Water Act 1912* licence. An application for a licence made under the *Water Act 1912* will be assessed on the same considerations as an application for an access licence made under the *Water Management Act 2000.*

Potential impacts to water resources are assessed by GHD in **Appendix 4** and summarised in **Section 9.1** of this SEE.

5.3.9 Lower Hunter Regional Strategy 2006-31

The Department of Planning and Environment's *Lower Hunter Regional Strategy 2006-31* (Lower Hunter Regional Strategy) identifies how the expected growth in the Lower Hunter Region (encompassing the five local government areas of Newcastle, Lake Macquarie, Port Stephens, Maitland and Cessnock) will be managed to provide for both economic development and the protection of environmental assets, cultural values and natural resources. The Lower Hunter Regional Strategy is implemented primarily through local environmental plans, development control plans, through the State Infrastructure Strategy and through funds collected as developer contributions. The Lower Hunter Regional Strategy is to be comprehensively reviewed every five years, so that it can adjust to any demographic and economic changes. This will assist local councils will their five-yearly review of local environmental plans, required under recent reforms to the planning system. In February 2010, the NSW Government announced it had re-endorsed the Lower Hunter Regional Strategy as a sound platform to guide the region's future growth.

6.0 SOCIO-ECONOMIC ANALYSIS

6.1 Economic Analysis

The Modification's economic assessment was prepared by AIGIS GROUP (2016) and appears as **Appendix 3** to this SEE.

The economic assessment has been prepared to comply to the greatest extent practicable with *Guidelines for the economic assessment of mining and coal seam gas proposals* (DP&E 2015). The assessment compares the relative outcomes of continuing the Mandalong Mine as originally approved under SSD-5144 against the changes proposed under this modification.

The Cost-Benefit Analysis (CBA) undertaken indicates a marginal improvement in the estimated economic outcomes for the mine as a result of the Modification. The principle 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 the same. Local Effects Analysis (LEA) indicates that there are no changes in the socio-economic effects to the regional and local economics estimated for the overall operation. Localised environmental/biophysical, public infrastructure and amenity effects remain similar to those for the Project as originally approved and therefore have no discernible cumulative impacts.

The project as modified would return positive net present value (NPV) and benefit-cost ratio (BCR) returns across a range of modelled possible economic outcomes. This is demonstrated in the Economic Impact Assessment (**Appendix 3**) through assessments of the current mining schedule, mining at the maximum extraction rate of 6.5 million tonnes per annum being sought under this Modification, sensitivity testing and application of alternative pricing data including World Bank price forecasts for the export components of the mine's output. Overall the project as modified is supportable on the basis of its likely positive economic contribution.

6.2 Social Analysis

Social considerations in relation to the Modification 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 fulltime equivalent employees. The Modification would not materially change the likelihood or magnitude of such effects.

6.3 Conclusion

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. The analysis suggests that the Modification would have a positive effect on the quantum of economic benefits accruing to NSW, which in effect is largely consistent with that identified for the Mandalong Southern Extension Project approved under SSD-5144.

Overall the project as modified results in no long term socio-economic impacts with the modification being undertaken to optimise the resource within the existing Development Consent boundary.

7.0 STAKEHOLDER ENGAGEMENT

7.1 Introduction

Centennial Mandalong places the utmost importance on maintaining effective communication with the local community and other key stakeholders. Centennial Mandalong has implemented a Stakeholder Engagement Strategy to undertake the following:

- Set a process for engagement with stakeholders of interest, with clear desired outcomes for the Company and stakeholders;
- Openly communicate with stakeholders about Mandalong Mine's operations;
- Serve as a tool for understanding the reasonable expectations and interests of stakeholders; and
- Provide a means of community access to the Project team.

Consultation has also been undertaken with stakeholders specifically in relation to this Modification. The sections below provide detail on the consultation undertaken.

7.2 Community and Local Government Engagement

Consultation with the broader community and local government has occurred as outlined below:

- Prior to the scheduled Mandalong Mine Community Consultative Committee (CCC) meeting on 7 June 2016 a CCC Pre-Meeting Report was drafted and circulated for review. The report contained a summary of the production tonnage increase being sought for discussion at the June CCC meeting.
- The Mandalong Mine CCC, which is independently chaired and comprises representatives from the local community and Lake Macquarie City Council (LMCC), meets on a quarterly basis. In accordance with the DP&E guidelines, the CCC is a forum for open discussion between Centennial Mandalong, the community, LMCC and other stakeholders on issues directly relating to Mandalong Mine's operations, projects, environmental performance and community relations. The Modification was discussed during the meeting on 7 June 2016. Minutes from these meetings and the presentations made are available on the Centennial Coal website.
- A dedicated community information telephone number was established for the Mandalong Southern Extension Project which has continued to be in use for this Modification. The number exists as a freecall 1800 730 919 number to provide interested community members with access to the Project Team regarding any queries or concerns in relation to the Modification. The telephone number continues to be advertised through ongoing correspondence including the Mandalong Mailbox newsletter.

7.3 Indigenous Stakeholders

Consultation with relevant indigenous stakeholders is ongoing for Mandalong Mine. The objective of the consultation process is to ensure that an opportunity is given to a broad range of Aboriginal stakeholders to express their cultural heritage values, including spiritual connections, archaeological sites, and the natural environment and landscape values.

The consultation methodology to date involved the identification of Aboriginal Land Councils, Aboriginal elders and other interested parties in accordance with the *NSW Aboriginal Cultural Heritage Consultation Requirements for Proponents* (ACHCR), followed by consultation with Aboriginal communities and other stakeholders in the area.

7.4 Department of Planning and Environment

DP&E were consulted with regarding the Modification during March 2016. Initially an overview of the Modification was discussed with DP&E representatives who expressed a need to understand how the proposed intensification of mining would impact on groundwater inflow, diesel and electricity usage, greenhouse gas emissions, particulate matter emissions, mine ventilation and noise. Specialist technical assessments have been undertaken to address those impacts that would change as a result of the proposed increased tonnage of coal production. As no change is proposed to the current operating speeds regarding the two surface ventilation fans located at the MMAS and Cooranbong Entry Site or the approved but yet constructed surface ventilation fan at the MSSS all ventilation fan operations are not proposed to change their associated noise profiles as a result of this modification. Thus a noise impact assessment was not deemed necessary.

DP&E noted that the impact of trucking and railing or conveying the extra coal production has previously been assessed and that no additional personnel are required to support the proposed operations. As such DP&E accepted that the proposal appears to be of *minimal environmental impact* and fits the requirements for a Section 96(1A) modification. It is noted DP&E will make a final decision as to whether this Modification should be assessed under Section 96(1A) or Section 96(2) at the time of application.

8.0 IDENTIFICATION OF KEY ENVIRONMENTAL ISSUES

8.1 Introduction and Objectives

Centennial Mandalong utilises a risk-based approach to manage safety, environment and social issues as a result of its operations at Mandalong Mine. This process involves personnel identifying issues or recognising areas where further information is required in addition to recommending any necessary controls to address identified risks. This practice is guided by the overarching Centennial Environmental Policy which requires continual improvement of environmental performance through risk management strategies based on clear science and valid data.

The compilation of this SEE has been undertaken through a risk based and consultative approach. The key assessment issues warranting detailed investigation and discussion were identified through a range of measures including:

- The existing environmental context of the overall operation and its surrounding locality (see **Sections 2 and 3**).
- The regulatory framework applicable to the Modification (see **Section 5**).
- The outcomes of consultation undertaken with government agencies and other relevant stakeholders (see **Section 7**).
- Specialist studies completed as part of the preparation of the SEE (see **Section 9**).

The scope of the assessment was discussed with DP&E. Where there was a knowledge gap in the information available, or where risks were considered unacceptable, a technical specialist assessment has been undertaken to support the SEE.

