

**Austar Coal Mine Pty Ltd**

# **BIODIVERSITY MANAGEMENT PLAN**

**December 2013**

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Prepared by  
**Umwelt (Australia) Pty Limited**  
on behalf of  
**Austar Coal Mine Pty Ltd**

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## **APPENDICES**

- 1 Project Approval Conditions**
- 2 Standard Flora and Condition Assessment Proforma**

# 1.0 Introduction

## 1.1 Background

Austar Coal Mine Pty Ltd (Austar), a subsidiary of Yancoal Australia Pty Limited (Yancoal), operates the Austar Coal Mine, an underground coal mine located approximately 10 kilometres south of Cessnock in the Lower Hunter Valley in NSW (see **Figure 1.1**). The mine is an aggregate of the former Ellalong, Pelton, Cessnock No.1 and Bellbird South Collieries and is located in the South Maitland Coalfields. These operations including coal extraction, handling, processing and transport collectively form the Austar Mining Complex.

Austar was granted Project Approval (PA) 08\_0111 under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2009. PA 08\_0111 enables longwall mining using Longwall Top Coal Caving (LTCC) technology in the Stage 3 area, construction and operation of the Kitchener Surface Infrastructure Site and continued use of the existing and approved infrastructure and facilities at the Austar Mining Complex to handle, process and transport ROM coal from the Stage 3 mining area.

PA 08\_0111 was modified under s75W of the EP&A Act in March 2012 (PA 08\_0111 MOD 2), allowing for reorientation of the longwalls (refer to **Figure 1.2**).

PA 08\_0111 was further modified under s75W of the EP&A Act in December 2013 (PA 08\_0111 MOD 3) to allow the extension of LWA7 to A10 within the Stage 3 mining area. The application was supported by the *Austar Coal Mine LWA7 - A10 Modification – Stage 3 Area Environmental Assessment* (EA) (Umwelt 2013). The LWA7 - A10 Modification extended longwalls A7 to A10 by between approximately 100 and 300 metres to the west. An assessment of the additional impacts that would be incurred as a result of the LWA7 – A10 Modification was provided in the supporting EA (Umwelt 2013). Underground longwall mining is currently progressing within the Stage 3 mining area in accordance with PA 08\_0111 MOD 3.

This Biodiversity Management Plan (BMP) has been prepared as a component of the Austar Extraction Plan, in accordance with Condition 4 of Schedule 3 of PA 08\_0111. This version of the BMP has been modified to accommodate changes as a result of the LWA7 - A10 Modification (MOD 3).

## 1.2 Purpose and Scope

This BMP addresses the requirements detailed in the Project Approval. An outline of the Project Approval conditions and Extraction Plan guideline requirements relevant to this plan is provided in **Sections 2.1** and **2.2** respectively. A checklist of the Project Approval conditions and where each condition has been addressed within this document is provided in **Appendix 1**.

The purpose of this BMP is to describe the ecological management strategies, procedures, controls and monitoring programs that are to be implemented for the management of flora and fauna as a result of subsidence related biodiversity impacts described in the Austar Stage 3 Modification Environmental Assessment (Umwelt 2011) and within the Austar Coal Mine LWA7-A10 Modification - Stage 3 Area Environmental Assessment (Umwelt 2013). Background information on biodiversity is provided for the entire Stage 3 Mining Area for LWA7 to A19 (the Stage 3 Mining Area).

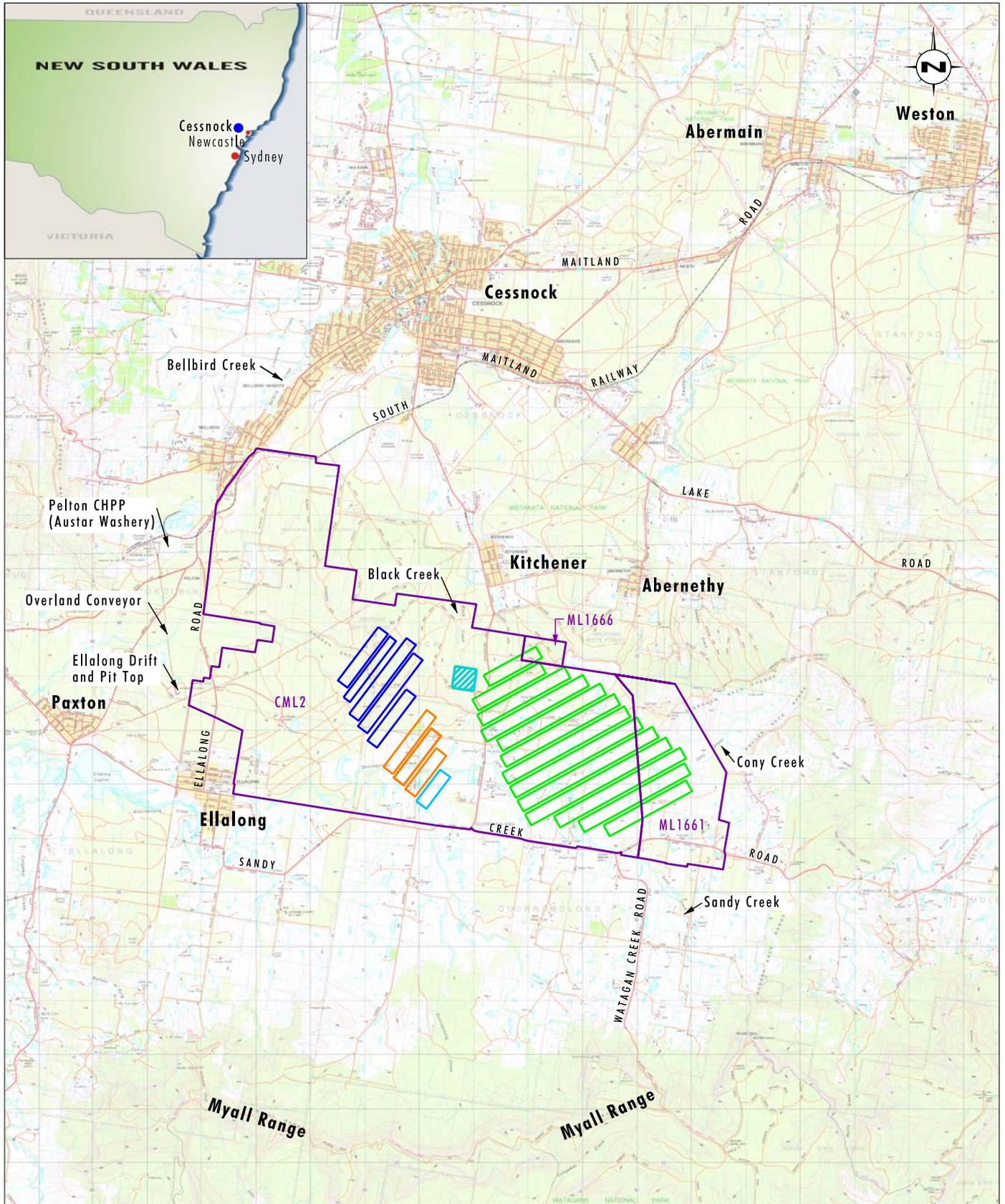


Image Source: LPI NSW (2009)  
 Data Source: Austar Coal Mine (2013)

0 1.0 2.5 5.0 km  
 1:100 000

**Legend**

- ▭ Layout for Stage 1 Longwall Panels (complete)
- ▭ Layout for Stage 2 Longwall Panels (complete)
- ▭ Layout for Stage 2 Extension Longwall Panels (complete)
- ▭ Layout for Stage 3 Longwall Panels, incorporating LW A7-A10 Modification
- ▨ Approved Surface Infrastructure Site
- ▭ Mining Lease Boundary

FIGURE 1.1

**Austar Mine Complex  
 Locality Plan**



The area covered by management strategies in this BMP includes the area above Longwall (LW) panels A7 to A10 only and is hereafter referred to as the Extraction Plan area. The area covered by this plan is shown on **Figure 1.2**.

An updated version of the BMP will be completed for future longwalls (i.e. LW A11 onwards) prior to the commencement of LW A11. LW A11 is scheduled to commence in 2018.

### 1.3 Objectives

The objectives of this BMP include the following:

- to provide a description of the potential environmental impacts of mining activities on the biodiversity of the Extraction Plan area;
- to provide a description of the key potential clearance activities for the Extraction Plan area;
- to provide an outline of the mitigation measures to minimise potential biodiversity impacts with specific focus on impacts to identified threatened species; and
- to provide a monitoring program that:
  - assesses potential impacts of underground mining on biodiversity;
  - provides a trigger to implement to minimise impacts if they occur; and
  - evaluates the effectiveness of biodiversity mitigation strategies as a means to promote continual improvement.

### 1.4 Performance Measures

Mining is not predicted to result in significant changes to the surface and groundwater patterns within the Extraction Plan area or the wider Stage 3 Mining Area, and therefore the potential for impacts on the vegetation and habitats is very low. Predicted impacts are further discussed in **Section 5.1**. The potential for impacts to vegetation as a result of subsidence will be monitored through the monitoring program outlined in **Section 8.1**; any unanticipated impacts identified will be managed in accordance with the adaptive management process outlined in **Section 8.6** and any incidents will be managed in accordance with **Section 9.2**.

Disturbance activities will be managed in accordance with the measures outlined in **Section 6.0**. The areas utilised for disturbance activities will be minimised to as small as reasonably practicable for the task and will avoid impacts to threatened species through the utilisation of pre-clearance inspections.

### 1.5 Relationship with other Plans

This BMP has been prepared as a component of the Austar Extraction Plan for LWA7 to LWA10, and should be read in conjunction with the Austar Extraction Plan.

## 2.0 Regulatory Requirements

### 2.1 Project Approval

The Austar Stage 3 Modification EA (Umwelt 2011) was assessed under the *Environmental Planning and Assessment Act 1979* (EP&A Act). Approval for Austar was granted by the DP&I Director-General on 13 March 2012. The requirement for this BMP arises from Condition 4e) of Schedule 3 of the Austar Project Approval which states:

'The Proponent shall prepare and implement an Extraction Plan for all second workings in the mining area to the satisfaction of the Director-General. Each extraction plan must include a:

- Biodiversity Management Plan, which has been prepared in consultation with OEH, to manage the environmental consequences of second workings on aquatic and terrestrial flora and fauna, with a specific focus on threatened species.'

The Austar Coal Mine LWA7-A10 Modification - Stage 3 Area Environmental Assessment (Umwelt 2013) was assessed as a modification to the approved Stage 3 project under Section 75W of the EP&A Act. Approval for the LWA7-A10 Modification (MOD 3) was granted by the DP&I Director-General on 17 December 2013. The BMP has been updated to account for changes that arise as a result of the LWA7-A10 Modification.

Management controls for potential biodiversity impacts associated with secondary workings in the Extraction Plan area and ancillary surface activities are provided in **Sections 6.0** and **7.0**. Ecological monitoring to be undertaken is provided in **Section 8.0**.

Aquatic biodiversity is not assessed as part of this BMP at this stage, as the scope of the BMP includes LW A7 to LW A10 only. The area of subsidence affectation incorporated within LW A7 to LW A10 does not include any alluvial areas or creek systems.

In addition to the above condition, the BMP is required to meet a range of general management plan requirements (in accordance with Condition 2 of Schedule 7 of the Project Approval) as well as conditions for management plans developed under the requirements of the Extraction Plan (in accordance with Condition 5 of Schedule 3 of the Project Approval). A description of these additional conditions and where they are addressed in this document is provided in **Appendix 1**.

