

Land Management Plan

Austar Coal Mine Pty Ltd

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Abbreviations

ACHMP	Aboriginal Cultural Heritage Management Plan
AEMR	Annual Environmental Management Plan
Austar	Austar Coal Mine Pty Ltd
AR	Annual Review
BMP	Biodiversity Management Plan
CML	Consolidated Mining Lease
DA	Development Application
DP&I	Department of Planning and Infrastructure
DRE	Division of Resources and Energy
EA	Environmental Assessment
EMS	Environmental Management System
ESCP	Erosion and Sediment Control Plan
GDP	Ground Disturbance Permit
LFA	Landscape Function Analysis
LMP	Land Management Plan
LTCC	Longwall Top Coal Caving
MOP	Mining Operations Plan
MSB	Mine Subsidence Board
NPWS	National Parks and Wildlife Service
PA	Project Approval
PSMP	Public Safety Management Plan
SM Program	Subsidence Monitoring Program
SWMP	Site Water Management Plan
TARP	Trigger Action Response Plan
WCMP	Watercourse Management Plan
Yancoal	Yancoal Australia Pty Limited

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1.0 Introduction

This Land Management Plan (LMP) has been prepared to meet conditions of Project Approval (PA) 08_0111 (as modified) and to support the Austar Stage 3 Extraction Plan.

1.1 Background

1.1.1 Operations and Approvals

Austar Coal Mine Pty Ltd (Austar), a subsidiary of Yancoal Australia Pty Limited (Yancoal), operates Austar Coal Mine, an underground coal mine located approximately 10 kilometres south of Cessnock in the Lower Hunter Valley in NSW. 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 introduced an enhanced form of the conventional retreat longwall system to the Australian coal mining industry in 2006 called Longwall Top Coal Caving (LTCC). This technology has been used in the Stage 1 and Stage 2 mining areas approved by modifications to Development Application (DA) 29/95.

In September 2009 the Minister for Planning granted Project Approval (PA 08_0111) for the Austar Stage 3 Extension under the *Environmental Planning and Assessment Act 1979* and Regulations.

In March 2012 the Department of Planning and Infrastructure (DP&I) approved modification of Project Approval 08_0111 (MOD 2) under delegation from the Minister for Planning and Infrastructure, to permit reorientation of the Stage 3 longwall panels.

In December 2013 the DP&I approved modification of Project Approval 08_0111 (MOD 3) under delegation from the Minister for Planning and Infrastructure, in order to vary to the commencing and finishing ends of LW A7 to A10.

This LMP has been updated to reflect predicted impacts from the MOD2 and MOD3 project modifications.

The Stage 3 project (as modified) will involve mining of known coal resources within approximately 800 hectares of Austar's Consolidated Mining Lease 2 (CML2), Mining Lease 1661, Mining Lease 1666. The Stage 3 mine plan provides for 13 longwall (LW) panels, named A7 to A19, arranged in a south west facing orientation (see Figure 1). Managing the predicted subsidence impacts resulting from secondary extraction of LW A7 to A19 is the primary focus of this LMP.

1.1.2 Land Ownership and Access

Land within the Stage 3 project area is overlain by a combination of the Werakata State Conservation Area, private landholdings, and public roads. Landownership is discussed further in Section 3.1. It is important to note that Austar may not undertake any works on land outside of Austar's ownership described in this plan without landowner permission.

Austar has a comprehensive consultation program to facilitate access for monitoring and potential remediation activities within the Stage 3 project area, and has already secured access to significant areas of land subject to this plan prior to any potential impacts from subsidence occurring. Austar is significantly progressed in securing access to further private lands in order to meet Austar's obligations and commitments of PA 08_0111 in relation to subsidence management.

1.2 Related Documents

This LMP will fit within Austar's Environmental Management System (EMS) as a sub plan to the Stage 3 Extraction Plan (in development) for second workings. In particular, the following documents, or future iterations thereof, as required by current development consent are of relevance to land management:

- Aboriginal Cultural Heritage Management Plan (ACHMP) (Umwelt, 2013);
- Biodiversity Management Plan (BMP) (Umwelt, 2013);
- Erosion and Sediment Control Plan (ESCP) (Austar, 2013);
- Subsidence Monitoring Program (SM Program) (Austar, 2013);