8.2 Proposed Activities with the Potential to Cause Environmental Impacts

The activities identified for the Modification with the potential to cause environmental, social and economic impacts are as follows:

- Change in the annual groundwater make attributable to the proposed increased rate of mining in addition to any subsequent water management requirements.
- Change in particulate matter emissions and impacts to sensitive receptors surrounding the MMAS.
- Change in greenhouse gas emissions emitted to the atmosphere via the existing Mandalong Mine gas flares, ventilation fans situated at the Cooranbong Entry Site and Mandalong Mine Access Site in addition to the yet to be constructed fan to be situated at the MSSS.
- Social and economic considerations.

No change is proposed to the current operating speeds regarding the two surface ventilation fans located at the MMAS and Cooranbong Entry Site or the approved but yet constructed surface ventilation fan at the MSSS. As all ventilation fan operations are not proposed to change their associated noise profiles will not change as a result of this modification. Thus a noise impact assessment was not required.

8.3 Conclusion

In response to the risks identified the following technical specialist assessments were carried out to inform this SEE:

- Groundwater Impact Assessment;
- Air Quality Impact Assessment;
- Greenhouse Gas emission calculations;
- Economic Impact Assessment.

The following sections of this report contain an assessment of all relevant environmental issues.

9.0 ASSESSMENT AND MANAGEMENT OF KEY ENVIRONMENTAL ISSUES

From the technical specialist assessments, this section provides a summary of the potential impacts of the Modification and the measures that will be implemented to mitigate and manage such impacts.

9.1 Water Resources

9.1.1 Introduction

Potential impacts to water resources associated with the Modification were assessed by the technical study *Centennial Mandalong Pty Ltd Mandalong Production Tonnage Project Groundwater and Water Balance Modelling Report* (GHD 2016) (**Appendix 4**).

The primary objectives of the assessment were:

- To recalibrate the existing hydrogeological model to reflect observed/calculated groundwater inflow data collected since the development of the original model.
- Undertake an analysis of the sensitivity of predicted groundwater inflows to hydraulic conductivity and storability.
- Incorporate the modified mine schedule into the existing hydrogeological model.
- Run the recalibrated model to predict groundwater inflows for the modified mining schedule that represents coal production at a worst case sustained rate of 6.5 million tonnes per annum and outline the groundwater flow budget under existing conditions and final year of mining conditions.
- Compare the groundwater make predictions for the recalibrated hydrogeological model for the modified mine schedule to groundwater make predictions developed as part of the groundwater impact assessment developed for the Mandalong Southern Extension Project (GHD, 2013).
- Update and re-run the existing Mandalong Mine site water balance (GHD, 2016) for the updated groundwater make predictions.

The assessment was completed in full consideration of the relevant legislation, guidelines in addition to any relevant stakeholder consultation.

9.1.2 Existing Environment

The groundwater sources in the vicinity of the PAA are generally low yielding and predominantly within the Quaternary alluvium, weathered and/or fractured sandstone and coal seams. GHD (2013) advises, in accordance with the AIP, they would be classified as “less productive”. These groundwater sources are described by GHD (2013) as follows:

- **Alluvial Water Sources**

  The alluvium throughout the PAA forms an unconfined shallow aquifer with a water table typically ranging in depth from less than 1 metre and up to about 3 metres below ground level, with an aquifer thickness of less than 20 metres. The alluvial groundwater is moderately acidic to slightly alkaline, brackish to saline, extremely hard and of sodium chloride type. Reported groundwater electrical conductivity throughout the Project Application Area exceeds 10,000 µS/cm at some locations.

Due to the relatively high silt and clay content of the alluvium, the groundwater yields are relatively low, at typically less than one litre per second. As a result of the low yield and relatively poor water quality, there are very few registered private alluvial groundwater bores throughout the PAA. The environmental value of the alluvial groundwater is considered to be "primary industry", with the saline groundwater only suitable for stock watering.

The alluvial water sources within the PAA are covered under the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009.

- **Porous and Fractured Rock Water Sources (Coal Seam and Overburden Rock)**

Coal Seam - the piezometric head within the Permian coal seams tends to reflect the natural topography and the orientation and dip of the seams, with reduced pressures at major surface drainage areas and in areas of coal extraction. Where coal seam groundwater has not been depressurised, the groundwater head generally tends to be in the order of 0 metres AHD due to the coastal environment.

The hydraulic conductivity of the West Wallarah Seam in the Southern Extension Area is generally expected to be lower than in the existing approved Mandalong Mine area given that the seam is deeper. Permeability testing of the West Wallarah and Wallarah / Great Northern Seams (at depths of 285 to 300 metres below ground level) undertaken in 2011 measured hydraulic conductivities ranging from approximately 0.75 to 35 metres per year (Sigra 2011, cited in GHD 2013). Groundwater inflows into the existing Mandalong Mine workings from the coal seam and adjacent strata are reported by Centennial Mandalong to be relatively low. This underground water is slightly alkaline and brackish to saline.

Overburden Rock - The overburden and inter-seam strata within the Newcastle Coalfield tend to have very low hydraulic conductivities (in the order of 0.0003 to 0.03 metres per year), unless joints or fracturing create a secondary permeability (Pacific Power International 1997, cited in GHD 2013). Groundwater within the overburden rock above the West Wallarah Seam primarily occurs within weathered or fractured Triassic sandstone. There has been a drop in groundwater elevation measured at most of the existing deeper monitoring bores screened within overburden rock above the existing Mandalong Mine longwall mining area.

Based on the groundwater monitoring program for the current Mandalong Mine operations, groundwater within the sandstone/siltstone of the Tuggerah Formation and Munmorah Conglomerate has been found to be saline and slightly acidic to strongly alkaline. The groundwater sources exhibit considerable variability in quality, particularly in terms of pH.

The porous and fractured rock groundwater sources are not currently managed under any Water Sharing Plan.

9.1.3 Hydrogeological Model

The numerical hydrogeological model developed for the Mandalong Southern Extension Project (GHD, 2013) has been used in this assessment to predict any change in groundwater inflow into the mine workings at Mandalong Mine as a result of the proposed increase in coal production rate from up to 6 Mtpa to 6.5 Mtpa. As part of this assessment, it was necessary to refine the layering within the model to better present the fracture zones above the coal seam and then recalibrate the model to better reflect calculated groundwater inflows into the underground workings over the period from June 2013 to June 2015.

Figure 5 shows the total predicted groundwater inflows into the mine workings for Transient run 24 for the mine schedule based on a constant coal production rate of 6.5 Mtpa. Based on the model output from Transient run 24 (best fit under transient calibration), total groundwater inflow into the mine workings

(Cooranbong, Mandalong and Mandalong South) for a constant coal production rate of 6.5 Mtpa is predicted to peak at 2.1 ML/day in the year 2030.

