



global environmental solutions

Angus Place Mine Extension Project Decommissioning and Rehabilitation Strategy

Report Number CCC07-011

19 March 2014

Centennial Angus Place Pty Ltd

Version: Final 3

Prepared for: Centennial Angus Place Pty Ltd

Prepared by: SLR Consulting Australia Pty Ltd

10 Kings Road

New Lambton NSW 2305

SLR Project Manager **Chris Jones**

B Env Sc

Senior Environmental Scientist

Project Officer **Jessica Elmes**

B Env Sc & Mgt

Environmental Scientist

Date of Issue: 19 March 2014

SLR Reference: CCC07-011

ISSUE AND AMENDMENT CONTROL HISTORY

Issue	Date	Description	Author	QA/QC
1	26 March 2013	Decommissioning and Rehabilitation Strategy Draft 1	Andrew Regan & Malvin Manuelli	Clayton Richards
2	22 May 2013	Decommissioning and Rehabilitation Strategy Draft 2	Jessica Elmes	Chris Jones
3	19 July 2013	Decommissioning and Rehabilitation Strategy Draft 3	Jessica Elmes	Chris Jones
4	23 August 2013	Decommissioning and Rehabilitation Strategy Draft 4	Jessica Elmes	Chris Jones
5	4 November 2013	Decommissioning and Rehabilitation Strategy Final 1	Jessica Elmes	Chris Jones
7	31 January 2014	Decommissioning and Rehabilitation Strategy Final 2	Jessica Elmes	Chris Jones
8	19 March 2014	Decommissioning and Rehabilitation Strategy Final 3	Jessica Elmes	Chris Jones

EXECUTIVE SUMMARY

Centennial Angus Place Pty Limited (Centennial Angus Place) commissioned SLR Consulting Australia Pty Ltd (SLR) to prepare a Decommissioning and Rehabilitation Strategy for the proposed Angus Place Mine Extension Project (the Project). This Rehabilitation and Decommissioning Strategy has been developed as an accompanying stand-alone report to form part of the Environmental Impact Statement for the Project.

Currently approved longwall mining at Angus Place Colliery (Angus Place), in accordance with the current mine plan, will end in March 2016. Accordingly, Centennial Angus Place is seeking approval for the continuation of longwall mining at Angus Place to the east of the current workings within its ML 1424 lease boundary beyond March 2016.

In order to effectively address the complexity of various land uses at Angus Place, the Project Application Area has been divided into three management or primary 'domains', defined as:

- **Domain 1** - Infrastructure Areas, comprising disturbance areas associated with the existing infrastructure at the Angus Place pit top, and existing and proposed infrastructure areas on Newnes Plateau;
- **Domain 2** - Other Lands, comprising areas within the Project Application Area, not captured in Domains 1 and 2; and
- **Domain 3** - Water Management Areas comprising water storage and sediment ponds located at the pit top.

Decommissioning and rehabilitation activities for each domain are outlined in this Strategy, including the proposed removal of infrastructure such as services, equipment and buildings, and roads. The rehabilitation to be undertaken will result in two rehabilitated or secondary domains within the Project Application Area as follows:

- **Domain A** – Woodland, arising from the rehabilitation of disturbance areas associated with the Angus Place pit top, and the existing and proposed infrastructure areas on Newnes Plateau; and
- **Domain B** – Water Management Areas, comprising the water storage and sediment ponds located at the pit top.

Rehabilitation activities will be undertaken both progressively, and at the end of the mine life. Progressive rehabilitation will involve partial rehabilitation of the disturbed areas following construction of the proposed infrastructure on Newnes Plateau, namely Ventilation Site 3 (APC – VS3), several dewatering boreholes, and exploration drill hole sites. Life-of-mine rehabilitation will commence on cessation of all mining activities and will include the rehabilitation of all infrastructures areas at the pit top and on Newnes Plateau. At this time the disturbance areas will be fully rehabilitated to create stable and self-sustaining landform for the nominated end land uses noted above.

Regular monitoring of the rehabilitated areas will occur during the initial vegetation establishment period and beyond to demonstrate whether the objectives of the Strategy are being achieved and whether a sustainable, stable landform has been provided. In the event that monitoring confirms that rehabilitation is not successful or it limited maintenance works will be undertaken to address the issue.

An indicative closure timeline has also been developed for the Project. The key rehabilitation and decommissioning activities include closure planning, decommissioning and rehabilitation, maintenance and monitoring, relinquishment and post relinquishment activities.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	II
1.0 INTRODUCTION.....	1
1.1 OVERVIEW.....	1
1.2 BACKGROUND.....	1
1.3 OBJECTIVES OF THE DECOMMISSIONING AND REHABILITATION STRATEGY	1
2.0 INFRASTRUCTURE, MINING AND REHABILITATION ACTIVITIES.....	4
2.1 CURRENT OPERATIONS.....	4
2.2 THE PROJECT.....	5
2.2.1 Dewatering Provisions.....	6
2.2.2 Underground Ventilation Services.....	6
3.0 LEGISLATION AND REGULATORY REQUIREMENTS.....	8
3.1 LEGISLATION	8
3.1.1 Mining Act 1992.....	8
3.1.2 Environmental Planning and Assessment Act 1979	8
3.1.3 Protection of the Environment Operations Act 1997.....	8
3.2 ENVIRONMENTAL PLANNING INSTRUMENTS AND POLICIES.....	8
3.2.1 State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007.....	8
3.2.2 Lithgow City Council Local Environmental Plan 1994.....	9
3.2.3 Lithgow City Council Draft Local Environmental Plan 2013.....	9
3.2.4 Lithgow Draft Land Use Strategy 2010-2030.....	9
3.3 OTHER POLICES AND GUIDELINES	9
3.3.1 Strategic Framework for Mine Closure, Minerals Council of Australia.....	9
3.3.2 Leading Practice Sustainable Development Program for the Mining Industry, Australian Government, 2011.....	10
3.3.3 Guidance Paper - Financial Assurance for Mine Closure and Reclamation, International Council of Mining and Metals, 2006	10
3.3.4 NSW Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) Guidelines.....	11
3.4 CENTENNIAL COAL ENVIRONMENT AND COMMUNITY POLICY	11
3.5 DIRECTOR GENERALS REQUIREMENTS	11
3.6 REGULATORY REQUIREMENTS FOR DECOMMISSIONING AND REHABILITATION	12
4.0 THE GENERAL ENVIRONMENT.....	15
4.1 EXISTING LAND USE.....	15
4.2 GEOLOGY AND SOIL LANDSCAPE	15
4.3 ECOLOGY	15
4.4 TOPOGRAPHY AND HYDROLOGY	16
4.5 SOIL AND LAND CAPABILITY.....	16
4.6 AGRICULTURAL SUITABILITY	16
5.0 PLANNING FOR DECOMMISSIONING.....	17

5.1 INVESTIGATION OF THE SITE	17
5.2 INVESTIGATION OF STRUCTURES	17
5.3 SITE PREPARATION.....	17
5.4 SITE INFRASTRUCTURE AND SERVICES	18
5.5 CONTAMINATION.....	18
5.6 HAZARDOUS MATERIALS	18
6.0 FINAL LAND USE OPTIONS ANALYSES, ASSESSING REHABILITATION AND CLOSURE DOMAINS	19
6.1 ASSIGNING REHABILITATION AND CLOSURE DOMAINS.....	19
6.2 DOMAIN REHABILITATION OBJECTIVES	20
6.3 FINAL LAND USE OPTIONS ANALYSES AND JUSTIFICATION.....	20
6.3.1 <i>Rehabilitation Domain A – Woodland</i>	20
6.3.2 <i>Rehabilitation Domain B – Water Management Area</i>	23
6.4 CENTENNIAL STRATEGIC LAND ASSESSMENT	24
6.5 STAKEHOLDER ENGAGEMENT.....	24
6.6 INTEGRATION WITH SURROUNDING REHABILITATION	25
7.0 RISK MANAGEMENT.....	26
7.1 ANGUS PLACE ENVIRONMENTAL RISK ASSESSMENT.....	26
7.2 ANGUS PLACE ENVIRONMENTAL RISK MANAGEMENT.....	26
8.0 DECOMMISSIONING AND REHABILITATION IMPLEMENTATION	27
8.1 DECOMMISSIONING PHASE.....	27
8.1.1 <i>Domain 1 – Infrastructure</i>	27
8.1.2 <i>Domain 2 – Other Lands</i>	30
8.1.3 <i>Domain 3 – Water Management Area</i>	31
8.2 LANDFORM ESTABLISHMENT PHASE.....	31
8.2.1 <i>Domain 1 – Infrastructure</i>	31
8.2.2 <i>Domain 2 – Other Lands</i>	32
8.2.3 <i>Domain 3 – Water Management Area</i>	32
8.3 GROWTH MEDIA DEVELOPMENT PHASE	32
8.3.1 <i>Topsoil Stripping and Handling</i>	33
8.3.2 <i>Topsoil Management</i>	33
8.3.3 <i>Erosion and Sediment Control</i>	33
8.3.4 <i>Weed Management</i>	34
8.4 ECOSYSTEM ESTABLISHMENT PHASE.....	34
8.5 ECOSYSTEM DEVELOPMENT PHASE.....	35
8.5.1 <i>Rehabilitation Monitoring</i>	35
8.5.2 <i>Rehabilitation Maintenance</i>	35
9.0 CONCEPTUAL REHABILITATION SUCCESS CRITERIA	37
10.0 INDICATIVE CLOSURE TIMELINE	40
11.0 REFERENCES.....	42

TABLES

TABLE 1 – SUMMARY OF DGRS FOR DECOMMISSIONING AND REHABILITATION.....	12
TABLE 2 – REGULATORY REQUIREMENTS FOR REHABILITATION	12
TABLE 3 – PRIMARY AND SECONDARY DOMAINS	19
TABLE 4 – DOMAIN REHABILITATION OBJECTIVES	20
TABLE 5 – LIFE OF MINE REHABILITATION PHASES.....	27
TABLE 6 – CONCEPTUAL REHABILITATION SUCCESS CRITERIA.....	37
TABLE 7 – INDICATIVE CLOSURE TIMELINE	41

FIGURES

FIGURE 1 - SITE LOCATION	2
FIGURE 2 - ANGUS PLACE SITE LAYOUT	7
FIGURE 3 - ANGUS PLACE REHABILITATION DOMAINS	21
FIGURE 4 - CONCEPTUAL FINAL REHABILITATION PLAN	22

ABBREVIATIONS

AIS	Agricultural Impact Statement
ANZECC	Australian New Zealand Environment and Conservation Council
ANZMEC	Australian and New Zealand Minerals and Energy Council
BBRA	Broad Brush Risk Assessment
BSAL	Biophysical Strategic Agricultural Land
DGR	Director General's Requirement
DP&I	NSW Department of Planning and Infrastructure
DTIRIS	NSW Department of Trade and Investment, Regional Infrastructure and Services
EIS	Environmental Impact Statement
EL	Exploration Licence
EMP	Environmental Management Plan
EMS	Environmental Management Strategy
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPL	Environment Protection Licence
FCNSW	Forestry Corporation of NSW
ICMM	International Council of Mining and Metals
LCC	Lithgow City Council
LDP	Licensed Discharge Point
LGA	Local Government Area
LLUS	Lithgow Land Use Strategy
ML	Mining Lease
MOP	Mining Operations Plan
NEPM	National Environment Protection Measure
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
ROM	Run of Mine
SDWTS	Springvale-Delta Water Transfer Scheme
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i>

1.0 INTRODUCTION

1.1 Overview

SLR Consulting Australia Pty Ltd (SLR) was commissioned by Centennial Angus Place Pty Ltd (Centennial Angus Place), operator of Angus Place Colliery (Angus Place) to prepare a Decommissioning and Rehabilitation Strategy as part of the Environmental Impact Statement (EIS) for the Angus Place Mine Extension Project (the Project) for submission to the Department of Planning and Infrastructure (DP&I). The EIS will support a development application by Centennial Angus Place to extend its mining operations to the east of its existing operations.

A plan detailing the general locality of Angus Place is shown as **Figure 1**. Angus Place is committed to return any land disturbed to a capacity which was present pre-mining. This Decommissioning and Rehabilitation Strategy provides an approach to rehabilitation of areas related to the Project to achieve this objective.

1.2 Background

Angus Place is managed by Centennial Angus Place Pty Ltd under a joint venture arrangement between Centennial Springvale Pty Ltd and Springvale SK Kores Pty Ltd. Centennial Angus Place Pty Ltd is 100% owned by Centennial Coal Company Ltd (Centennial Coal). Centennial Coal Company Ltd is a wholly owned subsidiary of Banpu Public Company Ltd.

