



# Centennial Coal

Angus Place



## *Flora and Fauna Management Plan*

### Angus Place Colliery

September 2014



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## Abbreviations

<b>AEMR</b>	Annual Environmental Management Report (now known as Annual Review)
<b>AusRivAS</b>	Australian River Assessment System
<b>CEMP</b>	Construction Environmental Management Plan
<b>CCL</b>	Consolidated Coal Lease
<b>DECCW</b>	Former NSW Department of Environment, Climate Change and Water
<b>DgS</b>	Ditton Geotechnical Services Pty Ltd
<b>DoP</b>	Former NSW Department of Planning
<b>DP&amp;E</b>	NSW Department of Planning and Environment
<b>DTIRIS</b>	NSW Department of Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy
<b>EA</b>	Environmental Assessment
<b>EEC</b>	Endangered Ecological Community
<b>EPBC Act</b>	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
<b>EPL</b>	Environment Protection Licence
<b>FCNSW</b>	Forestry Corporation of NSW
<b>GDE</b>	Groundwater Dependent Ecosystem
<b>LDP</b>	Licensed Discharge Point
<b>LW</b>	Longwall
<b>ML</b>	Mining Lease
<b>Mtpa</b>	Million tonnes per annum
<b>OEH</b>	NSW Office of Environment and Heritage
<b>nMDS</b>	Non-metric multi-dimensional scaling
<b>NPSS</b>	Newnes Plateau Shrub Swamp
<b>NRPMP</b>	National River Process Management Program
<b>PA</b>	Project Approval
<b>RCE</b>	River-Creek-Environment
<b>ROM</b>	Run of mine
<b>ROTAP</b>	Rare or Threatened Australian Plant
<b>SIGNAL</b>	Stream Invertebrate Grade Number Average Level
<b>SMP</b>	Subsidence Management Plan
<b>TSC Act</b>	<i>Threatened Species Conservation Act 1995</i>
<b>WIRES</b>	Wildlife Information Rescue and Education Services

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## 1. INTRODUCTION

Angus Place Colliery (Angus Place) is an underground coal mining operation located approximately 5 kilometres north of the village of Lidsdale, 8 kilometres northeast of the township of Wallerawang and approximately 15 kilometres northwest of the city of Lithgow in the Blue Mountains region of NSW. It is bordered by Springvale Colliery to the south, Ivanhoe Colliery to the northwest and the Wollgan Valley and Newnes Plateau to the north and east respectively. The locality of Angus Place is shown on **Figure 1**.

Angus Place has been in operation since 1979 and is operated by Centennial Angus Place Pty Ltd, a joint venture company owned in equal share between the Centennial Coal Company Ltd and SK Kores of Korea. Coal extraction utilising the longwall method of mining is currently undertaken within Mining Lease (ML) 1424 and Consolidated Coal Lease (CCL) 704. Project Approval (PA 06\_0021) was granted by the former NSW Department of Planning (now known as the NSW Department of Planning and Environment (DP&E)) in September 2006 for continuation of mining.

The main components of the site are an underground longwall mine and associated development units, supporting surface infrastructure, a coal stockpile area (identified as Kerosene Vale) and a haul road to Wallerawang power station. A second haul road to Mount Piper power station is owned by Coal Link Pty Ltd and operated by Angus Place. Angus Place currently operates 7 days a week, 24 hours per day, and has approval to extract up to 4 million tonnes per annum (Mtpa) of run of mine (ROM) coal from the Lithgow Seam. Mined coal is conveyed to the surface from a stackout/reclaim stockpile, which is equipped with underground feeders, enabling coal to be loaded onto the reclaim conveyor. Coal is then conveyed to the coal handling plant where it is crushed and sized, prior to delivery to the truck loading hoppers by conveyor. Angus Place holds coal supply contracts with Delta Electricity, therefore loaded trucks transport the coal to Mount Piper or Wallerawang power stations via private haul roads.

PA 06\_0021 has been modified on three occasions. Modification 1 (Mod 1) was approved on 29 August 2011 and allowed for the development and extraction of two additional longwall panels (Longwalls 910 and 900W), increasing the coal production limit from 3.5Mtpa to 4Mtpa and modifications for the improvement of the dirty water management system at the pit top. PA 06\_0021 Modification 2 (Mod 2) was approved in April 2013 and allowed for the development of underground roadways, and the construction and operation of a Ventilation Facility (APC-VS2) and supporting infrastructure (see **Figure 2**). Modification 3 (Mod 3) was approved in December 2013 and allows for the extension in length of Longwalls 980 and 900W by 43.4 metres (m) and 104.8 m, respectively, and an increase to the maximum extraction height of Longwalls 980, 900W and 910 from 3.25 m to 3.425 m.

The existing Angus Place Flora and Fauna Management Plan was developed in accordance the requirements of Schedule 3, Condition 24 of PA 06\_0021 (Mod 1). As a result of the approval of PA 06\_0021 (Mod 2) in August 2011, this Flora and Fauna Management Plan has been updated accordingly.

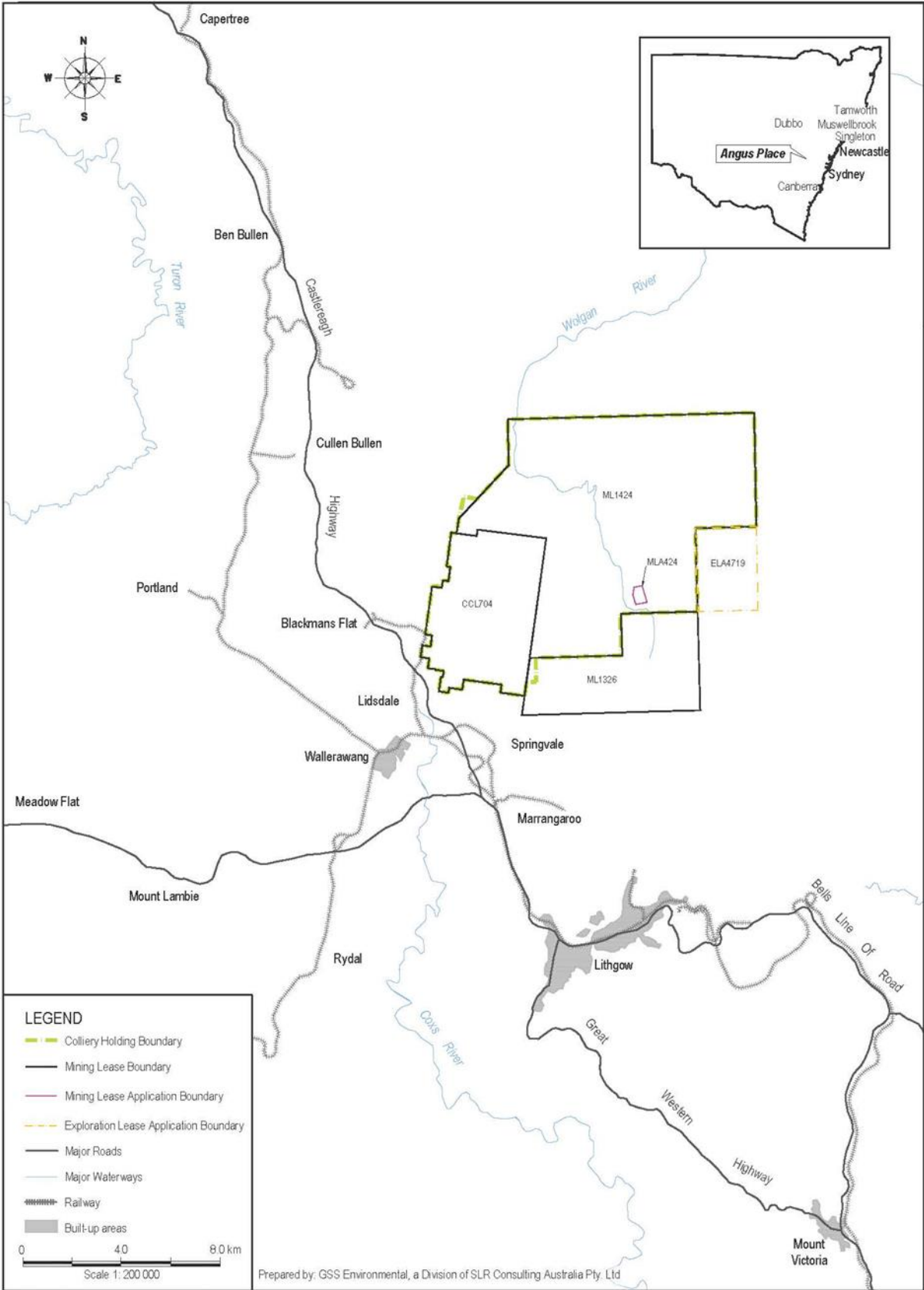


Figure 1 Locality Plan

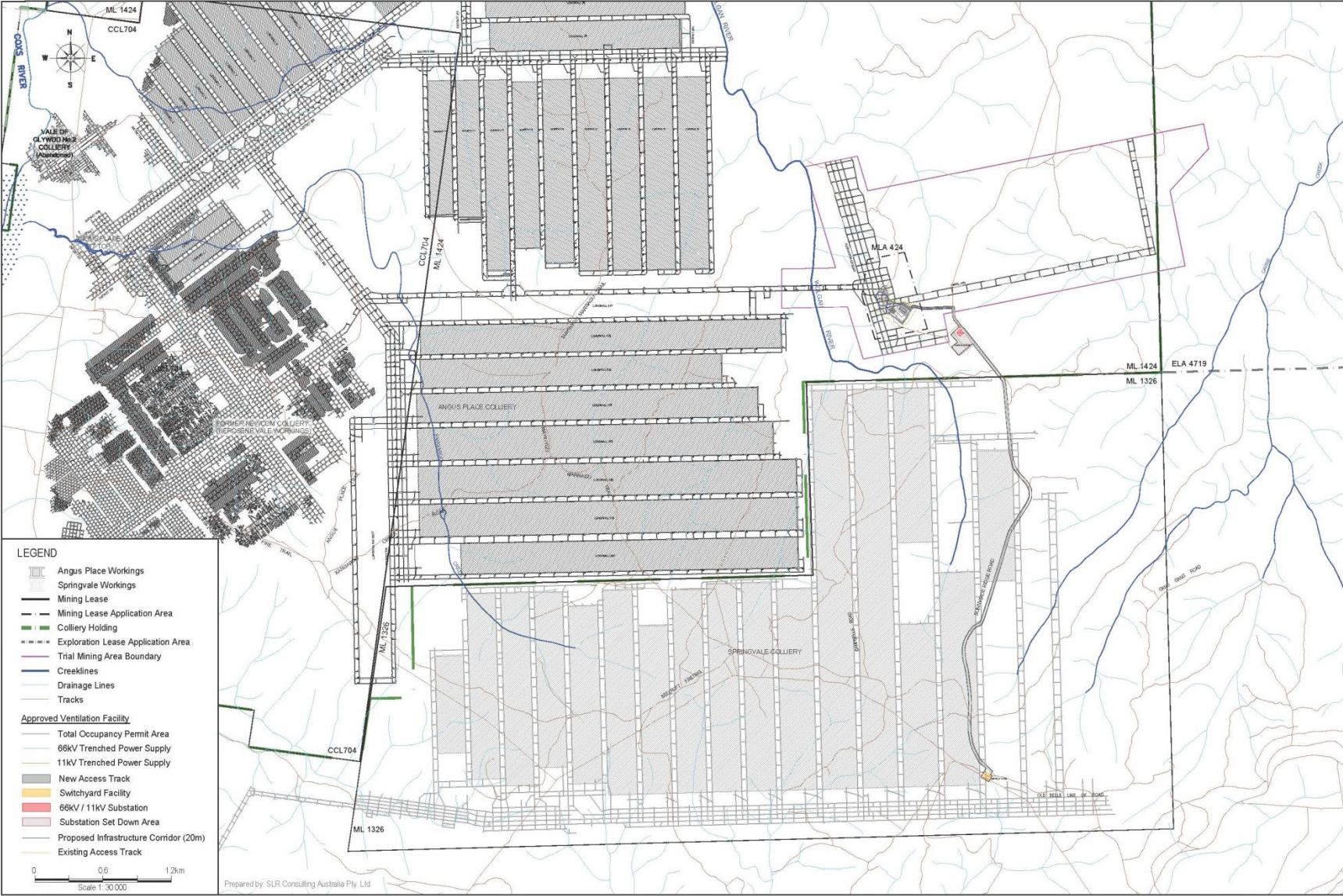


Figure 2 Angus Place Workings and Ventilation Facility Project

## 2. PURPOSE

This document has been completed in order to fulfil the requirements of the Project Approval and to provide employees and contractors of Angus Place with a clear understanding of the requirements of this plan.

The purpose of the Flora and Fauna Management Plan is to:

- Protect threatened species and communities;
- Minimise impact on native flora and fauna;
- Manage clearing on the site;
- Control weeds;
- Control access to environmentally sensitive areas; and
- Manage any potential conflicts between flora and fauna and Aboriginal heritage.

## 3. SCOPE

The Angus Place holding includes CCL 704, ML 1424, part of ML 1326 and part of CCL702 from Invincible Colliery. A Mining Lease Application (MLA 424) was submitted to the Department of Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy (DTIRIS) by Centennial Springvale Pty Ltd. on 1 May 2012 for the Ventilation Facility site (see **Figure 2**). This has not yet been approved. This Flora and Fauna Management Plan applies to all operations at Angus Place approved by PA 06\_0021 (Mod 2).

This Flora and Fauna Management Plan provides baseline data on existing habitat on site, provides detailed procedures to clear vegetation on site, control weeds, control access to environmentally sensitive areas and manage any potential conflicts between flora and fauna and Aboriginal heritage. A flora and fauna monitoring program forms part of this Flora and Fauna Management Plan including procedures for monitoring, reviewing and implementing this Flora and Fauna Management Plan.

This Flora and Fauna Management Plan needs to be read in conjunction with the Environmental Management Strategy and the Environmental Monitoring Program. The Environmental Management Strategy provides an overall structure for environmental management at Angus Place including the strategic context, statutory requirements and roles and responsibilities of key personnel. The Environmental Monitoring Program consolidates all monitoring requirements developed in the individual management plans and monitoring programs.

Following the approval of PA 06\_0021 (Mod 2), the existing Flora and Fauna Management Plan was revised for consistency with the approved operations. To satisfy Schedule 3, Condition 3C(h) of PA 06\_0021 (Mod 2), Angus Place submitted the revised Flora and Fauna Management Plan to the NSW Office of Environment and Heritage (OEH) and DTIRIS as part of the consultation process in May 2013. DTIRIS provided comments regarding the Flora and Fauna Management Plan on 5 June 2013 and OEH also provided comments regarding the document on 16 July 2013 (see **Appendix 1**). Subsequently, Angus Place have completed amendments to the Flora and Fauna Management Plan to address the comments received from DTIRIS and OEH. This document was resubmitted for further consultation to OEH and DTIRIS on 18 October 2013, prior to resubmission to DP&E for approval.