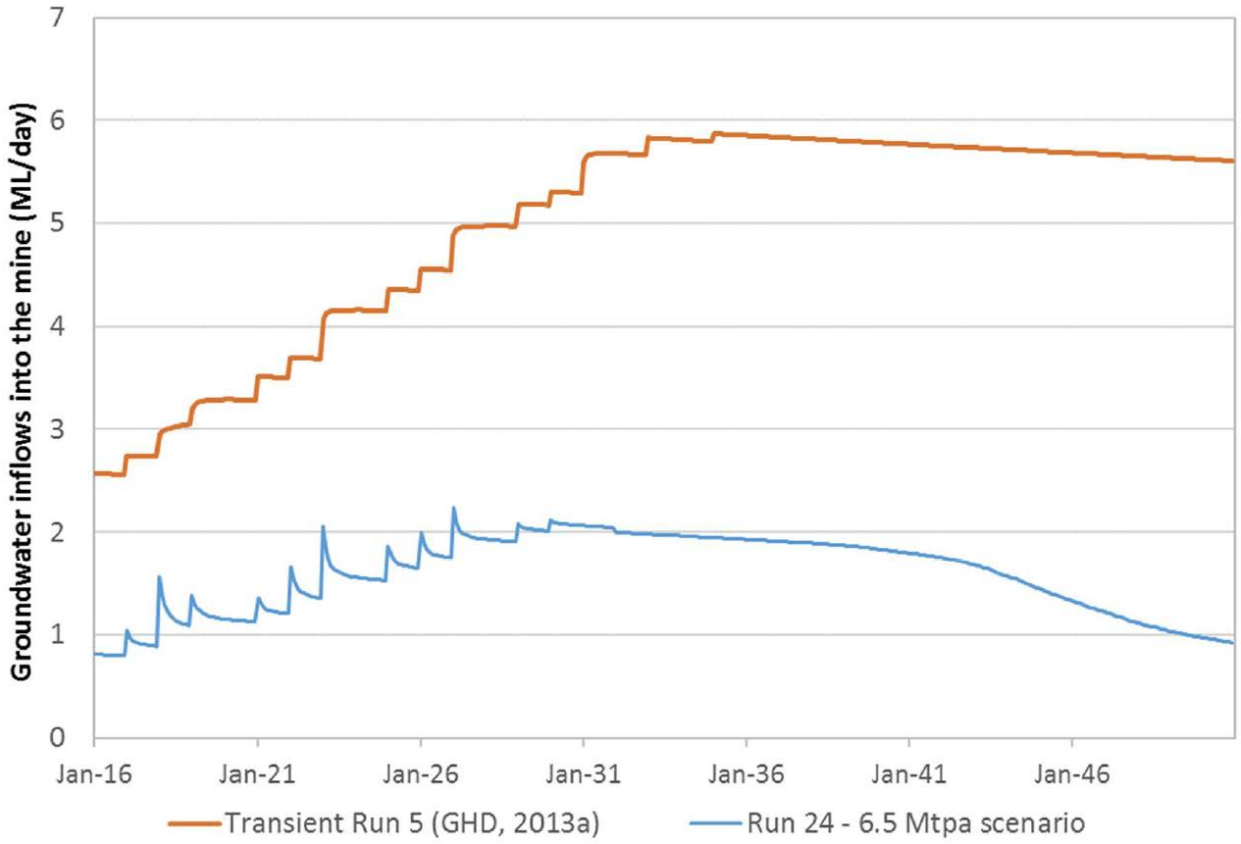

Figure 5 – Modelled Groundwater Inflows Showing Transient Run 24 with Constant Coal Production Rate of 6.5 Mtpa

This predicted groundwater make for the 6.5 Mtpa mine schedule is less than the predicted groundwater make for Transient run 5 from the EIS for the Mandalong Southern Extension Project (GHD, 2013). This is primarily attributable to the recalibration of the model to reflect the lower observed groundwater inflows. For the 6.5 Mtpa scenario, compared to the mining schedule presented in the Mandalong Southern Extension Project EIS (GHD, 2013), mining ceases at an earlier date and therefore inflows start to decrease at an earlier date as dewatering ceases and the mine workings begin to fill with groundwater.

9.1.4 Water Balance

The existing Mandalong Mine site water balance developed for the Mandalong Southern Extension Project (GHD, 2013) and revised on an annual basis (GHD, 2016) was updated to reflect the updated groundwater inflow predictions for Transient run 24 for the 6.5 Mtpa mine schedule. A summary of the average input and outputs of the Mandalong Mine Water Management System for years 2016 and 2030 is presented in **Table 7**. The original approved inputs and outputs presented as part of the Mandalong Southern Extension Project SSD-5144 is included for comparison purposes.

Table 7: Summary of Mean Projected Water Inputs and Outputs (GHD, 2016)

	Year 2016 (ML/yr)	Year 2030 (ML/yr)	Approved Inputs/Outputs Year 2035 from SSD-5144 (ML/yr)
Inputs			
Direct rainfall onto storages and catchment runoff	281.4	304.4	286.1

Potable water supply	443.5	442.5	412.7
Inflows into underground workings	310.7	641.0	2158.4
Total Inputs	**1035.6**	**1387.6**	**2857.2**
Outputs			
Evaporation	22.0	21.9	22.4
Dust suppression	-	-	2.0
Spray irrigation	20.4	20.3	18.7
Sewage to HWC	40.8	40.8	37.7
Discharge through LDP001 (Cooranbong)	810.3	1163.0	2605.4
Discharge through LDP002 (Cooranbong)	8.7	8.6	49.0
Discharge from Construction Dam (Cooranbong)	38.3	38.1	48.6
Discharge from MMAS	31.3	31.2	38.2
Discharge from Delta Entry Site	64.8	64.5	29.3
Discharge from MSSS	NA	0	0
Total Outputs	**1036.6**	**1388.4**	**2851.3**
Change in Storage			
Cooranbong Longwall Void	-1.1	-1	6
Surface Water Storages	0.1	0.2	-0.1
Total Change in Storage	**-1**	**-0.8**	**5.9**
Balance			
Inputs – Outputs – Change in Storage	0	0	0

From **Table 7**, the largest source of water into the Mandalong Mine water management system is currently potable water supply while under future conditions (year 2030) the largest source of water is groundwater inflow into the underground workings. The increased groundwater make over time will be discharged through LDP001 as water is transferred from the Cooranbong Longwall Void to the Borehole Dam at the Cooranbong Entry Site to manage water levels in the underground workings. The estimated discharge through LDP001 for end of mining conditions is approximately 1163 ML/year, which is less than the estimated discharge through LDP001 for end of mining conditions presented as part of the Mandalong Southern Extension Project SSD-5144 (GHD 2013).

The site water balance was run to quantify the salt budgets for years 2016 and 2030 in addition for the approved scenario being year 2035. The largest source of salt into the Mandalong Mine water management system is due to the inflow of groundwater into the underground workings. The salt load generated by the inflow of groundwater into the mine (2526.3 t/yr) is discharged through LDP001 as water is transferred from the Cooranbong Longwall Void to the Borehole Dam at the surface to manage water levels in the underground workings. The salt load discharged through LDP001 under an increased coal production rate of 6.5 Mtpa (2531.6 t/yr) is less that the salt load assessed and approved as part of the Mandalong Southern Extension Project (8586.8 t/yr).

The differences between the approved scenario and modelled conditions under a constant mining rate of 6.5 Mtpa are attributable to the decreased predicted groundwater inflows due to re-calibration of the hydrogeological model. Other differences between the approved scenario and modelled conditions under a constant mining rate of 6.5 Mtpa are attributable to changes in the water management system.

9.1.5 Impact Assessment

Predicted groundwater inflows into the Mandalong Mine workings for the modified mine schedule are less than the predicted groundwater inflows presented in GHD (2013). The MODFLOW water balance results for Transient run 5 presented in GHD (2013) suggested that there will not be an increase in the movement of alluvial groundwater to underlying groundwater sources as a result of the proposed Mandalong Southern Extension workings. Throughout the Southern Extension Area, the total area of alluvium (including Morans Creek, Wyee Creek and Mannering Creek alluvium), receives a net input from underlying groundwater sources in the order of 71 ML/year. The hydrogeological model suggests that under average rainfall this input will remain between 71 – 72 ML/year throughout the period of mining and up to 2050.

Transient run 24 developed as part of the revised hydrogeological model undertaken for this modification (GHD, 2016) shows that between 2016 and 2030, modelled outputs into drains increase. This increase is due to an increase in groundwater inflows into the mine workings over time as the mine progresses (which are removed from the model via drains). The increase in groundwater inflows into mine workings over time is offset by a decrease in net groundwater storage in the model as shown in **Table 8**. This indicates that the groundwater flow into the mine originates from groundwater stored in strata adjacent to the mine workings. For purposes of comparison, the groundwater flow budget for Transient Run 5 in years 2016 and 2035 (end of mining associated as part of GHD (2013)) is presented in **Table 8** below. The flow budget is presented for the entire mining area.