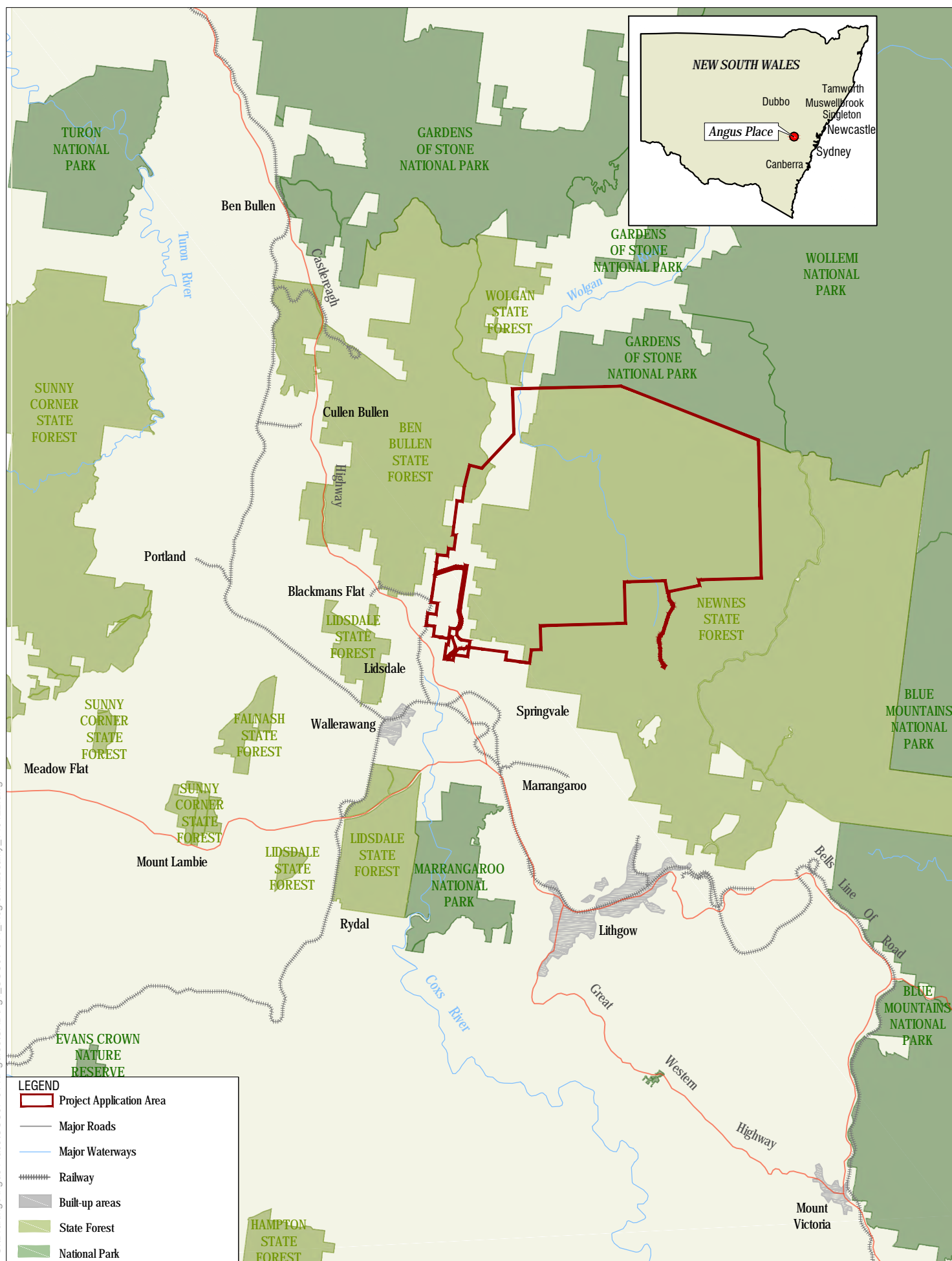
Angus Place is an underground coal mine producing thermal coal which is supplied to Wallerawang and Mount Piper power stations for domestic power generation. The Angus Place pit top is located approximately 5 kilometres north of the village of Lidsdale, 8 kilometres northeast of the township of Wallerawang and 15 kilometres northwest of the city of Lithgow. Angus Place is located within the Lithgow Local Government Area (LGA).

Collectively, existing land uses in the vicinity of the colliery include residential land, pastoral farming, open cut and underground coal mining, power generation and commercial forestry. The Angus Place pit top lies within the Cox's River Catchment, with the Mining Lease (ML) area traversing both the Cox's and Wolgan River Catchments.

1.3 Objectives of the Decommissioning and Rehabilitation Strategy

The purpose of this Decommissioning and Rehabilitation Strategy (Strategy) is to establish objectives for the rehabilitation of the existing disturbed land and disturbed land that will result from the Project. Specifically, the Decommissioning and Rehabilitation Strategy:

- Proposes rehabilitation and decommissioning strategies for existing disturbed areas and surface disturbance resulting from the Project;
- Proposes objectives for the rehabilitation of the existing disturbed areas and disturbance that will result from the Project;
- Develops a strategy to rehabilitate all disturbed land to original land capability or better;
- Proposes a strategy for the re-profiling of all disturbed areas to create a self-sustaining and stable final landform which will pose no long term environmental hazard;



- Proposes to create a woodland final landform commensurate with the proposed RU2 Rural Landscape and RU3 Forestry land zonings in the Draft Lithgow Local Environmental Plan (2013);
- Establishes management controls that will preserve downstream water quality through creation of a final landform that is self-draining;
- Proposes an effective revegetation program for the rehabilitated areas;
- Proposes an effective monitoring program to assess performance of the rehabilitated areas; and
- Proposes preliminary success criteria for decommissioning and rehabilitation.

This report has generally been prepared in accordance with the requirements of the following relevant strategic land use planning and resource management plans and policies relating to mine rehabilitation and decommissioning. These include:

- *ESG3: Draft Mining Operations Plan (MOP) Guidelines* (DTIRIS, Resources and Energy, 2012);
- *The Strategic Framework for Mine Closure* (ANZMEC & MCA, 2000);
- *Leading Practice Sustainable Development Program for the Mining Industry - Mine Rehabilitation* (Department of Industry, Tourism and Resources, 2006);
- *Leading Practice Sustainable Development Program for the Mining Industry – Mine Closure and Completion* (Department of Industry, Tourism and Resources, 2006);
- *The Angus Place MOP* (Centennial Coal, 2013);
- *The Draft Lithgow City Council Local Environmental Plan 2013* (Lithgow City Council, 2013); and
- *The Lithgow Draft Land Use Strategy 2010-2030* (Lithgow City Council, 2011).

Further to the above, decommissioning and rehabilitation will be undertaken in accordance with the relevant Angus Place approvals, leases, licences, the Director General's Requirements (DGRs) for the Project (refer **Tables 1** and **2**).

Relationship to the MOP

This Decommissioning and Rehabilitation Strategy has also been developed to integrate closely with the existing Angus Place MOP. The MOP is a statutory plan approved by the Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) and documents mining and rehabilitation activities for a period up to seven years. The MOP functions as a complementary rehabilitation and mine closure plan by documenting both long term rehabilitation and mine closure principles, and specific details of proposed rehabilitation activities and forecast rehabilitation progress for each year of the MOP term.

The current Angus Place MOP was submitted in May 2013 and covers the period from July 2013 to May 2015.

2.0 INFRASTRUCTURE, MINING AND REHABILITATION ACTIVITIES

2.1 Current Operations

The main components of the existing Angus Place operations are an underground longwall mine, supporting surface infrastructure (within the Angus Place pit top area and in the Newnes State Forest), a coal stockpile area (Kerosene Vale) and dedicated haul roads to Delta Electricity's Wallerawang and Mount Piper power stations. Additionally the site includes the surface infrastructure associated with former mining operations known as Kerosene Vale, Commonwealth Colliery and Vale of Clwydd No.2 Colliery.

Mined coal from the underground is transported to the surface and the stockpile area by a high capacity conveyor system. Coal is then sized and fed to the product supply bin to be transported to either Wallerawang or Mt Piper Power Station via private haul roads. No coal washing occurs on site, consequently there is no production of washery tailings or reject material.

The existing Angus Place surface facilities at the pit top area comprises the following components:

- Administration building and portable offices;
- Bathhouse and associated facilities and services;
- Coal Handling Plant and coal storage bins;
- Various workshops, service buildings and material storage sheds;
- Visitor and employee parking areas;
- Personnel and materials drift winder for access to underground workings;
- Coal conveyor drift and coal conveyor drive to transport coal from the underground workings to the surface at Angus Place;
- A ventilation fan installation at the Angus Place pit top;
- Coal stockpiles at both the Angus Place pit top and Kerosene Vale site;
- Diesel, solcenic and oil storage facilities; and
- A dirty and clean water management control system.

Existing underground infrastructure at Angus Place includes:

- Longwall equipment comprising:
 - Double ended ranging drum shearer;
 - Shield supports;
 - Armoured Face Conveyor;
- Continuous Miners;
- Shuttle Cars;
- Stamler Feeder/Breaker;
- Auxiliary fans;

- Mobile roof bolting rigs;
- Associated diesel personnel and equipment transporters and loaders; and
- Associated pumping, electrical reticulation equipment.

The existing infrastructure on Newnes Plateau comprises:

- Ventilation Facility APC-VS2 and associated electrical distribution systems and powerlines;
- 940 dewatering bore; and
- Infrastructure associated with Springvale-Delta Water Transfer Scheme (SDWTS), comprising trenched powerlines and pipelines.

The disturbance area associated with the abovementioned infrastructure areas will require decommissioning and rehabilitation.

2.2 The Project

The Project is seeking approval for the continuation of mining at Angus Place within its ML 1424 lease boundary beyond March 2016, when the current operation is planned to cease. Longwall mining is proposed to extend towards the east of the existing workings (Longwalls 1001 to 1019) as shown in **Figure 2**.

More specifically the Project will:

- Continue to extract up to 4 million tonnes per annum (Mtpa) of ROM coal from the Lithgow Seam underlying the Project Application Area;
- Develop underground access headings and roadways from the current mining area to the east to allow access to the proposed mining area;
- Undertake secondary extraction by retreat longwall mining for the proposed longwall panels LW1001 to LW1019;
- Continue to use the existing ancillary surface facilities at the Angus Place pit top;
- Continue to manage the handling of ROM coal through a crusher and screening plant at the Angus Place pit top, and the subsequent loading of the coal onto the existing road haulage trucks for despatch to offsite locations;
- Continue to operate and maintain the existing ancillary surface infrastructure for ventilation, electricity, water, materials supply, and communications at the Angus Place pit top and on Newnes Plateau;
- Install and operate seven additional dewatering borehole facilities on Newnes Plateau and the associated power and pipeline infrastructure;
- Upgrade and extend the existing access tracks from Sunnyside Ridge Road to the dewatering borehole facilities;
- Install and operate water transfer boreholes and pipeline infrastructure at the existing Ventilation Facility site (APC-VS2);
- Construct and operate a downcast ventilation shaft (APC-VS3) and upgrade the existing access track to the proposed facility from Sunnyside Ridge Road;

- Manage mine inflows using a combination of direct water transfer to the Wallerawang Power Station, via the SDWTS, and discharge through Angus Place Colliery's licensed discharge point LDP001 and Springvale Colliery's LDP009;
- Continue to undertake existing and initiate new environmental monitoring programs;
- Continue to operate 24 hours per day seven days per week;
- Continue to provide employment to a full time workforce of up to 225 persons and 75 contractors;
- Progressively rehabilitate disturbed areas at infrastructure sites no longer required for mining operations;
- Undertake life-of-mine rehabilitation at the Angus Place pit top and the Newnes Plateau infrastructure disturbance areas to create final landforms commensurate with the surrounding areas and the relevant zonings of the respective areas; and
- Transfer the operational management of coal processing and distribution infrastructure to the proposed Centennial Western Coal Services Project.

No changes are proposed to the existing pit top infrastructure noted in **Section 2.1** and all existing infrastructure for the underground mining and coal handling operations for subsequent despatch off site will continue to be utilised in this Project.

The following pieces of infrastructure will be established as part of the Project and all items will be located on Newnes Plateau.

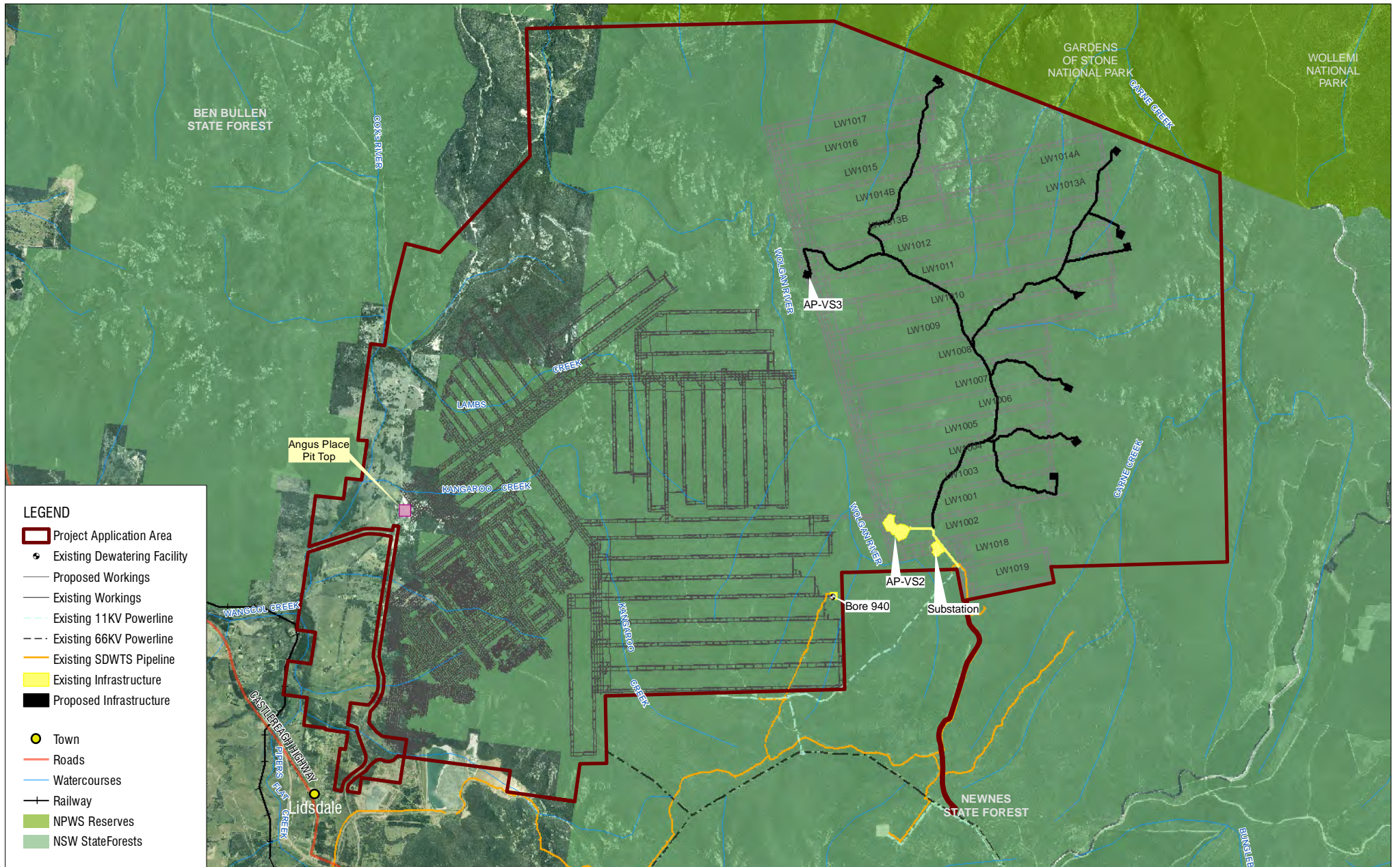
2.2.1 Dewatering Provisions

Several dewatering boreholes (refer **Figure 2**) will be established at the eastern end of specific longwall panels within the Angus Place East area for the continued management of mine inflows to satisfy safety and operational requirements. Each proposed borehole site will be equipped with submersible pump(s) and ancillary surface control equipment.