Final comment regarding the revised Flora and Fauna Management Plan was received from OEH on 5 November 2013. No comment was received from DTIRIS. Angus Place has considered the comments provided by OEH and provided the Flora and Fauna Management Plan to DP&E for approval on 15 November 2013. Evidence of this consultation has been provided in **Appendix 1**.

Following the approval of Mod 3 in December 2013, this Flora and Fauna Management Plan has been revised to include the modified geometry of Longwalls 980 and 900W. The revised Plan was then resubmitted to OEH and DTIRIS for consultation on 5 March 2014. Evidence of this consultation has been provided as **Appendix 1**. Following receipt and consideration of any feedback received from these agencies, this Flora and Fauna Management Plan will be submitted to the DP&E for approval.

## 4. REGULATORY REQUIREMENTS

PA 06\_0021 (Mod 2) defines a number of conditions relevant to the preparation and implementation of a Flora and Fauna Management Plan for Angus Place. Conditions relating specifically to the production of this management plan have been summarised in **Table 1**. This table also outlines where these conditions have been addressed within this document.

**Table 1. Relevant Project Approval Conditions**

Condition	Condition Requirement	Section Addressed
Schedule 3, Condition 3C	<p>The Proponent shall prepare and implement Extraction Plan/s for the second workings in Longwalls 910 and 900W to the satisfaction of the Director-General. Each Extraction Plan must:</p> <p>h) Include:</p> <ul style="list-style-type: none"> <li>• Appropriate revisions to the Flora and Fauna Management Plan required by condition 24, which has been prepared in consultation with OEH and DRE, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on aquatic and terrestrial flora and fauna;</li> </ul>	Sections 5.1 and 5.3
Schedule 3, Condition 3D	<p>The Proponent shall ensure that the management plans required under conditions 8-13, 24, 36 and 37 include:</p> <p>(a) An assessment of the potential environmental consequences of the impacts identified in the Extraction Plan, incorporating any relevant information that has been obtained since this approval;</p> <p>(b) a detailed description of the measures that would be implemented to remediate predicted impacts; and</p> <p>(c) a contingency plan that expressly provides for adaptive management.</p> <p>Note: A Subsidence Management Plan approved by DTIRIS prior to 31 March 2012 is taken to satisfy the requirements of this condition.</p>	<p>Section 5.2</p> <p>Section 5.3</p> <p>Section 10</p>
Schedule 3, Condition 24	<p>The Proponent shall prepare (and following approval implement) a Flora and Fauna Management Plan for the project, to the satisfaction of the Director-General. The Plan shall be submitted to the Director-General within 12 months of the date of this approval. The Plan must include:</p> <p>(a) baseline data of the existing habitat on site;</p> <p>(b) detailed procedures to:</p> <ul style="list-style-type: none"> <li>• clear vegetation on site;</li> <li>• control weeds;</li> <li>• control access to environmentally sensitive areas on site;</li> <li>• manage any potential conflicts between flora and fauna and Aboriginal heritage;</li> </ul> <p>(c) a flora and fauna monitoring program; and</p> <p>(d) procedures for monitoring, reviewing, and implementing the plan.</p>	<p>Sections 5.1 and 6.1</p> <p>Section 8</p> <p>Section 7</p> <p>Sections 12 and 13</p>

Condition	Condition Requirement	Section Addressed
Schedule 5, Condition 2	<p>The Proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:</p> <ul style="list-style-type: none"> <li>(a) Detailed baseline data;</li> <li>(b) A description of: <ul style="list-style-type: none"> <li>• The relevant statutory requirements (including any relevant approval, licence or lease conditions);</li> <li>• Any relevant limits or performance measures/criteria;</li> <li>• The specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;</li> </ul> </li> <li>(c) A description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;</li> <li>(d) A program to monitor and report on the: <ul style="list-style-type: none"> <li>• Impacts and environmental performance of the project;</li> <li>• Effectiveness of any management measures (see c above);</li> </ul> </li> <li>(e) A contingency plan to manage any unpredicted impacts and their consequences;</li> <li>(f) A protocol for managing and reporting any: <ul style="list-style-type: none"> <li>• Incidents;</li> <li>• Complaints;</li> <li>• Non-compliance with statutory requirements; and</li> <li>• Exceedances of the impact assessment criteria and/or performance criteria; and</li> </ul> </li> <li>(g) A protocol for periodic review of the plan.</li> </ul>	This Document

Table 2 provides details of relevant commitments made by Angus Place in the Statement of Commitments as appended to PA 06\_0021 (Mod 2). The table also details where these commitments have been addressed within this management plan.

**Table 2. Relevant Statements of Commitment**

Commitment	Statement of Commitment	Section Addressed
4.1, Mod 1	Within 6 months of obtaining approval relevant management plans (Table 6.1*) will be reviewed and updated as required.	Section 5
3, Mod 2	The existing Flora and Fauna Management Plan will be updated to include the Management Actions identified in Section 9.3.4 of this EA (RPS, 2012).	Section 6
*Refers to Table 8.1 of the EA (RPS, 2010)		

Table 8.1 of the Mod 1 Environmental Assessment (EA) titled *Angus Place Colliery, NSW Modification of Project Approval 06\_0021 under Section 75W, Part 3A* (RPS, 2010) outlines one commitment relevant to the revision of the Flora and Fauna Management Plan. The commitment specified that the existing Flora and Fauna Management Plan would be reviewed to include “inspection during clearance work by a suitably qualified ecologist and follow protocols set out within the Flora and Fauna Assessment report by RPS (2010a). The clearing in this commitment relates to the proposed installation of a dewatering bore, pipeline, powerline and access track above the eastern end of Longwall 910. In the document entitled *Environmental Assessment Response to Submissions* (Angus Place Colliery, 2011), Angus Place outlined that “no construction is now proposed beyond the existing footprint approved under the existing 2006 Project Approval 06\_0021”. Accordingly the commitments to inspect clearance within the Mod 1 Project Area are no longer relevant to preparation of the Flora and Fauna Management Plan. Additionally the *Environmental Assessment Response to Submissions*

(Angus Place Colliery, 2011) outlined an additional commitment for the “continued flora and fauna monitoring within the Extraction Plan boundary” for Longwalls 900W and 910. This has been addressed in **Sections 7.1** and **7.2**.

## 5. BASELINE MONITORING AND PREDICTED IMPACTS FOR THE 900 SERIES PANELS

This section refers to the mining area above existing Longwalls 920 – 980, as approved by PA 06\_0021), and the Project Area (including Longwalls 900W and 910) for the Mod 1 EA titled *Angus Place Colliery, NSW Modification of Project Approval 06\_0021 under Section 75W, Part 3A* (RPS, 2010).

### 5.1. Baseline Monitoring

#### 5.1.1. Flora

Baseline and ongoing monitoring has identified nine (9) vegetation communities occurring in the approved underground mining area, associated with Longwalls 900W and 910 (see **Figure 3**). Vegetation communities as mapped during the preparation of the Mod 1 EA include:

- Newnes Plateau Narrow-leaved Peppermint - Mountain Gum - Brown Stringybark 96.7ha;
- Newnes Sheltered Peppermint - Brown Barrel Shrubby Forest 3.6ha;
- Newnes Plateau Narrow-leaved Peppermint - Silver-top Ash Layered Open Forest 258.8ha;
- Newnes Plateau Gum Hollows variant: Brittle Gum - Mountain Gum, Scribbly Gum 41.8ha;
- Pagoda Rock Sparse Shrubland 2.1ha;
- Sandstone Plateau Tea Tree - Dwarf She Oak - Banksia Rock Heath 1.5ha;
- Newnes Plateau Shrub Swamp (Endangered Ecological Community (EEC)) 3.6ha;
- Newnes Plateau Hanging Swamp (EEC) 0.5ha; and
- Cleared and Severely Disturbed Lands 2.3ha.

RPS (2010a) stated that the vegetation communities within the site were found to be in a moderate to high condition. The majority of the site, particularly wooded areas on top of the plateau, has been subject to selective timber harvesting activities by the Forestry Corporation of NSW (FCNSW) for a sustained period of time and recent fire history in some parts of the site was also evident. As a consequence large areas of forest canopy strata across the plateau exhibit a relatively young to moderately aged cohort of canopy trees with only a low to moderate density of mature trees and a natural density of juvenile to immature canopy species in the understorey strata. Where shrub layers are present they represent a somewhat low diversity, likely due to a combination of disturbance and context in relation to elevation and soil composition. Ground-cover layers exhibit a relatively diverse assemblage of grasses, herbs and prostrate shrubs in areas not exhibiting recent disturbance. Generally those areas of vegetation occurring off the plateau, where forest harvesting activity has not been undertaken, remain intact with a natural complement of native flora species.



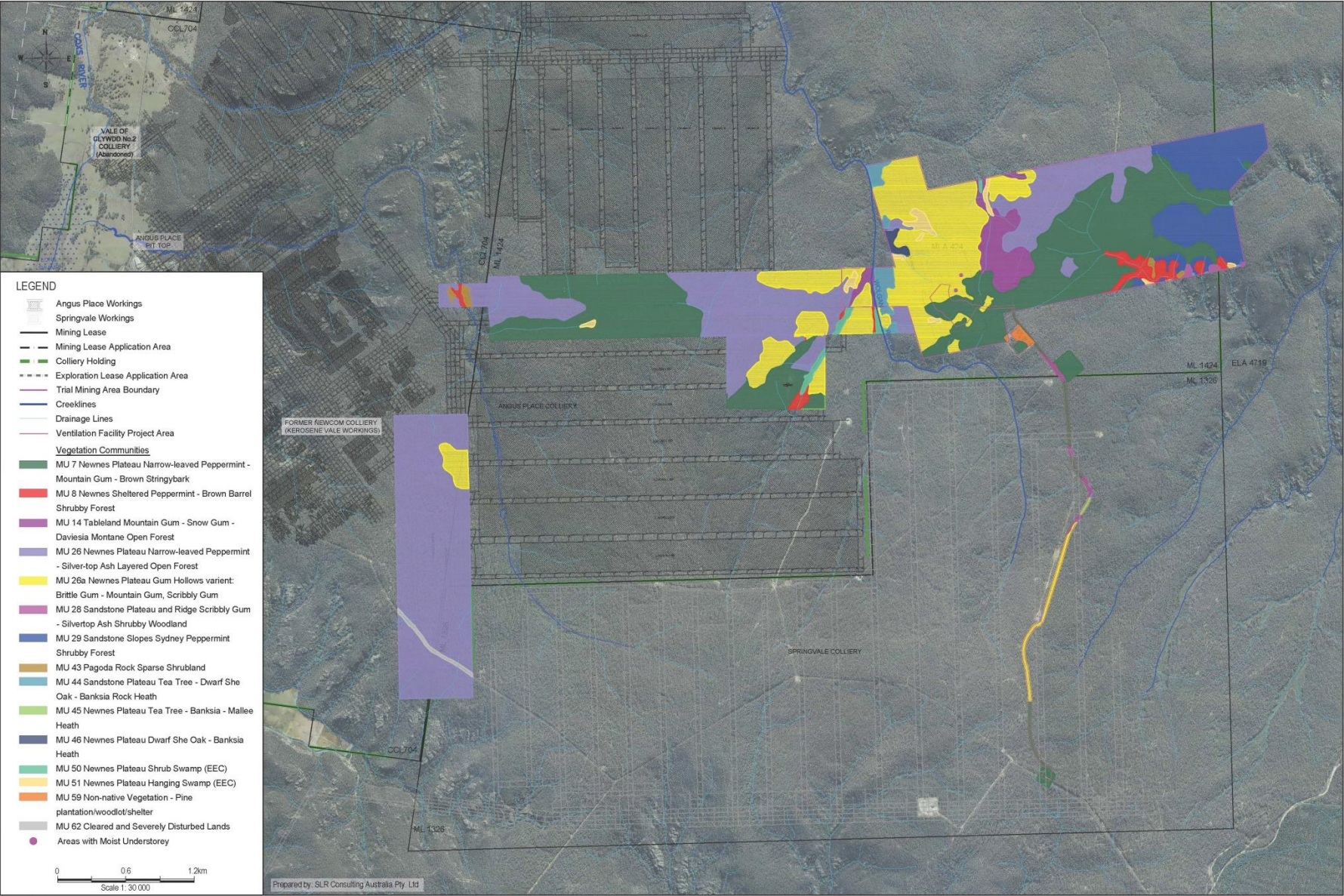


Figure 3 Vegetation Communities

Detailed descriptions of these communities are included in the Flora and Fauna Assessment (RPS, 2010a) and Subsidence Management Plan LW930 – 980 Written Report (Centennial Coal, 2005).

The Flora and Fauna Assessment for the Mod 1 EA (RPS, 2010a) found that results of database searches (DECCW Atlas of NSW Wildlife and EPBC Protected Matters Search) indicated 31 threatened flora species have been previously recorded within 10km of the site (the locality) and/or have potential habitat within the site. The Flora and Fauna Assessment also found during the flora surveys that two threatened flora species were observed within the areas of Longwalls 910 and 900W. These species were:

- *Derwentia blakelyi* (listed as Vulnerable under the NSW TSC Act 1995). RPS (2010) estimated that a potential 5,000 plants may occur within the MOD 1 EA study area, however noted that this was a conservative estimate; and
- *Persoonia hindii* (listed as Endangered under the NSW TSC Act 1995). RPS (2010) stated that 41 specimens of this species were observed within the south-eastern corner of Longwall 910, and an additional 22 specimens were observed near the western boundary of Longwall 900W.

The locations of where these species were observed is shown on **Figure 4**. One notable species, *Olearia quercifolia* (Oak Leaf Daisy Bush), which is listed as a Rare or Threatened Australian Plant (ROTAP) was recorded within degraded Newnes Plateau Shrub Swamp 250m to the east of Longwall 910, at the edge of the extent of predicted subsidence (RPS, 2010a).

Analysis of flora data from monitoring plots will be undertaken by the methodology currently used, as outlined in **Section 7.1.2**.

### 5.1.2. Fauna

During the preparation of the SMP Application for Angus Place Longwalls 930 - 980 (Centennial Coal, 2005), two long term fauna monitoring sites were established to identify impacts (if any) of mining induced subsidence on native fauna. Baseline data has been collected and will be used to monitor changes (if any) in populations that may occur. This monitoring consisted of a “desk top” survey and two seasonal field surveys. There are now, four long term fauna monitoring sites established at Angus Place to identify any potential impacts caused from mining induced subsidence on native fauna within the SMP boundary. The aim of the surveys has been to collect terrestrial fauna baseline data to be used to monitor changes in populations that may occur over time. Information regarding presence of fauna species, species diversity, population numbers and habitat characteristics were also obtained. The location of these monitoring plots are shown on **Figure 5**.