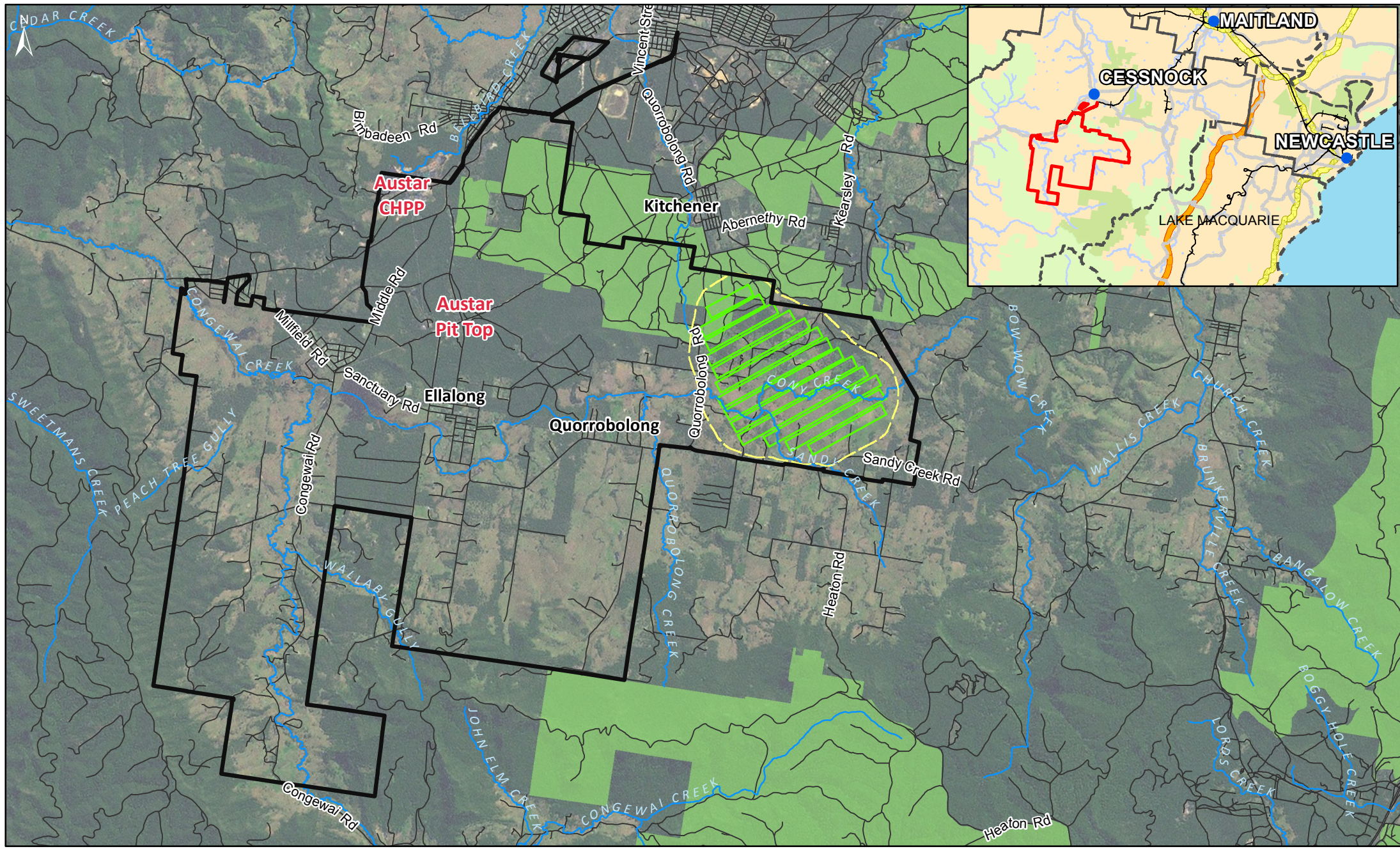
- Site Water Management Plan (SWMP) (Austar, 2013);
- Watercourse Management Plan (WCMP) (to be developed for Extraction Plan from LWA11 onwards); and
- Mining Operations Plan (MOP) (Austar, 2008).

This LMP should be read and implemented in conjunction with the latest approved versions of the above documents.

1.3 Structure of this Report

The remainder of this LMP is structured as follows:

- Section 2.0 Outlines the purpose and objectives of this management plan.
- Section 3.0 Describes the existing environment, identifying potential risks to the landscape as a result of Stage 3 project activities. Summarises existing management and mitigation measures in place.
- Section 4.0 Identifies the potential environmental consequences, as relevant to land management, resulting from the Stage 3 project activities.
- Section 5.0 Outlines the monitoring methodologies to be implemented for land management under this LMP.
- Section 5.0 Sets out the performance measures and performance indicators relevant to the management of land affected by the Stage 3 project activities.
- Section 7.0 Sets out a contingency plan for land management, including a Trigger Action Response Plan (TARP).
- Section 8.0 Outlines the management, reporting and review requirements of this LMP.