Groundwater is currently pumped from the underground workings to the surface by the existing 940 dewatering borehole, for transfer to Wallerawang Power Station, using the SDWTS. All proposed dewatering boreholes will continue to deliver water into the SDWTS,

2.2.2 Underground Ventilation Services

An additional air intake shaft (APC – VS3) will be constructed to deliver fresh air to the underground mine.



3.0 LEGISLATION AND REGULATORY REQUIREMENTS

3.1 Legislation

3.1.1 Mining Act 1992

The *Mining Act 1992* regulates environmental protection, rehabilitation and closure conditions included in all mining leases. Angus Place currently holds a number of mining leases and exploration licences issued under the *Mining Act 1992* over the Project Application Area. New mining leases may be required in certain areas of the Project Application Area. The *Mining Act 1992* has been considered during the preparation of this Strategy.

3.1.2 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal piece of legislation overseeing the assessment and determination of development proposals in New South Wales (NSW). Objectives of the EP&A Act are 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,*
- (ii) the promotion and co-ordination of the orderly and economic use and development of land,*
- (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*
- (vii) ecological sustainable development.*

This Strategy has been prepared with consideration of the EP&A Act.

3.1.3 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) establishes the State's environmental regulatory framework and includes licensing requirements for certain activities. The objectives of the POEO Act that relate to decommissioning and rehabilitation include to protect, restore, and enhance the environment, to reduce risks to human health and prevent degradation of the environment. This Act has been considered in the preparation of this Strategy.

3.2 Environmental Planning Instruments and Policies

3.2.1 State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

State Environmental Planning Policy (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. The SEPP provides that development for the purpose of mining may be carried out with development consent. It also defines mining developments that are prohibited, exempt from the need for consent or can be undertaken provided they comply with predetermined criteria/standards (complying development).

Development listed under the Mining SEPP as being exempt from the need for planning approval, which specifically relates to the decommissioning process, includes the demolition of a building or structure. Such demolition needs to be carried out in accordance with *Australian Standard AS2601-2001, Demolition of Structures*.

Furthermore, such development is only defined as exempt if the building or structure is not a heritage item, is not within a heritage conservation area and the demolition takes place on an approved mine site and is of minimal environmental impact.

3.2.2 Lithgow City Council Local Environmental Plan 1994

The Lithgow City Council Local Environment Plan (LEP) 1994 is the current environmental planning instrument governing land use and development decisions in the Lithgow City LGA. The LEP defines zones and the permissibility of development within each zone. The Project Application Area is located within the LEP, and the pit top is zoned 1(c) Rural (Small holdings), while the Newnes Plateau is zoned 1(f) Rural (Forestry). According to LEP 1994, development for the purpose of a 'mine' is permissible with consent in these zones. In addition, sub-clause 7(1)(a) of the Mining SEPP states that development for the purpose of underground mining (which includes mine related development) may be carried out on any land with development consent.

3.2.3 Lithgow City Council Draft Local Environmental Plan 2013

A draft Lithgow City Council *Local Environmental Plan* (LEP) 2013 (Draft LEP 2013) has been developed to implement a Standard Instrument LEP across the Lithgow LGA that will repeal and replace the two environmental planning instruments that currently apply to the Lithgow LGA: *Lithgow Local Environmental Plan 1994* and *Rylstone Local Environmental Plan 1996*. The Draft LEP 2013 seeks to implement Council's key strategic directions arising from the *Lithgow Land Use Strategy 2010-2030* (LLUS) adopted by Council on 31 October 2011 and formally endorsed by the Director General of DP&I on 24 May 2012.

The Draft LEP 2013 comprises a 'conversion' LEP where the land use zones within LEP 1994 are converted into similar zones that are set out in the Standard LEP Template prepared by the DP&I. In accordance with the Draft 2013 LEP, the Project Application Area comprises RU2 Rural Landscape zoning (Angus Place pit top) and RU3 Forestry zoning (Newnes Plateau).

3.2.4 Lithgow Draft Land Use Strategy 2010-2030

Lithgow City Council has prepared the LLUS which has been exhibited and amended in accordance with Council's resolutions, and was formally endorsed by the Director General of DP&I on 24 May 2012.

The LLUS is a combined land use issues paper and strategy. It explores the issues that currently face the Lithgow LGA and recommends a new planning approach to address these issues. The Strategy will be implemented through the planning system, primarily through a new LEP (LEP, 2013) and Development Control Plan, as well as Council's other policy, regulatory and governance functions.

The LLUS is significant to Council and the community because it sets directions and policy for the LGA's settlement and land use management for the next 20 years. The Strategy will be reviewed throughout this period every five years to ensure that its findings and recommendations remain relevant, are in keeping with sound planning principle and are continuing to meet the needs and expectations of the community.

3.3 Other Policies and Guidelines

3.3.1 Strategic Framework for Mine Closure, Minerals Council of Australia

The *Strategic Framework for Mine Closure* has evolved as a cooperative development between the Australian and New Zealand Minerals and Energy Council (ANZMEC) and the Australian Minerals Industry (represented by the Minerals Council of Australia). It is designed to provide a broadly consistent framework for mine closure across various Australian jurisdictions.

The objective of the *Strategic Framework for Mine Closure* is to encourage the development of comprehensive closure plans that return all mine sites to viable, and whenever practicable, self-sustaining ecosystems, and to ensure these plans are adequately financed, implemented and monitored within all jurisdictions.

The *Strategic Framework for Mine Closure* is structured around a set of objectives and principles under six key areas:

- *Stakeholder Engagement*: to enable all stakeholders to have their interests considered during the mine closure process;
- *Planning*: to ensure the process of closure occurs in an orderly, cost effective and timely manner;
- *Financial Provisioning*: to ensure the cost of closure is adequately represented in company accounts and that the community is not left with a liability;
- *Implementation*: to ensure there is clear accountability, and adequate resources, for the implementation of the closure plan;
- *Standards*: to establish a set of indicators which will demonstrate the successful completion of the closure process; and
- *Relinquishment*: to reach a point where the company has met agreed completion criteria to the satisfaction of the responsible authority.

3.3.2 Leading Practice Sustainable Development Program for the Mining Industry, Australian Government, 2011

This Guide consolidates a series of handbooks relevant to all stages of a mine's life, being exploration, feasibility, design, construction, operation, closure and rehabilitation. The aim of the guideline is to identify key issues affecting sustainable development in the mining industry and provide information and case studies to enable a more sustainable basis for its operation. This Decommissioning and Rehabilitation Strategy has been developed in accordance with a number of guides generated through the *Leading Practice Sustainable Development Program for Mines*. These include:

- Mine Closure and Completion;
- Mine Rehabilitation;
- Biodiversity Management;
- Tailings Management;
- Water Management;
- Community Engagement and Development; and
- Hazardous Materials Management.

3.3.3 Guidance Paper - Financial Assurance for Mine Closure and Reclamation, International Council of Mining and Metals, 2006

This document has been prepared by the International Council of Mining and Metals (ICMM) and considers environmental financial assurance measures. It looks at issues and current policies in the use of financial assurances through the industry; analysing trends that were revealed through a survey of the industry, governments and financial institutions.

Environmental financial assurance for mine closure ensures that funds are available for decommissioning and reclamation of a site if an operator does not fulfil its obligations. It provides confidence to both governments and communities that satisfactory closure will be achieved. This document provides guidance on environmental financial assurance for both operators and regulators and covers the following areas:

- The case for financial assurance;

- Key issues associated with the application of financial assurance policies; and
- Recommendations for improving standards of practice relating to financial assurance.

3.3.4 NSW Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) Guidelines

DTIRIS also has in place a series of policy guidelines or environmental management guidelines that are either directly or indirectly relevant to mine closure issues. These include:

- *DTIRIS Guideline EDG01: Borehole Sealing Requirements on Land: Coal Exploration* (DTIRIS, 2012);
- *DPI-MR Guideline EDG02: Borehole Sealing Requirements on the Beds of Water Bodies: Coal Exploration Management of Exploration and Mining in NSW*, (Department of Mineral Resources, 1997);
- *DPI-MR Guideline EDG14: Reporting Requirements For Mine Closure And Lease Relinquishment*, (Department of Mineral Resources, 2006);
- *DPI-MR Guideline ESB20: Rehabilitation Security Deposit Requirements for Mining and Petroleum Titles* (DPI-MR, 2006);
- *DTIRIS Form ESB26: Rehabilitation Cost Calculation Tool V1.12 Excel Spreadsheet Tool used to Calculate Mine Security Deposits* (DTIRIS, 2013);
- *DTIRIS Policy EDP11 Rehabilitation Security Deposits*, (DTIRIS, 2012); and
- *ESG1 Rehabilitation Cost Estimate Guidelines* (Industry and Investment NSW, 2010).

3.4 Centennial Coal Environment and Community Policy

The *Centennial Coal Environment and Community Policy* is a statement of Centennial Coal's commitment to manage environmental issues. When considering mine closure issues, the Policy contains specific reference to:

- Making appropriate decisions which comply with or exceed approvals, licences and agreements;
- Working constructively with local authorities, stakeholders and communities;
- Contributing to the conservation of biodiversity;
- Planning, designing and closing operations in a manner that enhances sustainable development; and
- Engaging and communicating openly with communities, with due regard and respect for local interests, cultures and customs.

3.5 Director Generals Requirements

This Decommissioning and Rehabilitation Strategy has been prepared in accordance with the DGR's issued for the Project in November 2012. **Table 1** provides the DGR's relevant to rehabilitation and indicates where specific issues have been addressed in this document.

Table 1 – Summary of DGRs for Decommissioning and Rehabilitation

Director Generals Requirements	Addressed in Report
Rehabilitation – including the proposed rehabilitation strategy for the site, having regard to the key principles in <i>Strategic Framework for Mine Closure</i> , including:	
1. Rehabilitation objectives, methodology, monitoring programs, performance standards and proposed completion criteria;	Sections 6.3, 8.0, and 9.0
2. Nominated final land use, having regard to any relevant strategic land use planning or resource management plans or policies;	Section 6
3. A conceptual final landform design, including a detailed figure depicting relevant site features; and	Section 6.2
4. The potential for integrating this strategy with any other rehabilitation and/or offset strategies in the region.	Section 3

3.6 Regulatory Requirements for Decommissioning and Rehabilitation

All regulatory requirements from PA06_0021, CCL704, ML 1326, ML 1424, EL 6293, EL 6856 and Occupation Permit issued by the Forestry Corporation of NSW (FCNSW) related to rehabilitation at the site are listed in **Table 2**. The relevant section where each requirement has been addressed in this report has also been included in this table.

Table 2 – Regulatory Requirements for Rehabilitation

Section/ Condition	Area	Requirement	Addressed in Report
PA 06_0021			
Schedule 3, Condition 37 Mod 2	Entire Site	The Proponent shall prepare and implement a Rehabilitation Management Plan for the project, to the satisfaction of the Director-General and Executive Director Mineral Resources. This plan must be: a) submitted to the Director-General for approval prior to the commencement of secondary extraction in either of longwalls 900W or 910; b) prepared in consultation with DRE, Forests NSW, OEH, NOW, SCA and Council; and c) prepared in accordance with the relevant DRE guideline.	This Document
Mod 1 Statement of Commitment 1	LW 910 and 900W Area	A Rehabilitation Strategy as set out in Appendix 7.6 and revised in relation to the measures identified for the rehabilitation of areas of construction for the dewatering bore at Longwall 910 and its associated infrastructure that have been withdrawn from the proposals of the EA will be developed for approval by the Director-General I&I NSW prior to commencement of Longwalls 910 and 900 west and within 12 months of the date of approval.	This Document
Mod 2 Statement of Commitment 7	Ventilation Facility Area	Rehabilitation will be implemented in accordance with the existing Rehabilitation Strategy.	Section 8.1.1.5
Mining Leases, Exploration Licences and Coal Leases			
CCL 704, Condition 7	CCL Area	Disturbed land must be rehabilitated to a sustainable/agreed end land use to the satisfaction of the Director General.	Section 8
CCL 704, Condition 34 (f)	CCL Area	Upon completion of operations on the subject area or upon the expiry or sooner determination of this lease or any renewal thereof the lease holder shall remove the form the subject area such works as may be required by the Minister and the lease holder shall rehabilitate the subject area and establish vegetation of a type specified by the Sydney Catchment Authority, and the area shall be left in a clean, tidy and safe condition to the satisfaction of the Minister and the Sydney Catchment Authority.	Section 8.1

Section/ Condition	Area	Requirement	Addressed in Report
ML 1326 and ML 1424, Condition 15 (2)	ML Areas	If the lease holder drills exploratory drill holes he must satisfy the Director General that: g) once any drill hole ceases to be used the land and its immediate vicinity is left in a clean, tidy and stable condition.	Section 8.1
ML 1326 Condition 29 and ML 1424 Condition 32	ML Areas	The lease holder shall: j) complete work in relation to rehabilitation within the Warragamba Outer Catchment Area before termination of the authority to the satisfaction of the Authority.	Section 8
EL 6293 Condition 1	EL Area	After consideration of the environmental impact as required by Section 111 of the <i>Environmental Planning and Assessment Act 1979</i> , it has been determined that the type of exploration activities listed in Category 1 and in certain circumstances Category 2 may be conducted on the licence area provided that: - Full rehabilitation in accordance with departmental guidelines/standards is carried out after completion of the exploration activities.	Section 8.1
EL 6293 Condition 9 (a)	EL Area	Land disturbed must be rehabilitated to a stable and permanent form suitable for a subsequent land use acceptable to the Director-General so that: <ul style="list-style-type: none"> • There is no adverse environmental effect outside the disturbed area and that the land is properly drained and protected from soil erosion. • The state of the land is compatible with the surrounding land and land use requirements. • The landform, soils, hydrology and flora require no greater maintenance than that in the surrounding land. • In cases where revegetation is required and native vegetation has been removed or damaged, the original species must be re-established. If the original vegetation was not native, any re-established vegetation must be appropriate to the area, and at an acceptable density. • The land does not pose a threat to public safety. 	Section 8
EL 6293 Condition 9 (b)	EL Area	Any topsoil that is removed must be stored and maintained manner acceptable to the Director General.	Section 8.3.1
EL 6293 Condition 10 (2)	EL Area	If the licence holder drills any exploratory drill holes he must satisfy the Director General that: f) Once any drill hole ceases to be used the hole must be sealed in accordance with Departmental Guidelines. Alternatively the hole must be sealed as instructed by the Director General. g) Once any drill hole ceases to be used the land and its immediate vicinity is left in a clean, tidy and stable condition.	Section 8.1
EL 6293 Condition 23	EL Area	Temporary Access Tracks must be ripped topsoiled, rehabilitated and appropriately revegetated as soon as possible after they are no longer required for prospecting operations.	Section 8.1.1.3
EL 6856 Condition 16 (g)	EL Area	As soon as possible after they are no longer required for prospecting operations temporary access tracks must be rehabilitated to the satisfaction of the department.	Section 8.1.1.3
EL 6856 Condition 20 (f)	EL Area	Any soil contaminated by chemicals, oils and fuels, or drilling mud, or drill core containing toxic metals must be collected and remediated or disposed of in an appropriate manner, and the site rehabilitated with clean soil.	Section 5.5
EL 6856 Condition 23 (vi)	EL Area	If the licence holder drills any exploratory drill holes he must satisfy the Department that during and after the activity: vi. Once any drill hole ceases to be used the land and its immediate vicinity is to be rehabilitated to its former condition.	Section 8.1