### 2.2 Draft Extraction Plan Guideline Requirements

In accordance with the Department of Planning and Infrastructure (DP&I) 'Draft Guidelines for the Preparation of Extraction Plans' each of the key component plans of the Extraction Plan should include the information provided in **Table 2.1**. **Table 2.1** outlines all extraction plan guideline conditions relevant to this BMP and an indication of where each condition is addressed in this document.

**Table 2.1 – Extraction Plan Guideline Requirements**

Extraction Plan Requirement	Section Addressed
Performance measures relevant to the environmental values to be managed under the BMP.	<b>Section 6.0</b> and <b>Section 7.0</b>
Performance indicators to establish compliance with these performance measures.	<b>Section 1.4</b>

**Table 2.1 – Extraction Plan Guideline Requirements (cont.)**

<b>Extraction Plan Requirement</b>	<b>Section Addressed</b>
Describing the environmental values to be managed under the BMP, and their significance. Due to the information being held in the EA, this section can be reasonably brief, and focus on the presentation of figures and/or plans.	<b>Section 3.0 and Section 4.0</b>
Fully describe all currently-predicted subsidence impacts and environmental consequences relevant to the features, sites and values to be managed under the BMP.	<b>Section 5.0</b>
Fully describe all measures planned to remediate these impacts and/or consequences.	<b>Section 6.0</b> (in particular <b>Section 6.2</b> )
Describe the existing baseline monitoring network and baseline monitoring results, including photographic surveys of key landscape features and key heritage sites which may be subject to significant subsidence impacts.	<b>Section 3.0 and Section 8.0</b>
Fully describe the proposed monitoring of subsidence impacts and environmental consequences.	<b>Section 8.0</b>
Describe the proposed monitoring of the success of remediation measures following implementation.	<b>Section 8.5</b>
Fully describe adaptive management proposed to avoid repetition of unpredicted subsidence impacts and/or environmental consequences.	<b>Section 8.6</b>
Fully describing contingency plans proposed to remediate unpredicted subsidence impacts and/or environmental consequences.	<b>Section 6.2 and Section 9.1</b>
A Trigger, Action, Response Plan.	<b>Section 9.1</b>

## 2.3 Stakeholder Consultation Regarding this Document

Extensive consultation with government authorities was undertaken during the preparation of the Austar Stage 3 Modification EA (Umwelt 2011) including project briefings, community consultation meetings and separate meetings with relevant government authorities to discuss specific issues (refer to Section 6.2 of the 2011 EA). Further consultation was undertaken as part of the LWA7-A10 Modification and is summarised in Section 5.0 of the Austar Coal Mine LWA7-A10 Modification - Stage 3 Area Environmental Assessment (Umwelt 2013).

A draft version of this BMP was provided to the NSW Office of Environment and Heritage (OEH) for comment in accordance with the Project Approval condition outlined in **Section 2.1**. Comments provided by the OEH have been incorporated into the BMP.

## 3.0 Baseline Information

### 3.1 Environmental Setting

The Austar Mine Complex and surrounding area is within the Cessnock-Kurri vegetation area in the Lower Hunter Valley, as defined by Bell and Driscoll (2008). The Cessnock-Kurri area comprises part of the Hunter Subregion (SB02). Plant species that are characteristic of coasts, mountains, semi-arid areas and sandstone outcrops are evident (DEC 2006). The major ecosystems of the Lower Hunter Valley include Wetlands, Dry forest and woodlands, Heath, Swamp forest and Moist forest/rainforest.

The Stage 3 Mining Area lies within the Sydney Basin Bioregion, and the North Coast Botanical Subdivision. A large proportion of the Stage 3 Mining Area comprises cleared agricultural land, however the northern areas contain natural forests which are part of Werakata State Conservation Area (SCA), previously known as the Aberdare State Forest. Werakata SCA was gazetted in mid 2007 and encompasses 2,257 hectares of land. The predominantly cleared private lands occupy the lower floodplains, flats and foothills, while the vegetated northern portions are hilly and undulating. The far north-eastern portions of the Stage 3 Mining Area encompass a small part of the Broken Back Range.

For the purpose of this BMP, only the Extraction Plan area for the northernmost four longwalls (LWA7 to LWA10) of the Stage 3 Mining Area is included in the scope of this plan. LWA7 to LWA10 are located beneath land that is privately owned agricultural land as well as the Werakata SCA. The land ownership of the Stage 3 Mining Area is shown on **Figure 3.1**.

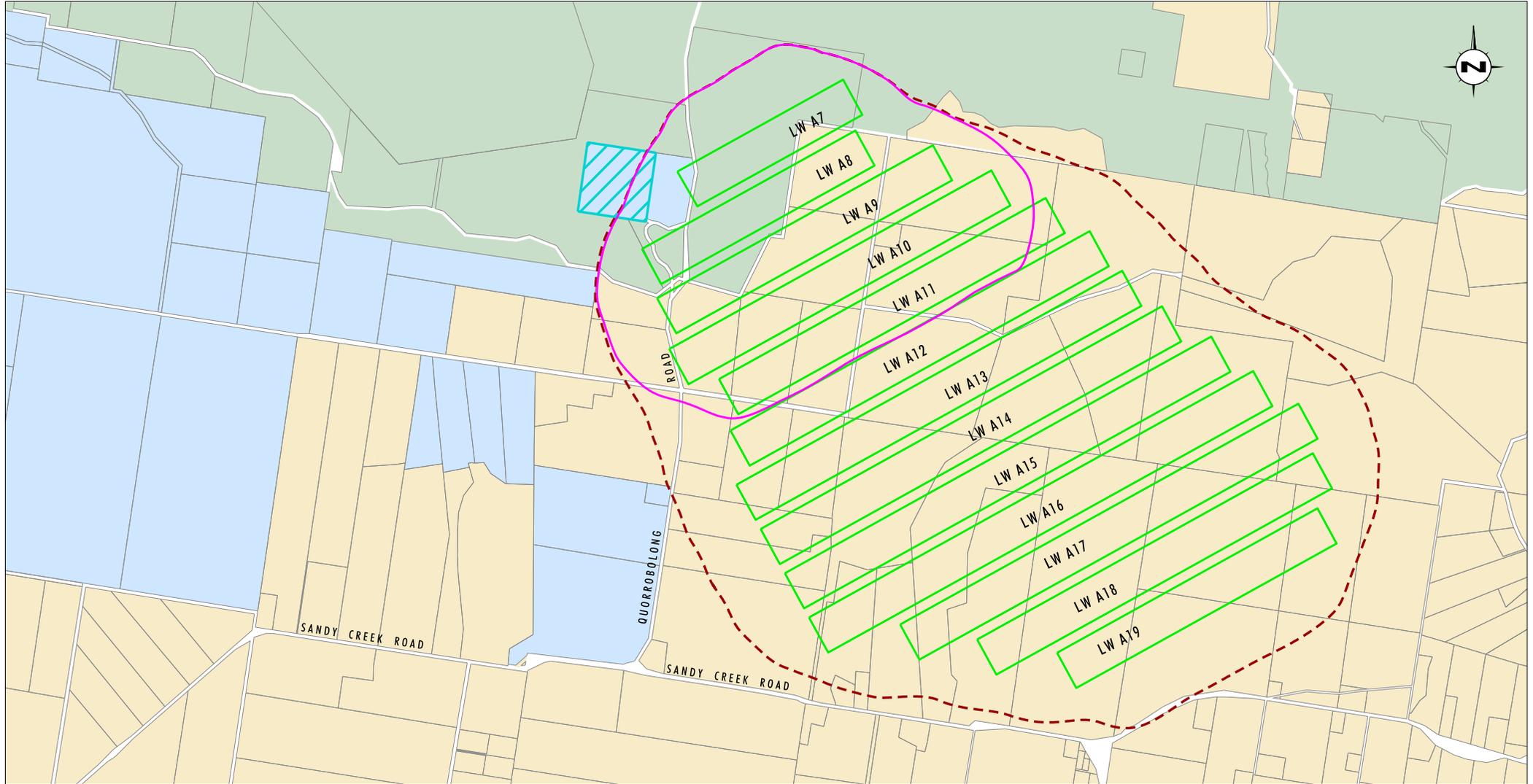
### 3.2 Vegetation Communities

A total of 317 species were recorded within the Stage 3 Mining Area, of which 274 (86%) are native and 43 (14%) are introduced species. A full list of the flora species recorded during surveys of the landform above the Stage 3 Mining Area is presented with Appendix 4 of the EA (Umwelt 2013). The landform above the Stage 3 Mining Area supports seven vegetation communities (not including cultivated land), as outlined in **Table 3.1** (refer to **Figure 3.2**).

Descriptions of the characteristics of each of these communities are provided in the Austar Stage 3 Modification EA (Umwelt 2011).

**Table 3.1 – Vegetation Communities of the Stage 3 Mining Area**

Vegetation Community	Area (ha)
Riparian Red Gum Forest	48.7
Swamp Oak Riparian Forest	55.5
Lower Hunter Spotted Gum – Ironbark Forest	355.4
Derived Grassland/Pasture	484.4
Derived Grassland with Scattered Canopy Trees	242.8
Woollybutt Open Forest	5.6
Regeneration	9.1
Cultivated	17.5
<b>TOTAL</b>	<b>1,219.0</b>



Data Source: Cadastre: LPI NSW, Land Ownership: Mineral Resources 2003, Longwall Layout: Austar Coal Mine

0 0.5 1 1.5 km  
1:32 000

**Legend**

- Layout for Stage 3 Longwall Panels, incorporating LW A7-A10 Modification
- Extraction Plan Area
- 20mm Subsidence Contour for Stage 3 Longwall Panels
- Approved Surface Infrastructure Site
- Austar Owned Land
- Werakata State Conservation Area / Crown Land
- Privately Owned Land