Table 8: Groundwater Flow Budget (GHD, 2016)

	Inputs (ML/year)				Outputs (ML/year)			
	Recharge	**GHB**	**Storage**	**Total**	**Drains**	**GHB**	**Storage**	**Total**
Transient Run 24								
Year 2016	4055	1677	683	6415	4269	255	1891	6415
Year 2030	4055	1674	1029	6758	4808	260	1690	6758
Transient Run 5								
Year 2016	4055	2093	1950	8098	7755	278	65	8098
Year 2035	4055	2095	2562	8712	8380	278	54	8712

Table 8 shows that between 2016 and 2030 for Transient Run 24, modelled outputs into drains increase. This increase is due to an increase in groundwater inflows into the mine workings over time as the mine progresses (which are removed from the model via drains). The increase in groundwater inflows into mine workings over time is offset by a decrease in net groundwater storage in the model as shown in **Table 8**. This indicates that the groundwater flow into the mine originates from groundwater stored in strata adjacent to the mine workings.

Comparison of the flow budget for Transient Run 5 with the predictions for the re-calibrated model indicates that there is less groundwater within the hydrogeological system for the recalibrated model. This is because the storage and hydraulic conductivity values for each material within the model have generally been reduced during re-calibration. Hence, the modelled inputs into drains is lower for the re-calibrated model.

Overall any impacts on aquifers and any groundwater drawdown is predicted to be no greater than the impacts presented and assessed in the *Mandalong South Extension Project Groundwater Impact Assessment*.

Transient run 5 of the hydrogeological model predicted that the Project will not cause a water table drop greater than 0.1 m within the alluvial aquifers through the proposed period of mining. The revised

hydrogeological model undertaken for this modification (GHD, 2016) makes the same conclusion based on Transient run 24 based on a constant annual extraction rate of 6.5 Mtpa. This prediction is based on no increase in the hydraulic conductivity of strata within the surface zone.

As discussed in the *Mandalong South Extension Project Groundwater Impact Assessment*, tensile and compressive cracks may develop within the surface zone and may result in localised increases in hydraulic conductivity and porosity. These stresses were not modelled by the hydrogeological model because it is likely that they will only result in temporary reductions in water table levels within the surface zone (as observed within the Mandalong Mine area) and they will not result in an increased movement of shallow groundwater to underlying aquifers. In addition, shallow subsidence cracks tend to fill over time and the hydraulic conductivity and porosity may return to pre-mining values.

Since groundwater inflows are predicted to be lower than those predicted and assessed as part of the EIS for the Mandalong Southern Extension Project (GHD, 2013), any impacts on aquifers and any groundwater drawdown is predicted to be no greater than the impacts presented in GHD (2013) and approved under the Mandalong Southern Extension Project Development Consent SSD-5144.

9.1.6 Mitigation and Management

As groundwater inflows are predicted to be lower than those predicted and approved under SSD-5144 they will be adequately managed within the capacity constraints of the existing water management system. No additional mitigation and management measures are proposed.

9.1.7 Conclusion

The numerical hydrogeological model developed for the Mandalong Southern Extension Project has been used in this assessment to predict any change in groundwater inflow into the mine workings at Mandalong Mine as a result of the proposed increase in coal production rate from up to 6 Mtpa to 6.5 Mtpa. As part of this assessment, it was necessary to refine the layering within the model to better present the fracture zones above the coal seam and then recalibrate the model to better reflect calculated groundwater inflows into the underground workings over the period from June 2013 to June 2015.

Based on the model output from Transient run 24 (best fit under transient calibration), total groundwater inflow into the mine workings (Cooranbong, Mandalong and Mandalong South) for a constant coal production rate of 6.5 Mtpa is predicted to peak at 2.1 ML/day in the year 2030.

The recalibrated hydrogeological model indicates that groundwater inflows based on a coal production rate of 6.5 Mtpa are less than groundwater inflows predicted as part of the Mandalong Southern Extension Project. This is primarily attributable to the recalibration of the model to reflect the lower observed groundwater inflows.

Since groundwater inflows are predicted to be lower than those predicted and assessed as part of the EIS for the Mandalong Southern Extension Project, any impacts on aquifers and any groundwater drawdown is predicted to be no greater than the impacts presented and assessed in the *Mandalong South Extension Project Groundwater Impact Assessment*.

The existing Mandalong Mine site water balance was updated to reflect the updated groundwater inflow predictions for the modified mine schedule using the recalibrated hydrogeological model. The site water balance was run to quantify the water and salt budgets for years 2016 and 2030. Year 2030 represents water management conditions when groundwater inflows reach their maximum (under the modified mine schedule).

Overall, the updated water and salt balance model indicates that the peak discharge volume and salt load (in year 2030) through LDP001 will be less that the predicted discharge and salt load approved as part of the Mandalong Southern Extension Project. It is now predicted that the average annual discharge through

LDP001 will peak in 2030 at approximately 1163 ML/year. This reduction in discharge is primarily attributable to a reduction in predicted groundwater inflow resulting from the recalibration of the groundwater model.

9.2 Air Quality

9.2.1 Introduction

An Air Quality Impact Assessment (AQIA) has been undertaken by SLR for the Modification to:

- Assess the potential air quality impacts on surrounding sensitive receptors (**Figure 3**) associated with the increased rate of production; and

- Identify appropriate mitigation measures to minimise air emissions, along with appropriate monitoring and management strategies as required.

The AQIA referred to information derived and provided as part of the Mandalong Southern Extension Project AQIA (SLR 2013). The ventilation air from the underground workings of the Mandalong Mine is emitted from the ventilation fans located at MMAS, MSSS and the Cooranbong Entry Site. The original AQIA assessed the impacts from the existing MMAS and the MSSS at the rate of 6 Mtpa. The Northern Coal Logistics Project AQIA (SLR 2014) assessed the impacts of the Mandalong Mine ventilation facility located at the Cooranbong Entry Site. The AQIA to support this modification assesses the air quality impacts on surrounding sensitive received around the MMAS, MSSS and the Cooranbong Entry Site associated within the increased production rate of 6.5 Mtpa.

To ensure a comparable assessment against the original AQIA a significant amount of information and data compiled as part of the Mandalong Southern Extension Project (SLR 2013) and Northern Coal Logistics Project (SLR 2014) is presented in this assessment.

SLR's assessment was completed in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005) (the Approved Methods). A copy of the AQIA (SLR, 2016) is contained within **Appendix 5** with significant findings and recommendations summarised below.

9.2.2 Sensitive Receptors

As is apparent from **Figure 3**, there are a number of privately owned residences in the PAA surrounding the MMAS, MSSS and Cooranbong Entry Site.

9.2.3 Existing Environment

A range of monitored data sources were analysed to form a regional background dataset. The monitoring data for particulates were adopted from the Mandalong Southern Extension Project AQIA (SLR 2013).

The air quality in the region surrounding the PAA is influenced by emissions generated by a range of sources, originating from both within and outside of the local area. Specifically for the area surrounding the PAA, air quality will be influenced by pollution transported into the area from more distant sources, emissions from power stations in the area, traffic-generated pollution in addition to air pollution generated by the Project itself.

The close proximity of these air pollution sources may have implications in terms of elevated background concentrations of combustion-related pollutants, including PM_{10} (particulate matter with an aerodynamic diameter of 10 microns (µm) or less), $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5 microns (µm) or less), sulphur dioxide, oxides of nitrogen, carbon monoxide and volatile organic compounds.

A summary of the ambient air quality environment for assessment purposes is presented in **Table 9** below.