Section/ Condition	Area	Requirement	Addressed in Report
EL 6856 Condition 27 (a)	EL Area	Land disturbed must be rehabilitated to a stable and permanent form suitable for a subsequent land use acceptable to the Department so that:- i) There is no adverse environmental effect outside the disturbed area and the land is properly drained and protected from soil erosion; ii) The state of the land is compatible with the surrounding land and land use requirements; iii) The landforms, soils, hydrology and flora require no greater maintenance than that in or on the surrounding land; iv) In cases where native vegetation has been removed or damaged, and where vegetation is required, species endemic to the area must be re-established. If the previous vegetation was not native, any re-established vegetation must be appropriate to the area or to the satisfaction of the landholder. Any re-established vegetation must be at an acceptable density and diversity; and v) The land does not pose a threat to public safety.	Section 8
EL 6856 Condition 27 (b)	EL Area	Any topsoil that is temporarily removed from an area of prospecting operations must be stored, maintained and returned as soon as possible in a manner acceptable to the Department	Section 8.1.1.3
EL 6856 Condition 27 (c)	EL Area	Any shafts, drill holes and excavations, that remain abandoned from previous mining or exploration, which are opened up or used by the licence holder must be filled in or otherwise rehabilitated to a standard Acceptable to the Department.	Section 8.1
EL 6856 Condition 27 (d)	EL Area	All rehabilitation of disturbed areas should be completed before the expiry of the licence or immediately following the termination of the licence.	Section 8
Level 3 Occupation Permit			
3.14	Newnes State Forest	Without affecting the liability of the Applicant for damages or in relation to any other remedy to the reasonable satisfaction of FCNSW, the Applicant shall remedy to the satisfaction of FCNSW at its own expense any damage caused to the Area by the Applicant in breach of the provisions of this clause or otherwise including by the spillage of petroleum products or other pollutants or the deposition of polluting or obstructive materials within the area.	Section 8.1.1.4
4.10.4	Newnes State Forest	The Applicant must remedy any erosion or other Environmental damage or deterioration of the Area caused as a result of the Activity, its works or use of the Area and rehabilitate and revegetate all disturbed ground surfaces to the reasonable satisfaction of FCNSW and any Authority.	Section 8.3
4.11	Newnes State Forest	If the Applicant or Applicants Employees and Agents Damage the Area or any part of it, or any part of FCNSW's Equipment, or any equipment, structures or other facilities of any party other than the Applicant, the Applicant must within a reasonable time make good the damage to the reasonable satisfaction of FCNSW or the relevant party whose equipment, structures or other facilities were so damaged.	Section 8.2.1

4.0 THE GENERAL ENVIRONMENT

4.1 Existing Land Use

The Angus Place pit top supports existing mining operations situated directly below the unpopulated bushland which is part of the Newnes State Forest. Collectively, existing land uses in the vicinity of the colliery include residential land, pastoral farming, open cut and underground coal mining, power generation and commercial forestry.

4.2 Geology and Soil Landscape

Angus Place is situated in the south western part of the Western Coalfields of the Sydney Basin. Strata in the Sydney Basin date from Early Permian to Late Triassic with Quaternary alluvium sediments deposited in erosional valleys. Two periods of coal deposition occurred during the Permian, with the more significant Late Permian episode resulting in widespread coal seam development across the entire Sydney Basin. The economically important Illawarra Coal Measures of the southern and Western Coalfields were formed during this phase. Total thickness of the Illawarra Coal Measures increases towards the east, from approximately 120 m in the Lithgow area to a maximum thickness of 520 m in the northern part of the Southern Coalfield, (RPS, 2013a).

Non coal-bearing Triassic strata directly overlie the Illawarra Coal Measures. The basal unit is the Narrabeen Group, which consists of sandstone, shale and claystone. This is overlain by the Hawkesbury Sandstone, which in turn, is overlain by the Wianamatta Shale. Economic development of the Hawkesbury Sandstone and the Wianamatta Shale has not taken place extensively within the Western Coalfield.

The Lithgow area of the Western Coalfield occupies a unique geological position located on the edge of the Permian age coal bearing strata of the Sydney Basin. West of the coal bearing Permian strata, the older sediments, meta sediments and granitic bodies of the underlying Silurian and Devonian age rocks of the Lachlan Fold Belt dominate the surface geology. These older strata also extend beneath the coal bearing Sydney basin, (RPS, 2013a).

The Lithgow seam at Angus Place is the lowermost economic seam and is only tens of meters to 100 meters above the older basement strata. In other parts of the Sydney basin it is typical for the Permian coal bearing strata to be separated from the basement strata by many hundreds of meters. The highest stratigraphic units present at Angus Place are those of the Narrabeen Group.

4.3 Ecology

The Flora and Fauna Assessment (RPS, 2013b) undertaken for the Project identified 30 native vegetation communities. Of these, five were listed as Endangered Ecology Communities however just two were within the predicted subsidence extents, namely Newnes Plateau Shrub Swamp, listed under the NSW Threatened Species Conservation Act (TSC Act) and Temperate Highland Peat Swamp on Sandstone, listed under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

A total of 13 threatened flora species listed under the TSC Act and/or EPBC Act were noted to have potential to occur within Project Application Area, and of these, two were recorded during the RPS survey. These species were *Persoonia hindii*, which is listed as Endangered under the TSC Act and *Veronica blakelyi* which is listed as Vulnerable under the TSC Act.

A total of 44 threatened fauna species listed under the TSC Act and/or EPBC Act were noted to have potential to occur within the Project Application Area, of these, nine were recorded within the Project Application Area during the RPS survey.

Further detail on the ecology of the Project Application Area is provided in the RPS Flora and Fauna Assessment (2013b) included as an Appendix to the EA.

4.4 Topography and Hydrology

The surface lands adjacent to and above Angus Place underground workings are situated on the Newnes State Forest, which comprises narrow gorges with high ridgelines, steep sided slopes and sandstone cliffs above incised valleys, hilly areas with relatively flat crests and spurs and moderately sloped ephemeral drainage lines. Streams, such as Kangaroo Creek, the Wolgan River, Carne Creek and their tributaries can be found in the vicinity. At a far lower elevation, pastoral farming lands and private land surrounds the existing Angus Place pit top. The Coxs River and Lambs Creek exist within the western portion of the Colliery Holding Boundary.

The Project Application Area lies within the Coxs River Catchment, reporting to the Sydney Catchment area. The Colliery Holding Boundary (mining lease area) traverses the Coxs River Catchment area and Wolgan River Catchment area, the latter of which reports to the Hawkesbury Nepean Catchment.

4.5 Soil and Land Capability

A Soil and Land Capability Assessment was undertaken for the Project Application Area by SLR (2014). The results of the desktop study, field investigations and laboratory soil testing identified four major soil types within the area of land assessed for Proposed Surface Infrastructure. The report identified that Class 5 (52 ha), Class 6 (87 ha), Class 7 (1 ha), and Class 8 (1 ha) land have the potential to be impacted by the new surface infrastructure, however SLR concluded that the LSC classes are expected to be returned to the pre-disturbance class.

A Biophysical Strategic Agricultural Land (BSAL) assessment undertaken for the Project Application Area (refer **Section 4.6**) to determine if any sensitive land resources occur determined that the soil and land resources within the Project Application Area do not qualify as BSAL.

The LSC assessment undertaken for the Project (SLR 2013a) determined the suitable soil resources available within the Project Application Area for later use in mine rehabilitation. The identified limitations were sodic subsoils, erosion hazard, and acidity; however these characteristics can be ameliorated (e.g. with organic matter, gypsum, lime) to overcome these limitations. SLR (2013a) stated that soil resources will require standard erosion and sediment controls for any proposed disturbance areas associated with surface infrastructure or surface cracking as a result of subsidence. The report recommended that topsoil and subsoil resources proposed to be disturbed for infrastructure should be stripped and stockpiled separately nearby, for the reinstatement of the soil profile upon rehabilitation.

4.6 Agricultural Suitability

An Agricultural Impact Statement (AIS) for the Project has been developed by SLR (2013). The AIS assessed the impacts of the project within the entire Project Application Area of 10,460 hectares. Assessments of land disturbance due to the new proposed infrastructure on Newnes Plateau (covering a total area of 23.25 ha) and any potential subsidence impacts within the proposed workings area (approximately 2,275 ha) were undertaken. The assessment found that only 6% (615 hectares) of the Project Application Area is cleared land which is currently used for agricultural production. The main agricultural land use is cattle, horse and goat grazing. There are no agricultural enterprises located within or adjacent to the Project Application Area. Importantly, SLR (2013) concluded that post-mining potential agricultural economic activity within in the Project Application Area is expected to be similar to pre-mining activity as there is no change predicted between the pre- and post-mining LSC classifications (refer **Section 4.5**).

BSAL was also assessed in SLR (2013) to determine if any sensitive land resources occur within the Project Application Area. As no Strategic Regional Land Use Plan relevant to Project Application Area exists, the Project Application Area was assessed against the BSAL criteria contained in the *Upper Hunter Strategic Regional Land Use Plan* (DP&I, 2012) and the Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land (OEH, 2013). Both assessments determined that no BSAL is present within the Study Area.

5.0 PLANNING FOR DECOMMISSIONING

This Decommissioning and Rehabilitation Strategy will form an integral part of the detailed closure planning for the Project. This will be developed for the site prior to closure and will include engaging structural engineers and appropriate technical experts with experience in demolition and the application of relevant Australian Standards and guidelines. A detailed investigation of all structures will be completed at this stage to determine the appropriate techniques, equipment required, and the sequence for decommissioning and removal required to execute the demolition activities safely.

Prior to commencement of demolition, an asset register will be distributed to all other Centennial sites to ascertain whether any of the key assets can be reused within the Centennial business.

5.1 Investigation of the Site

A site investigation will be completed during the decommissioning and demolition planning phase. This will include:

- The type, location and extent of underground services such as conduits, cables and pipe work owned and/or managed by Centennial Angus Place;
- The location and extent of underground structures to be retained and those to be removed;
- The location, type and extent of overhead services and structures such as power cables, conveyors, light poles and pipe work that are owned and/or managed by Centennial Angus Place;
- The location and condition of all tanks and vessels (with emphasis on remaining combustible materials and methods required for their removal);
- The presence of contaminated and hazardous materials and the classification and disposal of these materials;
- The general condition of adjacent structures; and
- Any infrastructure to remain following decommissioning (where appropriate).

5.2 Investigation of Structures

When planning for decommissioning and demolition an investigation of the structures will be completed to identify the following:

- The structures current condition with regard to their state of disrepair or deterioration;
- The presence of heavy steel within structures that may require specialised demolition equipment and/or techniques; and
- Confined spaces and/or techniques required to be implemented in order to avoid entering such spaces.

5.3 Site Preparation

Prior to the commencement of any demolition activities the following tasks will be undertaken:

- All sumps will be dewatered;
- All items will be decommissioned, de-oiled, depressurised and isolated; and
- All hazardous materials will be removed and transported to appropriately licensed disposal facilities.

5.4 Site Infrastructure and Services

All buildings, including the main administration buildings, workshop areas, coal delivery systems (including conveyors and gantries), portals, decline tunnels and other surface infrastructure will be demolished unless there is a future landholder who is prepared to accept the on-going liability of a structure that they may wish to use. Opportunities for the sale and/or re-use of assets and recycling of scrap steel will be maximised where possible.

Concrete footings and pads will be broken up and removed. Options for the re-use of this material (for example, crushed and used for road and track stabilisation) will be investigated as the operation approaches closure. If re-use or recycling opportunities are not available or viable, all non-contaminated waste material will be disposed of in a suitable location on site (for example, in a shaft or portal) or taken off site to an approved waste management facility.

5.5 Contamination

Centennial Angus Place routinely undertakes investigations within their sites in relation to potential contamination. Phase 1 and 2 contamination studies have been undertaken at Angus Place. Prior to closure additional contamination studies will be undertaken at Angus Place.

5.6 Hazardous Materials

Prior to the demolition of any structures, a hazardous material assessment will be undertaken to determine whether there are any hazardous materials present, including asbestos. Where hazardous materials are identified, they will be assessed and quantified to enable appropriate safety measures to be implemented during removal by a licensed contractor. All hazardous material removed from the buildings will be recorded and disposed of at an approved waste management facility.

6.0 FINAL LAND USE OPTIONS ANALYSES, ASSESSING REHABILITATION AND CLOSURE DOMAINS

6.1 Assigning Rehabilitation and Closure Domains

This section describes the primary and secondary rehabilitation domains proposed for the Project. Primary domains can be defined as land management units within the mine site, usually with unique operational and functional purpose and therefore similar geophysical characteristics. Secondary domains are land management units characterised by a similar post mining land use objective. Accordingly, the Project's rehabilitation areas have been divided up into three primary domains and two secondary domains based on like rehabilitation outcome and closure criteria. These are shown in **Figures 3** and **4** and described in **Table 3**.