During the preparation of the Mod 1 EA (RPS, 2010), it was found that a relatively diverse range of fauna guilds are represented across the site, due to the moderately high quality of associated habitats.

In 2012, fauna surveys were carried out during autumn, spring and summer. A total of 63 bird, 12 reptile, two amphibian and 14 native (plus five introduced) mammal species have been located within the Longwall 930 – 980 SMP Approval Area during the surveys. This number of species is similar to that obtained for the last five years and can be considered as typical of that expected from the Central Tablelands. The total numbers of species found in the Longwall 930 – 980 SMP Approval Area since 2004 are: birds 107; reptiles 24; native mammals 33, and amphibians 6.

A full list of fauna recorded within the site is provided in Appendix 1 of the Flora and Fauna Assessment (RPS, 2010a) and Appendix E of the Angus Place Longwalls 930 – 980 SMP Application (Mount King Ecological Surveys, 2004). Those species observed within the site have been listed below.

### Terrestrial Mammals

Terrestrial mammals found during the Flora and Fauna Assessment (RPS, 2010) included:

- *Macropus rufogriseus* (Red-necked Wallaby);
- *M. giganteus* (Eastern Grey Kangaroo);
- *Wallabia bicolor* (Swamp Wallaby); and
- *Antechinus agilis* (Agile Antechinus).

### Arboreal Mammals

Arboreal mammals found during the Flora and Fauna Assessment (RPS, 2010a) included:

- *Petauroides volans* (Greater Glider);
- *Pseudocheirus peregrinus* (Common Ringtail Possum);
- *Trichosurus vulpecular* (Common Brushtail Possum); and
- An immature *Cercartetus nana* (Eastern Pygmy Possum) was observed on Beecroft Track to the east of Longwall 900W within open forest habitat similar to that occurring within the site. This species was not observed within the site, but its presence within similar habitat suggests that this species may utilise a wide range of habitats on the Newnes Plateau and as such its presence within the site cannot be discounted.

### Bats

Microchiropteran bats found during the Flora and Fauna Assessment (RPS, 2010a) included:

- *Chalinolobus dwyeri* (Large-eared Pied Bat);
- *Chalinolobus morio* (Chocolate Wattled Bat);
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle);
- *Rhinolophus megaphyllus* (Eastern Horseshoe Bat);
- *Saccolaimus falviventris* (Yellow-bellied Sheath-tail Bat);
- *Vespadelus darlingtoni* (Large Forest Bat); and
- *Vespadelus regulus* (Southern Forest Bat).

### Avifauna

Birds found during the Flora and Fauna Assessment (RPS, 2010a) included, but were not limited to the following:

- *Petroica multicolor* (Scarlet Robin);
- *Petroica phoenicea* (Flame Robin);
- *Daphoenositta chrysoptera* (Varied Sittella);
- *Callocephalon fimbriatum* (Gang-Gang Cockatoo);
- *Climacteris picumnus ssp. victoriae* (Brown Treecreeper – South eastern);
- *Chthonicola sagittata* (Speckled Warbler);
- *Melithreptus gularis ssp. Gularis* (Black-chinned Honeyeater); and
- *Melanodryas cucullata ssp. cucullata* (Hooded Robin – South-eastern).

Repeatable fauna monitoring methodologies are also currently utilised to ensure consistency of monitoring approach and to provide a basis for comparative studies. Analysis of fauna monitoring data is undertaken to identify statistically significant differences between each of the sites, as detailed in **Section 7.2.2**.

### 5.1.3. Aquatic Ecology

Angus Place have established a detailed aquatic ecology baseline monitoring program, that describes the existing aquatic environment, assesses potential impacts from the proposed development and advises possible mitigation and offset measures (Marine Pollution Research 2011). This monitoring program has been implemented to address the requirements of Schedule 3, Condition 11A of PA 06\_0021 (Mod 2). This condition requires that Angus Place shall provide for the establishment of a program for investigating and monitoring water quality and aquatic ecosystems in the Kangaroo Creek/Cox's River system upstream and downstream of the project's licensed water discharge points.

An Aquatic Ecology Monitoring Report for Angus Place was prepared by Marine Pollution Research in 2011. This report outlined the results of the first baseline survey undertaken as part of an aquatic ecology monitoring program for Angus Place, in relation to its existing and future underground mining operations.

The monitoring program included the sampling of 12 sites. The sites were located as follows; five in the Cox's River, two in Kangaroo Creek, two sites in the drainage lines downstream of LDP2 and LDP3, and three sites within the Wolgan River.

### 5.2. Predicted Impacts

Mining is expected to result in a maximum subsidence of 0.69m to 1.47m which is likely to result in minor surface cracking and shearing ranging in width from 1mm to 20mm (DgS, 2010). There may also be increases or decreases of surface gradients of up to 0.3 degrees (0.5%) along ephemeral watercourses or gullies that exist above the proposed longwall panels. There is also the potential for a minor increase in erosion and sedimentation along creek beds after several storm events or until a new equilibrium is reached.

Gully stormwater or groundwater seepage flows may be temporarily re-routed to below surface pathways and re-surface downstream of cracked areas where shallow surface rock is present. The temporary loss of surface water flows is unlikely to occur where deep alluvial soil profiles exist (such as within swamp areas). Creek bed sediment is likely to infill any surface cracking during storm events. Ponding depths of less than 0.1m may develop along creeks and flatter areas beneath the longwalls. Any increases of existing ponded areas or development of new ponds are likely to be in-channel and unlikely to cause significant impact to the existing environmental conditions.

The Flora and Fauna Assessment undertaken by RPS (2010a) stated that the expected subsidence from the proposed underground longwall mining within the site is expected to have low levels of direct impact on the surface vegetation, fauna and the habitats currently present. In particular, the proposal will not result in any significant impact on Threatened Species, Populations or Ecological Communities which are listed within the *Threatened Species Conservation Act 1995* (TSC Act) or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). RPS (2010a) stated that the *Derwentia blakelyi* and *Persoonia hindii* specimens identified in the Longwalls 910 and 900W area are unlikely to be impacted by the proposal, stating that the proposed development is not likely to have an adverse effect on the life cycle of the species such that viable local populations of the species are likely to be placed at risk of extinction.

While some subsidence is predicted to occur, this is not expected to result in any substantial alteration of fauna and its habitat. Due to the low level of direct impacts expected, the threatened fauna species recorded on the site are not likely to be significantly affected by the proposal.

The proposed longwall panels will have an indirect impact on the ecology of the subject site via the expected subsidence and modified subsurface hydrology subsequent to the proposed coal extraction, although projected subsidence predictions are considered unlikely to have a significant adverse impact upon ecological attributes within the study area (RPS, 2010a).

As a component of the Mod 1 EA, Aurecon prepared an Assessment of Hydrogeological Impacts (2010) reported that there will be no adverse subsidence-related impacts on the Newnes Plateau Shrub Swamp EEC located within the area that may be influenced by the extraction in Longwall 910, as the predicted incremental surface movements at the swamps are insufficient to cause any significant surface fracturing. The small hanging swamp on the southern side of Longwall 910 in the potential influence zone of the longwall has already been undermined by Longwall 920 so any additional impacts should be minimal. Similarly, Narrow Swamp is just on the edge of the zone of influence where the ground movements will be negligible when compared to the subsidence from longwall 920. Hydrological changes due to subsidence are not expected to alter the habitats and condition of the overlying vegetation communities or other components of biodiversity including terrestrial threatened species or populations, associated habitats and EEC's or Groundwater Dependent Ecosystems (GDE).

Two threatened flora species, three threatened bat species, four threatened bird species and one EEC have been recorded within the site during recent surveys, although habitat is considered suitable for a number of other threatened fauna, which may use the site on at least an intermittent basis. The proposed road upgrades, dewatering facility provisions and subsequent underground mining activities are likely to result in minimal impacts upon the available habitats on the site. The approved operations are considered unlikely to cause a significant adverse effect upon threatened species recorded within the study area or those which may potentially occur within the site on an intermittent basis (RPS, 2010a).

### 5.2.1. Subsidence Assessment Review

As a component of the *Longwalls 900W and 910 Integrated SMP/Extraction Plan*, DgS completed a review of the *Subsidence Prediction and Impact Assessment* (DgS, 2010). This review was completed to satisfy the requirement of Schedule 3, Condition 3C(e) of PA 06\_0021 (as modified), which requires the proponent to:

*“Provide revised predictions of the potential subsidence effects, subsidence impacts and environmental consequences of the proposed second workings, incorporating any relevant information obtained since this approval.”*

The report titled *Subsidence Assessment Review for the Longwalls 900W and 910 Integrated SMP/Extraction Plan, Centennial Angus Place Colliery* (DgS, 2013a), incorporated relevant information obtained by Angus Place since the approval of PA 06\_0021 (Mod 1) in August 2011, including subsidence monitoring data and observed subsidence effects following the completion of secondary extraction in Longwalls 960 and 970, and a change to the mining height within Longwalls 900W and 910.

The *Subsidence Prediction and Impact Assessment* (DgS, 2010) assessed potential subsidence effects based upon a mining height of 3.25 m. Angus Place will now mine Longwalls 900W and 910 at an extraction height up to 3.425 m. This change has been assessed by DgS (2013a) which concluded that *“the observed and predicted subsidence impacts and environmental consequences for LWs 960 and 970 have also been consistent with predictions for LWs 900W and 910, and as such, the predicted ‘negligible’ environmental consequences for LWs 900W and 910 are not expected to change from the previous assessment due to the 5% increase in mining height.”*

*“It is therefore considered that the impact management strategies for the environment and site developments (e.g. access roads and Endeavour Energy 66kV power line) that were outlined in DgS, 2010 are still valid and do not require amendment”* (DgS, 2013a). The management measures as outlined in this Flora and Fauna Management Plan are consistent with the impact management strategies outlined in the *Subsidence Prediction and Impact Assessment* (DgS, 2010).

### 5.2.2. Mod 3 Subsidence Assessment for Longwall 900W

An assessment titled *Subsidence Assessment on the Proposed Modification to Longwall 900W, Centennial Angus Place Colliery, Lidsdale* (DgS, 2013b) was completed in October 2013 to support an application to modify PA 06\_0021 (Mod 3).

The assessment considered the modifications to the longwall panel geometry, specifically extending the northern (finishing) end of Longwall 900W by 104.8 m into the barrier pillar at an extraction height of 3.425 m. DgS (2013b) concluded the following:

*“Based on the increased area of predicted subsidence effects for LW900W and ‘minor’ impacts observed to-date above LWs 920 to 970, it is assessed that the impacts due to the proposed modification to LW900W are expected to remain within the predicted range of environmental consequences outlined in DgS, 2010.”*

Subsequently there has been no need to amend the management measures outlined within this Flora and Fauna Management Plan.

### 5.2.3. Mod 3 Subsidence Assessment for Longwall 980

In October 2013, DgS prepared an assessment titled *Subsidence Assessment on the Proposed Modification to Longwall 980, Centennial Angus Place Colliery, Lidsdale* (DgS, 2013c). This assessment was prepared to support an application to modify PA 06\_0021 (Mod 3), including extending the western (finishing) end of Longwall 980 by 43.4 m into the barrier pillar at an extraction height of 3.425 m. The assessment concluded the following:

*Based on the negligible increases to the predicted subsidence effects for LW980 and ‘minor’ impacts observed to-date above LWs 920 to 970, it is assessed that the impacts due to the proposed modification to LW980 are expected to remain within the predicted range of environmental consequences outlined in DgS, 2010.*

Based upon the findings of DgS (2013c) it was considered that the current management measures outlined within this Flora and Fauna Management Plan are adequate.

## 5.3. Management/Mitigation Measures

As per the recommendations of the Flora and Fauna Assessment (RPS, 2010a), the following mitigation measures will be implemented at Angus Place to minimise potential impacts as outlined in **Section 5.2**:

- The minimal amount of clearing should take place as a general objective of the approved operations, particularly within those areas that contain hollow-bearing trees;
- Where the removal of hollow-bearing trees is not avoidable, inspection of hollow-bearing trees prior to and during clearing should be undertaken by a qualified ecologist to ensure removal and relocation of animals can occur as outlined in **Section 8.1**.

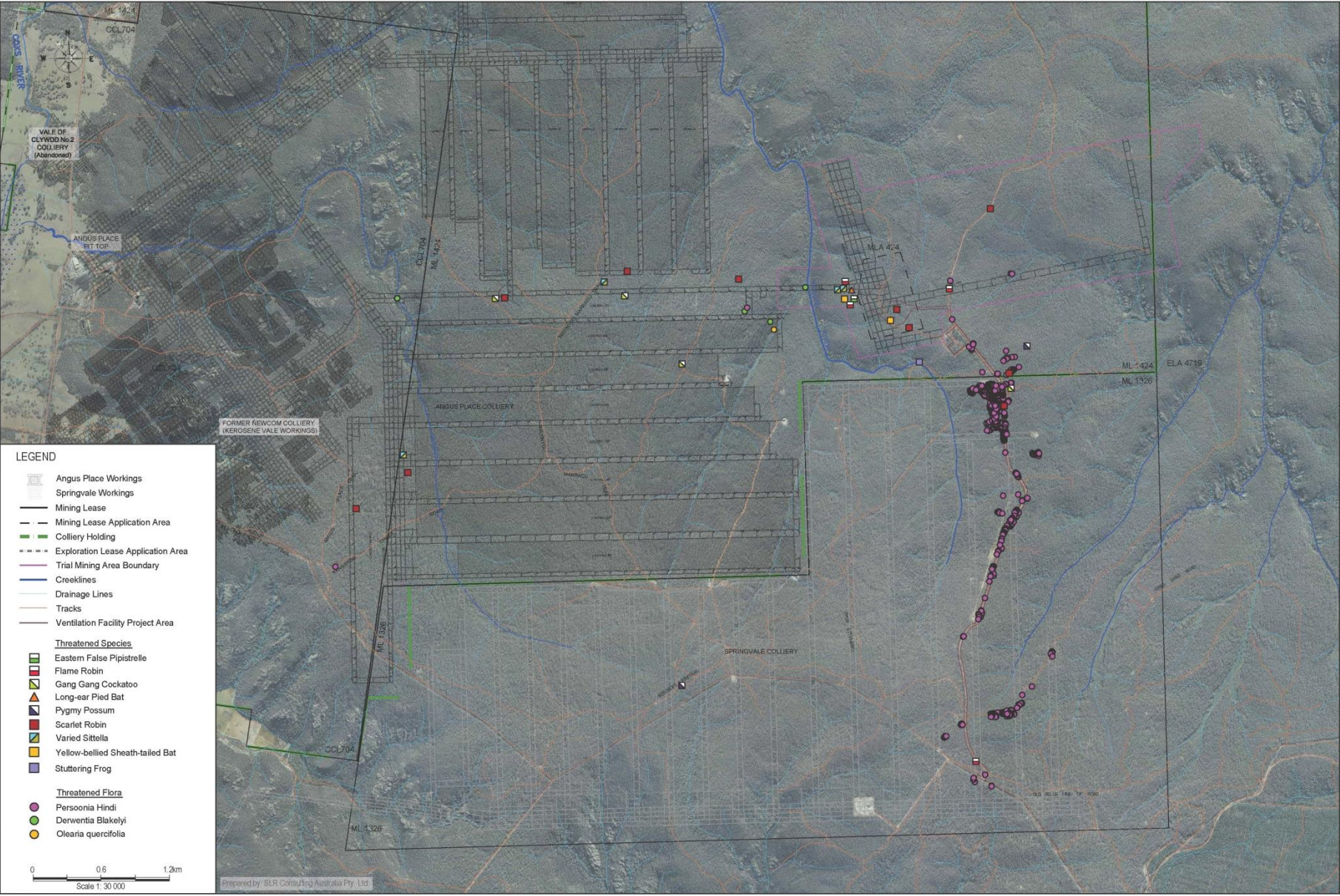


Figure 4 Threatened Species

## 6. BASELINE MONITORING AND PREDICTED IMPACTS FOR THE VENTILATION FACILITY

This section refers to the Project Application Area for the Mod 2 EA titled, *Environmental Assessment Angus Place Colliery, Ventilation Facility Project: Modification 2 of Project Approval 06\_0021* (RPS, 2012).