Table 9: Ambient Air Quality Environment for Assessment Purposes (SLR, 2016)

Pollutant	Averaging Period	Assumed Background Ambient Level	Notes
TSP	Annual	29.4 µg/m^3 plus Power Station increments	Maximum increment due to power station is 0.4 µg/m^3 at receptor R5
PM_{10}	24-hour	Daily varying based on 2010 observations from Newcastle	Maximum increment due to power station is 2.3 µg/m^3 at Receptor R4
	Annual	14.7 µg/m^3 plus power station increments	
$PM_{2.5}$	24-hour	Daily varying based on 2010 observations from Newcastle	Maximum increment due to power station is 0.6 µg/m^3 at receptor R4
	Annual	4.6 µg/m^3 plus power station increments	
Deposited Dust	Annual	2 g/m^2/month	Assumed
NO_2	1-hour	71.5 µg/m^3 (constant)	Newcastle monitoring station
	Annual	31.3 µg/m^3 (constant)	Newcastle monitoring station
CO	8-hour	1,604 µg/m^3 (constant)	Newcastle monitoring station
	1-hour	No data	Newcastle monitoring station
SO_2	1-hour	70.7 µg/m^3 (constant)	Newcastle monitoring station
	24-hour	13.1 µg/m^3 (constant)	Newcastle monitoring station
	Annual	2.6 µg/m^3 (constant)	Newcastle monitoring station

9.2.4 Assessment Criteria

Air quality goals adopted for this assessment, which conform to current EPA and Federal air quality criteria, are summarised in **Table 10** below.

Table 10: Summary of Project Air Quality Goals (SLR, 2016)

Pollutant	Averaging Time	Goal
TSP	Annual	90 µg/m^3
PM_{10}	24 Hours	50 µg/m^3
	Annual	25 µg/m^3
$PM_{2.5}$	24 Hours	25 µg/m^3
	Annual	8 µg/m^3
Dust Deposition	Annual	Maximum incremental (project only) increase of 2g/m^2/month Maximum total of 4g/m^2/month (Project and other sources)
NO_2	1 hour	246 µg/m^3
	Annual	62 µg/m^3
CO	15 minutes	100 mg/m^3
	1 hour	30 mg/m^3
	8 hours	10 mg/m^3
SO_2	10 minutes	712 µg/m^3
	1 hour	570 µg/m^3
	24 hours	228 µg/m^3
	Annual	60 µg/m^3

Emissions Estimation

Emission estimates have been compiled for three operating scenarios to assess the pollutant emissions due to the upgraded operations at the Mandalong Mine. A summary of the emission sources and associated pollutants assessed in these three scenarios is shown in **Table 11** below.

Table 11: Summary of the Scenarios Assessed (SLR, 2016)

Scenario	Emission Sources	Pollutants
Gas Flaring (Scenario 2a)	Gas flares at MMAS	CO, NO_x
	Existing ventilation fans at MMAS (x2)	TSP, PM_{10}, $PM_{2.5}$ and deposited dust
	Existing ventilation fans at MSSS (x2)	TSP, PM_{10}, $PM_{2.5}$ and deposited dust
Gas Engines (Scenario 2b)	Gas engines at MMAS	CO, NO_x, SO_2
	Existing ventilation fans at MMAS (x2)	TSP, PM_{10}, $PM_{2.5}$ and deposited dust
	Existing ventilation fans at MSSS (x2)	TSP, PM_{10}, $PM_{2.5}$ and deposited dust
Cooranbong Entry Site (Scenario 5a)	Coal handling and transportation (6 Mtpa)	TSP, PM_{10}, $PM_{2.5}$ and deposited dust
	Existing ventilation fan at Cooranbong Entry Site (x1)	TSP, PM_{10}, $PM_{2.5}$ and deposited dust

Scenarios 2a (Gas flaring)

This scenario assesses the impacts of air emissions from gas flares in conjunction with the ventilation fans.

As a worst case scenario for the operation of the gas flares, emissions from the gas flares have been estimated assuming that 100 percent of the methane from the drainage plant will be flared.

It is noted that the ventilation fans at the existing MMAS, MSSS (yet to be constructed) and Cooranbong Entry Site will operate concurrently with the gas flares.

Scenarios 2b (Gas engines)

This scenario assesses the impacts of air emissions from gas engines in conjunction with the ventilation fans. It should be noted that whilst the gas engines are approved development they are yet to be constructed.

It has been assumed that once the power generation facility is implemented, it will be capable of utilising all methane drainage gas with the gas flare units existing as back-up infrastructure for peak gas flows only. As a worst case scenario for the operation of the gas engines, modelling has therefore been carried out assuming that 100 percent of the methane is combusted in the gas engines and that no methane is being flared.

It is noted that the mine ventilation fans at the existing MMAS, MSSS (yet to be constructed) and Cooranbong Entry Site will operate concurrently with the gas engines.

Scenario 5a (Cooranbong Entry Site)

This scenario assesses the impacts in the vicinity of the Cooranbong Entry Site due to air emissions associated with the receipt and handling of coal from Mandalong Mine and the dispatch of coal to Newstan Colliery Surface Site by haul road. This facility includes the operation of a ventilation fan at the site that vents air from the underground workings of Mandalong Mine.

Emission Estimation Methodology

The emissions from the gas flaring units have been estimated using emission factors from the National Pollution Inventory Emissions Estimation Technique Manual, Oil and Gas Exploration and Production.

To estimate emissions from the gas ventilation fans at the MMAS, a monitoring program was conducted by SLR Consulting at the existing MMAS in June 2012, August 2012 and September 2013. The pollutant emissions that were monitored were:

- TSP
- PM_{10}
- $PM_{2.5}$

The monitoring of particulate emissions was undertaken during a period of normal underground mining operations. For further details on the emission test results refer to SLR 2013. The pollutant emission rates used in this modelling study for the ventilation fans are unchanged for TSP and PM_{10} from the Extension Project AQIA (SLR 2013) and are presented in SLR (2016).

Whilst the Modification proposes to increase the production rate from 6 Mtpa to 6.5 Mtpa no additional mine ventilation throughput is required. Existing underground dust mitigation and suppression measures will continue to be implemented at the mine to control particulate emissions within the underground work environment. Importantly this will ensure a safe underground working environment for mine operators. There is no reason to expect that an increase in production would result in a proportional increase in dust concentrations within the ventilation system.

On this basis, it is considered appropriate to adopt the same pollutant emission rates from the existing ventilation fans for MMAS, MSSS and Cooranbong Entry Site. It is noted that the ventilation fans at the MMAS and MSSS are of a horizontal exit flow stack type and Cooranbong Entry Site is a vertical exhaust fan. In order to consistently model each exhaust, the horizontal fans were represented as pseudo stacks in the dispersion model. Specifically, the ventilation fan sources were located in the direction of the horizontal flow, off-set from the actual vent location by the value of the pseudo radius.

Gas Engines

It should be noted that whilst the gas engines are approved development they are yet to be constructed. The emissions from the gas engines have been estimated from monitoring performed on similar gas engines. It has been shown that the emissions from the proposed gas engines (total of six with a capacity of 2 Megawatts each) would constitute a worst case scenario in terms of emissions. The same configuration has therefore been used within this assessment.

Emissions Inventory

A summary of the emissions inventory for the assessment scenarios is shown in **Table 12** below.

Table 12: Emissions Inventory Summary

Pollutant	Value	Units
Scenario 2a (Gas Flaring)		
Gas Flares (at MMAS)		
CO	4.7	g/s
NO_X	0.8	g/s
SO_2	0	g/s
Ventilation Fans (at MMAS)		
TSP	0.99	g/s
PM_{10}	0.16	g/s
$PM_{2.5}$	0.05	g/s
Scenario 2b (Gas Engines)		
Gas Engines (at MMAS)		
CO	1.3	g/s
NO_x	0.58	g/s
SO_2	0.024	g/s
Ventilation Fans (at MMAS and MSSS)		
TSP	0.99	g/s
PM_{10}	0.16	g/s
$PM_{2.5}$	0.05	g/s
Scenario 5a		
Surface Operations (at the Cooranbong Entry Site)		
Identical emission rates to the Northern Coal Logistics Project (SLR 2014)		
Ventilation Fans (at the Cooranbong Entry Site)		
TSP	0.99	g/s
PM_{10}	0.16	g/s
$PM_{2.5}$	0.05	g/s

9.2.5 Impact Assessment

A detailed assessment of the background concentrations in the area surrounding the PAA was performed with a regional background concentration determined to which a contribution from local power stations was added. A contribution from project activities was incorporated to the background dataset in order to provide information on the cumulative impact to local air quality resulting from the project activities as modified. This section presents the highest numerical value modelled at any sensitive receptor compared against the relevant criterion for each pollutant.