Table 3 – Primary and Secondary Domains

Domains	Description	Code
Primary Domains (refer Figure 3)		
Infrastructure	<p>Includes existing and proposed infrastructure and facilities at the pit top and Newnes Plateau including workshops, administration buildings, powerlines (overhead and trench), pipelines (trenched), substations, car parks, access roads, haul roads, sewage treatment plant and associated irrigation area, hardstand/laydown areas, coal stockpile areas, underground infrastructure including mine access, ventilation shafts and dewatering bore facilities and associated water management structures.</p> <p>This domain also includes the surface infrastructure associated with former mining operations known as Kerosene Vale, Commonwealth Colliery and Vale of Clwydd No.2 Colliery.</p> <p>Equipment components within this domain that are not sold at mine closure or relocated to other Centennial Coal sites will be decommissioned and/or demolished and the disturbed areas will be rehabilitated, with the exception of the tracks to the infrastructure facilities on Newnes Plateau. These tracks will not be rehabilitated but will be retained for use as fire tails or access tracks by recreational users of Newnes State Forest and FCNSW.</p>	1
Other Lands	<p>This domain will include all areas of the Project Application Area not captured in Domains 1 and 3, and does not include disturbed areas arising from clearing of vegetation for infrastructure establishment.</p> <p>Domain 2 will include the proposed mining areas (proposed workings area) where limited rehabilitation works may be required given the subsidence impacts predicted for the Project (MSEC, 2013) are minimal or manageable for the majority of natural and man-made features. Furthermore, rehabilitation of any subsidence impacts will be triggered by the criteria outlined in the existing Subsidence Management Plan (SMP) and future Extraction Plan for the proposed longwalls, as relevant.</p>	2
Water Management Area	Includes the network of dams and associated water management infrastructure at Angus Place pit top. These structures will not be decommissioned at the end of mine life but will be maintained for future use.	3
Secondary Domains (refer Figure 4)		
Rehabilitation – Woodland	<p>Rehabilitation Domain A – Woodland will comprise the Angus Place pit top (excluding the water management structures), as well as components of infrastructure areas from the Newnes Plateau that will be rehabilitated by the Project (excluding the access tracks).</p> <p>Areas will be rehabilitated with woodland species commensurate with adjacent remnant vegetation. This domain will provide wildlife corridors.</p>	A
Rehabilitation – Water Management Area	Rehabilitation Domain B – Water Management Area comprises the footprint of water management structures retained in the final landform at the Angus Place pit top.	B

6.2 Domain Rehabilitation Objectives

General rehabilitation objectives for the Project are outlined in **Section 1.3**. Rehabilitation domains require specific management objectives to realise the desired final land use outcome due to the distinct geophysical features associated with the current land function. Rehabilitation objectives for each domain, and the relevant regulatory and approval requirements, are listed in **Table 4**.

Table 4 – Domain Rehabilitation Objectives

Domain	Rehabilitation Objective
Primary Domains (refer Figure 3)	
Domain 1 – Infrastructure	The principal objectives of Domain 1 are: <ul style="list-style-type: none"> to form a stable landform which will pose no long-term environmental hazard; and to create final landforms for the nominated end land use of open forest for the disturbed areas at the Pit Top and the Newnes Plateau.
Domain 2 – Other Lands	The principal objective of Domain 2 is to rehabilitate surface impacts arising from activities other than direct clearing of vegetation, including subsidence effects, for the stabilisation of the impacted areas.
Domain 3 – Water Management Area	The principal objective of Domain 3 is to allow the on-going capture of surface water run-off to provide water resources for any fauna habiting the pit top and the separation of clean and dirty water.
Secondary Domains (refer Figure 4)	
Domain A Rehabilitation – Woodland	The principal objectives of this domain are to form a stable and a self-sustaining landform which will pose no long-term environmental hazard, and to establish native forest ecosystem similar to the immediate surrounds, to ultimately provide opportunities to develop wildlife corridors.
Domain B Rehabilitation – Water Management Area	The principal objectives of this domain are to provide water resources to the fauna habiting the rehabilitated areas at the pit top, to allow separation of clean and dirty water within the rehabilitated areas prior to vegetation establishment within the disturbed areas, and to meet water requirements during the landform establishment, growth medium development, ecosystem establishment and development stages of the rehabilitation program.

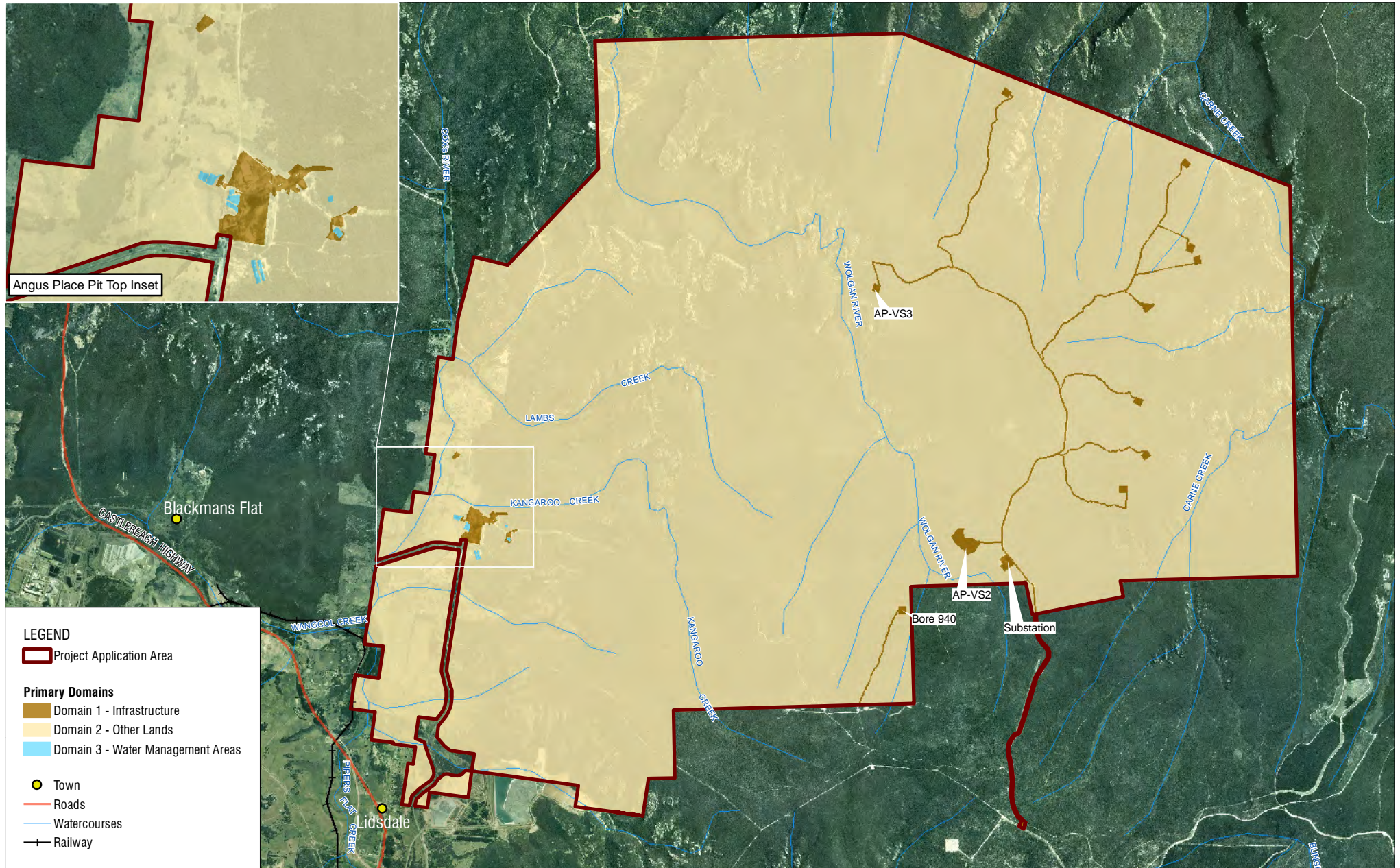
6.3 Final Land use Options Analyses and Justification

6.3.1 Rehabilitation Domain A – Woodland

Rehabilitation Domain A – Woodland comprises the Angus Place Pit Top and the rehabilitated infrastructure areas (refer **Table 3** and **Figure 4**) on Newnes Plateau. The Angus Place pit top is currently zoned 1(c) Rural (small holdings) pursuant to the LEP 1994. The zoning of this land is set to change to RU2 Rural Landscape, under the provisions of the Draft LEP 2013 (see **Section 3.2**). The objectives of the RU2 zoning are:

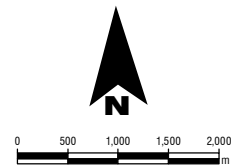
- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base;
- To maintain the rural landscape character of the land;
- To provide for a range of compatible land uses, including extensive agriculture;
- To ensure that the type and intensity of development is appropriate in relation to the rural capability and suitability of the land, the preservation of the agricultural, mineral and extractive production of the land, the rural environment (including scenic resources) and the costs of providing services and amenities;
- To facilitate tourism and recreational uses that are compatible with the capability and suitability of the land; and
- To maintain or improve the water quality of receiving water catchments in accordance with the NSW water quality objectives.

G:\Drafting\Angus Place\CCC07-011\Figures\ArcGIS\Fg3_CCC07-011_APC_RehabDomains_04.mxd



The content contained within this document may be based on third party data.
SLR Consulting Australia Pty Ltd does not guarantee the accuracy of such information.

Project No.:	CCC07-011
Date:	30/01/2014
Drawn by:	NT
Scale:	1:75,000
Sheet Size:	A4
Projection:	GDA 1994 MGA Zone 56



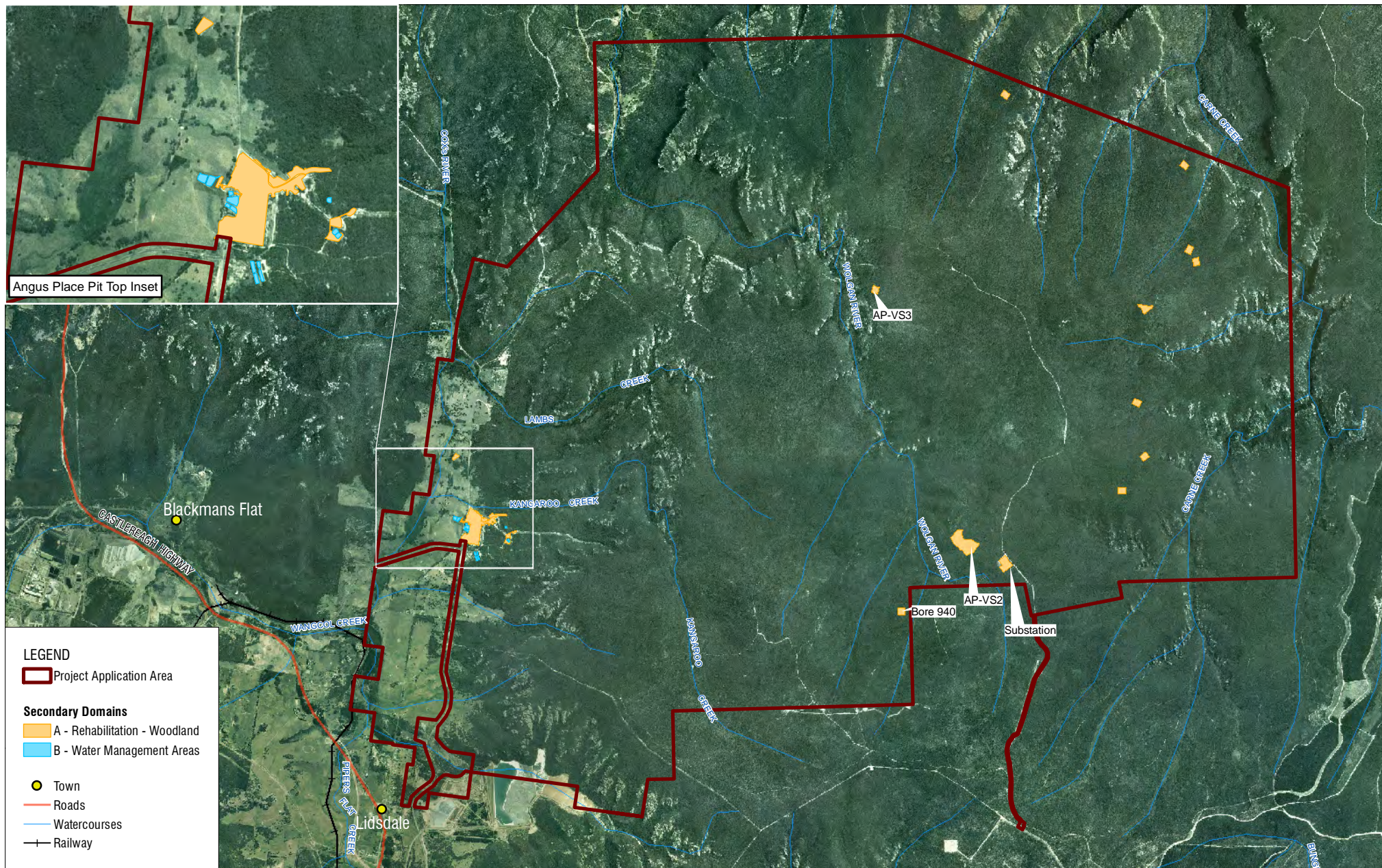
Centennial Angus Place Pty Ltd

ANGUS PLACE REHABILITATION STRATEGY

**Angus Place
Rehabilitation Domains**

FIGURE 3

G:\Drafting\Angus Place\CCC07-011\Figures\ArcGIS\Fg4_CCC07-011_APC_FinalLandform_05.mxd

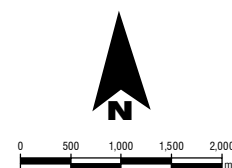




10 KINGS ROAD
NEW LAMBTON
NEW SOUTH WALES 2305
AUSTRALIA
T: 61 2 4037 3200
F: 61 2 4037 3201
www.slrconsulting.com

Project No.:	CCC07-011
Date:	30/01/2014
Drawn by:	NT
Scale:	1:75,000
Sheet Size:	A4
Projection:	GDA 1994 MGA Zone 56

The content contained within this document may be based on third party data.
SLR Consulting Australia Pty Ltd does not guarantee the accuracy of such information.



Centennial Angus Place Pty Ltd

ANGUS PLACE REHABILITATION STRATEGY

**Angus Place
Conceptual Final Landform**

FIGURE 4

Under both the 1(c) and the RU2 zonings, environmental protection works are permitted with consent. Under the 2013 Draft Lithgow LEP, environmental protection works are defined as means works associated with the rehabilitation of land towards its natural state or any work to protect land from environmental degradation, and includes bush regeneration works, wetland protection works, erosion protection works, dune restoration works and the like, but does not include coastal protection works.