### 6.1. Baseline Monitoring

#### 6.1.1. Flora

The Flora and Fauna Assessment (RPS, 2012a) prepared as a component of the Mod 2 EA identified that there are 15 vegetation communities within the Project Application Area. These vegetation communities present within the Project Application Area for the Mod 2 EA have been outlined below and have been shown on **Figure 3**.

- Newnes Plateau Narrow-leaved Peppermint - Mountain Gum - Brown Stringybark 151.7ha;
- Newnes Sheltered Peppermint - Brown Barrel Shrubby Forest 8.8ha;
- Tableland Mountain Gum - Snow Gum - Daviesia Montane Open Forest 31.8ha;
- Newnes Plateau Narrow-leaved Peppermint - Silver-top Ash Layered Open Forest 52.4ha;
- Newnes Plateau Gum Hollows variant: Brittle Gum - Mountain Gum, Scribbly Gum 109.4ha;
- Sandstone Plateau and Ridge Scribbly Gum - Silvertop Ash Shrubby Woodland 1.8ha;
- Sandstone Slopes Sydney Peppermint Shrubby Forest 69.0ha;
- Pagoda Rock Sparse Shrubland 1.1ha;
- Sandstone Plateau Tea Tree - Dwarf She Oak - Banksia Rock Heath 7.6ha;
- Newnes Plateau Tea Tree - Banksia - Mallee Heath 0.4ha;
- Newnes Plateau Dwarf She Oak - Banksia Heath 2.1ha;
- Newnes Plateau Shrub Swamp (EEC) 0.4ha;
- Newnes Plateau Hanging Swamp (EEC) 6.6ha; and
- Non-native Vegetation - Pine plantation/woodlot/shelter 2.0ha; and
- Cleared and Severely Disturbed Lands 0.03ha.

There are two EEC's within the Project Application Area: MU50 - Newnes Plateau Shrub Swamp and MU51 - Newnes Plateau Hanging Swamp. The location of these vegetation communities is shown on **Figure 3**.

MU50 corresponds to one EEC as listed under the TSC Act, Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion (both MU50 and MU51 correspond to the federally listed EEC, Temperate Highland Peat Swamps on Sandstone under the EPBC Act). Both types are present within the Subsidence Assessment Area and an area of MU51 Newnes Plateau Hanging Swamp approximately 55m from the proposed Ventilation Facility (APC-VS2).

MU 50 - Newnes Plateau Shrub Swamp and MU 51 - Newnes Plateau Hanging Swamp are also classified as GDEs as they are dependent on the groundwater sourced from the locally occurring bedding planes with permeable and impermeable layers.

During the EA process two significant ecological areas were identified within proximity to the Ventilation Facility (APC-VS2). The location of these areas is shown as "Areas with Moist Understorey" on **Figure 3**.



One threatened flora species listed as Endangered under the TSC Act was observed within the Project Application Area, *Persoonia hindii*. *Persoonia hindii* is an erect to spreading shrub with numerous shoots (or “stems”) which arise from underground rhizomes. Due to its rhizomatous nature each individual is referred to as a “stem” as a number of seemingly individual plants may actually be a single plant connected underground. As the Subsidence Assessment Area (DgS, 2012) is predicted to have negligible subsidence *Persoonia hindii* are not likely to be impacted therefore the areas of the proposed infrastructure resulting in vegetation clearance (approximately 17.3ha) were focused on during surveys. Approximately 1,269 stems were recorded within this area where the removal of vegetation would occur. There are relatively high numbers of this species in the local area and across the Newnes Plateau.

RPS (2012a) stated that the vegetation condition within the Project Application Area was moderately high. The Project Application Area and surrounds, for a distance of greater than 2km in any direction, contain native vegetation that is unbroken apart from occasional fire trails and small clearings. Being a State Forest, the native vegetation is also periodically selectively logged but such impacts are of a temporary nature in terms of habitat connectivity. Analysis of flora monitoring data will be undertaken as described in **Section 7.1.2**.

### 6.1.2. Fauna

Three species of macropod were observed within the Project Application Area; *Macropus rufogriseus* (Red-necked Wallaby), *M. giganteus* (Eastern Grey Kangaroo) and *Wallabia bicolor* (Swamp Wallaby) and signs of *Vombatus ursinus* (Common Wombat) were encountered frequently during field surveys (RPS, 2012a).

Two arboreal mammal species were recorded during spotlighting *Petauroides volans* (Greater Glider), *Pseudocheirus peregrinus* (Common Ringtail Possum). In addition, one Eastern Pygmy Possum (*Cercartetus nanus*), a species listed as vulnerable under the TSC Act was captured just outside (approximately 120m) the Project Application Area boundary. This species is known to occur throughout the Newnes Plateau (RPS, 2012a).

One microchiropteran bat species was positively identified, *Saccolaimus flaviventris* (Yellow-bellied Sheath-tail-bat – TSC Act: Vulnerable).

The Blue Mountains Water Skink is listed as Endangered under the TSC Act and the EPBC Act. Targeted and opportunistic searches for *Eulamprus leuraensis* (Blue Mountains Water Skink) were undertaken. Only a number of common skink species were recorded, including two species related to *Eulamprus leuraensis*, namely, *E. heatwolei* (Yellow-bellied Water Skink) and *E. quoyii* (Eastern Water Skink). The swamp areas are not considered to be suitable habitat for the Blue Mountains Water Skink (RPS, 2012a).

Analysis of fauna monitoring data will be undertaken as described in **Section 7.2.2**.

### 6.1.3. Aquatic Ecology

The Wolgan River, small streams and drainage lines are present within the Project Application Area. A baseline survey investigating macro invertebrate and fish diversity occurring within the swamps and their surroundings has been undertaken by Marine Pollution Research during Spring 2010. Twenty two macro invertebrate species including a range of species that are highly sensitive to water pollution were recorded. The aquatic survey effort is ongoing at Angus Place.

There is not considered to be any suitable aquatic habitat within the Project Application Area for species listed under the *Fisheries Management Act 1994*.

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## 6.2. Predicted Impacts

### 6.2.1. Construction Impacts and Consequences

#### Aquatic Ecology

The Wolgan River and its contributing drainage lines and a small stream are within the Subsidence Assessment Area. As negligible subsidence resulting from the underground roadways is predicted, there are not anticipated to be impacts on the surface aquatic environment. This is explained in further detail within the Subsidence Prediction and Impact Assessment (DgS, 2012).

Whilst there are small streams and drainage lines within the Project Application Area, none are located within the areas proposed for vegetation clearance (17.3ha) as these are located on ridgelines rather than midslopes or gullies where no streams or drainage lines occur. Adequate sediment and accidental spill controls would be required and such measures are identified in the Surface Water Assessment (GHD, 2012).

#### Flora

The area of vegetation clearance associated with the proposed infrastructure would be approximately 17.3ha comprising approximately 15ha of native vegetation. None of the vegetation communities to be impacted upon mapped within the Project Application Area correspond to any EEC's as listed within the TSC Act (or EPBC Act).

As stated in Section 6.1.1, *Persoonia hindii* is a shrub with numerous shoots (or "stems") which arise from underground rhizomes. Due to its rhizomatous nature each individual is referred to as a "stem" as a number of seemingly individual plants may actually be a single plant connected underground. The vegetation clearance would result in the removal of up to approximately 1,269 *Persoonia hindii* stems (this would apply to the power supply line along the western side of Sunnyside Ridge Road). The local population is estimated to consist of approximately 12,420 to 13,688 stems (depending on the approach taken – see RPS, 2012a). Therefore this represents the removal of an estimated total of 9.3 to 10.2% of the known local population (based on the project proposed). Amendments to the design of the project during the EA process have resulted in avoiding the loss of significantly higher numbers of *Persoonia hindii* and this is described in detail in the Flora and Fauna Assessment (RPS, 2012a). Due to the remaining existence of over 11,000 stems in the local population and the removal of approximately 1,269 stems the project is considered unlikely to have an adverse effect on the ongoing viability of this species (RPS, 2012a). There is potential for cumulative effects on *Persoonia hindii* resulting from loss due to a number of projects and activities in the area and this is addressed in further detail in Section 9.21 of the Mod 2 EA (RPS, 2012). Mitigation measures for the project are identified in **Section 6.3**.

The narrow, linear area of infrastructure works is not expected to disrupt or isolate any vegetated areas or disrupt any corridors allowing flora or fauna species or propagules to freely travel within the area.

Other potential impacts during construction of the project may include the introduction or spread of weeds or pathogens from construction plant and machinery and reduction in aquatic biodiversity from increased sedimentation of surface waters. The direct and indirect impacts to biodiversity are described in the section below.

## Groundwater Dependent Ecosystems

The Assessment of Hydrogeological Impacts (Aurecon, 2012) reports that because the project is expected to have no impact on the groundwater aquifer levels that feed the swamps, there is not expected to be an impact from the underground roadways on GDE's. Therefore, there would be no adverse subsidence related impacts on the shrub and hanging swamps within the Subsidence Assessment Area.

For impacts from the proposed infrastructure, the design of the project has been revised during the EA process to avoid and minimise such impacts and buffers of at least 50m around the Hanging Swamp and the two potentially ecological significant areas (see **Figure 3**) near the Ventilation Facility (APC-VS2) are proposed within which no disturbance to vegetation or works would take place. These areas would be protected from changes in water quality and quantity (such as from run off) through mitigation such as the sediment control and runoff measures identified in the Surface Water Assessment (GHD, 2012). Whilst it is desirable to have as large a protective buffer as possible, a buffer of at least 50m exceeds the minimum reference of 40m identified in the *Water Management Act 2000*, and is informed by past experience of OEH's requirements for similar buffers.

The areas of identified GDE's MU50 and MU51 within the Project Application Area are relatively small at 0.38ha and 6.57ha respectively. Therefore, it is likely that the negligible impacts on these communities would not cause an adverse effect on the extent of the community such that their local occurrence is likely to be placed at risk of extinction (RPS, 2012a).

## Threatened Species Assessment

The project is considered unlikely to cause a significant adverse effect upon threatened species recorded within the Project Application Area or those which may potentially occur within it on an intermittent basis.

### 6.2.2. Operation Impacts and Consequences

Potential impacts during operation are stormwater runoff such as from the roof of the substation or the concreted surfaces, minor land disturbances, noise from the substation and Ventilation Facility (APC-VS2) and potential weed invasion into disturbed land and land surrounding the infrastructure.

### 6.3. Management/Mitigation Measures

As per the recommendations of the Flora and Fauna Assessment (RPS, 2012a), Angus Place will implement the following mitigation measures to minimise potential impacts as outlined in **Section 6.2**:

The mitigation measures are as follows:

- Measures identified for the Surface Water Assessment (GHD, 2012), Rehabilitation Strategy (GSS Environmental, 2012) and the Soil and Land Resources Assessment (GSS Environmental, 2012a) will be implemented to protect flora and fauna. In particular, such measures are the regrading and erosion and sediment controls for the Ventilation Facility (APC-VS2), management and monitoring of the sedimentation ponds, harvesting of site runoff, the employment of soil stripping and handling techniques, an inventory of detailed soil resources and bunding of chemical and fuel storage areas.
- Specific detail regarding the management and mitigation of impacts on *Persoonia hindii* at Angus Place will be included in the *Persoonia hindii* Management and Research Program which will be developed in consultation with the OEH and FCNSW by suitably qualified and experienced persons prior to the commencement of activities that involve clearing of *Persoonia hindii* stems as required under Schedule 3, Condition 24A of PA 06\_0021. In summary, mitigation and management for *Persoonia hindii* will comprise:

- Seed collection and seed banking from plants/populations of *Persoonia hindii* that are identified for removal. This will be undertaken once relevant scientific approval has been granted. This may include the deposition of collected seeds in the NSW Seedbank at the Royal Botanic Gardens or the NSW Seedbank of Greening Australia. This approach assists in the conservation of the genetic pool held by the plants proposed for removal, may allow for their future propagation and therefore reduces the overall impact on the species;
  - Translocation of plants/populations of *Persoonia hindii* that are scheduled for removal. This will only be undertaken once relevant scientific approval has been granted. Undertaking a 'salvage dig' of mature plants is often seen as being the least effective method of translocation (Vallee et al., 2004). However, in this situation where plant removal is unavoidable, it is considered an appropriate mitigation measure provided that adequate care is taken during the salvage dig and that translocated populations are monitored after re-establishment. Possible sites for the re-establishment of *Persoonia hindii* include other areas within 1km that already contain lower densities of the species (thus may contain unexploited habitat niches). Specific locations will be identified if this approach is approved by relevant authorities. Observations of this species growth habit could also be undertaken at the same time;
  - Direct management of residual populations adjoining the Project Application Area in consultation with stakeholders and the landowner (FCNSW). This includes undertaking weed management near populations of *Persoonia hindii* that may be threatened by weed invasion and an increased awareness of populations adjacent to road verges that could be impacted upon by roadworks on the Newnes Plateau (through consultation with FCNSW) or working with other parties (e.g. FCNSW, NSW Rural Fire Service) to ensure that appropriate fire regimes (at intervals of 5-50 years; considered the appropriate fire frequency for dry sclerophyll shrub/ grass forest after Kenny et al., 2004) occur, rather than very frequent fire which has the potential to reduce the abundance of *Persoonia hindii* across the Newnes Plateau. This will also include specific measures such as project staff training, specific inclusion of this issue in the Construction Environmental Management Plan (CEMP) (or any other applicable management plan for the project), and inductions for construction staff that includes specific education on protecting this species;
  - A desktop review of the status of records other than those collected by RPS or that are within the NSW Atlas of Wildlife will be undertaken. These may include but are not limited to herbarium specimens within the Royal Botanic Gardens Sydney and other herbariums along with records of *Persoonia hindii* from other field surveys, for example those held by FCNSW and from within the OEH YETI database;
- The minimum amount of vegetation clearing will take place;
  - An Angus Place Environmental Representative or Ecologist will be present to supervise vegetation clearing to ensure fauna is handled appropriately;
  - Appropriate measures will be employed to ensure that machinery working within the Project Application Area does not bring materials (soils etc.) onto the sites that may infect onsite vegetation with *Phytophthora cinnamomi* or Myrtle Rust (*Uredo rangelii*) fungus;
  - The Newnes Plateau Hanging Swamp to the west of the Ventilation Facility (APC-VS2) will be protected by a buffer of at least 50m within which no works and no disturbance to native vegetation will occur and the boundaries of the buffer zone will be physically marked and inspected during construction by Angus Place personnel;
  - Ongoing weed monitoring to be instituted and potential weed infestations appropriately managed to ensure surrounding communities (particularly hanging swamps and shrub swamps) are protected from invasive species;
  - The two areas of significant ecological value to the north of the Ventilation Facility (APC-VS2) (see **Figure 3**) identified in the Flora and Fauna Assessment (RPS, 2012a) will be protected by a buffer of at least 50m within which no works will occur and the boundaries of the buffer zone will be physically marked and inspected during construction by Angus Place personnel;

- Training regarding the buffer zones will be provided to all personnel engaged at the relevant sites; and
- Minor land disturbances during operation will be subject to the same mitigation measures that are implemented for the construction stage as identified.

Habitat re-instatement for the return of fauna will include the following where possible:

- Hollow bearing trees that were removed will be replaced, or equivalent nesting structures, such as nest boxes will be erected. Hollow bearing trees will also be retained and used as ground habitat;
- Woody debris will be reinstated randomly over the sites being rehabilitated. This will be sourced from material stockpiled from clearing or imported from other sources or sites if not available;
- Woody material not used for habitat re-instatement will, if possible, be chipped, and placed on the ground after seeding to decompose and add to the organic content as well as aid in erosion control; and
- Rocks that were removed prior to construction will be replaced in approximate size and location. These will form an important habitat feature for many of reptiles that inhabit these sites. Any large rocky material that was brought onto the construction site will be used for this purpose within the site, given that it does not interfere with revegetation/rehabilitation outcomes, rather than removed from the site.

## 7. FLORA AND FAUNA MONITORING PROGRAM

Flora and fauna monitoring sites established at Angus Place are relevant to both current and proposed mining areas. The monitoring locations, frequency and reporting requirements vary depending on where mining is occurring. Monitoring of flora and fauna within the Longwalls 930 – 980 SMP Application Area is undertaken in accordance with the Longwalls 930 – 980 Environmental Monitoring Program, as required by the SMP Approval. Following the completion of mining in Longwall 980, Angus Place will commence secondary extraction within the Longwalls 900W and 910 Project Area, which will be undertaken in accordance with the Longwalls 900W and 910 Integrated SMP/Extraction Plan, including a Longwall 900W and 910 Environmental Monitoring Program (following approval).

If variations to flora and fauna monitoring program are made, the site will instigate a review and consequent update of this Flora and Fauna Management Plan and the Environmental Monitoring Program. Any variations will be submitted to the Director-General of DP&E for approval in consultation with relevant stakeholders

### 7.1. Flora

The location of established flora monitoring sites are shown in **Figure 5. Table 3** outlines the flora monitoring locations, vegetation communities and establishment dates. Angus Place propose to establish an additional three flora monitoring sites above Longwalls 900W and 910. The location of these proposed monitoring sites is shown in **Figure 5**.

Due to the number and location of current flora monitoring sites, only *Persoonia hindii* and weed monitoring of the Ventilation Facility Project Area were recommended as being necessary by RPS (2012a).

Following cessation of mining in Longwalls 920 – 980, Angus Place will consider rationalising the frequency of monitoring, in consultation with the relevant stakeholders.

**Table 3. Flora Monitoring Sites**

Area and Vegetation Community	Site	Easting	Northing	Establishment Date
West Wolgan Swamp (MU50 Newnes Plateau Shrub Swamp)	WW01	234499	6304343	March 2002
	WW02	234510	6304306	August 2002
	WW03	234513	6304708	July 2004
	WW04	234447	6304792	July 2004
	WW05	234779	6304918	March 2006
	WW06	234727	6304863	March 2006
Narrow Swamp (MU50 Newnes Plateau Shrub Swamp)	NS1	236015	6305085	July 2004
	NS2	235947	6304991	July 2004
	NS4	235797	6304710	July 2004
Narrow Swamp (MU50 Newnes Plateau Shrub Swamp)	NS3	235664	6304448	July 2004
Kangaroo Creek North (MU50 Newnes Plateau Shrub Swamp)	KC3	233070	6304283	August 2006
	KC4	233050	6304395	August 2006
East Wolgan (MU50 Newnes Plateau Shrub Swamp)	EW01	236443	6304264	July 2004
	EW02	236428	6304107	July 2004
Tri-star (MU50 Newnes Plateau Shrub Swamp)	TRI01	236565	6308755	May 2011
	TRI02	236439	6308765	May 2011
Twin Gully (MU50 Newnes Plateau Shrub Swamp)	TG01	237378	6306876	May 2011
	TG02	237212	6307036	May 2011

### 7.1.1. Methodology

All sites at Angus Place, are permanently marked with 20m x 20m plots within which vegetation abundance and condition was measured, with the exception of two sites (EW01 and NS01) where 10m x 40m quadrats are used instead due to narrower sections of swamp.

At each site, observers record all species within the plot; estimate cover/abundance using a modified Braun-Blanquet scale (**Table 4**); and estimate condition of common species using a pre-determined condition scale (**Table 5**). Site photographs are also recorded.

**Table 4. The Modified Braun-Blanquet scale**

Cover/abundance Score	Interpretation
1	Cover less than 5% of site and rare
2	Cover less than 5% of site and uncommon
3	Cover of less than 5% and common
4	Cover of 5-20% of site
5	Cover of 20-50% of site
6	Cover of 50-75% of site
7	Cover of greater than 75%

**Table 5. The Condition Scale**

Condition ranking	Interpretation
1	Severe damage/dieback
2	Many dead stems
3	Some dead branches
4	Minor damage
5	Healthy

A quantitative assessment of weedy species is also undertaken. Transects are established between the diagonal corners of the plots; at approximately 1 m intervals along these transects, a 0.5m x 0.5m quadrat was placed on the ground to assess the presence or absence of weeds. For those sites with 10m x 40m plots (EW01 and NS01) the assessment was carried out at 2m intervals.

Monitoring is undertaken in Summer, Autumn and Spring by a specialist consultant.

### 7.1.2. Data Analysis

Data will be analysed by the specialist consultant with a report and comprehensive summary prepared. If threatened species are located/reported within the quadrats, specific monitoring for each species will be conducted during subsequent surveys.

Flora monitoring at Angus Place is undertaken to identify trends that have been observed between seasonal monitoring periods throughout the year, and to make comparisons with previous years. The primary objective of this monitoring program is to determine whether mining activities impact the health, species composition, and extent of the Newnes Plateau Shrub Swamp.

Analysis of flora data from monitoring plots will be undertaken by the methodology currently used. Currently, all cover/abundance and condition data that is collected is entered into Microsoft Excel for basic analysis, as well as being examined with the statistical package Plymouth Routines in Multivariate Ecological Research. This program is designed specifically to analyse multivariate ecological data. To examine plant compositional changes between years or seasons at different sites, cover/abundance scores are transformed using presence/absence transformations as there are few statistical tools for data with unequal measurement classes such as Braun-Blanquet. A Bray-Curtis dissimilarity matrix is calculated with this presence/absence data and non-metric multi-dimensional scaling (nMDS) plots are generated.

The axes of nMDS plots cannot be directly compared to the input variables, but basic interpretation is relatively straight-forward in that sites with similar species composition and abundance appear physically closer on the graph. nMDS analysis generates a stress value which relates to the goodness of fit between the distances between points on the plot and the original distances in the dissimilarity matrix. The stress value shown on the graph are the lowest stress value obtained from all the re-runs of the data. The lower the stress value the better the plot 'fits', or represents the distances in the dissimilarity matrix. Stress values of up to 0.2 are considered to show a reasonable fit of data. Data will be analysed and reports generated by a specialist consultant and provided to Angus Place who will compare results to previous monitoring periods. A comparative summary will also be provided by the consultant. Summaries of the results of these assessments will be outlined in the Annual Environmental Management Report (AEMR)/Annual Review, which is publically available on the Centennial Coal website.



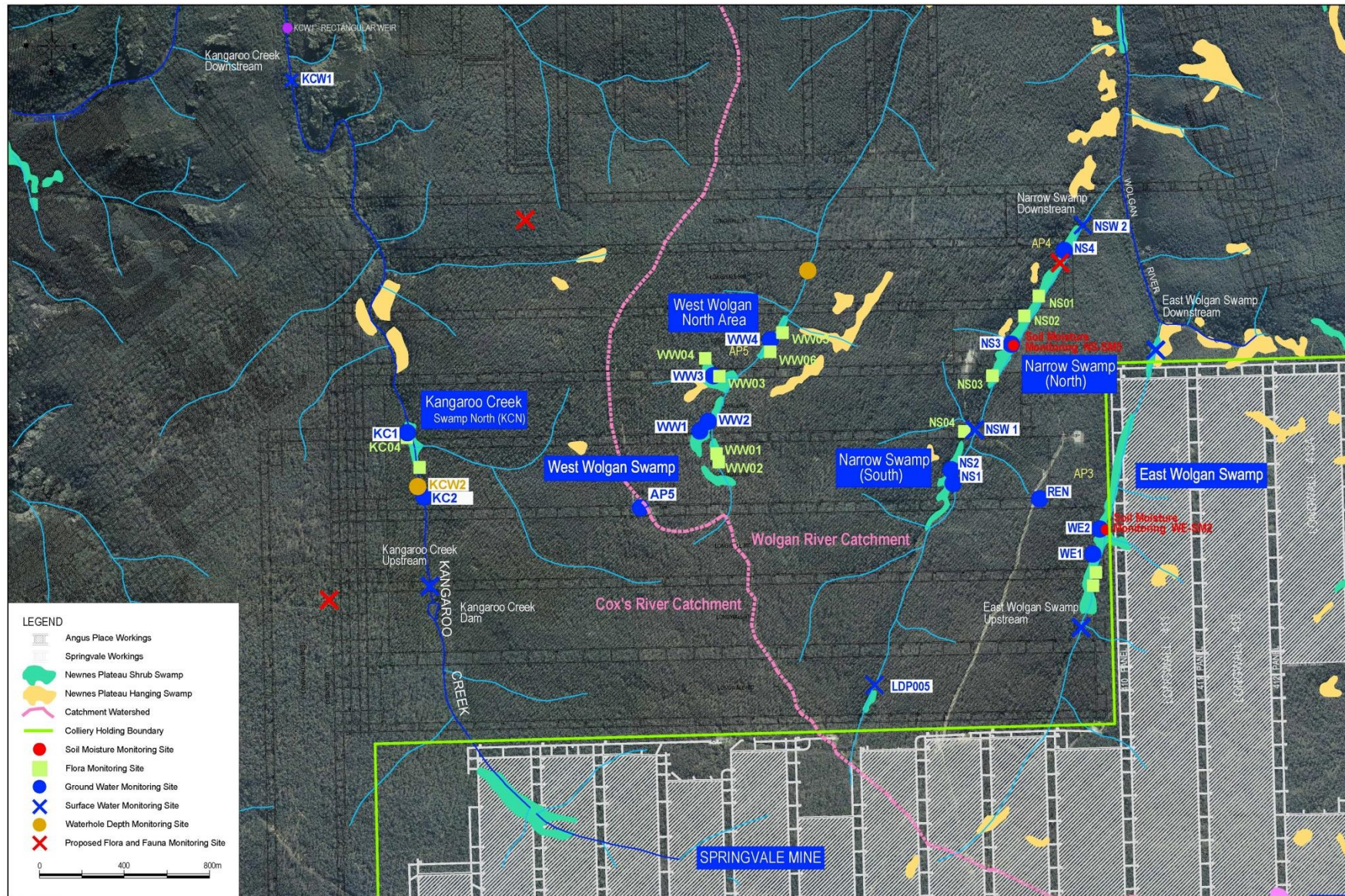


Figure 5 Environmental Monitoring Locations

## 7.2. Fauna

The location of established fauna monitoring sites is outlined in **Table 6** and is shown on **Figure 5**. Angus Place also propose to establish an additional three fauna monitoring sites above Longwalls 900W and 910. The location of these proposed monitoring sites is shown in **Figure 5**.

**Table 6. Fauna Monitoring Sites**

Area	Site	Easting	Northing
East Wolgan Swamp	AP3	236391	6304315
Narrow Swamp	AP4	236157	6305113
West Wolgan Swamp	AP5	234837	6304696
Kangaroo Creek	KC	233204	6304434

### 7.2.1. Methodology

Four long term fauna monitoring sites have been established at Angus Place to identify any potential impacts caused from mining induced subsidence upon native fauna. Information regarding presence of fauna species, species diversity, population numbers and habitat characteristics are obtained. All sites primarily sample wetland habitat (shrub swamps), although the quality of the surrounding woodland habitat is also surveyed. The fauna monitoring undertaken at Angus Place is primarily focussed on threatened species listed under the TSC Act 1995 and the EPBC Act 1999.

The faunal surveys will sample a full range of faunal groups using the following techniques:

- Hair tubes;
- Spotlighting;
- Nocturnal call playback;
- Remote cameras;
- Diurnal bird censuses;
- Bat echolocation recording;
- Herptofauna searches;
- Camera traps; and
- Secondary indications and incidental observations.

The proposed fauna monitoring sites for Longwalls 900W and 910 (see **Figure 5**) have been selected based on their suitability to provide habitat attributes for a majority of the species which are likely to occur within these areas.