Dust Deposition

Scenario 2a and 2b receptors R6, R7 and R9 have the highest predicted annual average rate increment of 0.3 g/m^2/month and cumulative value of 2.4 g/m^2/month. Both rates are significantly below the criterion of 2 g/m^2/month and 4 g/m^2/month respectively.

Whilst Scenario 5a receptor 22 experiences the highest increment rate of <0.1 g/m^2/month and cumulative rate of <2.6 g/m^2/month, both rates are significantly below the criterion of 2 g/m^2/month and 4 g/m^2/month respectively.

Overall the results indicate that incremental and cumulative annual average dust deposition rates at all nominated residences/properties surrounding the MMAS, MSSS and Cooranbong Entry Site are predicted to be well below the criterion of 2 g/m^2/month (incremental increase in dust deposition) and below 4 g/m^2/month (cumulative dust deposition) for all three operating scenarios. As the nominated

residences/properties were chosen as being indicative of all surrounding residences/properties, it can be concluded that cumulative dust deposition levels at residences/properties surrounding those modelled would also be below the relevant criterion of 4 g/m^2/month during these scenarios.

Particles (as TSP)

Under Scenario 2a and 2b receptor R10 experiences the highest annual average TSP concentration project increment of 9.7 µg/m^3 which results in a total background plus project cumulative result of 39.5 µg/m^3 being significantly below the criterion of 90 µg/m^3.

Under Scenario 5a receptor 22 experiences the highest cumulative annual average TSP concentration of 40.6 µg/m^3 which is significantly below the criterion of 90 µg/m^3.

During Scenario 2a, 2b and 5a operations, cumulative annual average TSP concentrations are predicted to be well below the criterion of 90 µg/m^3 at all identified sensitive receptor locations. As the nominated residences/properties were chosen as being indicative sensitive locations typifying the local surrounding communities, it is unlikely that annual average TSP concentrations at other residences and properties surrounding these modelled residences would exceed the EPA criterion of 90 µg/m^3.

Particles (as PM_{10})

For Scenarios 2a and 2b, the maximum increment from the Project (30.7 µg/m^3) is predicted to occur at receptor R7. The subsequent total background plus project concentration of 45.2 µg/m^3 and maximum cumulative concentration of 40.7 µg/m^3 are below the criterion of 50 µg/m^3.

For Scenario 5a, the maximum increment due to the operation of the ventilation fan (0.7 µg/m^3) is predicted to occur at receptors 30 and 31. Both cumulative totals are below the criterion of 50 µg/m^3.

Overall, all maximum cumulative 24-hour average PM_{10} concentrations are predicted to be below the criterion of 50 µg/m^3 at all identified sensitive receptor locations.

During Scenario 2a and 2b operations, annual average PM_{10} concentrations are predicted to be well below the criterion of 25 µg/m^3 at all identified sensitive receptor locations. Receptor R10 experiences the highest project increase of 1.9 µg/m^3 which results in a total background plus project cumulative concentration of 16.7 µg/m^3 being under the criterion of 25 µg/m^3. Under Scenario 5a receptor 22 exhibits the highest cumulative concentration of 17.1 µg/m^3 with a 0.1 µg/m^3 increment from the ventilation fan. This remains below the criterion of 25 µg/m^3. As the nominated residences/properties were chosen as being indicative sensitive locations typifying the local surrounding communities, modelling illustrates that cumulative annual average PM_{10} concentrations at other residences and properties surrounding these modelled residences would not exceed the criterion of 25 µg/m^3.

Particles (as $PM_{2.5}$)

For Scenarios 2a and 2b, the maximum increment from the Project (8.6 µg/m^3) is predicted to occur at receptor R7. For Scenario 5a, the maximum increment due to the operations ventilation fan (0.21 µg/m^3) is predicted to occur at receptors 30 and 31. The maximum cumulative 24-hour average $PM_{2.5}$ concentrations are predicted to be below the criterion of 25 µg/m^3 at all identified sensitive receptor locations.

During Scenario 2a and 2b receptors R7, R8 and R10 experience the highest related project increment of 0.5 µg/m^3. The same receptors experience the highest cumulative total background plus project concentration of <5.2 µg/m^3 which is below the criterion of 8 µg/m^3. Under Scenario 5a, Receptor 22 exhibits the highest cumulative concentration of <5.2 µg/m^3 which is below the criterion of 8 µg/m^3.

Overall, during Scenario 2a, 2b and 5a operations, annual average $PM_{2.5}$ concentrations are predicted to be well below the criterion of 8 µg/m^3 at all identified sensitive receptor locations. As the nominated

residences/properties were chosen as being indicative sensitive locations typifying the local surrounding communities, it is unlikely that cumulative annual average $PM_{2.5}$ concentrations at other residences and properties surrounding these modelled residences would exceed the criterion of 8 µg/m^3.

Nitrogen Dioxide

The maximum predicted 1-hour average NO_2 concentrations are below the project criterion of 246 µg/m^3 at all the sensitive receptors during both Scenario 2a and Scenario 2b. R5 shows the highest increment of 3.2 µg/m^3 and cumulative result of 74.7 µg/m^3 under Scenario 2a and R6 experiences the highest increment of 30.7 µg/m^3 and cumulative of 102.2 µg/m^3 under Scenario 2b.

All receptors experience an increment of <0.1 µg/m^3 and cumulative result of <31.4 µg/m^3 under Scenario 2a. Receptors R7, R8 and R10 experience an overall maximum increment of 0.4 µg/m^3 and cumulative result of 31.7 µg/m^3 being under the project criterion of 62 µg/m^3. Overall, annual average NO_2 concentrations are predicted to be below the project criterion of 62 µg/m^3 at all the sensitive receptors during both Scenario 2a and Scenario 2b.

Carbon Monoxide

The predicted maximum 1-hour average incremental impacts are well below the project criterion of 30 mg/m^3. A number of receptors are expected to experience an increment of 0.1 mg/m^3 under Scenario 2a with receptors R6, R7 and R8 experiencing a maximum increment of 0.3 mg/m^3 under Scenario 2b.

Maximum 8-hour average concentrations are also well below the project criterion of 10 mg/m^3. Under Scenario 2a all receptors experience a maximum increment of <0.1 mg/m^3 and maximum cumulative concentration of <1.7 mg/m^3. Receptors R7, R8, R9 and R10 experience maximum increments of 0.2 mg/m^3 and maximum cumulative concentrations of 1.8 mg/m^3 under Scenario 2b. Overall, the maximum predicted 8-hour average CO concentrations are all predicted to be below the project criterion of 10 mg/m^3 at the sensitive receptors during both Scenario 2a and Scenario 2b.

Sulphur Dioxide

Sulphur Dioxide is only emitted during Scenario 2b. The maximum cumulative 1-hour average, 24-hour average and annual average SO_2 concentrations are predicted to be below the project criteria of 570 µg/m^3 (highest being R6 with 77 µg/m^3), 228 µg/m^3 (highest being R8 with 14.7 µg/m^3) and 60 µg/m^3 (highest being R6, R7, R8 and R10 with 2.7 µg/m^3) respectively at all of the sensitive receptors during Scenario 2b operations.

9.2.6 Mitigation and Management

As air quality emission levels are predicted to occur within the air quality goals established for the project, no additional mitigation and management measures are proposed beyond the existing protocols within the mine's Air Quality & Greenhouse Gas Management Plan.