FIGURE 3.1

Land Ownership

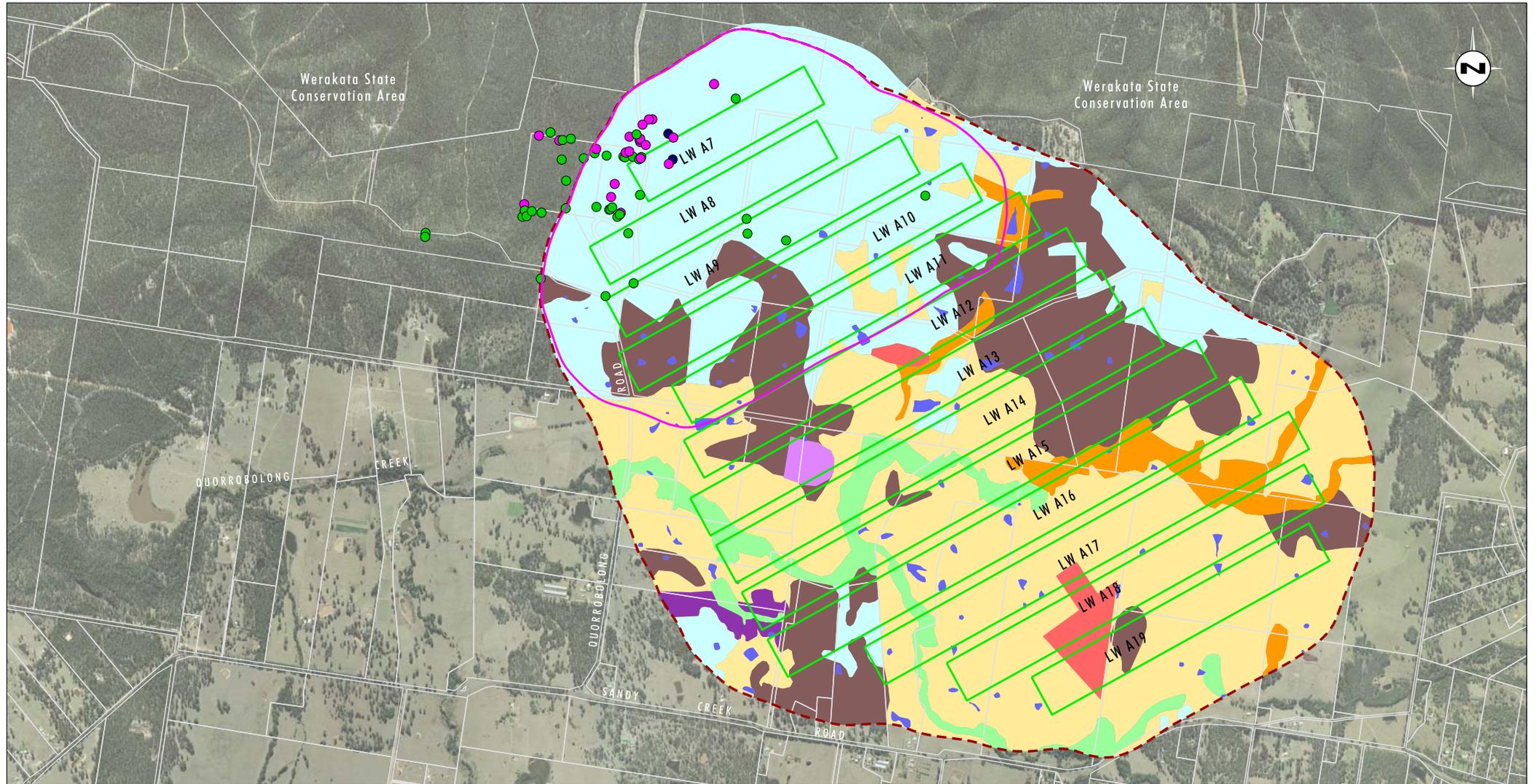


Image Source: AAM Hatch (2006)  
 Data Source: Austar Coal Mine (2013), LPI NSW (2009)

0 0,5 1,0 1,5 km  
 1:30 000

**Legend**

- Layout for Stage 3 Longwall Panels, incorporating LW A7-A10 Modification
- Extraction Plan Area
- 20mm Subsidence Contour for Stage 3 Longwall Panels
- Cultivated
- Dam
- Derived Grassland / Pasture
- Derived Grassland with Scattered Canopy Trees
- Regeneration
- Riparian Red Gum Forest - EEC
- Lower Hunter Spotted Gum Ironbark Forest - EEC
- Swamp Oak Riparian Forest
- Woollybutt Open Forest Remnant
- *Rutidosis heterogama*
- *Grevillea parviflora* subsp. *parviflora*
- *Callistemon linearifolius*

File Name (A4): R06/3264\_056.dgn  
 20131023 10.09

FIGURE 3.2

Vegetation Communities and  
 Threatened Species Records

For the purposes of this plan the majority of the Extraction Plan area (LWs A7 to A10) comprises the Lower Hunter Spotted Gum – Ironbark Forest and Derived Grassland with Scattered Canopy Trees vegetation communities. The Riparian Red Gum Forest within the Stage 3 Mining Area (refer to **Figure 3.2**) was found to broadly align with the description of the *Threatened Species Conservation Act 1995* (TSC Act) listed River-flat Eucalypt Forest Endangered Ecological Community (EEC).

Threatened flora species observed are outlined in **Section 4.3**.

### 3.3 Fauna Habitat and Species

A full list of the fauna and aquatic species recorded in the Stage 3 Mining Area is provided in Appendix 4 of the EA (Umwelt 2013). The results included:

- A total of 83 bird species recorded within the Stage 3 Mining Area. The species recorded are typical of those associated with open woodland and grassland habitats, such as the Australian magpie (*Gymnorhina tibicen*), noisy miner (*Manorina melanocephala*), masked lapwing (*Vanellus miles*) and Australian magpie-lark (*Grallina cyanoleuca*). A number of birds more commonly associated with wetland habitats were recorded, including white-faced heron (*Egretta novaehollandiae*), Australian white ibis (*Threskiornis molucca*), Eurasian coot (*Fulica atra*), Australian wood duck (*Chenonetta dubata*) and the Pacific black duck (*Anas superciliosa*).
- Nine frog species have been recorded within the Stage 3 Mining Area. This primarily included locally common species such as the common eastern froglet (*Crinia signifera*), striped marsh-frog (*Limnodynastes peroni*) and the spotted marsh-frog (*Limnodynastes tasmaniensis*).
- Six reptile species were recorded within the Stage 3 Mining Area during the surveys. This included locally common species the Jacky lizard (*Amphibolurus muricatus*), bearded dragon (*Pogona barbata*) and eastern water skink (*Eulamprus quoyii*).
- A total of 27 mammal species were recorded within the Stage 3 Mining Area. Commonly recorded species included common brush-tail possum (*Trichosurus vulpecula*), eastern grey kangaroo (*Macropus giganteus*) and common wombat (*Vombatus ursinus*).
- A total of 39 taxa of macro invertebrates were recorded across six sampling sites in the Stage 3 Mining Area. No freshwater vertebrates were recorded.

Threatened fauna species observed are outlined in **Section 4.4**.

## 4.0 Ecological Values

### 4.1 Threatened Ecological Communities

The two EECs that were found to be present within the Stage 3 Mining Area are the Lower Hunter Spotted Gum – Ironbark Forest EEC and the River-flat Eucalypt Forest EEC (refer to **Figure 3.2**). A summary of the extent of the two EECs is provided in **Table 4.1**.

**Table 4.1 – EECs Recorded within the Stage 3 Mining Area**

Endangered Ecological Communities	Area (ha)
River-flat Eucalypt Forest	48.7
Lower Hunter Spotted Gum – Ironbark Forest	355.4
<b>TOTAL</b>	<b>404.1</b>

There are no aquatic EECs listed under the *Fisheries Management Act 1994* (FM Act) occurring within or with potential to occur within the Extraction Plan area.

### 4.2 Endangered Flora Species

No endangered flora species were identified within the Stage 3 Mining Area. Four endangered flora populations are relevant to the Hunter Valley catchment (in which the Stage 3 Mining Area is located):

- weeping myall (*Acacia pendula*) population in the Hunter Valley;
- river red gum (*Eucalyptus camaldulensis*) population in the Hunter Valley;
- tiger orchid (*Cymbidium canaliculatum*) population in the Hunter Valley; and
- *Leionema lamprophyllum* subsp. *obovatus* population in the Hunter Valley.

The ecological assessment concludes that no endangered flora populations have potential to occur within the Stage 3 Mining Area (refer to Appendix 4 of the EA (Umwelt 2013)).

### 4.3 Threatened Flora Species

Three threatened flora species were recorded within the Stage 3 Mining Area during the field surveys, being heath wrinklewort (*Rutidosia heterogama*), small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*) and netted bottle-brush (*Callistemon linearifolius*). These species were all recorded in the northern portions of the Stage 3 Mining Area. The recorded locations of these species are shown on **Figure 3.2**, however the actual extent of occurrence of each species is expected to be greater.

In order to provide context to the distribution of heath wrinklewort (*Rutidosia heterogama*) and small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*) within the locality, a map showing all records from the OEH Atlas of NSW Wildlife (OEH 2011) for the Cessnock 1:100,000 topographic map sheet is provided in Appendix 8 of the 2011 EA (Umwelt 2011). This shows that potential habitat for the two species is relatively widespread within the locality, particularly to the north-east of the Stage 3 Mining Area. Assessments of significance for heath wrinklewort (*Rutidosia heterogama*) and small-flower grevillea

(*Grevillea parviflora* subsp. *parviflora*) are included within Appendix 4 of the EA (Umwelt 2013).

In addition to this, database searches undertaken in 2013 (BioNet 2013) indicated that there were approximately 900 records of netted bottle-brush (*Callistemon linearifolius*) within 10 kilometres of the Extraction Plan area. These records indicate that this species is widespread in the locality. An assessment of significance for this species was also included in Appendix 4 of the EA (Umwelt 2013).

#### 4.4 Threatened Fauna Species

Thirteen threatened fauna species have been recorded within the Stage 3 Mining Area, and are identified in **Table 4.2** below.

**Table 4.2 – Threatened Fauna Species Recorded within the Stage 3 Mining Area**

Species	Status
gang-gang cockatoo <i>Callocephalon fimbriatum</i>	V (TSC Act)
grey-crowned babbler (eastern subspecies) <i>Pomatostomus temporalis temporalis</i>	V (TSC Act)
speckled warbler <i>Chthonicola sagittata</i>	V (TSC Act)
little lorikeet <i>Glossopsitta pusilla</i>	V (TSC Act)
scarlet robin <i>Petroica boodang</i>	V (TSC Act)
powerful owl <i>Ninox strenua</i>	V (TSC Act)
grey-headed flying-fox <i>Pteropus poliocephalus</i>	V (TSC Act) V (EPBC Act)
squirrel glider <i>Petaurus norfolcensis</i>	V (TSC Act)
little bentwing-bat <i>Miniopterus australis</i>	V (TSC Act)
eastern bentwing-bat <i>Miniopterus schreibersii oceanensis</i>	V (TSC Act)
large-footed myotis <i>Myotis macropus</i>	V (TSC Act)
eastern freetail-bat <i>Mormopterus norfolkensis</i>	V (TSC Act)
eastern false pipistrelle <i>Falsistrellus tasmaniensis</i>	V (TSC Act)

Note to **Table 4.2**:

EPBC Act: *Environment Protection Biodiversity Conservation Act 1999*

TSC Act: *Threatened Species Conservation Act 1995*

V: Vulnerable

The survey and assessment for the 2011 and 2013 EAs (Umwelt 2011 and Umwelt 2013) found that:

- there are no endangered fauna populations known to occur within the landform above the Stage 3 Mining Area. There are no endangered fauna populations with potential to occur within the assessment area;
- there are no areas of critical habitat occurring within or in proximity to the Stage 3 Mining Area; and
- no FM Act listed threatened species or endangered populations were recorded within the Stage 3 Mining Area during surveys, and there is no record of any having been previously recorded within the locality. There is no potential for any FM Act listed threatened species or endangered populations to occur in the aquatic habitats of the ecological assessment area.

Assessment of potential impacts under the EPA Act was undertaken to identify any impacts upon TSC Act listed threatened species, populations and EECs (Umwelt 2011 and 2013). These assessments indicated that Stage 3 Mining would not have any significant impacts on any of the identified threatened species, populations or EECs.

In addition, an assessment of potential impacts upon Matters of National Environmental Significance (MNES) under the *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) was undertaken to identify any impacts upon EPBC Act listed threatened or migratory species which could potentially occur within a 10 kilometre radius of the Stage 3 Mining Area and the LWA7 to A10 Modification (Umwelt 2011 and 2013 respectively). These assessments both concluded that Stage 3 mining will not have a significant impact on any EPBC Act listed MNES, and therefore referral to the Minister for Environment and Water Resources was not required.

## 5.0 Ecological Impacts

### 5.1 Summary of Impacts

Subsidence as a result of Stage 3 mining will occur reasonably consistently over the breadth of the Stage 3 Mining Area. The mining is not predicted to result in significant changes to the surface and groundwater patterns within the Stage 3 Mining Area, and therefore the potential for impacts on the vegetation and habitats is very low. It is expected that there will be no loss of vegetation due to subsidence. However, it is anticipated that minor loss of vegetation will occur due to subsidence monitoring and subsidence remediation activities in the Stage 3 Mining Area. Utilising the management measures outlined in **Section 6.0**, there is unlikely to be an impact on ecological values. As such, there will be no significant impact on any recorded or potentially occurring threatened species, populations or Threatened Ecological Communities (TECs). Any surface cracking that is observed is expected to be minor in nature and is likely to be naturally filled with alluvial material, or would be able to be remediated using minimal disturbance manual techniques rather than high impact machinery (refer to Austar Land Management Plan).