Fauna surveys will be performed at three permanent census plots established during the commencement of the fauna monitoring program. Opportunistic pest monitoring will also be undertaken in association with these works.

All monitoring sites sites will be surveyed during autumn, spring and summer. Inspections will be carried out by a qualified and experienced fauna consultant.

### **Hair Tubes**

Surveys will be undertaken using Faunatech Hair Tubes across the monitoring sites. These will be baited with rolled oats, peanut butter and honey. At each site 5 arboreal and 5 terrestrial Hair Tubes will be set. Trees in which arboreal Hair Tubes are erected will be sprayed each day with a brown sugar and water mix.

Hair Tubes target small-medium mammals such as dasyurids (eg. Antechinus and Dunnarts), rodents (e.g. rats and mice), gliders and bandicoots.

Any hair samples retrieved during the surveys will be sent to a qualified consultant for analysis.

### **Spotlighting**

Spotlighting will be undertaken across the monitoring sites using 75-Watt hand-held spotlights and head torches. A combination of vehicular and on foot spotlighting transects will be undertaken within and between the monitoring sites, targeting tracks and other areas safely accessible during night time periods.

### **Nocturnal Call Playback**

Pre-recorded calls of Koala, Owl, and Glider species with the potential to occur within the monitoring sites will be broadcast during the surveys in an effort to elicit vocal responses or to attract the species to the call playback site. The calls will be broadcast through an amplification system (loud hailer) designed to project the sound for at least 1km under still night conditions. Owl species targeted include the Barking Owl (*Ninox connivens*), Powerful Owl (*Ninox strenua*) and the Masked Owl (*Tyto novaehollandiae*).

As detailed by Kavanagh and Peake (1993) and Debus (1995), the call of each species will be broadcast for at least five minutes, followed by five minutes of listening and stationary spotlighting. Following the final broadcast the immediate area will be spotlighted on foot.

### **Diurnal Bird Censuses**

Birds can be identified by direct observation or by recognition of calls or distinctive features such as nests, feathers and owl regurgitation pellets. Surveys will involve walking the one hectare census plot for twenty minutes early in the morning (at dawn) as activity decreases with time from dawn (DEC 2004).

Methods adopted for bird surveys are to include:

- Discrete one hectare survey plots; and
- Surveys conducted for a period of twenty (20) minutes at dawn or dusk at each monitoring site.

### **Bat Echolocation Recording**

Anabat recording using Anabat II units (made by Titley Scientific) will be undertaken to determine whether insectivorous microchiropteran bat species are utilising the airspace over the monitoring sites for foraging. The units will be set out prior to nightfall and recording continues through the night until early morning. Surveys for bats are best done in the warmer months when activity is optimised. Survey points will be subject to one Anabat II recorder set up for at least one whole survey night during each survey period, with emphasis placed on those areas deemed likely to provide potential foraging and flyway sites for microchiropteran bat species.

Ultrasonic echolocation bat surveys will include:

- One sound activated recording device is to be utilised for an entire night per monitoring site; and
- Calls analysed by an experienced bat call analyst.

### **Camera Traps**

To enable comparisons to be made between surveys, a standardised camera trapping program will be used. Cameras will be placed in the same location (fixed monitoring point), at the same height (300 - 500mm above ground), at the same time of year, for the same amount of time (3 nights minimum), facing the same direction and using the same baits. This method will be used to monitor both native and pest species presence.

Camera traps can be used to monitor a wide variety of fauna species accurately and efficiently. Camera traps are used as a tool to conduct surveys or record general observations as they provide better results than standard surveys, such as live trapping (Paull et al, 2011). Detection rate is one of the simplest methods of measuring animals that are photographed at camera trap sets, which provides a general index of abundance, and is recorded as:

- $\text{Detection Rate} = \text{Total number of events of a species} / \text{deployment time}$ .

If each camera trap is queried separately, a probability of detection per-site can be derived by calculating the detection of each species by each camera each day.

Camera trapping will include:

- At least 3 trap nights per fauna census plot; and
- The use of both carnivore and omnivore baits.

### **Secondary Indications and Incidental Observations**

Opportunistic sightings and secondary indications (scratches, scats, diggings, tracks etc.) of resident fauna will be noted. Such indicators include:

- Distinctive scats and scents left by mammals;
- Collection of predator scats for analysis;
- Nests made by various guilds of birds;
- Whitewash, regurgitation pellets and prey remains from Owls;
- Skeletal material of vertebrate fauna;
- The calls of fauna;
- Tracks and scratches left by fauna; and
- Chewed Allocasuarina cones indicative of feeding by *Calyptorhynchus lathami* (Glossy Black-cockatoo).

#### **7.2.2. Data Analysis**

Data will be analysed and reports generated by a specialist consultant and provided to Angus Place who will compare results to previous monitoring periods. A comparative summary will also be provided by the consultant. Data from the surveys is analysed to show:

- Species counts;
- Habitat characteristics;
- Species diversity; and
- Species richness.

Repeatable fauna monitoring methodologies are currently utilised to ensure consistency of monitoring approach and to provide a basis for comparative studies. Non-parametric Kruskal-Wallis Analysis of Variance on Ranks tests are undertaken on fauna monitoring data to identify statistically significant differences between each of the sites. Measurements of habitat characteristics derived from trap site descriptions are also used to provide an index of habitat complexity to determine changes over time of the habitats surveyed. The index system currently used is the Habitat Complexity Score developed by Catling and Burt (1995). This system scores parameters including tree cover, tall and short shrub cover, ground cover, logs/rocks and litter cover, from 0 to 3. Statistical analyses (paired t-test and non-parametric Wilcoxon Signed Rank Test), are also used to identify statistically significant differences between groups of indices.

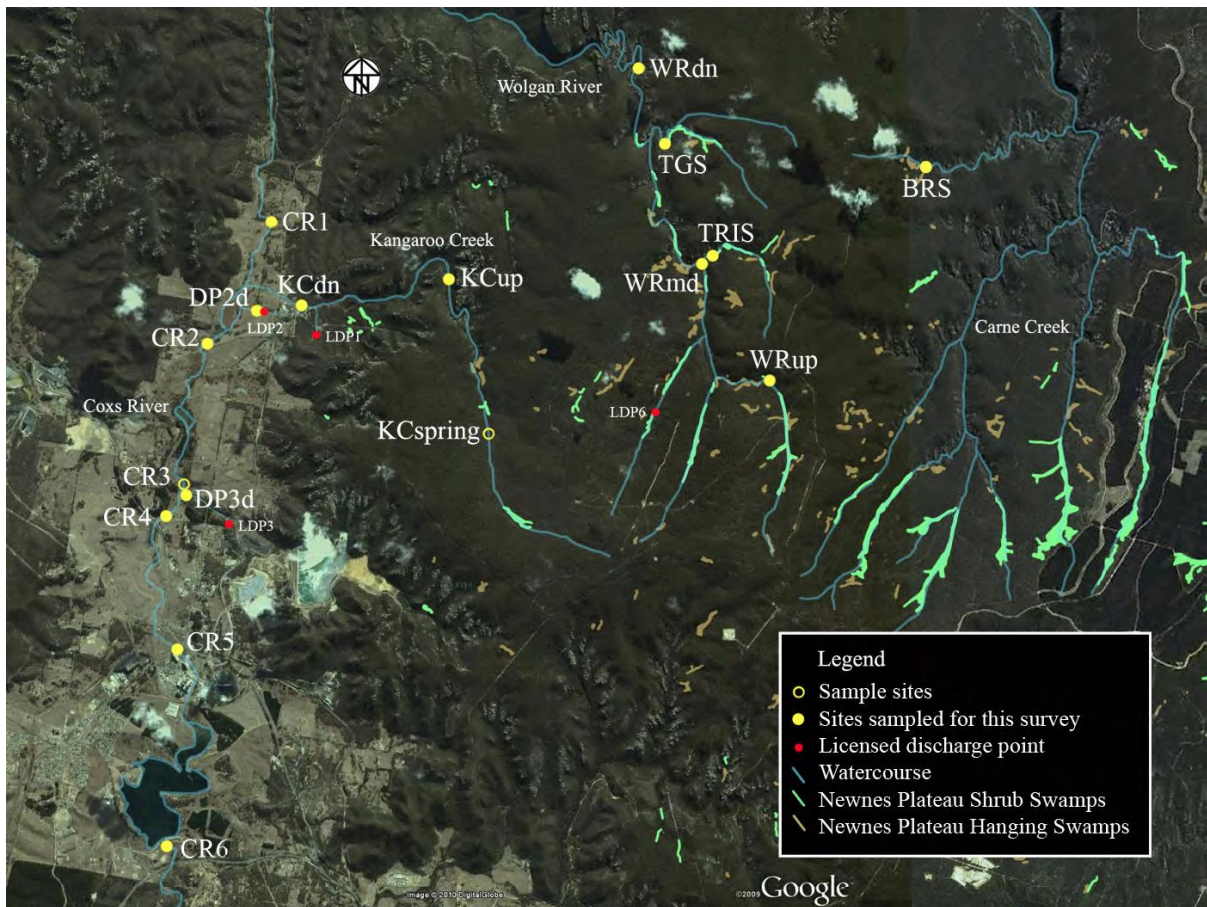
### 7.3. Aquatic Ecology

The location of aquatic ecology monitoring sites have been shown in **Figure 6**. **Table 7** outlines the physical location of aquatic ecology monitoring sites.

**Table 7. Aquatic Ecology Monitoring Sites**

Area	Site	Easting	Northing
Kangaroo Creek	KCup	232588	6306501
	KCdn	230368	6306102
Coxs River	CR1	229809	6307337
	CR2	228691	6305324
	CR4	228361	6302773
	CR5	228529	6300752
	CR6	228533	6297741
	DP2d	229752	6306048
	DP3d	228599	6303181
Wolgan River	WRup	237495	6305114
	WRmd	236420	6306880
	WRdn	235388	6309805
	TGS	235780	6308693
	TRIS	236571	6307015
Carne Creek	BRS	239961	6308489

Upper Coxs River site CR1 is located upstream of Angus Place LDPs and is surrounded by active grazing pastures.



**Figure 6 Aquatic Ecology Monitoring Sites**

### 7.3.1. Methodology

The following methodology has been outlined in accordance with the Angus Place Aquatic Ecology Monitoring Report (Marine Pollution Research, 2011).

The aquatic macroinvertebrate assemblages are determined using the standardised National River Process and Management Program River Bio-assessment Manual methods (NRPMP, 1994) as adapted for the National River Health Program (referred to as the AusRivAS method). The AusRivAS protocol provides a number of definitions of sites and habitats within sites for selection of sampling locations and recommends that, wherever possible, two habitats (riffles and edges) be sampled at each site.

The following AusRivAS definitions are relevant and sampling has conformed to these definitions:

- A site is "a stream reach with a length of 100m or 10 times the stream width, whichever is the greater";
- A riffle habitat is "an area of broken water with rapid current that has some cobble or boulder substratum". However, "sampling riffles where the substratum consists predominantly of large boulders may be difficult and may not produce reliable results"; and
- Edge habitat is "an area along the creek with little or no current".

Ideally, a particular reach within each of the sample locations is selected on the basis of it being (i) a reach with high drought resistance (generally based on pool size, depth and riparian cover) and (ii) a reach with high aquatic habitat diversity; ideally deep pools connected by gentle riffles, abundance of stream bed litter, presence of snags, presence of aquatic vegetation and good extent of cover of overhanging riparian vegetation.

Field methods for the sampling of water quality, macroinvertebrates, fish and other vertebrates are outlined within Angus Place Aquatic Ecology Monitoring Report (Marine Pollution Research, 2011).

### 7.3.2. Data Analysis

#### Aquatic Macroinvertebrate Data

The aquatic invertebrate assemblage for each sample site is described in terms of the site taxa diversity (number of individual AusRivAS taxa) and in terms of a site SIGNAL score. SIGNAL (Stream Invertebrate Grade Number Average Level) is a pollution tolerance index for stream macroinvertebrates. The indices are derived by correlation analysis of macroinvertebrate occurrence against water chemical analysis. The water chemistry attributes generally used are temperature, turbidity, conductivity, alkalinity, pH, dissolved oxygen, total nitrogen and total phosphorus (Marine Pollution Research, 2011).

Each macroinvertebrate family has been assigned a SIGNAL score ranging from 10 (very pollution intolerant) to 1 (very pollution tolerant). For the present study SIGNAL-2 scores were applied. Taxa with no published SIGNAL score were excluded from the site SIGNAL analysis. Once taxa SIGNAL indices have been applied individual site SIGNAL indices are calculated (as the mean) from all site taxa with SIGNAL scores. Creek SIGNAL scores are calculated as the mean of all taxa SIGNAL value occurrences recorded within each creek system for a survey. Site and creek SIGNAL scores are then summarised and compared across each survey and between surveys. As a general guide site SIGNAL Indices are graded into the following categories:

- SIGNAL Index > 6 = Healthy Unimpaired
- SIGNAL Index 5-6 = Mildly Impaired
- SIGNAL Index 4-5 = Moderately Impaired
- SIGNAL Index < 4 = Severely Impaired.

However, as the intent of this study is to assess site condition relative to other sites plus over time, the site scores are used for these comparison purposes rather than as overall study area condition indices. That is, the overall changes in site indices over time are of greater interest than the basic and generalised 'health' scores (as per Chessman et al 1997). The indices are derived by correlation analysis of macroinvertebrate occurrence against water chemical analysis. The water chemistry attributes generally used are temperature, turbidity, conductivity, alkalinity, pH, dissolved oxygen, total nitrogen and total phosphorus.

#### Fish Survey Data

Taxonomic identification of fish species are made to the levels required by AusRivAS.

#### Description of Site Condition

A standardised description of site condition is used to compile a stream site condition index, based on a modified version of the River-Creek-Environment (RCE) method developed by Petersen (1992), as reported by Chessman et al (1997) for the greater Hunter River catchment. The index is compiled by giving each of the 13 RCE descriptors a score between 0 and 4, then summing the scores to reach a maximum possible score of 52. Scores are then expressed as a percentage.