9.2.7 Conclusion

Whilst the Modification proposes to increase the production rate from 6 Mtpa to 6.5 Mtpa no additional mine ventilation throughput is required. Existing underground dust mitigation and suppression measures will continue to be implemented at the mine to control particulate emissions within the underground work environment.

Dispersion modelling was conducted for the identified emission sources for three scenarios representing gas flaring, gas engines at the existing MMAS and the operation of ventilation fan at the Cooranbong Entry Site.

In order to assess the background air quality of the region, a number of industrial facilities with the potential to have a cumulative impact on the local airshed were identified. A dispersion modelling exercise was performed to determine suitable background levels of air pollutants associated with these regional emission sources in order to assess the cumulative impacts.

It was concluded from the dispersion modelling exercise that concentrations of TSP, PM_{10}, $PM_{2.5}$, CO, NO_2 and SO_2 are unlikely to exceed the relevant criterion at any of the identified sensitive receptors around the MMAS, MSSS and the Cooranbong Entry Site as a result of the proposed increase in production rate. Odour impacts were not assessed as part of this assessment as it was concluded that the proposed increase in coal throughput would not have any impact on the odour emissions from the Project.

Based on these results, it is concluded that there are no constraints in relation to air quality experienced at nearby residential locations if the total annual coal production rate was increased from 6 Mtpa to 6.5 Mtpa.

9.3 Greenhouse Gas

9.3.1 Introduction

Greenhouse gas emissions associated with the Mandalong Southern Extension Project were originally calculated based on an annual extraction rate of 6 Mtpa (BDM Resources 2013). These estimations have since been recalculated to reflect the proposed increase in the annual extraction rate of 6.5 Mtpa being the subject of this Modification.

Three scopes of emissions are defined for greenhouse gas accounting and reporting purposes as detailed below:

Scope 1 Emissions

Scope 1 emissions refer to the direct emissions that occur as a result of a development's activities. The Scope 1 emissions for the project are:

- Fugitive emissions from methane gas drainage from the underground workings.
- Fugitive emissions from ventilation air methane from the underground workings.
- Emissions from the combustion of diesel.

A number of Scope 1 emission sources such as liquid petroleum gas as well as oils and greases were not included in the assessment by BDM Resources (2013) due to their contribution being less than 1 per cent of the Project's total emissions and thus were considered immaterial.

Scope 2 Emissions

Scope 2 emissions refer to indirect emissions that are a consequence of a development's activities but are not from sources owned or controlled by the company. For example the emissions associated with purchased electricity.

Scope 3 Emissions

Scope 3 emissions include all other indirect emissions that are a consequence of the development's activities but are not from sources owned or controlled by the company. For example the emissions associated with the combustion of coal extracted from Mandalong Mine. Scope 3 emissions are generally scope 1 or 2 emissions for other companies. The original sum of over 300 million tonnes of carbon

dioxide equivalent (Mt CO_2-e) for the life of mine remains unchanged. Other sources, such as production coal transport and employee travel total less than 5 percent and are considered immaterial in comparison (BDM Resources, 2013).

9.3.2 Summary of Modification Emissions

The revised annual Scope 1, 2 and 3 emissions for the Modification are summarised in **Table 13** below.

Table 13: Annual Greenhouse Gas Emissions

Scope	Emission Source	Maximum Annual Emissions (t CO_2-e) at 6 Mtpa	Maximum Annual Emissions (t CO_2-e) at 6.5 Mtpa	Percentage Change in Annual Emissions
Scope 1	Ventilation air emissions	1,274,035	1,385,486	10.6% increase
	Pre-drainage gas	429,837	429,837	0%
	Diesel combustion	2,640	2,870	8.7% increase
Scope 1 Sub-total		**1,706,512**	**1,818,193**	**6.5% increase**
Scope 2	Electricity consumption	107,152	116,471	8.7% increase
Scope 1 and 2 Sub-total		**1,813,664**	**1,934,664**	**6.7% increase**
Scope 3	Product coal combustion	14,325,660	15,571,370	8.7% increase
Total		**16,139,324**	**17,506,034**	**8.5% increase**

The pre-drainage gas emission rate has not been increased. This is justified as the in-situ seam gas pressures remain unchanged and are independent of production rates. The pre-drainage gas flow rate of 800 L/s is therefore unchanged. Notably, this rate is higher than actual measured flows and therefore a conservative prediction.

Drainage of gas is time dependent, so the increase in longwall production from 6 Mtpa to 6.5 Mtpa would mean that the coal is pre-drained for a slightly shorter period of time. In reality this would result in lower pre-drainage emissions, but no reduction has been used in this assessment as it is difficult to quantify. This is a conservative approach and deemed to be appropriate.

The gas that is not recovered by pre-drainage will be released as ventilation air emissions during the longwall extraction process. The balance between the ventilation air emissions and pre-drainage gas therefore alters. The total gas emitted for the life of the mine (being the ventilation air emissions combined with the pre-drainage emissions) remains unchanged from the original SSD-5144 assessment (BDM Resources, 2013) as the amount of coal to be extracted is finite and has not changed under this modification.

Similarly, an increase in the extraction rate to 6.5 Mtpa requires more effort from equipment such as conveyor belts and underground vehicles therefore consuming greater quantities of diesel and electricity on an annual basis. Importantly, the life-of-mine total usage is assumed to remain unchanged.

9.3.3 Impact Assessment

In line with the increased rate of production the overall change in annual greenhouse emissions has been calculated to increase by 8.5 percent over a shorter period of time when contrasted against the original assessment (BDM Resources, 2013). Given the finite nature of the resource, life of mine total emissions remain as originally assessed by BDM Resources (2013) with Scope 1 and 2 being 45,038,008 t CO_2-e and Scope 3 being 358,141,500 t CO_2-e. In reality the total Scope 1 emissions will likely be lower due to changes in production rates, methane concentrations within the coal and coal permeability. BDM Resources (2013) outlined that the original Project's Scope 1 emissions accounted for approximately 0.24

percent of Australia's total emissions and that it will have a negligible effect on global climate change. As the modified production rate of 6.5 Mtpa will not increase the overall life of mine emissions there will be no further impacts to global climate change beyond those originally approved under SSD-5144.

9.3.4 Mitigation and Management

Centennial Mandalong will continue to employ the mitigation measures and management strategies currently adopted at the Mandalong Mine, as relevant to the Project, to reduce energy use and minimise greenhouse emissions.

9.3.5 Conclusion

Revised annual scope 1, 2 and 3 emission rates have been calculated based on the increased rate of extraction being the subject of this modification. Whilst the total annual emission rate increased by 8.5 percent the overall life of mine emissions have remained unchanged as the increased annual rate will occur over a shorter period of time. As such no additional greenhouse gas impacts are predicted to occur beyond those originally approved.

10.0 JUSTIFICATION AND CONCLUSION

A description of the need and justification for the Modification is provided in this chapter with regard to environmental, social and economic factors. This includes consideration of alternatives, the principles of Ecologically Sustainable Development (ESD) and the consistency of the Modification with the objectives of the EP&A Act.

10.1 Modification Justification and Alternatives

The increase in the annual production limit to 6.5 Mtpa is required due to the mine optimising the production process, both in terms of mechanical improvements and through the continued development and training of underground operators. The increased rate of production will enable operational efficiencies to be realised within the existing approved extraction area. Ultimately the benefits associated with the accelerated mining program are in the form of the resultant earlier realisation of returns. It is estimated that the modification will increase beneficial economic and related social effects by approximately $20 million.

The alternative of not increasing the annual production limit, which is currently 6 Mtpa, will result in the mine either slowing production or having scheduled outages to avoid exceeding the production limit during high yielding years. Such outages would affect the mine's ability to maintain continuity and likely involve employees being temporarily stood down.

As detailed in the SEE, the Modification will have limited environmental, social and economic impacts beyond those approved in SSD-5144. The Modification will enable continued safe and efficient operations at Mandalong Mine within the approved mining footprint.