The outcomes of the 7 part tests undertaken for the EAs (Umwelt 2011 and 2013) in accordance with the EP&A Act concluded that there would not be a significant impact on any threatened species, populations or TECs as a result of mining in the Stage 3 Mining Area and hence the Extraction Plan area managed under this BMP.

The outcomes of Assessments of Significance listed under the EPBC Act (Umwelt 2011 and 2013) for threatened and migratory species also concluded that there would be no significant impacts on any of these species as a result of the Stage 3 Mining Area and hence the Extraction Plan area managed under this BMP.

### 5.2 Disturbance Activities

In addition to the predicted impacts of subsidence from secondary workings on ecological values, additional surface impacts within the Extraction Plan area that will result in the clearing of minor quantities of vegetation in the Werakata SCA are expected from the following ancillary activities:

- subsidence monitoring line installation; and
- subsidence remediation works.

Further discussion regarding the potential impact associated with each of the activities listed above is included in the EA (Umwelt 2011) and the LWA7-A10 Modification - Stage 3 Area EA (Umwelt 2013). The management of the impacts associated with these activities is outlined in **Section 6.0** below, and have also been detailed in the Umwelt 2011 and 2013.

## 6.0 Ecological Management Controls

In the first instance, the plan to mitigate impacts to potential sensitive areas such as EECs will be to avoid impact. Impacts will be avoided where possible through the use of existing access tracks and planning of disturbance activities to avoid habitat trees and identified threatened species. However, where impacts cannot be avoided, the following sections detail the process required to manage potential impacts to identified ecological values.

Further detail has been provided in the following sections to provide specific management actions to be utilised in the Extraction Plan area.

### 6.1 Management of Disturbance Activities

The vegetation in the Extraction Plan area is considered to be of ecological significance, as the majority of LW A7 to LW A10 fall within the Werakata SCA. The underground mining at Austar is not expected to result in the loss of biodiversity or loss/deterioration of fauna habitat from within the Extraction Plan area. The predictions of no significant impacts (as discussed in the EAs (Umwelt 2011 and Umwelt 2013) will be assessed through the ongoing implementation of the Austar biodiversity monitoring program (refer to **Section 8.0**).

Surface disturbance activities may be undertaken within the Werakata SCA or within privately owned land, provided the necessary approvals are received for the works. The extent of any disturbance activities in the Werakata SCA or on privately owned land will be minimised as far as practicable. Any disturbance activities within vegetated areas will be managed in accordance with the relevant Austar clearing permit and vegetation clearing procedures.

For works within the Werakata SCA, disturbance activities will be undertaken in accordance with the management techniques outlined in a Review of Environmental Factors (REF). The REF will be completed in order to seek a licence from the OEH to undertake works in the SCA.

All disturbance works undertaken within privately owned land will be undertaken in consultation and in agreement with private landowners.

It is a requirement of the vegetation clearance procedure and clearing permit that due diligence surveys be completed for the clearing of previously undisturbed vegetation (refer to **Section 6.1.1**). In addition, any works involving the clearance of vegetation for subsidence monitoring and remediation works within the Werakata SCA (as identified in **Section 5.0**) will require the permission of OEH.

Due diligence inspections will have a focus on the identification of potential presence of threatened flora species such as the small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*), heath wrinklewort (*Rutidosia heterogama*) and netted bottlebrush (*Callistemon linearifolius*) as well as any potential impacts on identified EECs.

Any requirement to clear trees will also trigger the tree felling procedure, as described in **Section 6.1.2**.

### 6.1.1 Due Diligence Requirements

Where it is necessary to disturb areas of native vegetation, due diligence assessments will be required to be undertaken in accordance with the Austar vegetation clearance procedure.

Pre-clearing requirements involve the completion of adequate due diligence assessments by a suitably qualified and experienced person (e.g. ecologist). The requirements for the pre-clearing inspections are provided below:

- disturbance will be minimised in the first instance by the utilisation of existing access tracks and avoidance of significant vegetation where possible;
- the area to be cleared must be appropriately identified in the field, prior to the pre-clearing inspections;
- a pre-clearance inspection will be undertaken prior to the scheduled clearing by a suitably qualified and experienced person. In the unlikely event that hollow-bearing trees and habitat trees within the area are to be cleared, these features will be identified and marked using spray paint;
- the number of hollows present in each tree will be recorded, as will the size class of each hollow;
- a suitably qualified and experienced person will recommend any specific activities that are deemed necessary as a result of any findings of the pre-clearance inspection;
- the total number of hollows in each tree to be cleared will define the number of nest boxes that are required to compensate for the clearing. One nest box per tree hollow removed will be erected in nearby secure habitats within the Austar land holding;
- the nest boxes will be of the same size classes that were removed, and the design will be appropriate for native fauna species known from the area; and
- all nest boxes will be installed on a 'like for like' basis, and will be mounted using an appropriate method, such as the 'Habisure™' system. This system allows for growth of the trunk without damage to the tree, or nest box.

All nest boxes will be subject to regular monitoring for their condition and usage by target native species.

### 6.1.2 Tree Felling

After the pre-clearance inspection has been completed, the clearing of vegetation will be undertaken in accordance with the Austar Tree Felling procedure which includes the following:

- prior to clearing, the Environmental Coordinator will contact a suitably qualified wildlife rescue professional and have them on standby should the need arise to recover any fauna from the felled habitat trees;
- all non-habitat trees will be cleared first, taking care to avoid all marked habitat trees. Providing that pre-clearing inspections have been completed, it is not necessary for an ecologist to be present while clearing non-habitat trees;

- within one to two days following the clearing of non-habitat trees, habitat trees will be cleared in the presence of a suitably qualified person. Before clearing, the trunk of the hollow-bearing tree will be shaken vigorously with heavy machinery then shaking will be paused for 30 seconds to allow fauna to escape, prior to felling of the tree. The machinery operator will then push the tree over as slowly as possible, so as to minimise the intensity of impact when hitting the ground;
- once the tree has been felled, the qualified person will inspect the tree (particularly tree hollows) for signs of any trapped or injured fauna. Where necessary, a spotlight will be used to inspect deep hollows;
- any injured fauna will be carefully captured by the qualified and experienced person, and taken to a wildlife carer or veterinary clinic. E.g. West Cessnock Veterinary Hospital (02 4990 4400) or Native Animal Trust Fund, Cessnock (24 hour rescue service – 0447 667 737); and
- cleared vegetation is proposed to be either mulched to allow re-use on Austar rehabilitation projects or used directly as brush matting.

### 6.1.3 Erosion and Sediment Control

Erosion and sediment control works may be undertaken by Austar within the Extraction Plan area. Prior to the installation of erosion and sediment controls, the pre clearance procedure will be undertaken where required.

The erosion and sediment control measures that will be implemented to counter potential erosion and sediment impacts will be undertaken in accordance with the Austar Site Water Management Plan.

## 6.2 Subsidence Remediation

The need to remediate subsidence impacts will be assessed on a case by case basis and take into consideration potential risks to public safety and the environment. If a crack requires remediation, the method of remediation will be selected to minimise the potential disturbance to the surrounding environment (i.e. grouting as opposed to backfilling).

In the event that minor cracking is observed that requires remediation, the Austar clearing permit and vegetation clearance procedure will be followed where required, as outlined in **Section 6.1**, to minimise the potential for impacts upon sensitive ecological features.

The impacts of subsidence on existing natural and built features are monitored and managed generally in accordance with the Austar Land Management Plan (LMP), Built Features Management Plan (BFMP) and Subsidence Monitoring Program (SMP).

## 6.3 Weed Management

Introduced species are most prevalent within the Derived Grassland/Pasture and Derived Grassland with Scattered Canopy Trees vegetation communities (refer to **Figure 3.2**). Introduced species commonly recorded in the derived grassland include scarlet pimpernel (*Anagallis arvensis*), fireweed (*Senecio madagascariensis*), onion weed (*Romulea rosea*) and Scotch thistle (*Onopordum acanthium*).

A number of introduced species were also recorded in the Lower Hunter Spotted Gum Ironbark Forest (EEC), the majority of which are not a threat to the native flora diversity of this community. Some of the more common species recorded include plantain (*Plantago lanceolata*), scarlet pimpernel (*Anagallis arvensis*), balloon cotton bush (*Gomphocarpus fruticosus*), fireweed (*Senecio madagascariensis*) and cobblers pegs (*Bidens pilosa*). A few very small patches of lantana (*Lantana camara*) were observed within this community in the Stage 3 Mining Area.

The following weed management methods will be undertaken in areas where surface activities have been undertaken by Austar (e.g. subsidence remediation areas):

- the implementation of weed management measures including hand removal, mechanical removal in authorised areas when favourable conditions prevail; and
- monitoring and inspections of areas to assess the effectiveness of the weed control activities and to ascertain the requirement for further work.

### **6.3.1 Sensitive Weed Management**

All weed management activities undertaken in TECs or in areas known to contain threatened flora records (particularly that of small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*) heath wrinklewort (*Rutidosis heterogama*) or netted bottlebrush (*Callistemon linearifolius*)) will be subject to consultation with a qualified ecologist, with any works required, undertaken by the appropriately qualified personnel.

## 7.0 Management of Habitat and Communities

### 7.1 Threatened Species Management

Mining activities at Austar are not expected to have a significant impact on the ecological values of the Werakata SCA. Mining operations will not result in the substantial loss of vegetation communities or the floristic composition of vegetation communities; fauna species or habitat; or threatened species, populations and TECs or their habitat. However, for activities that involve clearing in the Extraction Plan area, specific threatened species management actions are detailed below.

#### 7.1.1 Small Flower Grevillea (*Grevillea Parviflora subsp. parviflora*), Heath Wrinklewort (*Rutidosia heterogama*) and Netted Bottlebrush (*Callistemon linearifolius*)

The small flower grevillea (*Grevillea parviflora subsp. parviflora*), heath wrinklewort (*Rutidosia heterogama*) and netted bottlebrush (*Callistemon linearifolius*) have been identified at various locations across the Extraction Plan area, however no significant impacts to these species are expected as a result of mining. To minimise the risks associated with impacts to these species, the following management recommendations will be undertaken:

- Austar will maintain an accurate database for all known records of small flower grevillea (*Grevillea parviflora subsp. parviflora*), heath wrinklewort (*Rutidosia heterogama*) and netted bottlebrush (*Callistemon linearifolius*) and any other threatened flora species identified through monitoring surveys on site. This database will then be utilised for any proposed future works and will be reviewed to assist in planning of disturbance activities; and
- targeted monitoring for these species will be undertaken, as outlined in **Section 8.3**.

In the event that unpredicted, adverse impacts on small flower grevillea (*Grevillea parviflora subsp. parviflora*), heath wrinklewort (*Rutidosia heterogama*) or netted bottlebrush (*Callistemon linearifolius*) are identified during management and monitoring of the Extraction Plan area, Austar will investigate appropriate remediation and mitigation requirements, in consultation with the relevant government authorities (refer to **Section 9.0**).

#### 7.1.2 Identification of Previously Unidentified Threatened Species

In the event that additional threatened species are identified in the Extraction Plan area, this BMP may need to be revised to include the appropriate management of these species.

### 7.2 Endangered Ecological Community Management

There are not expected to be any significant impacts to any EECs (in particular Lower Hunter Spotted Gum Ironbark Forest and River Flat Eucalypt Forest EECs) as a result of mining operations at Austar. Ongoing monitoring of the EECs (as detailed in **Section 8.1**) will be undertaken to ensure that no significant impacts are occurring as a result of the continued mining operations. If negative impacts to the EECs are identified during management and monitoring of the Extraction Plan area, Austar will investigate appropriate remediation and mitigation requirements, in consultation with the relevant government authorities.