As noted in **Section 3.2**, the Newnes Plateau is currently zoned 1(f) Rural (Forestry) pursuant to the LEP 1994. Development for any purpose authorised by the Forestry Corporation under the *Forestry Act 2012* is a permissible land use within zone 1(f) without consent.

However, the zoning of this land is set to change to RU3 Forestry, under the provisions of the Draft LEP 2013 (refer **Section 3.2**). Uses authorised under the *Forestry Act 2012* are also a land use permitted without consent within zone RU3. The objectives of the RU3 zoning are:

- To enable development for forestry purposes; and
- To enable other development that is compatible with forestry land uses

The objectives of both the RU2 and the RU3 zonings have been taken into consideration when determining the final land use option for Rehabilitation Domain A – Woodland.

The *Lithgow Draft Land Use Strategy 2010-2030* states that two of the major environmental protection and natural resource issues affecting the Lithgow Local Government Area, are the “*loss or reduction of environmentally sensitive land, water and biodiversity resources*”, and “*the encroachment of development on the scenic quality of landscapes*” (*Lithgow City Council, 2011*). Returning the pit top and Newnes Plateau disturbance areas to woodland would support biodiversity within the region and increase the scenic landscape of the area, therefore aligning with the outcomes of the *Lithgow Draft Land Use Strategy 2010-2030*.

The final land use for this domain will become ‘environmental protection works’ at the pit top, and forestry on the Newnes Plateau. This final land use is consistent with the surrounding land use of forestry in the Newnes State Forest. These final land uses align with the current *Lithgow LEP 1994*, the *Draft Lithgow LEP 2013* and the *Lithgow Draft Land Use Strategy 2010-2030*. No additional strategic land use planning, or resource management plans or policies apply to the Project Application Area.

6.3.2 Rehabilitation Domain B – Water Management Area

The Rehabilitation Domain B – Water Management Area comprises the water management structures within the Angus Place pit top to be used for the supply of water to meet rehabilitation requirements in the short term, and to provide water resources for any fauna habiting the pit top. As stated in **Section 3.2**, the Angus Place pit top is currently zoned 1(c) Rural (small holdings) pursuant to the LEP 1994. The zoning of this land is set to change to RU2 Rural Landscape, under the provisions of the Draft LEP 2013 (see **Section 3.2**). The objectives of the RU2 zoning are listed in Section 6.3.1 above.

These objectives have been taken into consideration when determining the final land use option for Rehabilitation Domain B – Water Management.

6.4 Centennial Strategic Land Assessment

Centennial Coal recently completed a strategic agricultural land assessment for their on-tenement land holdings, which included the preparation of an internal report titled *Strategic Agricultural Land Assessment: On-Tenement Lands* (GSS Environmental, 2013). The assessment was targeted at assessing the options, opportunities and constraints to facilitate strategically managing Centennial Coal's on-tenement land bank. Only a section of the land within the Project Application Area was considered as part of this assessment, namely around the Angus Place Pit Top. The assessment included lands other than those proposed to be disturbed by this Project, however the summary outcomes of this work are relevant in terms of establishing the future land use of the area and have been considered during the preparation of this report.

A review of the BSAL criteria was carried out to determine the potential for BSAL to be present within the Project Application Area. This BSAL assessment was undertaken at a desktop level for the Angus Place pit top only, prior to the BSAL assessments undertaken for the AIS described in **Section 4.6**. The BSAL assessments were undertaken against both the *Upper Hunter Strategic Regional Land Use Plan* (DP&I, 2012) criteria, and the *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (OEH, 2013) BSAL criteria.

The *Strategic Agricultural Land Assessment: On-Tenement Lands* report concluded that the 73 lots which make up Angus Place and Springvale Collieries only meet one of the *Upper Hunter Strategic Regional Land Use Plan* (DP&I, 2012) BSAL criteria, that being water availability, with an annual rainfall greater than 350 mm. The report found that, as the Inherent Fertility is Low and the Land Capability is Class IV and higher, it is unlikely any of the lots at Angus Place and Springvale Mines will meet the Upper Hunter Strategic Regional Land Use Plan criteria for BSAL.

Furthermore, although the slope analysis showed there are 529 hectares which meet the *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (OEH, 2013) BSAL criteria, none of the lots meet the minimum criteria for soil type. These lots were therefore not classified as BSAL land.

6.5 Stakeholder Engagement

Centennial Coal has a strong commitment to stakeholder engagement, in particular the company's website states that:

"Centennial recognises both our local neighbours and the broader community as important stakeholders in our business and we aim to maintain effective working relationships with these stakeholders."

Angus Place currently conducts community consultation widely and in accordance with the *Angus Place 2011-2014 Stakeholder Engagement Plan*. Community consultation is undertaken through a number of forums, including:

- The combined Springvale and Angus Place Community Consultative Committee;
- Meetings with individual landowners and stakeholders;
- Letters and community newsletters;
- Publications in local newspapers;
- Community information sessions and open days; and
- The Centennial Coal website.

Consultation with the appropriate landholders and additional stakeholders impacted by the specific activities will be undertaken prior to any proposed constructions works and progressive rehabilitation, where practicable. Decommissioning and rehabilitation works at the cessation of operations will require

additional consultation and this will be included in the detailed closure planning process. The consultation process may include:

- Identification of all stakeholders and preparation of a specific stakeholder engagement strategy;
- Discussion regarding the opportunities for the re-use of infrastructure constructed for the Project (including water management structures, roads and tracks); and
- Identification of any other issues, key risks and information needs regarding decommissioning and rehabilitation of the Project.

Centennial Coal places the utmost importance on maintaining effective communication with the local communities and other stakeholders in which it operates. Detailed rehabilitation and closure planning will be integrated into the stakeholder engagement process as the Project approaches five years out from permanent closure.

This report has been updated based on the adequacy comments received from the DP&I on the 28 December 2013 and the DTIRIS on 12 December 2013 relating to rehabilitation and land management.

6.6 Integration with Surrounding Rehabilitation

The size of the areas of disturbance associated with the Project does not allow for linkages with other rehabilitation and/ or offset strategies in the region. Consequently, the final land uses have been chosen to be consistent with surrounding environment, namely the Newnes State Forest.

Notwithstanding, the Angus Place and Springvale rehabilitation strategies have been prepared simultaneously to ensure they are consistent and the two final landforms for the Projects are integrated. Both of these Projects will be rehabilitated to woodland commensurate with the vegetation communities present across the Newnes State Forest.

7.0 RISK MANAGEMENT

7.1 Angus Place Environmental Risk Assessment

A Broad Brush Risk Assessment (BBRA) was undertaken during development of the Briefing Paper for the Project. *Centennial Coal's Risk Management Standard Risk Matrix* was used to calculate the consequence and likelihood of an event to evaluate the subsequent risk level (risk rank). Risks were ranked as Low, Moderate, Significant, High or Extreme. This system operates in accordance with AS/NZS ISO 31000/2009. The primary objectives of the environmental risk analysis include:

- Identification of potential hazards/impacts;
- Determination of the consequence of the hazard/impact occurring;
- Determination of the likelihood of an event occurring;
- Assessment of the risk by determining the probability (likelihood) and consequence (effect) of each hazard/impact; and
- Identification of the controls/safe guards to mitigate the hazard/impact.

No risks were identified as extreme. The high and significant risks identified in the Project BBRA relating to decommissioning and rehabilitation related to:

- Mine life not being extended resulting in mine closure;
- Subsidence resulting in impacts to Endangered Ecological Communities or fauna habitat;
- Exceedances of EPL and/or ANZECC water quality criteria resulting in community complaints or non-compliance with EPL conditions;
- Depressurisation of groundwater aquifers resulting in impacts to Groundwater Dependent Ecosystems or other groundwater users; and
- An increase in GHG emissions from the site.

The existing Angus Place Environmental Management Plans (EMPs) already address the risks and controls identified in the abovementioned Risk Assessment. To ensure the continued implementation and improvement of the Angus Place Environmental Management System (EMS), the identification and assessment of site based hazards and risks (aspects and impacts) are undertaken periodically.

7.2 Angus Place Environmental Risk Management

Angus Place has implemented an EMS, supported by a comprehensive set of EMPs to manage environmental risks at Angus Place, including rehabilitation areas. These plans have been developed and implemented by Angus Place in accordance with the current Project Approval and regulatory requirements. EMPs are supported by an environmental monitoring program which includes monitoring meteorological conditions, air quality, noise, surface water and groundwater.

These plans are regularly updated with the relevant management plans made publically available on the Centennial Coal website. All relevant Angus Place EMPs will be reviewed and updated to include the Angus Place Mine Extension Project following approval. Angus Place will notify DTIRIS when management plans have been updated, and approved management plans will be available on the Centennial Coal website.

8.0 DECOMMISSIONING AND REHABILITATION IMPLEMENTATION

Rehabilitation of the Project will comprise:

Progressive Rehabilitation – Part rehabilitation of the disturbed areas following construction of the proposed infrastructure on Newnes Plateau, namely, Ventilation Site 3 (APC – VS3), and the several dewatering boreholes will be undertaken on completion of the respective construction phase. These areas to be progressively rehabilitated comprise areas that were only required for infrastructure construction stage and will not be required for operational phase. When any other infrastructure area is no longer required for operations it will be rehabilitated after decommissioning within a reasonable timeframe and as agreed with FCNSW.

Progressive rehabilitation will also be undertaken within exploration drillhole sites should any exploration drilling activities be undertaken within the Project Application Area during the life of mine.

Life-of-Mine Rehabilitation – On cessation of all mining activities the disturbance areas will be fully rehabilitated to create stable and self-sustaining landform for the nominated end land use of woodland. Achievement of the agreed post mining land use will be achieved through a series of conceptual rehabilitation stages described in **Table 5**.

Table 5 – Life of Mine Rehabilitation Phases

Phase		Description
1	Decommissioning	The process of removing hardstand areas, plant, equipment, buildings and other structures and all contaminated and hazardous materials.
2	Landform Establishment	The process of shaping unformed rock or other sub-stratum material into a desired land surface profile including final landform drainage features. This phase includes substrate material characterisation, hazardous material encapsulation and earthworks to achieve safe and stable slopes with the desired gradients and landscape characteristics.
3	Growth Medium Development	The process of establishing and enhancing the physical structure, chemical properties and biological properties of a soil stratum suitable for plant growth. This includes placing and spreading soil and applying ameliorants.
4	Ecosystem Establishment	The process of seeding, planting and transplanting plant species. Incorporates management actions such as weed and feral pest control to achieve species establishment and growth to juvenile communities, and habitat augmentation.
5	Ecosystem Development	The process of applying management techniques to encourage an ecosystem to grow and develop towards a desired and sustainable post mining land use outcome. Incorporates features including species reproduction, nutrient recycling and community structure.
6	Rehabilitation Complete/Relinquishment	Completion criteria for rehabilitation are met and the land is determined to be suitable to be relinquished from the mine lease.

8.1 Decommissioning Phase

8.1.1 Domain 1 – Infrastructure

The key infrastructure to be decommissioned and rehabilitated in Domain 1 includes the following:

Angus Place Pit Top

- Administration buildings and portable offices;
- Bathhouse and associated facilities and services for the workforce;
- Coal Handling Plant and coal storage bins;

- Various workshops, service buildings and material storage sheds;
- Visitor and employee parking areas;
- Personnel and materials drift winder for access to underground workings;
- Coal conveyor drift and coal conveyor drive to transport coal from the underground workings to the surface at Angus Place;
- The ventilation fan at the Angus Place pit top;
- Coal stockpiles at both the Angus Place pit top and Kerosene Vale site;
- Diesel, solcenic and oil storage facilities; and
- The dirty and clean water management structures.

The underground infrastructure listed in **Section 2.1** will either be reclaimed and relocated for use elsewhere, or left behind underground after being made safe.

Newnes Plateau

- Ventilation Facility APC-VS2 and associated electrical distribution systems and powerlines;
- Ventilation Facility APC-VS3 and associated electrical distribution systems and powerlines;
- 940 dewatering bore;
- Infrastructure associated with the SDWTS, comprising trenched powerlines and pipelines; and
- Monitoring infrastructure (piezometers, weirs and transducers, seismometers, survey markers).

8.1.1.1 Site Services

All services, including power, water, data and telephone, that are not required for demolition activities will be safely isolated, disconnected and terminated. Generally all underground services will be made safe and left buried in-situ. Overhead powerline connections to the infrastructure sites will be isolated and removed, and the materials, including poles and wire, recovered for potential re-sale or recycling where practicable.

Where also practicable, pipelines and cables, including those associated with the SDWTS, will be capped and will remain in-situ. Pipelines and power cables on the Newnes Plateau will be isolated and made safe but will be left trenched. This is due to the risk of disturbing the re-established vegetation by excavation and removal. The location of pipelines that are to remain in-situ will be recorded in an abandoned services register and signs will be erected where appropriate.

Pipelines located in critical locations, for example infrastructure crossings of environmentally sensitive areas and/or riparian zones, will be filled with inert a material (such as concrete) to avoid additional disturbance of the environment.

8.1.1.2 Equipment and Buildings

All demountable/transportable buildings will be removed from the surface facility site, including the pit top. All remaining permanent buildings, including the administration buildings and workshops will then be demolished, with the component materials being recycled or re-sold. Any materials not recycled or re-sold will be disposed of in a suitable location either on-site or off site at a licenced waste management facility. Opportunities for the sale and/or re-use of assets and recycling of scrap steel will be maximised where possible. Material assessed as not hazardous or contaminated by a suitably qualified person will be crushed and disposed of within the main Angus Place portal entry or placed as fill into the shafts.

Concrete footings and pads will be broken up and removed. Options for the re-use of this material (for example, crushed and used for road and track stabilisation) will be investigated as the mine approaches closure. If re-use or recycling opportunities are not available or viable, all non-contaminated waste material will be disposed of in a suitable location on-site (for example, filling the drift) or off-site at an approved waste management facility.

All sumps will be de-watered and de-silted prior to the commencement of demolition. In addition, all items of equipment will be de-oiled, degassed, depressurised and isolated, and all hazardous materials associated with the Angus Place operations will be removed from the Project Application Area. Prior to disposal, all wastes will be assessed and classified in accordance with the relevant regulatory requirements.