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## 8. PROCEDURES

### 8.1. Vegetation Clearing

Where clearing of trees has been required for the construction of the Ventilation Facility (APC-VS2) and associated infrastructure, the following procedures have taken place:

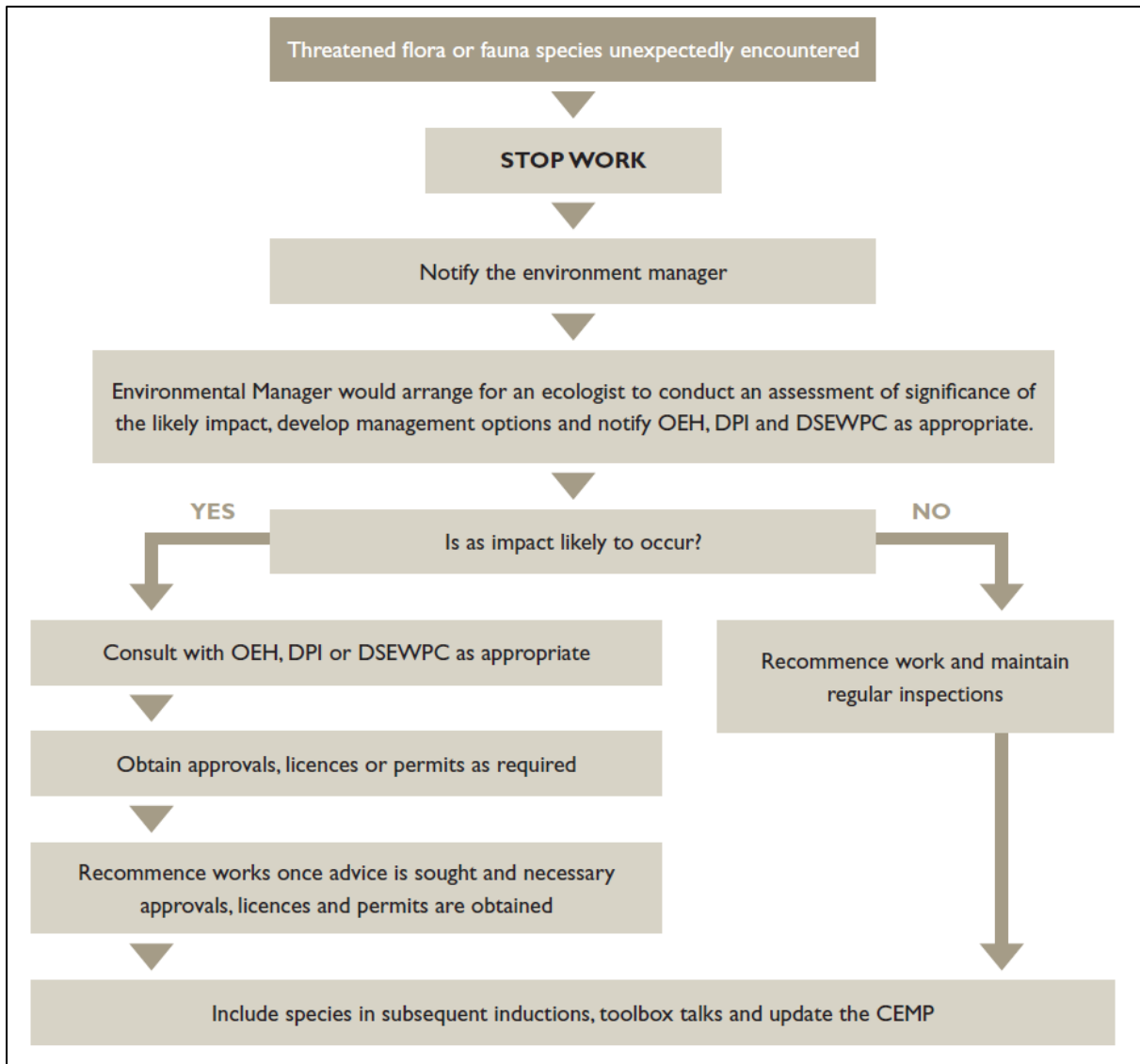
- Pre-clearing survey of individual trees which require removal, specifically directed towards detecting any fauna present. Investigation of trees should be conducted on the day that they are to be felled, to detect any individual animals present at the time;
- Where arboreal species are detected in a tree, that tree and a 10 metre buffer around it are to be left uncleared, and the animal left to vacate the tree of its own accord. Generally, this will occur overnight;
- Inspection of any safely accessible tree-hollows by a qualified ecologist prior to and during clearing should be undertaken to ensure removal and relocation of animals can occur and the following protocol should be adopted:
  - A qualified ecologist shall supervise the removal of the hollow-bearing trees to ensure the protection of native fauna;
  - Trees shall be soft-felled to minimise impacts upon any fauna inside (described below); and
  - Felled habitat trees shall be left for two days to allow fauna inside to escape unless the absence of fauna can be confirmed at an earlier time.
- Careful felling of hollow-bearing trees (as described below), and checking of tree-hollows to locate any wildlife;
- Collection of any wildlife located during clearing activities after all the above mitigation measures have been undertaken, and its immediate release into adjacent bushland; and
- In the event that an animal is found injured, the local Wildlife Information Rescue and Education Services (WIRES) organisation will be contacted immediately for assistance on phone number 1300 094 737.

Vegetation clearing for the Ventilation Facility Project has been completed with an ecologist present to supervise vegetation clearing to ensure fauna was handled appropriately and in accordance with commitments made in the Mod 2 EA (RPS, 2012). During the clearing of native vegetation for the Ventilation Facility Project, no animals were required to be removed by the ecologist.

#### 8.1.1. Unexpected Threatened Species Finds Procedure

Angus Place has adopted the Biodiversity Guidelines Unexpected Threatened Species Finds Procedure (RTA, 2011). This procedure has been implemented to detail the actions to be taken if a threatened flora or fauna species is unexpectedly encountered on site. This procedure is provided as **Figure 7**.





**Figure 7 Unexpected Threatened Species Finds Procedure (RTA, 2011)**

Photos and descriptions of *Persoonia hindii* have been included in the CEMP. Details regarding the Unexpected Threatened Species Finds Procedure will be outlined to all relevant personnel and contractors in a site specific induction prior to undertaking works that have the potential to impact upon threatened flora and fauna species.

### 8.1.2. Hollow-bearing Tree Management Protocol

Tree-hollows are an important resource for many native fauna species, and are vital for some species. The retention and protection of hollow-bearing trees is an important element in the maintenance of biodiversity and in the execution of an environmentally sound development. To this end, specific protocols relating to hollow-bearing trees that would be implemented include:

- Hollow-bearing trees removed to be used in rehabilitation works around the site; and
- If hollow bearing trees are to be felled, a controlled felling technique will be used (described below).

### 8.1.3. Controlled Felling of Trees

In the case where a tree with hollows has to be felled, the tree is assumed to provide habitat for fauna. A staged approach to clearing of any hollow-bearing trees will be undertaken to enable arboreal fauna (particularly gliders and possums) to safely leave the work area. This method provides a disturbance stimulus and time for fauna to leave the area. It also is likely to reduce the need for human intervention in the rescue and/or translocation of arboreal fauna. This method is recommended as preferable over the situation where the habitat tree is felled in the midst of a previously cleared swathe and escaping fauna must cross a treeless and open expanse (exposed to high risks of predation) to reach secure habitat.

To minimise the risk of harm to any animal that may inhabit the tree, the following procedure shall be followed:

- Nudge the tree with mechanical plant to induce any fauna to vacate the tree. Then thump the tree two or three times sufficiently to cause vibration and sudden movement of small branches;
- Watch and wait for fauna to vacate the tree (5 minutes or more may be required for slow moving fauna). Repeat if necessary;
- Select the preferred direction of fall and any alternative directions;
- Extend the plant to push the tree at a good height above ground. Push the tree in the preferred direction of fall. If the tree is too strong for the mechanical pusher, try another preferred direction;
- If the tree is too strong to be pushed with all roots intact, excavate and cut some of the roots on the restraining side;
- Push the tree over, or repeat the steps above until the tree can be successfully pushed over;
- Once felled the trees will be examined for the presence of fauna by a qualified ecologist, who will examine potential shelter sites (hollows, nests, termitaria, epiphytes, decorticating bark, crevices);
- When an animal is detected in a tree, clearing activities are to be directed elsewhere to allow fauna time to leave, or the animal will be carefully removed from the tree. After fauna are observed to leave or are removed safely from the tree, the habitat tree will be disturbed again and placed carefully in the direction of remaining trees (care is to be taken to ensure trees are not pushed into the 'Exclusion Zone'); and
- Any fauna disturbed during clearing procedures will first be permitted to escape into adjacent habitat. Where this does not occur or where fauna appear to be shocked or injured, fauna will be carefully captured and held in appropriate circumstances and a local wildlife rescue organisation will be contacted if required.

Using this method, the tree falls gently to the ground, restrained by the remaining root system. Fauna are generally not harmed. Note that a large excavator can serve as a tree pusher and enables the tree to be felled very accurately.

In these situations, as for tree pushing, the tree should be thumped to induce fauna to vacate it, albeit with an axe or other hand held tool. Some reduction in the speed of fall of a tree is achievable by well designed cutting of the tree. The appropriate design addresses the locations of the cuts and the size and shape of the wedge removed in the direction of fall. In cases where several adjacent trees have to be cut, it may be possible to create a bed of vegetation to break the fall of the most significant habitat tree.

Appropriate temporary housing for fauna is species-dependent. An appropriate large safe container will be used for capture of koalas, which are then transferred into a thick sack. Gliders, possums, snakes and frogs will be similarly held individually in a calico bag until release in adjacent habitat. Nesting birds and eggs will be placed in a covered cardboard box equipped with soft cloth.

Rescued fauna will be protected from exposure to heat and removed from the area undergoing clearing activities to minimise exposure to noise. Any fauna which cannot be released immediately or by the evening of the day clearing occurred will be passed onto a wildlife rescue organisation/carer.

Appropriate measures are to be employed to ensure that machinery working within the site does not bring materials (soils etc.) onto the sites that may infect onsite vegetation with *Phytophthora cinnamomi*.

#### 8.1.4. Weed Control

Flora monitoring data for species present on the Newnes Plateau (including weed species) has been collected by Angus Place since 2004. This data can be used as baseline data to establish pre-disturbance weed conditions for the Ventilation Facility Project. Results from the 2012 flora monitoring found that weed species were generally rare in the Newnes Plateau EECs, with *Hypochaeris radicata* being the most frequently encountered. Other weed species recorded were *Cirsium vulgare*, *Holcus lanatus* and *Sonchus* spp.

Similarly, the 2012 Flora and Fauna Assessment undertaken by RPS (2012a) for the Mod 2 EA identified three weed species within the Project Application Area. These species were *Hypochaeris glabra*, *Hypochaeris radicata*, and *Centaurium erythraea*. This is consistent with the species identified in the Flora and Fauna Assessment (RPS, 2010).

Angus Place use a contractor to provide weed identification and eradication services. The contractor visits the pit top/surface on a monthly basis for maintenance weed control, and identifies the presence of any weeds. Monitoring of weeds in disturbance areas on the Newnes Plateau is undertaken quarterly and maintenance activities are undertaken as needed. Following identification, the contractor carries out an inspection with the Environment and Community Coordinator and proposes a weed spraying program including nomination of the chemicals to be used. Weed control will be carried out where required, as identified during the inspections of the Pit Top and disturbance areas of the Newnes Plateau. All weed species identified will be targeted for eradication. Weed spraying is conducted by the contractor as required following approval by the Environment and Community Coordinator.

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

- Hosing down equipment in an approved wash down area before entry to site;
- Herbicide spraying (in consultation with FCNSW) or scalping weeds from topsoil stockpiles prior to re-spreading topsoil;
- Inspections to identify potential weed infestations; and
- Identifying and spraying existing weed populations on-site together with ongoing weed spraying over the life of the mine.

The spread of declared noxious weeds will be prevented by using the measures above. The monitoring and control of weed populations using herbicides within the site will significantly reduce weed infestations. Weed control, if required, will be undertaken in a manner that will minimise soil disturbance. Any use of herbicides will be carried out in accordance with the relevant 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.

A report on weed control activities undertaken each year is provided in the AEMR/Annual Review.

Ongoing weed monitoring is to be instituted and potential weed infestations be appropriately managed to ensure surrounding communities are protected from invasive species. The annual flora monitoring undertaken at Angus Place also includes a quantitative assessment of weedy species at a number of sites.

Transects are established between the diagonal corners of the plots; at approximately 1m intervals along these transects, a 0.5m x 0.5m quadrat is placed on the ground to assess the presence or absence of weeds. For those sites with 10m x 40m plots the assessment is carried out at 2m intervals. A weed contractor and/or rehabilitation consultant will monitor disturbance areas for weeds following rehabilitation, and the results of this monitoring will be reported in the AEMR/Annual review. Monitoring of weeds in rehabilitation areas will be undertaken quarterly during the first two years following rehabilitation, and biennially thereafter. Inspections will be opportunistic after significant rainfall events.

Further detail regarding weed monitoring in rehabilitation areas is provided in Section 7 of the Angus Place Ventilation Facility Rehabilitation Management Plan.

#### **8.1.5. Pest Animal Species**

Current fauna monitoring methodologies utilised at Angus Place (including monitoring pest species) include Elliott ground traps, tree-mounted Elliott traps, Tomahawk ground traps, tree-mounted tomahawk traps, large Elliott traps, glider funnels, hair funnels, Anabat recording, remote cameras, call broadcasting, litter searches, bird counts, and amphibian searches. These methods are used to monitor species identity, the approximate numbers/level of species abundance, and the observations of any impacts of pest species to the site.

Currently at Angus Place, pest management is not considered a significant environmental risk, and no pest management activities are deemed necessary. Notwithstanding, a Pest Management Strategy exists for the site, which outlines the management of pest animals on site. Any future pest animal control measures required will be undertaken in accordance with this Pest Management Strategy. Pest management methodologies that may be implemented as required to prevent detrimental impacts to the site include ground baiting, trapping, shooting, and strategic aerial control programs. Goats, foxes, cats, rabbits, pigs and dogs will be controlled in accordance with Livestock Health and Pest Authority procedures.

Further detail regarding pest management can be found in the Pest Management Strategy.

#### **8.1.6. Access to Environmentally Sensitive Areas**

No areas of European heritage significance have been identified within the Angus Place lease areas. The SMP Application (Centennial Coal, 2005), Mod 1 EA (RPS, 2010) and the Mod 2 EA (RPS, 2012) found no Aboriginal heritage sites with the potential to be impacted by longwall mining within the Angus Place extended mining area and analysis of the landforms observed during site survey suggests that it is unlikely such sites would be present.

A Cultural Heritage Impact Assessment (RPS, 2010b) prepared as a component of the Mod 1 EA noted, that occasional individual artefacts may occur undetected within the Angus Place mining area due to the low ground visibility. Despite the fact such sites were not detected in the current survey due to poor visibility, no further effort is warranted to identify or assess such sites.