## 8.0 Biodiversity Monitoring

As discussed in **Section 5.0** and in the 2011 and 2013 EAs (Umwelt 2011 and Umwelt 2013), secondary workings undertaken as part of the Stage 3 mining are not anticipated to have a significant impact on biodiversity. However, in order to assess any potential impacts, a detailed Monitoring Program has been developed for the Extraction Plan area. The monitoring specifically focuses on the Lower Hunter Spotted Gum – Ironbark Forest EEC and River Flat Eucalypt Forest EEC which occur on the drier slopes and ridges of the Extraction Plan area and on the drainage flats/lower slopes respectively, and threatened species identified within the subsidence zone of LWA7 to LWA10.

Monitoring will be undertaken on a bi-annual basis, preferably with one survey in autumn and one in spring. The cessation of monitoring will be linked with the results of the subsidence monitoring. That is, when the subsidence monitoring reveals that there is no longer any significant ground movement, monitoring will continue for a period of approximately two years. This timeframe for completion of monitoring is indicative only, as it will depend strongly on whether any impacts are observed and whether remediation works are required. Monitoring will need to continue for a longer period of time if remediation works are required or if changes to the ecological values are observed, in which case monitoring will continue until the condition of the site is found to be stable.

It is intended that the monitoring sites will be added to and removed from the program progressively as mining proceeds. For example, sites influenced by mining of LWA8 will be monitored for baseline data 12 months prior to the mining of that longwall, and will continue after the mining of that longwall. Additional sites for future longwall panels (i.e. LW A11 onwards) will be commenced approximately 2 years prior to mining of these panels. As mining of LW A11 is scheduled to commence in 2018, the addition of further monitoring sites will be commenced in approximately 2016.

**Table 8.1** presents the proposed ecological monitoring schedule for longwall panels. This timeline may be subject to change in the event that there are delays in mining works (refer to **Figure 8.1** for monitoring locations).

**Table 8.1 – Proposed Ecological Monitoring Schedule for Longwall Panels**

	Year							
	2013	2014	2015	2016	2017	2018	2019	
<b>Longwall Panel Sites (Control Sites)</b>								
LW A7 (Site 7) – Lower Hunter Spotted Gum Ironbark Forest EEC								
LW A8 (Site 8) – Lower Hunter Spotted Gum Ironbark Forest EEC								
LW A9 (Site 11) – Lower Hunter Spotted Gum Ironbark Forest EEC								
LW A10 (Site 13) – Lower Hunter Spotted Gum Ironbark Forest EEC <sup>1</sup>								
LW A10 (Site 14) – River Flat Eucalypt Forest EEC <sup>1</sup>								
<b>Reference Sites</b>								
Reference Site 1 (Site 9)								
Reference Site 2 (Site 10)								

**Table 8.1 – Proposed Ecological Monitoring Schedule for Longwall Panels (cont.)**

	Year						
	2013	2014	2015	2016	2017	2018	2019
<b>Threatened Species</b>							
<i>Grevillea parviflora</i> subsp. <i>parviflora</i> (Site 12)							
<i>Rutidosia heterogama</i> (Site 13)							
<i>Callistemon linearifolius</i> (Site 15)							

**Notes to Table 8.1:**

This table assumes that monitoring is being undertaken the year before mining commencement and will be finished 2 years after mining has ceased. This table also assumes that no remediation works are required-if they occur, the program will need to be extended.

<sup>1</sup> Pending Landholder approval to undertake monitoring at these locations.

Sites 7, 8, 9, 10, 11 and 12 are currently being monitored (refer to **Section 8.1**), while sites 13, 14 and 15 are part of the proposed future monitoring program. It is noted that both Lower Hunter Spotted Gum Ironbark Forest EEC flora monitoring and threatened species (*Rutidosia heterogama*) monitoring will be undertaken at Site 13.

It is recommended that ecological monitoring at each site is undertaken two years prior to longwall mining (where practicable) and for two years post mining (subject to review based on monitoring results). It is assumed that each longwall takes one year or less to mine and therefore each site requires approximately five years of monitoring. Ecological monitoring may need to be extended if longwall mining takes longer than one year to complete a panel.

The monitoring program incorporates three key survey methods: permanent vegetation plots; vegetation condition and habitat assessment; and photo monitoring.

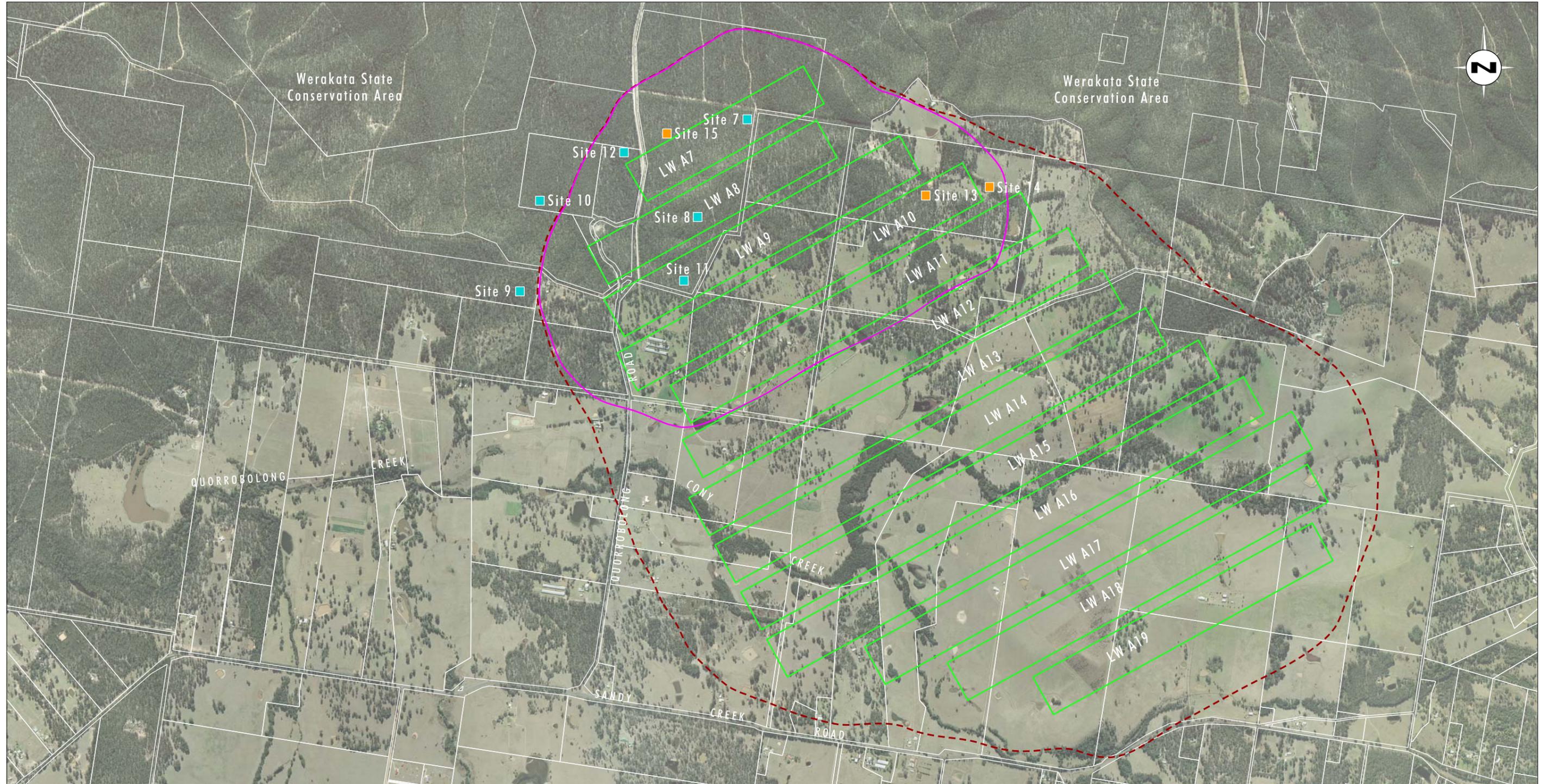
## 8.1 Background and Baseline Data

Four biannual monitoring sites (Sites 7, 8, 9 and 10) were established in the Extraction Plan area during spring of 2012, with a further biannual monitoring site (Site 11) established in spring 2013 (refer to **Figure 8.1**). These consist of two reference and three control sites each located within the Lower Hunter Spotted Gum-Ironbark Woodland EEC. An additional annual small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*) monitoring site was established in spring 2013 (Site 12). These monitoring sites were established to assess the pre-mining biodiversity conditions above longwall panels LWA7, LWA8 and LWA9.

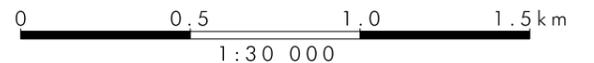
Ecological monitoring of these sites indicated that the vegetation prior to longwall panel mining was in a good state of health.

Baseline monitoring surveys will be undertaken for each of the below monitoring categories, prior to undermining occurring. This will assist in:

- understanding of existing flora and fauna characteristic prior to subsidence;
- developing plans for the rehabilitation of disturbed and subsided land;
- the implementation of appropriate erosion and sediment control systems to prevent damage to flora and fauna from erosion and unnatural flooding events; and
- seasonal comparative monitoring of flora and fauna species and habitats.



Source: Longwall Layout: Astar Coal Mine, Cadastre: LPI NSW, Aerial Photography: AAM Hatch 2006



- Legend**
- ▭ Layout for Stage 3 Longwall Panels, incorporating LW A7-A10 Modification
  - ▭ Extraction Plan Area
  - ▭ 20mm Subsidence Contour for Stage 3 Longwall Panels
  - Current Monitoring Location
  - Proposed Monitoring Location

File Name (A4): R06/3264\_057.dgn  
20131023 10.10

**FIGURE 8.1**  
**Monitoring Locations**

## 8.2 Flora (EEC) Monitoring

At each of the 'longwall panel' and 'control site' monitoring locations (refer to **Table 8.1** and **Figure 8.1**), a 400 square metre (20 x 20 metre) vegetation survey plot will be sampled in order to assess flora diversity and abundance. The locations of these vegetation plots have been selected in order to sample the key vegetation communities identified (Lower Hunter Spotted Gum Ironbark Forest EEC and River Flat Eucalypt Forest EEC) in comparison with the control sites. The condition of the vegetation at each site will also be determined. Baseline flora monitoring for each plot will be undertaken prior to undermining occurring and will be undertaken biannually.

Each vegetation plot will be marked with a metal star-picket in each corner. A metal tag recording the relevant site details will be attached to each star-picket. The centre of each site will be recorded via GPS to enable accurate location of the vegetation plot, should the star-pickets be removed. This will allow for repeatable surveys over time.

At each site, a qualified ecologist will identify all vascular flora species present within the plot. Species within the plot will be assigned a cover-abundance value to reflect their relative cover and abundance in the plot. A modified Braun-Blanquet 6-point scale (see **Table 8.2**) will be used to estimate cover-abundances of all plant species within each plot. Species located outside the plot will be marked as being present, however will not be assigned a cover-abundance value. **Appendix 2** provides the standard flora monitoring proforma.

**Table 8.2 – Modified Braun-Blanquet Crown Cover-Abundance Scale**

Class	Cover-abundance*	Notes
1	Few individuals (less than 5% cover)	Herbs, sedges and grasses: <5 individuals Shrubs and small trees: <5 individuals
2	Many individuals (less than 5% cover)	Herbs, sedges and grasses: 5 or more individuals Shrubs and small trees: 5 or more individuals Medium-large overhanging tree
3	5 – less than 20% cover	
4	20 – less than 50% cover	
5	50 – less than 75% cover	
6	75 – 100% cover	

**Note to Table 8.2:**

\* Modified Braun-Blanquet scale (Poore 1955; Austin *et al.* 2000).