8.1.1.3 Bitumen Roads, Tracks, Car Parks and Hard Stand Areas

Roadways and/or tracks may be required to remain to provide on-going access for rehabilitation monitoring and maintenance activities. Access tracks upgraded or established as part of the Project on Newnes Plateau will remain for use as access tracks by recreational users and by FCNSW.

Access roads, tracks, car parks and hard stand areas at the pit top that are not required will be scalped to remove stabilised and compacted material. The inert waste will be disposed of in a suitable location on site or off site at an approved waste management facility. Material assessed as not hazardous or contaminated by a suitably qualified person can be crushed and disposed of within the Angus Place portal entry or placed as fill into the shafts.

Should cracking due to subsidence impacts occur in roads or general disturbed areas, the surface will be graded and the cracks filled with sand, or other suitable material, prior to the surface being re-graded and compacted. If the area is no longer utilised, it will be deep ripped, top-soiled and appropriately re-vegetated.

8.1.1.4 Fuel and Chemical Storage Areas

Prior to closure any remaining fuel and/or chemicals will be recycled or disposed of at an appropriately licenced facility. All items of equipment will be de-oiled, degassed, depressurised and isolated, and all hazardous materials removed from the site. All infrastructure associated with fuel and chemical storage areas will be demolished and disposed of offsite at a licenced waste management facility. Opportunities for the sale and/or re-use of assets and recycling of scrap steel will be maximised where possible.

Concrete footings and pads will be broken up and removed. Options for the re-use of this material (for example, crushed and used for road and track stabilisation) will be investigated as the operation approaches closure. If re-use or recycling opportunities are not available or viable, all non-contaminated waste material will be disposed of in a suitable location on-site or off-site at an approved waste management facility. Material assessed as not hazardous or contaminated by a suitably qualified person can be crushed and disposed of within the Angus Place portal entry or placed as fill into the shafts.

8.1.1.5 Mine Ventilation Shafts and Bore Holes

Decommissioning and rehabilitation of ventilation fans shall be undertaken with general safety precautions and, where necessary, relevant approvals will be obtained from DTIRIS (or its equivalent at the time of decommissioning). The appropriate guidelines and standards will be followed to ensure that the works meet the relevant standards of the day.

Sealing of shafts associated with ventilation fans is required to ensure that surface runoff does not enter the mine and potentially contaminate groundwater. In addition, sealing of the shaft will improve safety and prevent fugitive gas emissions from the mine. For this task the key decommissioning activities will include:

- Removal of equipment (fans, pumps, housing, electrical services, etc.);

- Backfilling the shaft ensuring appropriate compaction to minimise subsidence, this may require the construction of a bulk head within the mine workings where it is accessible;
- Sealing of shaft openings using an appropriately designed and engineered plug reinforcement that complies with relevant construction standards;
- Construction of the engineered plug will be undertaken by component personnel under the supervision of a suitably qualified engineer; and
- Construction of appropriate drainage infrastructure on the surface to prevent erosion and ensure runoff does not enter the mine or cause potential groundwater contamination.

The boreholes will be sealed using an appropriately designed and engineered plug reinforcement that complies with relevant construction standards and DTIRIS guidelines, and following discussions with DTIRIS and the FCNSW. The sealing activity will be undertaken under the supervision of a suitably qualified engineer.

8.1.1.6 Mine Access Portals and Coal Delivery Systems

All services associated with the mine access portals and coal delivery systems will be disconnected and made safe. The conveyor and services from underground to the surface will be dismantled, removed from site and recycled at an appropriate facility. The length of services to be dismantled as part of this Project will be based on the relevant DTIRIS (or its equivalent at the time of decommissioning) guidelines at the time of decommissioning. Opportunities for the sale and/or re-use of assets and recycling of materials will be maximised to the extent practicable.

The mine access portals will be backfilled against an engineered concrete bulk head. The distance of backfilling will be determined at the time of closure and will be based on relevant DTIRIS (or its equivalent at the time of decommissioning) guidelines and best practice at that time. Construction of the engineered bulkhead will be undertaken by competent personnel under the supervision of a suitably qualified engineer. Inert material such as concrete from around the site will be backfilled against the bulk head equal to the natural surface. Sealing of the portals will be undertaken in accordance with relevant regulatory guidelines and approved by the DTIRIS (or its equivalent at the time of decommissioning). The location of portals will be recorded on an abandoned services register, which will be retained on site records.

8.1.1.7 Trenched Pipelines and Power Cables

The trenched pipelines (SDWTS) and power cables supplying power to the dewatering bores will not be removed but will be isolated and made safe in accordance with the relevant guidelines.

8.1.1.8 Former Mining Operations

Contamination assessments will be required prior to rehabilitation of the former Newcom Colliery (Kerosene Vale) pit top, Commonwealth Colliery site, and the Vale of Clwydd No. 2 Colliery site to determine the extent of contamination to enable rehabilitation activities to commence. Contamination assessments will identify potential soil and groundwater contamination, and evaluate remedial and or environmental management obligations.

The Vale of Clwydd No. 2 Colliery site has been identified as being a site of European heritage significance as it satisfies Criterion B of the NSW Heritage Branch Criteria at a local level. The heritage value of this site will be considered during the detailed closure planning as the Project approaches five years out from permanent closure.

8.1.2 Domain 2 – Other Lands

8.1.2.1 Subsidence Survey Markers

Subsidence survey markers will be decommissioned and removed.

8.1.2.2 Groundwater Monitoring Boreholes and Surface Water Monitoring

Groundwater monitoring wells (shallow and deep piezometers) will be decommissioned in accordance with relevant DTIRIS (or its equivalent at the time of decommissioning) requirements. The aim of well decommissioning is to prevent the leakage of gas and water.

Devices associated with the monitoring of surface water baseflows (for example transducers and telemetry data management equipment) will be decommissioned and removed from within the Project Application Area, for use at other Centennial Coal mines as appropriate.

All borehole sealing will be undertaken in accordance with *EDG01: Borehole Sealing Requirements on Land: Coal Exploration* (DTIRIS, 2012). All boreholes will be filled in from the total depth to the surface with approved cement mixtures. Records will be kept to demonstrate the method used to seal each bore hole, volumes and types of materials used and information on the drillhole such as depth, diameter and casing string(s) left in the hole. All records relating to the sealing of boreholes will be provided to the DTIRIS together with a declaration confirming that the work was carried out according to the guidelines.

All boreholes will be sealed by filling with a cement mixture, then plugging and grouting as necessary. In order to produce an effective seal all casing strings that are not cemented into place according to the guideline will be removed prior to or during the sealing of the hole. Where non-grouted casing cannot be removed, methods will be undertaken as outlined in EDG01.

Following decommissioning, all boreholes will be surveyed in accordance with EDG01 to determine their horizontal and vertical positions and a permanent steel identification plate or reference mark will be placed at the location of each borehole for relocation purposes. Survey details will be provided to the DTIRIS.

8.1.2.3 Associated Infrastructure

Where practicable, all other associated infrastructure will be removed. Re-use and/or recycling opportunities will be investigated, or alternately all non-contaminated waste material will be disposed of in a suitable approved location.

8.1.3 Domain 3 – Water Management Area

The network of dams and associated water management infrastructure at Angus Place pit top will not be decommissioned at the end of mine life but will be maintained for future use. The water storages will provide a valuable water resource to surrounding fauna or an asset to the final land use.

Generally all underground water management infrastructure will be made safe and left buried in-situ. The location of water management infrastructure that is to remain in-situ will be recorded in an abandoned services register and signs will be erected where appropriate.

8.2 Landform Establishment Phase

8.2.1 Domain 1 – Infrastructure

The primary objective of landform establishment within infrastructure areas will be stabilisation of batters, road verges, drains, banks, and cleared areas. Disturbed areas within this domain will be re-profiled to establish geotechnically stable and self-draining areas. In the case of disturbance areas associated with infrastructure sites on Newnes Plateau full rehabilitation will be undertaken in accordance with the Occupation Permit, and to FCNSW's standard and satisfaction.

All areas will be trimmed and ripped, and the proposed rehabilitation works will ensure that the final landforms at the sites are stable and non-polluting, and mimic the near-original landform for an end land use of open forest for infrastructure located on the Newnes Plateau and the Angus Place pit top.

Prior to the re-establishment of vegetation cover, temporary control measures will be utilised for erosion and sediment control. These measures may include the use of sediment fences for non-channelised flow over disturbed areas, sand bags, rip rap, or any combination of those materials.

8.2.2 Domain 2 – Other Lands

Should subsidence impacts occur to surface features, remediation and rehabilitation will be undertaken in accordance with the Trigger Action Response Plans, the existing SMP, and future approved Extraction Plans that will be developed for the Project. Subsidence remediation and rehabilitation will be on-going throughout the life of the mine. Any cracking in the surface soils associated with mining activities is expected to be typically within the range of less than 5 mm to 25 mm (MSEC, 2013). Surface cracks are expected to be generally isolated and minor in nature due to the reasonable depths of cover above the proposed longwalls, the relatively low magnitudes of predicted strain, and the clayey soils which can more readily absorb ground strains.

The majority of surface cracking is predicted to be naturally filled with soil during subsequent flow events, especially during times of heavy rainfall (MSEC, 2013). If any surface cracks are found not to fill naturally, some remedial measures may be required at the completion of mining. Where necessary, any significant surface cracks in the drainage line beds will be remediated by infilling with soil or other suitable materials, or by locally re-grading and re-compacting the surface. These works will be undertaken as per best practice for landform design in Mine Rehabilitation (Department of Industry, Tourism and Resources, 2006).

MSEC (2013) stated that the predicted changes in grade along the Wolgan river are small when compared to the existing natural grades and, therefore, it is unlikely that there would be any significant changes in the levels of ponding, flooding or scouring of the river banks, or any significant changes in the stream alignment. Similarly, the predicted post mining grades along the minor drainage lines within the subsidence area are similar to the natural grades and, therefore, it is not expected that there would be any significant adverse changes in ponding or scouring resulting from the proposed mining. MSEC (2013) also stated that there could be some very minor localised areas which could experience small increases in the levels of ponding, where the natural gradients are low immediately upstream of the longwall chain pillars.

The predicted post mining grades within the swamps in the subsidence area are similar to the natural grades and, therefore MSEC has stated that it is not expected that there would be any adverse changes in ponding or scouring within the swamps.

Any disturbance associated with access tracks to the groundwater (piezometer) and surface water monitoring sites will be reshaped as required and re-vegetated to be consistent with the surrounding vegetation.

8.2.3 Domain 3 – Water Management Area

As for Domain 1, control measures will be utilised for erosion and sediment control within Domain 3, including the use of sediment fences, sand bags, rip rap, or any combination of those materials. Erosion control structures will be installed at intervals commensurate with the slope of the landform.

Water storages will be rehabilitated to a stable non-polluting condition. It is anticipated that the only features to remain will be sediment ponds associated with the water management system for the site. These will be necessary until a stable landform is created following removal of all other infrastructure.

Once revegetation works for the site are advanced, the remaining sediment ponds will provide a valuable water resource to surrounding fauna or an asset to the final land use.

8.3 Growth Media Development Phase

Angus Place recognises the importance of appropriate soil identification, stripping, and management practices for successful rehabilitation and the achievement of the nominated end land use. Soil resources from the already disturbed areas at the pit top and the Newnes Plateau areas will be utilised to rehabilitate

areas of direct surface disturbance. Preference will be given to any stockpiled soil resources available at the infrastructure sites. The growth media development stage of the proposed rehabilitation relates mainly to rehabilitation Domain A – Woodland. Limited growth media development activities will apply to Domain B – Water Management Area.

A description of appropriate topsoil resources within the Project Application Area and their management is included in the Soil and Land Capability Assessment (SLR, 2014).

8.3.1 Topsoil Stripping and Handling

Where topsoil stripping and transportation is required, the topsoil handling techniques, as detailed in the Soil and Land Capability Assessment (SLR, 2014a) and the current Angus Place MOP will be adopted to prevent excessive soil deterioration.

8.3.2 Topsoil Management

Where possible, topsoil will be re-spread directly onto cleared/reshaped landforms. Where topsoil resources allow, topsoil will be spread to a nominal minimum depth range of 100 to 300 mm on all areas to be rehabilitated.

Thorough seedbed preparation will be undertaken to optimise establishment and growth of vegetation. All topsoiled areas will be lightly contour-ripped (after topsoil spreading) to create a 'key' between the topsoil and the subsoil. Ripping will be undertaken on the contour and the tynes lifted for approximately 2 metres every 200 metres to reduce the potential for channelised erosion on slopes greater than 10°. Ripping will be undertaken when soil is moist and immediately prior to sowing for best results. The respread topsoil surface will be scarified prior to or during seeding to reduce runoff and increase infiltration.

For areas requiring a long stockpiling duration, topsoil stockpiling opportunities will be investigated for the application of additional ameliorants (e.g. bio-solids) to assist with the regeneration of the desirable microorganism activity in the soil stockpiles.

The spoil generated from construction will be reused to fill the shafts during decommissioning and rehabilitation. The spoil will be stored and treated as a subsoil stockpile with regard to stockpile design and with appropriate erosion and sediment controls in place. The cuttings will be tested to ensure they are within the required limits of the *National Environment Protection Measure (NEPM) Assessment of Site Contamination (1999) - Schedule B (1) Guideline on the Investigation Levels for Soil and Groundwater*, and if required will be either treated prior to use for rehabilitation or disposed of at a licensed facility.

8.3.3 Erosion and Sediment Control

Standard erosion and sediment controls (e.g. sediment fences, clean and dirty water diversion structures) will be implemented during rehabilitation to manage surface runoff water from all disturbed areas within Domain A – Woodland. These controls will be in place until the success of the revegetation activities has been established and stable surfaces result within the domains. Within the Domain B – Water Management Area the existing erosion and sediment controls will be maintained on a regular basis until completion of rehabilitation.

Prior to the re-establishment of vegetation cover, temporary control measures will be utilised for erosion and sediment control. These measures may include the use of sediment fences for non-channelised flow over disturbed areas, sand bags, rip rap, or any combination of those materials.

Consideration will be given to erosion and sediment control procedures for activities undertaken during the construction phase. These procedures may include restricted access during wet weather or to areas under rehabilitation, reporting of erosion and sediment hazards or incidents and regular checking and maintenance of structures.