The EA and SMP Application identified one environmentally sensitive area, which is associated with the vegetation community known as the Newnes Plateau Shrub Swamp. The Newnes Plateau Shrub Swamp is listed under the Federal EPBC Act and the State TSC Act. The EPBC Act lists Temperate Highland Peat Swamps on Sandstone (of which Newnes Shrub Swamps are a subset) as a Nationally Threatened Ecological Community. The TSC Act lists Newnes Plateau Shrub Swamps as an EEC.

The NPSS exists above underground mining areas on land controlled by FCNSW. Protection of the NPSS from underground mining occurs through the SMP process and subsidence and Environmental Monitoring Programs approved by the DTIRIS. Access to NPSS areas is controlled by FCNSW.

Should any further environmentally sensitive areas be identified within Angus Place lease areas, a system will be developed to control access as required.

### 8.1.7. Managing Conflicts Between Flora and Fauna and Aboriginal Heritage

No Aboriginal heritage sites with the potential to be impacted by longwall mining were found in the Angus Place extended mining area and analysis of the landforms observed during site survey suggests that it is unlikely such sites would be present.

With no known Aboriginal heritage sites and no offset areas that require maintenance in the form of weed spraying, erosion and sediment control or broad-scale planting, there is no known conflict between flora and fauna and Aboriginal heritage. Should a potential conflict arise, Angus Place will develop a strategy at the time to manage the conflict. The strategy will include liaison with Local Aboriginal Land Councils and regulatory stakeholders.

## 9. ROLES AND RESPONSIBILITIES

All employees and contractors of Angus Place are responsible for environmental management. However, various positions in the organisation have roles, responsibilities and authorities for managing environmental aspects, action plans, programs and controls.

Key site personnel and responsibilities associated with the Flora and Fauna Management Plan are provided in **Table 8**.

**Table 8. Key Personnel and Accountabilities**

Position	Responsibility
Mine Manager	<ul style="list-style-type: none"> <li>Overall responsibility for environmental compliance with Mining Lease, OEH Licence, Project Approval and mining approvals;</li> <li>Planning for adequate resources to implement this Flora and Fauna Management Plan; and</li> <li>Approving revised versions of this Flora and Fauna Management Plan.</li> </ul>
Environment and Community Coordinator	<ul style="list-style-type: none"> <li>Coordinate environmental monitoring, reporting, inspections, environmental training, authority liaison, maintaining complaints register, community liaison;</li> <li>Allocation of resources within area of responsibility and budget;</li> <li>The implementation and adherence to this Flora and Fauna Management Plan;</li> <li>Providing adequate training to employees and contractors regarding their requirements under this Flora and Fauna Management Plan;</li> <li>Contractor management; and</li> <li>Delegating tasks associated with this Flora and Fauna Management Plan when responsible personnel are absent.</li> </ul>
Centennial Group Environmental Manager	<ul style="list-style-type: none"> <li>Co-ordination of external audits, corporate reporting and management.</li> </ul>

## **10. CONTINGENCY PLAN**

In accordance with the requirement of Schedule 5, Condition 2 of PA 06\_0021 (as modified) contingency plans relevant to flora and fauna have been outlined within the Site Water Management Plan and the approved Subsidence Management Plan. Additional contingency plans for the Longwalls 900W and 910 area will be included in the Integrated SMP/Extraction Plan.

## **11. REPORTING**

Results from the flora and fauna monitoring, undertaken in accordance with this Flora and Fauna Management Plan, will be reported in the AEMR/Annual Review with an analysis against the relevant impact assessment criteria.

A copy of the AEMR/Annual Review will be provided to DP&E, OEH, DTIRIS, Sydney Catchment Authority, Greater Lithgow Council and the Community Consultative Committee.

All flora and fauna monitoring undertaken as part of the approved SMP Application, including updates on the condition of control plots and any potential impact from mining, is reported every 4 months and is available to relevant stakeholders as requested.

## **12. PERIODIC REVIEW**

An internal audit and review of this plan will occur in the first quarter of each year following the preparation of the AEMR/Annual Review and EPL Annual Return. The plan will be updated where inadequacies are identified either as part of the annual review, through routine monitoring or where records obtained in accordance with this document indicate that it is warranted.

A review of this Flora and Fauna Management Plan will be instigated in the event that there is a change to how flora and fauna management is implemented at Angus Place. Any modifications to the Flora and Fauna Management Plan will be undertaken in consultation with the appropriate government agencies, and be forwarded to the Director-General of the DP&E for approval.

### 13. REFERENCES

- Angus Place Colliery, 2006, *Longwalls 930 - 980 Subsidence Management Plan Application Variation Written Report*.
- Angus Place Colliery, 2006, *Longwalls 930 - 980 Subsidence Management Plan*.
- Angus Place Colliery, 2011, *Environmental Assessment Response to Submissions*.
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# Appendix 1: Stakeholder Consultation



## Centennial Angus Place



18<sup>th</sup> of October 2013

### By Post

Mr Greg Kininmonth  
Team Leader Environment  
Department of Trade and Investment, Regional Infrastructure and Services  
Division of Resources and Energy  
PO Box 674  
Wollongong NSW 2500

### Attention: Greg Kininmonth

Dear Greg,

### RE: Angus Place Flora and Fauna Management Plan

I refer to Schedule 3, Condition 3C(h) of the Angus Place Project Approval PA 06\_0021 (as modified) which states:

*"Appropriate revisions to the Flora and Fauna Management Plan required by condition 24, which has been prepared in consultation with OEH and DRE, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on aquatic and terrestrial flora and fauna."*

To satisfy this condition and to ensure consistency with the currently approved operations following the approval of PA 06\_0021 (Mod 2) (the Ventilation Facility Project) in April 2013, Angus Place submitted a revised Flora and Fauna Management Plan to OEH and DRE in May 2013. OEH provided comments regarding the document on 16 July 2013 and comments were also received from DRE on 5 June 2013 (see Appendix 1). Subsequently, Angus Place has completed amendments to the Flora and Fauna Management Plan to address the comments received by OEH.


Attached to this letter as Appendix 2 are two tables summarising the OEH (Table 1) and DRE (Table 2) comments and how they have been addressed by Angus Place

in the revised Flora and Fauna Management Plan. A copy of the revised Management Plan has been provided as Appendix 3.

To this end the colliery is seeking written notification that the document has been received and feedback regarding the revised Flora and Fauna Management Plan as part of the consultation process as required by Schedule 3, Condition 3C(h) of PA 06\_0021 (as modified). Angus Place requests that this feedback is received by 8 November 2013. By default, if no comment or extension request is received by Angus Place by this date it will be assumed there are no objections and the document will be submitted for approval to the Department of Planning and Infrastructure.

If you require further information regarding the changes to the enclosed Flora and Fauna Management Plan, please contact the Angus Place Environment and Community Coordinator, Natalie Conroy by telephone, (02) 6354 8938 or by email, [natalie.conroy@centennialcoal.com.au](mailto:natalie.conroy@centennialcoal.com.au).

Yours sincerely

A handwritten signature in black ink, appearing to read 'Brian Nicholls', written over a large, light-colored oval shape that serves as a placeholder or a stylized element.

**Brian Nicholls**

Manager of Mining Engineering



## Centennial Angus Place



18<sup>th</sup> of October 2013

### By Post

Mr Marc Irvin  
Senior Threatened Species Officer  
Biodiversity Conservation Unit  
Office of Environment and Heritage  
PO Box 2111  
Dubbo NSW 2830

**Attention: Marc Irvin**

Dear Marc,

### RE: Angus Place Flora and Fauna Management Plan

I refer to Schedule 3, Condition 3C(h) of the Angus Place Project Approval PA 06\_0021 (as modified) which states:

*“Appropriate revisions to the Flora and Fauna Management Plan required by condition 24, which has been prepared in consultation with OEH and DRE, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on aquatic and terrestrial flora and fauna.”*

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Yours sincerely

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**Brian Nicholls**

Manager of Mining Engineering



**Office of  
Environment  
& Heritage**

Your reference: PA 06\_0021 Sch 3, Cnd 3C(h)  
Our reference: DOC13/79453  
Contact: Liz Mazzer 6883 5325  
Date: 5<sup>th</sup> November 2013

Brian Nicholls  
Manager of Mining Engineering  
Angus Place Colliery  
PO Box 42  
Wallerawang NSW 2845

Dear Mr Nicholls,

**RE: ANGUS PLACE FLORA AND FAUNA MANAGEMENT PLAN**

I refer to your letter dated 18<sup>TH</sup> October 2013 regarding the revised Angus Place Flora and Fauna Management Plan (FFMP). Thank you for providing the Office of Environment and Heritage (OEH) with the opportunity to comment on this revised plan.

OEH has reviewed the FFMP against our comments provided in our letter dated 16<sup>th</sup> July 2013. The revised FFMP has addressed most of the issues raised in Attachment B of that letter. Outstanding issues are:

**6.2.1 Construction Impacts and Consequences**

As OEH has commented previously, the high number of recorded *Persoonia hindii* stems is not a reliable indicator of the population of this species given that it is rhizomatous (and thereby the number of individual plants may actually be quite low). Also, given that this species is geographically limited to the Newnes Plateau and likely to be of low genetic diversity, the statement by the proponent that this project is considered unlikely to have an adverse effect on the ongoing viability of this species is inconclusive.

It is the lack of information regarding the population size, growth habit and propagation of this species that has led to the *Persoonia hindii* Management and Research Program project to fulfil condition 24A of the Angus Place MOD 2 Determination.

*Recommendation*

While some detail regarding the *P. hindii* Management and Research Program is included in section 6.3 of the FFMP, OEH recommends that section 6.2.1 of the FFMP also references the *P. hindii* Management and Research Program, including the reasons for the Program being included as a condition in the Determination.

**6.3 Management / Mitigation Measures**

With regard to *P. hindii*, section 6.3 now refers to the "Research and Monitoring Program". It is assumed that this is the *Persoonia hindii: Management and Research Program* provided to OEH by Bernie Kirsch on 2nd October 2013.

It is still unclear how the *P. hindii* plants to be translocated will be protected from future disturbance / development.

*Recommendations*

- The correct title of the *P. hindii* Management and Research Program be used in the FFMP to avoid any confusion.
- A discussion regarding long-term protection of translocated *P. hindii* plants is included in the FFMP.

Should you require further information please contact Liz Mazzer, Conservation Planning Officer on (02) 6883 5325 or [liz.mazzer@environment.nsw.gov.au](mailto:liz.mazzer@environment.nsw.gov.au).

Yours sincerely,

A handwritten signature in cursive script, appearing to read 'SArdill'.

**SONYA ARDILL**  
**Senior Team Leader Planning**  
**North West Region**



# Centennial Angus Place



15<sup>th</sup> of November 2013

## By Post

Director General  
NSW Department of Planning  
PO Box 39  
SYDNEY NSW 2001

## Attention: Colin Phillips

Dear Colin,

## RE: Angus Place PA 06\_0021 Management Plan Review

As required under Schedule 5 Condition 4 Angus Place Colliery has reviewed and revised the Site Water Management Plan and Flora and Fauna Management Plan following receipt of the second modification to Angus Place Colliery's Project Approval 06\_0021 and during the preparation of the Extraction Plan for 900W and 910. Details regarding these changes have been documented to the Department on the 8<sup>th</sup> of May and 30<sup>th</sup> September 2013.

The above mentioned plans have been finalised in November following consultation with stakeholders. OEH and DTRIS have been consulted during the preparation of the Flora and Fauna Management Plan. The Site Water Management Plan has been prepared in consultation with EPA, SCA and NOW.

The management plans and evidence of consultation is attached for your review and if satisfactory approval.

If you require further information regarding this letter, please contact the Angus Place Environmental Co-ordinator, Natalie Conroy on (02) 6354 8938 or [natalie.conroy@centennialcoal.com.au](mailto:natalie.conroy@centennialcoal.com.au).

Yours sincerely,

**Brian Nicholls**

Manager of Mining Engineering





## Centennial Angus Place



5 March 2014

### By Post

Mr Greg Kininmonth  
Team Leader Environment  
NSW Department of Trade and Investment, Regional Infrastructure and Services  
Division of Resources and Energy  
PO Box 674  
Wollongong East NSW 2520

### Attention: Greg Kininmonth

Dear Greg,

### RE: Angus Place Flora and Flora Management Plan

I refer to Schedule 3, Conditions 3C(h) and 24, and Schedule 5, Condition 4 of the Angus Place Project Approval PA 06\_0021 (as modified) which require that appropriate revisions to the Flora and Fauna Management Plan are undertaken in consultation with relevant stakeholders within 3 months of any modification to the consent.

To satisfy these conditions and to ensure consistency with the currently approved operations following the approval of PA 06\_0021 (Mod 3), Angus Place is submitting a revised version of the Flora and Fauna Management Plan to relevant stakeholders for review and comment. Evidence of this consultation has been provided in **Appendix 1**. Mod 3 was approved in December 2013 and allows for the extension in length of Longwalls 980 and 900W by 43.4 metres (m) and 104.8 m, respectively, and an increase to the maximum extraction height of Longwalls 980, 900W and 910 from 3.25 m to 3.425 m.

Attached to this letter as **Appendix 2** is a table summarising the changes that have been made in the revised Flora and Fauna Management Plan. A copy of the revised Flora and Fauna Management Plan has been provided as **Appendix 3**. All revisions to the Flora and Fauna Management Plan have been made in red font for clarity.

To this end the colliery is seeking written notification that the document has been received and feedback regarding the revised Flora and Fauna Management Plan as part of the consultation process as required by relevant conditions of PA 06\_0021 (as modified). Angus Place requests that this feedback is received by 2 April 2014. By default, if no comment or extension request is received by Angus Place by this date it will be assumed there are no objections and the document will be submitted for approval to the Department of Planning and Infrastructure.

If you require further information regarding the changes to the enclosed Flora and Fauna Management Plan, please contact the Angus Place Environment and Community Coordinator, Natalie Conroy by telephone, (02) 6354 8938 or by email, [natalie.conroy@centennialcoal.com.au](mailto:natalie.conroy@centennialcoal.com.au).

Yours sincerely

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**Brian Nicholls**

Manager of Mining Engineering



## Centennial Angus Place



5 March 2014

### By Post

Mr Marc Irvin  
Senior Threatened Species Officer  
Biodiversity Conservation Unit  
Office of Environment and Heritage  
PO Box 2111  
Dubbo NSW 2830

**Attention: Marc Irvin**

Dear Marc,

### RE: Angus Place Flora and Flora Management Plan

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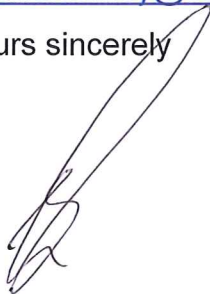
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Yours sincerely

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**Brian Nicholls**

Manager of Mining Engineering



# Centennial Coal

Angus Place

Angus Place Colliery

PO Box 42

Wallerawang NSW 2845