Comparison with previous remnant vegetation monitoring will be made and the results evaluated to determine if the mining and subsidence related impacts are detrimentally affecting remnant vegetation communities.

### 8.2.1 Condition Assessment

For the purpose of this monitoring program, information will be gathered on the condition of the vegetation at each of the flora monitoring sites. Information collected will be on the general health of the vegetation, including:

- evidence of natural regeneration;

- identification of terrestrial and arboreal nesting and roosting sites;
- food and water resources;
- habitat structure and habitat deficiencies;
- occurrence and abundance of weeds; and
- evidence of disturbance by feral animals.

Ecological condition is assessed at each of the monitoring sites using a simplified scoring system of the following 17 given attributes (the standard recording proforma used in condition assessments is provided in **Appendix 2**, which provides more detail on the scoring system used for each attribute):

- presence of subsidence cracking;
- myrtle rust;
- grazing by stock;
- logging/clearing;
- weed invasion;
- clearing or mowing of understorey;
- dieback in crown;
- epicormic growth;
- canopy plants age diversity/regeneration;
- canopy health;
- native diversity of mid strata;
- native diversity of lower strata/ground cover;
- presence of erosion;
- time since last flood (from records);
- fire history of remnant (from records);
- connectivity of remnant; and
- remnant shape.

### 8.2.2 Habitat Assessment

Utilising the 20 metre by 20 metre assessment plots (refer to **Section 8.2**) additional data will be collected in the flora plots to be used in an assessment of habitat.

Habitat values will be assessed by identifying terrestrial and arboreal nesting and roosting sites, food and water resources, habitat structure and habitat deficiencies. Recommended improvements will be made (if necessary) particularly in relation to threatened fauna species known to occur in the area. The following factors will be assessed by evaluating the following features within each plot:

- evidence of natural seedling recruitment;
- presence of logs;
- presence of hollow-bearing trees;
- presence of stags;
- presence of rock on rock habitat;
- signs of disturbance, either by stock, humans or feral animals;
- characteristics of ground cover (e.g. litter, logs, rock, soil);
- nectar, mistletoe or fruit resources and perch sites;
- presence of koala feed trees;
- range of age classes of vegetation present;
- water resources; and
- secondary evidence of fauna occupation such as scats, diggings or tree scratches.

Other general notes will be made where necessary in respect to general habitat values present.

### 8.2.3 Photo Monitoring

Photo monitoring will be undertaken for each vegetation monitoring site identified in **Figure 8.1**. For each vegetation monitoring plot, metal-star pickets will be established to indicate the corners. From two of these corners three photos will be taken (i.e. corner 1 to 2, corner 1 to 3, corner 1 to 4, corner 3 to 1, corner 3 to 2, and corner 3 to 4). These photos will be used for comparison to previous years over time, and to identify changes in the floristic composition and structure of sites.

## 8.3 Threatened Flora Species Monitoring

One threatened flora monitoring site was established in spring 2013 for small-flowered grevillea (*Grevillea parviflora* subsp. *parviflora*), and two further monitoring sites will be established for heath wrinklewort (*Rutidosis heterogama*) and netted bottle brush (*Callistemon linearifolius*) (refer to **Table 8.1** and **Figure 8.1**). The purpose of these sites is to assess the impacts of longwall mining on threatened species.

These sites will be established above these longwall panels at least one year prior to mining (where practical) and will be monitored for at least two years post mining to determine any impacts as a result of longwall mining. It is noted that proposed monitoring site 15 is located above longwall A7 where mining has already commenced. Monitoring at this site is

scheduled for spring 2013 with results to be incorporated into the 2013 annual ecological monitoring report.

The type of monitoring that will be undertaken for these threatened species varies due to the different growth forms of the plants being monitored. Heath wrinklewort (*Rutidosia heterogama*) is a daisy, small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*) is a small shrub and netted bottle brush (*Callistemon linearifolius*) is a tall shrub, as such they have different growth forms and habits. For this reason, small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*) and netted bottle brush (*Callistemon linearifolius*) are proposed to be monitored on an individual plant-by-plant basis, and heath wrinklewort (*Rutidosia heterogama*) is proposed to be monitored as discrete plant 'clumps'.

### 8.3.1 Small Flower Grevillea (*Grevillea parviflora* subsp. *parviflora*) Monitoring

Small flower grevillea (*Grevillea parviflora* subsp. *parviflora*) will be monitored at Site 12 as shown on **Figure 8.1**. At this monitoring location a 20 metre by 20 metre plot with each corner marked out using a star picket will be established. A count will be undertaken of the number of small-flowered grevillea (*Grevillea parviflora* subsp. *parviflora*) shrubs present within this plot. Each shrub will be marked with a silver metal tag, recording its individual number, attached to a galvanised tent peg which will be placed in the ground.

All small flower grevillea present will be monitored for the following features:

- visual canopy structure and allocation to a category of 'dead', 'near-dead', 'stressed' 'slightly stressed' or 'healthy' for each stem (see categories in **Table 8.3** below);
- position of shrub in relation to the plot (i.e. two metres south east of north west corner);
- mud-map of locations of shrubs within the plot;
- height (centimetres);
- reproductive status;
- number of plants in flower;
- age cohort; and
- information on the presence of potentially limiting factors, caused by longwall mining.

**Table 8.3 – Visual Canopy Categories**

Category of Tree Health	Description
Healthy	show no signs of dieback or leaf loss
Slightly Stressed	show minimal dieback through the presence of few small dead branches on otherwise healthy looking trees
Stressed	show reductions in leaf size or leaf loss, discolouration, canopy thinning, or dead branches with some level of dieback
Near-dead	show brown leaves, fine branches and thin canopy
Dead	are clearly identifiable because of an absence of leaves, fine branches and bark

Monitoring of small flower grevillea will be undertaken on an annual basis. As small flower grevillea (*Grevillea parviflora* subsp. *parviflora*) is a year-round flowering plant, monitoring can be undertaken at any time.

General observations regarding the health and presence of weed species etc. will also be recorded. Details will be recorded on presence of surface cracks, water ponding, gas venting, or other potential surface impacts. Photo monitoring will also be undertaken in this monitoring plot from a permanent monitoring location.

This site will be monitored until at least two years post mining to determine any impacts as a result of longwall mining.

### 8.3.2 Heath Wrinklewort (*Rutidosia heterogama*) Monitoring

Heath wrinklewort (*Rutidosia heterogama*) flowers primarily during autumn and as such will be monitored during this time. Monitoring for this species will be undertaken on an annual basis. The heath wrinklewort monitoring location will be undertaken at Site 13 as shown in **Figure 8.1**.

The heath wrinklewort monitoring site will consist of a 20 metre by 20 metre plot with each corner marked out using a metal star picket. It will also consist of two nested quadrats of dimensions two metres by two metres. Each metal star-picket will be marked with an attached metal tag recording the relevant site details. The positions of each of these star-pickets have also been recorded with a GPS so that the site can be accurately located.

Information recorded within the 20 metre by 20 metre plot will include identification of all vascular flora species present within the plot. Species within the plot will be assigned a cover-abundance value to reflect their relative cover and abundance in the plot.

Within the 20 metre by 20 metre plot, all heath wrinklewort clumps will be identified. Each clump will be marked with a silver metal tags, recording its individual number, attached to a galvanised tent peg which will be placed in the ground in the approximate centre of each clump. For the purposes of this monitoring a 'clump' will be considered as being those separated by more than 30 centimetres. The following information will be recorded for each heath wrinklewort clump:

- clump number;
- position of the clump in relation to the plot;
- mud-map of locations of clumps within the plot; and
- the approximate size of the clump.

In each two metre by two metre nested quadrat the following information will be recorded:

- number of individual clumps of heath wrinklewort;
- age cohort;
- height;
- reproductive status;
- number of plants in flower;

- minimum, maximum and average number of flowers per plant; and
- the approximate size of the clump.

The location of the clump in relation to the plot will be recorded to allow for accurate relocation of each clump during future monitoring events.

General observations regarding the health and presence of weed species etc will also be recorded. Details will also be recorded on presence of surface cracks, water ponding, gas venting, or other potential surface impacts. Photo monitoring will also be undertaken in this monitoring plot from a permanent monitoring location.

This site will be monitored until at least two years post mining to determine any impacts as a result of longwall mining.

### 8.3.3 Netted Bottlebrush (*Callistemon linearifolius*) Monitoring

Netted bottlebrush (*Callistemon linearifolius*) will be monitored in the same manner as small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*) monitoring as indicated in **Section 8.3.1** above. Netted bottlebrush (*Callistemon linearifolius*) monitoring will be undertaken at Site 15 as shown on **Figure 8.1**.

This site will be monitored until at least two years post mining to determine any impacts as a result of longwall mining.

## 8.4 Fauna Monitoring

Specific survey targeting fauna groups is not deemed necessary given the minimal surface disturbances predicted and the extensive effort required to collect sufficient data on fauna species to allow reliable comparisons to be made (Umwelt 2011).

Should the results of flora monitoring surveys reveal sufficient reason to conduct fauna surveys, the monitoring program should be appropriately adapted. Habitat assessments (refer to **Section 8.2.2**) will be undertaken as part of flora monitoring surveys and will provide a general indication of whether further fauna specific monitoring is required to be undertaken.

## 8.5 Rehabilitation Monitoring

Locations within the Extraction Plan area where rehabilitation or remediation works have been undertaken will be monitored on a regular basis in accordance with site procedures until they are considered to be self sustaining and no longer requiring management.

Monitoring of these areas will include visual inspections and photo monitoring and will focus on the following:

- germination rates;
- success rates of tubestock;
- weed infestation; and
- general condition.

## 8.6 Adaptive Management

The results of the ecological monitoring and management measures will be reviewed annually and reported in the Annual Review (refer to **Section 9.4**). Management measures will be adapted, as required, on the basis of monitoring outcomes. Amendments to ecological management processes may be undertaken to improve the ecological value of the Extraction Plan area (refer to **Section 7.0**). Amendments to management processes may be undertaken in light of any findings of the ecological monitoring identified in **Section 8.0**.

## 8.7 Post Mining Longwall Walkover Inspection

Subsidence monitoring surveys within the Extraction Plan area will be undertaken in accordance with the monitoring outlined in the Austar Subsidence Monitoring Program. Subsidence surveys will be undertaken pre-mining, during mining and post mining and will include inspection for potential impacts on biodiversity. Any changes to EECs or threatened species as a result of Austar mining activities would trigger the requirement for further investigation (refer to **Section 9.1**).

## 9.0 Reporting and Review

### 9.1 Trigger, Action, Response Plan

Austar has developed a protocol that outlines the response required in the event that mining operations have potentially resulted in adverse impacts to the ecological values of the surrounding environment.

The response protocol has been developed by identifying methods of addressing unanticipated identified impacts on ecological values in the Extraction Plan area, and outlining the response required in accordance with Project Approval conditions.

If the results of biodiversity monitoring (refer to **Section 8.0**), and/or walkover inspections (refer to **Section 8.7**) determine that impacts to biodiversity may have occurred, the Trigger, Action, Response, Plan (TARP) process outlined in **Table 9.1** is to be followed.