8.3.4 Weed Management

The presence of weed species within topsoil spread on the rehabilitated areas has the potential to have a major impact on revegetation and regeneration outcomes. The presence of weed species within the surrounding land also has the potential to significantly impact on the biodiversity value of the rehabilitated areas. Weed management will be a critical component of rehabilitation activities.

Weeds will be managed across the site through a series of control measures, including:

- Herbicide spraying or scalping weeds from topsoil stockpiles prior to re-spreading topsoil;
- Regular inspections of the rehabilitated areas to identify potential weed infestations; and
- Identifying and spraying weed populations.

The spread of declared noxious weeds will be prevented by using the measures above. Weed control, if required, will be undertaken in a manner that will minimise soil disturbance. Herbicides will be used in accordance with regulatory requirements. Records will be maintained of weed infestations and control programs will be implemented according to best management practice for the weed species concerned.

8.4 Ecosystem Establishment Phase

Revegetation of the re-profiled areas, within Domain 1 – Infrastructure and Domain 2 – Other Lands, will be undertaken to create rehabilitated domains for final land use of Woodland. Given Domain 3 – Water Management Area will be retained following maintenance works, the proposed rehabilitation of the relevant areas within the Project Application Area will result in two rehabilitated domains as follows (refer **Figure 4**).

- Domain A – Woodland; and
- Domain B – Water Management Area.

Domain A – Woodland

Appropriate revegetation steps and selection criteria for the species mix will be undertaken to ensure a high success revegetation rate, and will comprise, but not be limited to, the following

- Appropriate species selection for the rehabilitation domain;
- Optimal sowing rates and species proportions;
- Seed pre-treatment; and
- Soil amelioration and fertiliser application.

In Domain A, endemic species mixes will be utilised on disturbed areas. The species selection will focus on those species that will successfully establish on the available growth medium, bind the soil and will result in a variety of structure and food/habitat resources. The woodland seed mix will include a mix of understorey, mid-storey and overstorey species. Whilst every attempt will be made to use species that existed prior to disturbance, additional species may be required to ensure suitable initial groundcover for site stabilisation and minimal soil erosion. This may include the use of short-lived annual exotic non-invasive grass species.

Fertiliser will be applied with seed mixes to increase the likelihood of initial revegetation success. All revegetation activities will be undertaken immediately after the landform establishment stage.

Domain B – Water Management Area

No revegetation activities will be undertaken for this domain.

8.5 Ecosystem Development Phase

8.5.1 Rehabilitation Monitoring

A commitment to effective rehabilitation involves an on-going monitoring (and concurrent maintenance as required) program, developed for the Project in consultation with FCNSW. Areas of completed rehabilitation will be regularly inspected and assessed against the short-term and long-term rehabilitation objectives.

A dedicated monitoring system will be established in order to assess the effectiveness of the implementation of the rehabilitation measures as well as to identify the need for corrective action as soon as required. The monitoring program will be developed for each closure domain, incorporating the most appropriate indicators and methods that:

- Provide a measure of completion criteria to be assessed in accordance with the defined rehabilitation objectives;
- Are reproducible;
- Utilise scientific recognised techniques; and
- Are cost-effective.

Rehabilitation monitoring will include regular inspections for the following key aspects:

- Evidence of any erosion or sedimentation;
- Success of initial establishment of grass cover and tree and shrub seeding/plantings;
- Natural regeneration of native species;
- Weed infestation (primarily noxious weeds, but also where rehabilitation areas are dominated by other weeds);
- Integrity of graded banks, diversion drains, waterways and sediment control structures; and
- General stability of the rehabilitation areas.

A feral animal control strategy will be implemented to contain the spread of weeds and other detrimental impacts on rehabilitation areas by feral animals. Goats, foxes, cats, rabbits, pigs and dogs will be controlled in accordance with Livestock Health and Pest Authority procedures.

8.5.2 Rehabilitation Maintenance

Where rehabilitation monitoring undertaken as described in **Section 8.5.1** confirms that the rehabilitation is not successful or is limited, maintenance works will be undertaken. This may include the following:

- Re-seeding and, where necessary, re-topsoiling and/or the application of specialised treatments such as composted mulch or bio-solids to areas with poor vegetation establishment;
- Installation of tree guards around planted seedlings or construction of temporary fencing suitable for excluding native and feral fauna species should grazing by animals be excessive;
- Replacement of drainage controls if they are found to be inadequate for their intended purpose, or compromised by vegetation or wildlife;
- De-silting or repair of sediment control structures; and

- Where monitoring indicates the presence of excessive weeds or the potential for noxious weed infestation, necessary precautions to prevent the development of weeds within the rehabilitated areas will be undertaken.

Monitoring results, any required maintenance activities and any refinements of rehabilitation techniques will be reported as part of Angus Place's reporting requirements, for example, in the Annual Environmental Management Report.

9.0 CONCEPTUAL REHABILITATION SUCCESS CRITERIA

Conceptual rehabilitation success criteria have been developed to provide long-term performance goals for rehabilitation activities. The rehabilitation success criteria presented in this section are considered conceptual, and will be developed further following consultation on the final land use with the relevant stakeholders during the detailed mine closure planning stage. The mine closure planning for the Project will commence no later than five years from permanent closure. This will include the development of specific, measurable, achievable, realistic, and outcome based, criteria. The criteria will be based on the results of research and on-going monitoring of the progressive rehabilitation areas.

Conceptual rehabilitation success criteria are provided in **Table 6**. Each criterion is designed as a performance objective or standard against which rehabilitation success can be demonstrated. Meeting the success criteria (as indicated by monitoring results) demonstrates that the rehabilitated landscape is in a sustainable condition, ready to be relinquished, and handed back to the appropriate stakeholders.

The success criteria comprise indicators for vegetation, fauna, soil, stability, land use and safety on a landform-type basis that reflects the nominated end land use of open forest/native bushland and water management area.

Table 6 – Conceptual Rehabilitation Success Criteria

Rehabilitation Element	Domain	Indicator	Rehabilitation Success Criteria
Phase 1 – Decommissioning			
Infrastructure	Domains 1 and 2	Land use (open forest/native woodland)	<ul style="list-style-type: none"> All infrastructure within the Angus Place pit top has been removed, and disposed appropriately, for example, to appropriate waste management facilities. All buildings and equipment, water storage, and other infrastructure on the Newnes Plateau have been removed unless agreed with stakeholders, including the landowner FCNSW, for their retention. All boreholes (except those retained for monitoring purposes) have been shut down, bore casings near the surface are removed and holes plugged or capped in accordance with the regulatory standards. All landforms are stable and free draining. The domain accomplishes and remains as healthy open forest, and the management inputs are no greater than other open forest land.
	Domain 3	Water Management Area	<ul style="list-style-type: none"> Presence of sediment and erosion controls for the minimisation of discharge of dirty water off site. Presence of water management structures (e.g. contour banks and diversion drains) to direct water into the retained dams or other into stable areas. Water quality of the receiving waters is not affected by surface water runoff from the site. Discharge water meets the contaminant limits (EC, pH, TSS and oil and grease) of the EPL conditions.
	Domain 1	Underground Infrastructure	<ul style="list-style-type: none"> Underground infrastructure has been made safe, or reclaimed and relocated for use elsewhere. The relocation of the underground infrastructure is undertaken within an appropriate timeframe determined by the regulatory requirements at the time of decommissioning.
	All Domains	No contamination	<ul style="list-style-type: none"> All sites have been assessed by suitably qualified personnel as not containing contaminants exceeding the relevant criteria for the proposed final land use.

Rehabilitation Element	Domain	Indicator	Rehabilitation Success Criteria
Safety	Domains 1 and 2	Physical	<ul style="list-style-type: none"> Excavations have been rendered safe. All holes/pits and other openings are securely capped, filled or otherwise made safe. Access to members of the public and livestock is restricted as appropriate to site conditions. No rubbish remains at the surface, or at risk of being exposed through erosion.
Phase 2 – Landform Establishment			
Landform Stability	Domains 1 and 2	Surface water drainage	<ul style="list-style-type: none"> The landform is stable and contour banks and diversion drains are installed to direct water into stable areas or sediment control basins.
	All Domains	Erosion control	<ul style="list-style-type: none"> Erosion control structures are installed at intervals commensurate with the slope of the landform.
	Domain 3	Stable landform	<ul style="list-style-type: none"> Water storages to be rehabilitated to a stable non-polluting condition.
Phase 3 – Growth Media Development			
Top soil	Domain 1 and 2	Physical and chemical parameters	<ul style="list-style-type: none"> Previously stockpiled topsoil has been used in the rehabilitation activities. Suitable and alternative topsoil substitute (for example bio-solids, organics, etc.) have been used at the site to make up any short-fall in the topsoil required for complete rehabilitation.
Phase 4 – Ecosystem Establishment			
Vegetation	Domains 1 and 2	Species composition	<ul style="list-style-type: none"> A mixture of native trees, shrubs and grasses representative of regionally occurring woodland is present within Domain A. Established species survive and/or regenerate after disturbance. Weeds do not dominate native species after disturbance or after rain. Pests do not occur in substantial numbers or visibly affect the development of planted species. Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present).
Phase 5 – Ecosystem Development			
Vegetation	Domain 1 and 2	Sustainability	<ul style="list-style-type: none"> Species are capable of setting viable seed, flowering or otherwise reproducing. Evidence of second generation of tree/shrub species. Evidence of active use of habitat provided during rehabilitation such as nest boxes, and logs and signs of natural generation of shelter sources including leaf litter.
Fauna	All Domains	Vertebrate Species	<ul style="list-style-type: none"> Presence of representatives of a broad range of functional indicator groups involved in different ecological processes.
	All Domains	Invertebrate species	<ul style="list-style-type: none"> Presence of representatives of a broad range of functional indicator groups involved in different ecological processes.
	All Domains	Habitat structure	<ul style="list-style-type: none"> Typical food and water sources required by the majority of vertebrate and invertebrate inhabitants of that ecosystem type are present.

Rehabilitation Element	Domain	Indicator	Rehabilitation Success Criteria
Land Use	All Domains	Land use	<ul style="list-style-type: none">The rehabilitated sites can be managed for the designated land uses without any greater management inputs than other land in the area being used for a similar purpose.

10.0 INDICATIVE CLOSURE TIMELINE

An indicative closure timeline is shown in **Table 7**, including the key rehabilitation and closure activities throughout the life of the Project. In particular the key activities include:

- Closure planning;
- Decommissioning and rehabilitation;
- Maintenance and monitoring;
- Relinquishment; and
- Post relinquishment activities.

Table 7 – Indicative Closure Timeline

Years From Closure	Closure Planning					Decommissioning and Rehabilitation				Monitoring and Maintenance				Relinquishment	
	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10
Closure Planning															
Stakeholder consultation regarding closure															
Agreed final detailed closure strategy															
Develop an infrastructure demolition plan															
Closure Activities															
Demolition of infrastructure															
Sealing of underground access areas															
Landform establishment															
Growth media establishment															
Ecosystem establishment															
Ecosystem development															
Post Closure Activities															
Maintenance of Rehabilitated Areas															
Monitoring and Inspections															

11.0 REFERENCES

Australian and New Zealand Minerals and Energy Council (ANZMEC) & Minerals Council of Australia (MCA) (2000) *The Strategic Framework for Mine Closure*.

Centennial Coal (2013) *Angus Place 2013-2015 Mining Operations Plan*.

Department of Industry and Investment NSW (2010) *ESG1 Rehabilitation Cost Estimate Guidelines*.

Department of Industry, Tourism and Resources (2006a) *Leading Practice Sustainable Development Program for the Mining Industry – Mine Closure and Completion*.

Department of Industry, Tourism and Resources (2006b) *Leading Practice Sustainable Development Program for the Mining Industry – Mine Rehabilitation*.

Department of Mineral Resources (1997) *Guideline EDG02: – Borehole Sealing Requirements on the Beds of Water Bodies: Coal Exploration Management of Exploration and Mining in NSW*.

Department of Planning and Infrastructure (2012) *Upper Hunter Strategic Regional Land Use Plan*.

Department of Primary Industries Mineral Resources (2006a) *Guideline ESB20 V1.0: – Rehabilitation Security Deposit Requirements for Mining and Petroleum Titles*.

Department of Primary Industries Mineral Resources (2006b) *Guideline EDG 14: – Reporting Requirements for Mine Closure and Lease Relinquishment*.

Department of Resources, Energy and Tourism (2011) *Leading Practice Sustainable Development Program for the Mining Industry, A Guide To Leading Practice Sustainable Development In Mining*.

Department of Trade and Investment, Regional Infrastructure and Services (2012) *EDG01: – Borehole Sealing Requirements on Land: Coal Exploration*.

Department of Trade and Investment, Regional Infrastructure and Services (2013) *ESB26: – Rehabilitation Cost Calculation Tool V1.12*.

Department of Trade and Investment, Regional Infrastructure and Services (2012) *Policy EDP11 – Rehabilitation Security Deposits*.

Department of Trade and Investment, Regional Infrastructure and Services (2012) *ESG3: Draft Mining Operations Plan (MOP) Guidelines*.

Environment Protection and Heritage Council (1999) *National Environment Protection Measure Assessment of Site Contamination Schedule B (1) Guideline on the Investigation Levels for Soil and Groundwater*.

Golder (2014), *Environmental Impact Statement, Angus Place Mine Extension Project*, Centennial Angus Place Pty Limited.

GSS Environmental (2013) *Strategic Agricultural Land Assessment: On-Tenement Lands*.

Lithgow City Council (2011) *Lithgow Draft Land Use Strategy 2010-2030*.

Lithgow City Council (2013) *The Draft Lithgow City Council Local Environmental Plan 2013*.

MSEC (2013) *Angus Place Mine Extension Project. Subsidence Predictions and Impact Assessments for the Natural and Built Features in Support of the Environmental Impact Statement for the Proposed Longwalls 1001 to 1019 in the Lithgow Seam*. Report No. MSEC593.

NSW Office of Environment and Heritage (2013) *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land*.

RPS (2013a) *Angus Place Mine Extension Project Groundwater Impact Assessment*.

RPS (2013b) *Angus Place Mine Extension Project Ecology Assessment*.

SLR (2013) *Angus Place Mine Extension Project Agricultural Impact Assessment*.

SLR (2014) *Angus Place Mine Extension Project Soil and Land Capability Assessment*.

Standards Australia (2001) AS 2601:2001 *The Demolition of Structures*.

Standards Australia (2009) AS/NZS ISO 31000:2009 *Risk Management - Principles and Guidelines*.