10.2 Modification Impacts

This SEE, which includes relevant technical specialist assessments, documents the various studies that have been undertaken to examine potential impacts that may occur as a result of the Modification.

The assessment of environmental issues has been multi-disciplinary and involved consultation with key stakeholders. The Modification is anticipated to pose minimal environmental impacts beyond those previously assessed and approved under SSD-5144.

10.3 Modification Benefits

The socio-economic assessment prepared in relation to the Modification has considered the findings from the relevant technical specialist assessments which have assumed a worst case scenario, meaning that potential impacts may be less than predicted.

Overall the Modification results in no long term socio-economic impacts with the Modification being undertaken to sustain the ongoing operation of Mandalong Mine.

Approval of the Modification will result in greater royalty and tax yields for state and federal governments. This will also have a positive social impact over the life of the mine.

10.4 Ecologically Sustainable Development

Ecologically Sustainable Development (ESD) is a primary objective of environmental protection in NSW. The objects of the EP&A Act adopt the principles of ESD and it is defined under section 6(2) of the *Protection of the Environment Administration Act 1991* as:

> *6(2) For the purposes of subsection (1)(a), ecologically sustainable development requires the effective integration of economic and environmental considerations in decision-making processes.*

Ecologically sustainable development can be achieved through the implementation of the following principles and programs:

(a) ***the precautionary principle*** *- namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:*

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk-weighted consequences of various options,

(b) ***inter-generational equity*** *- namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,*

(c) ***conservation of biological diversity and ecological integrity*** *- namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,*

(d) ***improved valuation, pricing and incentive mechanisms*** *- namely, that environmental factors should be included in the valuation of assets and services, such as:*

(i) polluter pays - that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

The overall objectives of ESD are to use, conserve and enhance natural resources. This ensures that ecological processes are maintained facilitating improved quality of life, now and into the future.

Mandalong Mine is committed to the principles of ESD and understands that social, economic and environmental objectives are interdependent. The company acknowledges that a well-designed and effectively managed operation will avoid significant and/or costly environmental impacts or degradation. Consideration has been given to appropriately identifying, avoiding, mitigating and managing environmental risks. This demonstrates environmental due diligence and will provide for on-going and adaptive monitoring and management of the operation in line with the ESD principles outlined in the below sub-sections.

10.4.1 The Precautionary Principle

The precautionary principle, in summary, holds that where there are threats of serious or irreversible environmental damage, the lack of full scientific certainty should not be used as a reason for postponing measures to prevent the degradation.

The SEE has enabled an understanding of the potential impacts of the Modification on environmental, social and economic factors. Existing management controls and mitigation strategies are already in place to effectively monitor, mitigate and/or manage the potential environmental and socio-economic impacts of the Modification should it be approved.

10.4.2 Intergenerational Equity

Intergenerational equity is centered on the concept that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations. There is a moral obligation to ensure that today's economic progress, which will benefit both current and future generations, is not offset by environmental deterioration.

Mandalong Mine undertakes on-going environmental monitoring with mitigation measures to provide effective environmental management across its operations. This management is provided through planning, communication, documentation, review and feedback. These environmental management measures ensure that the health, diversity and productivity of the environment is maintained or enhanced for future generations.

10.4.3 Conservation of Biological Diversity and Ecological Integrity

The principle of "conservation of biological diversity and ecological integrity" holds that the conservation of biological diversity and ecological integrity should be a fundamental consideration for development proposals.

The potential environmental impacts of the Modification and existing measures to ameliorate these potential impacts are detailed in this report. The Modification poses no impacts to biodiversity of ecological matters beyond those approved under SSD-5144.

10.4.4 Improved Valuation, Pricing and Incentive Mechanisms

The principle of "improved valuation, pricing and incentive mechanisms" deems that environmental factors should be included in the valuation of assets and services. The cost associated with using or impacting upon an environmental resource is seen as a cost incurred to protect that resource.

Mandalong Mine will optimise the valuation and pricing of the coal resource by achieving extraction at a higher annual rate. The increased rate of production will enable operational efficiencies to be realised within the existing approved extraction area with the benefits associated with the accelerated mining program are in the form of the resultant earlier realisation of returns.

10.5 Conclusion

The Modification has been assessed using a risk-based and consultative approach to identify and assess potential environmental, social and economic impacts. The assessment has been multi-disciplinary and has involved consultation with DP&E in addition to other stakeholders. Emphasis has been placed on ensuring minimal impacts to the environment and sensitive receptors whilst enabling Centennial Mandalong's operations to proceed in accordance with the mine's business plan.

A range of potential impacts have been assessed in this report in addition to the attached technical specialist assessments. Conclusions indicate that the Modification will have minimal environmental, social and economic consequences. Existing management controls and mitigation strategies are in place for Mandalong Mine to effectively monitor, mitigate and/or manage the potential environmental and socio-economic impacts of the Modification should it be approved.

The Modification is considered to be consistent with relevant objectives of the EP&A Act, including the principles of ESD, and will not change the nature of the development as originally approved. On considering the balance of environmental, social and economic impacts, it is considered reasonable to conclude that the benefits of the Modification outweigh the impacts. Based on the findings of this report, it is recommended that the Modification be approved.

11.0 REFERENCES

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12.0 ABBREVIATIONS

ACHCR	Aboriginal Cultural Heritage Consultation Requirements for Proponents
AHD	Australian Height Datum
AIP	Aquifer Interference Policy
AQIA	Air Quality Impact Assessment
BCR	Benefit-Cost Ratio
BDM	BDM Resources Pty. Ltd.
BoM	Bureau of Meteorology
BSAL	Biophysical Strategic Agricultural Land
CO2-e	Carbon Dioxide Equivalent
DA	Development Application
DEC	Former NSW Department of Environment and Conservation
DECCW	Former NSW Department of Environment, Climate Change and Water
DP&E	NSW Department of Planning and Environment
DRE	NSW Division of Resources and Energy
CALMET	California METeorological Model
CBA	Cost-Benefit Analysis
CCC	Community Consultative Committee
CO	Carbon Monoxide
EIS	Environmental Impact Statement
EL	Exploration Licence
EMS	Environmental Management Strategy
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EP&A Reg	NSW Environmental Planning and Assessment Regulation 2000
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
EPA	Environment Protection Agency
EPL	Environment Protection Licence
ESD	Ecologically Sustainable Development
GHD	GHD Pty. Ltd.
ha	Hectares
ILUA	Indigenous Land Use Agreements
ISO	International Standards Organisation
km	Kilometres
LEP	Local Environmental Plan
LGA	Local Government Area
LMCC	Lake Macquarie City Council
LS2030	Lake Macquarie City Council's Lifestyle 2030 Strategy
LW	Longwall
M	Metres
mg	Milligrams
ML	Mining Lease
MMAS	Mandalong Mine Access Site

MNES	Matter of National Environmental Significance
MOP	Mining Operations Plan
MSSS	Mandalong South Surface Site
Mtpa	Million tonnes per annum
MU	Mapping Unit
NGER Act	National Greenhouse and Energy Reporting Act 2007
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NPV	Net Present Value
NPW Act	NSW National Parks and Wildlife Act 1974
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
PAA	Project Application Area
PAC	NSW Planning Assessment Commission
$PM_{2.5}$	Particulate matter less than 2.5µm
PM_{10}	Particulate matter less than 10µm
POEO Act	NSW Protection of the Environment Operations Act 1997
ROM	Run of Mine
SEE	Statement of Environmental Effects
SEP	Stakeholder Engagement Plan
SEPP	State Environmental Planning Policy
SILO	Scientific Information for Land Owners
SLR	SLR Consulting Australia Pty. Ltd.
SO_2	Sulphur Dioxide
SSD	State Significant Development
t	Tonnes
TSC Act	NSW Threatened Species Conservation Act 1995
TSP	Total Suspended Particulates
WM Act	NSW Water Management Act 2000
WSP	Water Sharing Plan
µg	Microns
µs/cm	Microsiemens per Centimetre

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