**Table 9.1 – Impacts to Biodiversity TARP**

<b>TARP</b>	<b>Process Step</b>
<b>Trigger</b>	<ul style="list-style-type: none"> <li>Biodiversity monitoring/walkover inspection indicates potential unanticipated impacts (i.e. dieback/tree falls in EEC or threatened species deaths).</li> </ul>
<b>Action</b>	<ul style="list-style-type: none"> <li>Notify the Austar Environment and Community Manager.</li> <li>Review recent monitoring results against historical monitoring data.</li> <li>Investigate the potential cause of any die backs/tree falls and whether this could be linked to subsidence in the area.</li> <li>Review recent monitoring results for control monitoring sites.</li> <li>Determine if an incident has potentially occurred in consultation with the relevant specialists as required.</li> </ul>
<b>Response</b>	<ul style="list-style-type: none"> <li>Report any Environment Incidents in accordance with the Austar EMS and reporting obligations detailed in the Project Approval (refer to <b>Section 9.2</b>).</li> </ul>
<b>Plan</b>	<ul style="list-style-type: none"> <li>Undertake any corrective actions required in consultation with regulatory authorities and relevant expert requirements.</li> <li>Prioritise actions based on the risk to the environment and likelihood of a repeat incident.</li> <li>Monitor the completion of actions to ensure they have been effective.</li> </ul>

### 9.2 Environmental Incidents

Austar has developed an environmental incident management procedure to:

- manage environmental hazards and incidents to minimise damage to people, environment, community and other assets;
- facilitate reporting of environmental incidents; and
- identify factors that contributed to incidents through an investigation process and to learn from those events and prevent reoccurrence.

All environmental incidents will be investigated to a level commensurate to their risk level in consultation with the Austar Environment and Community Manager.

Additionally, in accordance with Condition 7, Schedule 6 of the Project Approval:

The Proponent shall notify the Director-General and any other relevant agencies of any incident associated with the mine complex as soon as practicable after the Proponent becomes aware of the incident. Within 7 days of the date of the incident, the Proponent shall provide the Director-General and any relevant agencies with a detailed report on the incident.

Should any incident arise resulting in unpredicted impacts to biodiversity values at Austar as a result of Austar operations, a written report will be prepared in accordance with the above requirements. The written report will be provided to Department of Planning and Infrastructure (DP&I), OEH and any other relevant government agencies and will include the following details:

- the date, time and nature of the incident;
- identify the likely cause of the incident;
- description of the response action that has been undertaken to date; and
- description of the proposed measures to address the incident.

### 9.3 Community Complaints

All community complaints relating to biodiversity will be managed in accordance with the Austar Environmental Management Strategy which outlines the procedures to receive, handle, respond to and record complaints.

### 9.4 External Reporting

An Annual Ecological Monitoring Report will be prepared and will document the monitoring methods and results from the monitoring outlined in **Section 8.0**. This report will provide a comparison of the data collected with previous year's results as well as include management recommendations and ameliorative methods for ongoing biodiversity management of Austar. The results of the ecological monitoring and management measures will also be reported in the Annual Review. Management measures will be adapted, as required, on the basis of monitoring outcomes.

In addition, all environmental incidents, community complaints and non-compliances with statutory requirements in relation to biodiversity will be reported annually in the Annual Review.

### 9.5 Review

In accordance with Condition 4 of Schedule 7 of the Project Approval, Austar shall review, and if necessary revise, the strategies, plans, and programs required under Project Approval to the satisfaction of the Director-General, within 3 months of the submission of:

- the submission of an annual review;
- the submission of an incident report;

- the submission of an audit report; and
- any modification to the conditions of this approval (unless the conditions require otherwise).

The Environment and Community Manager (or delegate) will review this BMP on at least an annual basis or earlier in the event of modifications to the project approval or biodiversity related incidents. Any changes made to the BMP as a result of the review will be made in consultation with OEH. A copy of the revised BMP will be supplied to the Director-General of DP&I for approval. The approved BMP will be made publicly available on the Austar website ([www.austarcoalmine.com.au](http://www.austarcoalmine.com.au)).

## 10.0 Accountabilities

Table 10.1 – Accountabilities for this Document

Role	Accountabilities for this Document
General Manager	<ul style="list-style-type: none"> <li>• Approve appropriate resources for the effective implementation of this Plan.</li> </ul>
Environment and Community Manager	<ul style="list-style-type: none"> <li>• Coordinate the implementation of biodiversity management controls and strategies in accordance with this Plan.</li> <li>• Coordinate the ecological monitoring requirements of this plan, and evaluate and report monitoring results as required.</li> <li>• Coordinate biodiversity related incident investigations and reporting as required by legislation and internal standards and guidelines and TARP process outlined in <b>Section 9.1</b>.</li> <li>• Coordinate the review of this plan in accordance with the requirements of the Project Approval.</li> </ul>
All employees and contractors	<ul style="list-style-type: none"> <li>• Comply with all requirements of this plan.</li> <li>• Report all potential environmental incidents to their supervisor immediately.</li> <li>• Seek approval from the Austar Environment and Community Manager prior to any clearance activities.</li> </ul>

## 11.0 References

Austar Coal Mine 2009. *Site Water Management Plan*.

Austar Coal Mine in preparation, 2013. *Built Features Management Plan*.

Austar Coal Mine in preparation, 2013. *Subsidence Monitoring Program*.

Austar Coal Mine in preparation, 2013. *Land Management Plan*.

Austin et al 2000. *Predicted Vegetation Cover in the Central Lachlan Region. Final report of the Natural Heritage Trust Project AA 1368.97*. CSIRO Wildlife and Ecology, Canberra.

Bionet 2013. *Bionet – the website for the NSW Atlas of Wildlife*. <http://www.bionet.nsw.gov.au/>

Bell, S A J & Driscoll, C 2008. *Vegetation of the Cessnock-Kurri Region, Cessnock LGA, New South Wales: Survey, Classification & Mapping*. Prepared for the Department of Environment and Conservation, Newcastle.

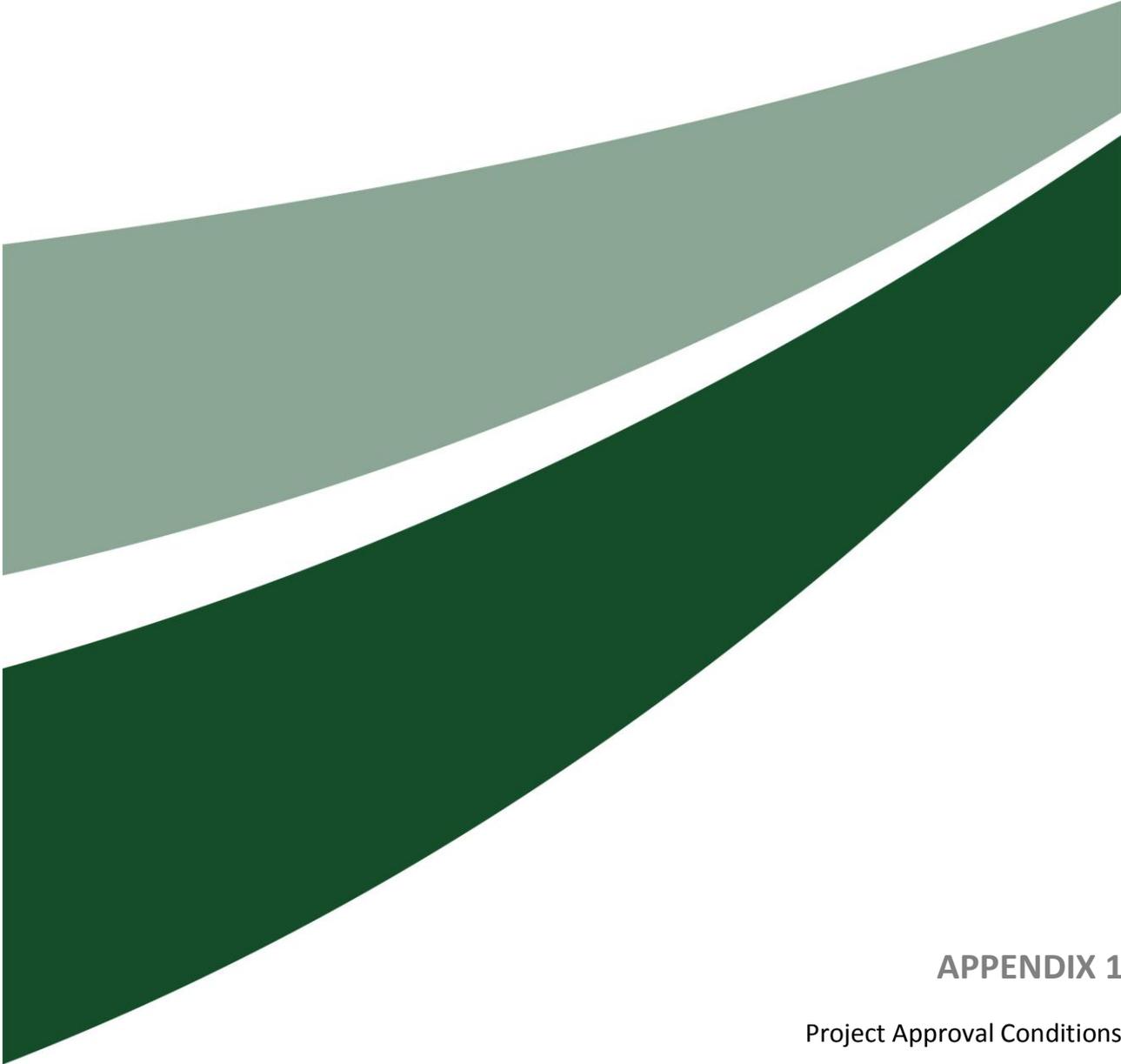
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Department of Environment and Conservation (DEC) 2006. *Lower Hunter Regional Conservation Plan 2006 (LHRCP)*.

Poore M, E, D, 1955. *The use of phytosociological methods in ecological investigations. I. The Braun-Blanquet system*. Journal of Ecology 42:216-224.

Umwelt 2011. *Austar Coal Mine Project – Stage 3 Modification Environmental Assessment*. Prepared by Umwelt (Australia) Pty Limited.

Umwelt 2013. *Austar Coal Mine LWA7-A10 Modification – Stage 3 Area Environmental Assessment*.



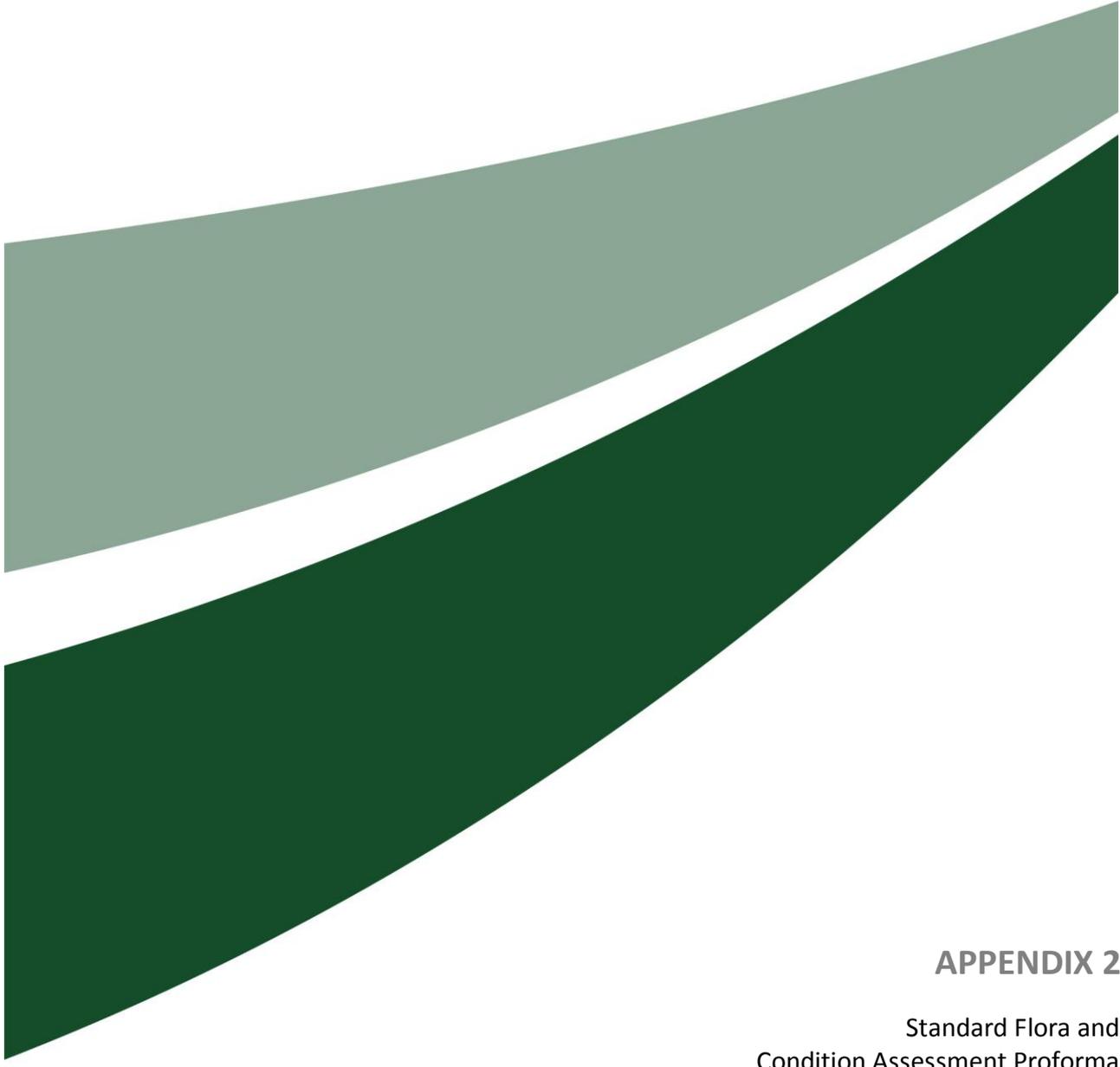
## **APPENDIX 1**

Project Approval Conditions

## Appendix 1 – Project Approval Conditions

<b>General Management Plan Requirements - Schedule 7 Condition 2</b>	<b>Section</b>
The Proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:	3.0, 4.0, 8.1
a) detailed baseline data	
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>	2.0, 2.0, 8.0 8.0
c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	6.0, 7.0
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>	8.0
e) a contingency plan to manage any unpredicted impacts and their consequences;	9.0
f) a program to investigate and implement ways to improve the environmental performance of the project over time;	8.6
g) a protocol for managing and reporting any: <ul style="list-style-type: none"> <li>• incidents;</li> <li>• complaints;</li> <li>• non-compliances with conditions of this approval and statutory requirements; and</li> <li>• exceedances of the impact assessment criteria and/or performance criteria; and</li> </ul>	9.0
h) a protocol for periodic review of the plan.	9.4

<b>Additional Extraction Plan Requirements – Condition 5 of Schedule 3</b>	<b>Section</b>
In addition to the standard requirements for management plans (above), the proponent shall ensure that the management plans required under 4e) include:	
a) a program to collect sufficient baseline data for future extraction plans	8.0
b) a revised assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since the approval	5.0
c) a detailed description of the measures that would be implemented to remediate predicted impacts; and	6.0 (in particular Section 6.2)
d) a contingency plan that expressly provides for adaptive management	8.6



## **APPENDIX 2**

Standard Flora and  
Condition Assessment Proforma

Date \_\_\_\_\_ Site No \_\_\_\_\_

Job No. \_\_\_\_\_

Recorders \_\_\_\_\_

Photo No. \_\_\_\_\_

**General Location** \_\_\_\_\_

**Specific Site Location** \_\_\_\_\_

\_\_\_\_\_

MGA Ref. (centre) E \_\_\_\_\_ N \_\_\_\_\_

**Quadrat Size** (if not 20x20) \_\_\_\_\_

**Map Geology** \_\_\_\_\_ **Lithology** \_\_\_\_\_

**General Comments** \_\_\_\_\_

\_\_\_\_\_

**Draft Vegetation Community** \_\_\_\_\_

\_\_\_\_\_

**Elevation** \_\_\_\_\_ m **Slope** \_\_\_\_\_ deg. **Aspect** \_\_\_\_\_ deg.

**HorElev** N \_\_\_ NE \_\_\_ E \_\_\_ SE \_\_\_ S \_\_\_ SW \_\_\_ W \_\_\_ NW \_\_\_

**Soil** Drainage- waterlogged/damp/well (moist)/ well (dry)  
 Texture - sand/loam/clay/peat \_\_\_\_\_  
 Depth - deep (>1m)/shallow(0.3-1m)/Skeletal (<0.3m)  
 Microrelief \_\_\_\_\_  
 Outcropping (% cover) \_\_\_\_\_  
 Runoff - nil/very slow/slow/ rapid/ very rapid \_\_\_\_\_  
 Colour \_\_\_\_\_ Moisture \_\_\_\_\_ Ph \_\_\_\_\_

**Disturb.** grazing \_\_\_ logging \_\_\_ erosion \_\_\_ feral \_\_\_ other \_\_\_\_\_

**Fire History** (How Determined) \_\_\_\_\_

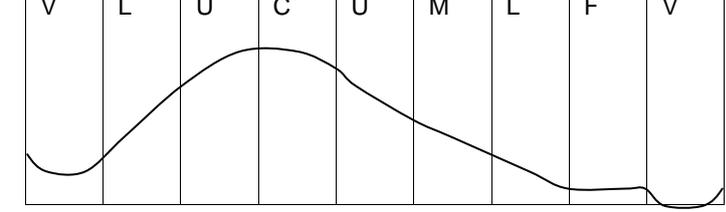
\_\_\_\_\_

**Ground** % Litter \_\_\_ Rock \_\_\_ Lichen \_\_\_ Non Vas. Plants \_\_\_\_\_

**SEPP 44 Assessment completed** yes / no

Cover (Modified Braun-Blanquet)	Abundance	Scale	Growth Form Dependent (*)
1...few individuals,<5% cover(*)`			Herbs, sedges and grasses; <5 individuals... 1 >= 5 individuals... 2
2..many individuals,<5% cover (*)			
3...5 - <20% cover			Shrubs and small trees; <5 individuals..... 1 >= 5 individuals... 2
4...20 - <50% cover			
5...50 - <75% cover			Medium-large overhanging tree... 2
6.....75 - 100% cover			

**Physiography**



**Vegetation Structure**

	Stratum	Ht (m)	%	Dominant Species
1				
2				
3				
4				
5				

ID	Field Name	Botanical Name	C/A	Entered	Herbarium
1					
2					
3					
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<b>KOALA FEED TREE SPECIES</b>	<b>COUNT OF KOALA FEED TREES IN PLOT</b>
<i>Eucalyptus tereticornis</i> (Forest Red Gum)	
<i>Eucalyptus microcorys</i> (Tallowwood)	
<i>Eucalyptus punctata</i> (Grey Gum)	
<i>Eucalyptus viminalis</i> (Manna Gum)	
<i>Eucalyptus camaldulensis</i> (River Red Gum)	
<i>Eucalyptus haemastoma</i> (Broad-leaved Stringybark)	
<i>Eucalyptus signata</i> (Scribbly Gum)	
<i>Eucalyptus albens</i> (White Box)	
<i>Eucalyptus populnea</i> (Poplar Box)	
<i>Eucalyptus robusta</i> (Swamp Mahogany)	
<b>TOTAL NUMBER OF TREES IN PLOT</b>	

## Condition Assessment Proforma

Site No: \_\_\_\_\_ Recorder/s: \_\_\_\_\_ Date: \_\_\_\_\_

Location: GPS way pt. of site marker (if used) \_\_\_\_\_ Easting \_\_\_\_\_ Northing \_\_\_\_\_

Fencing: fully/ partial / not fenced \_\_\_\_\_ Current land use: \_\_\_\_\_

Monitoring Photos (taken from marker: stake or tagged tree)

Position of site marker in remnant:

North East Corner				North West Corner			
Bearing	Photo No.	Bearing	Photo No.	Bearing	Photo No.	Bearing	Photo No.
180 deg	518	0 deg	517	90 deg	520	270 deg	523
90 deg	519	270 deg	516	0 deg	521	180 deg	522
Attribute of Remnant/Site				Score	Comments		
<b>Presence of Cracking</b>							
1	extensive cracking present (>50mm width)						
2	moderate cracking present (up to 50mm width)						
3	cracking present, however only hairline cracks						
4	cracking absent						
<b>Myrtle Rust</b>							
1	Severe (impacting >50% of Myrtaceae individuals)						
2	moderate (impacting 5 – 50% of Myrtaceae individuals)						
3	Slight (impacting <5% Myrtaceae individuals)						
4	absent						
<b>Grazing by stock</b>							
1	severe/heavy						
2	moderate (limited but evident)						
3	nil – very low						
<b>Logging/Clearing</b>							
1	severe/heavy						
2	moderate (selective)						
3	nil – very low						
<b>Weed invasion</b>							
1	30%+ cover						
2	10-30%						
3	<10%						
<b>Clearing or mowing of understorey</b>							
1	30%+ cleared						
2	10-30% cleared						
3	<10% cleared						
<b>Dieback in crown</b>							
1	30%+ dead						
2	10-30% dead						
3	<10% dead						
<b>Epicormic Growth</b>							
1	Severe (lots of growth on the majority of trees)						
2	Moderate (several growths on less than half of trees)						
3	Nil-low						
<b>Canopy plants age diversity/regeneration</b>							
1	1-2 ages						
2	3-4 ages						
3	5+ ages						

<b>Canopy Health</b>			
0	Long term dead (small branches fallen, leaves totally gone, bark mostly gone)		
1	Medium term dead( small branches still attached, no leaves, cracked bark)		
2	Recent dead (small branches still attached, none or dead leaves still attached, bark intact)		
3	Near dead (<10% foliage alive)		
4	Highly stressed (Canopy: severe dieback, mostly epicormic or recovery growth)		
5	Very stressed (50-90% canopy foliage dead/absent, many small branches bare/fallen (nil to moderate epicormic or new growth recovery))		
6	Stressed (10-50% canopy foliage dead/absent (significant dieback))		
7	Slightly Stressed (5-10% canopy foliage dead/absent or brown (minimal dieback))		
8	Healthy (0-5% canopy foliage dead/absent or brown (Dieback not apparent))		
<b>Native diversity of mid strata</b>			
1	<5 species		
2	5-10 species		
3	10+ species		
<b>Native diversity of lower strata/ground cover</b>			
1	<5 species		
2	5-10 species		
3	10+ species		
<b>Erosion</b>			
1	severe/impacting >30%of site		
2	moderate (limited but evident)		
3	nil – very low (minimal impact)		
<b>Time since last flood (from records)</b>			
1	<5 years		
2	5-10 years		
3	over 10 years		
<b>Fire history of remnant (from records)</b>			
1	< 20 years		
2	20-50 years		
3	>50 years		
<b>Connectivity of Remnant</b>			
1	isolated (over 50m from nearest neighbouring remnant)		
2	part of a local corridor (occurs within 50m of two or more similar sized or larger remnants)		
3	part of a regional corridor (connected to large tract of vegetation that extends across floodplain to catchment foothills)		
<b>Remnant shape</b>			
1	linear (1-3 trees wide)		
2	rectangle, oblong or narrow core (>3 trees wide)		
3	square, circle or large core (many trees wide)		



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