- Mining Lease Boundary
- Stage 3 Longwall Panels
- Limit of Subsidence (20mm)
- Roads
- Creek Lines
- NPWS Reserve

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2.0 Purpose and Objectives

2.1 Purpose of the LMP

The purpose of this LMP is to provide a framework to manage the environmental consequences of the Stage 3 project on land within the Stage 3 underground mining area and includes areas of steep slopes and general surface drainage. However this LMP does not describe management of watercourses or alluvium within the Stage 3 underground mining area. These environmental aspects will be managed separately in a Watercourse Management Plan.

2.2 Statutory Requirements

The PA (08_0111) requirements relevant to this LMP are reproduced in Appendix A.

2.3 Objectives of the LMP

The objectives of the LMP are to:

- Establish baseline data to inform future management activities.
- Identify and describe the environmental consequences of the Stage 3 project on land within the Stage 3 underground mining area.
- Specify the objectives and performance measures to effectively manage the environmental consequences on land within the Stage 3 project area.
- Identify performance indicators and completion criteria which will be used to judge the effectiveness of land management activities and the environmental performance of the Stage 3 project.
- Describe the monitoring methods which will be employed to inform and/or trigger land management activities.
- Provide contingency measures which explicitly provide for adaptive management.
- Describe the process for responding to any incidents, complaints or non-compliances with statutory requirements.
- Outline a process detailing periodic review of this plan and continual improvement.

2.4 Rehabilitation Objectives

Rehabilitation objectives for land affected by the Stage 3 project are presented in Table 1 (from Table 6; PA 08_0111).

Table 1 Rehabilitation Objectives

Domain	Objectives
Land affected by the project (including watercourses and steep slopes)	Rehabilitate landform, land use and ecosystem function to that existing pre-mining and consistent with the surrounding landform.
	Reduce safety hazards to no more than those existing pre-mining.
	Minimise erosion risk.

Note: This LMP does not describe management of watercourses or alluvium within the Stage 3 underground mining area. These environmental aspects will be managed separately in a Watercourse Management Plan.

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3.0 Existing Environment

Land potentially affected by the Stage 3 project is shown on Figure 2 and the features of this landscape are summarised below.

3.1 Land Ownership

Land ownership within the Stage 3 mining area is shown in Figure 2. Land within the Stage 3 project area is overlain by a combination of the Werakata State Conservation Area, private landholdings, and public roads. Landowners and the general public may therefore access these areas.

A Public Safety Management Plan (PSMP) for the Stage 3 project area has been developed as part of the Extraction Plan to address public safety risks as a result of secondary extraction in the mining area.

3.2 General Landform

The majority of the Stage 3 mining area is located immediately to the south of Broken Back Range which is a major landform extending from west of Pokolbin to Mulbring. Broken Back Range has a maximum elevation adjacent to the Stage 3 mining area of RL 236 metres. This landform is characterised by steep slopes, narrow ridges and deep gullies. The majority of the Broken Back Range landform in the vicinity of the Austar mine complex is within the boundary of the Werakata State Conservation Area.

3.3 Steep Slopes

A steep slope has been defined as an area of land having a natural gradient greater than 18° (MSEC 2011) with these areas being identified as areas where the existing ground slopes are considered to be marginally stable (MSEC 2011). However the stability of natural slopes varies depending on soil or rock type and natural slopes can be stable at gradients much higher than 18° (MSEC 2011). The reason for identifying steep slopes is to highlight areas in which existing ground slopes may be marginally stable.

The locations of steep slopes within the Stage 3 project area are shown in Figure 3. Steep slopes are concentrated where the Broken Back Range crosses the northern part of the study area (above LW A7 to LW A9), east of LW A11 to LW A15 and along the hill in the southern part of the study area (above LW A19). Coney Creek may also present some steep slopes along its banks within the Stage 3 project area.

3.4 Hydrology and Drainage

Catchment boundaries in the vicinity of the Stage 3 mining area are shown on Figure 3. The majority of the Stage 3 mining area drains to Congewai Creek catchment. Water flows west out of the catchment via Quorrobolong Creek system which drains to Ellalong Lagoon, from where it flows into Congewai Creek, Wollombi Brook and subsequently the Hunter River.

The Stage 3 underground mining area is located on the south facing gentle lower slopes of the Broken Back Range and includes the Sandy Creek and Cony Creek drainage system and associated flats and footslopes. Most of the central and southern portions of the Stage 3 project area are located under undulating hillslopes, which extend from the Broken Back Range to the alluvial landforms of the Cony and Sandy Creek systems. Numerous tributaries of these creek systems occur within the Stage 3 mining area.

Flats of up to 55 metres in width extend from both Cony Creek and Sandy Creeks. The majority of all creeks within the Stage 3 project area have been dammed at least once along their length. Cony Creek flows from east to west above the longwalls where it joins Quorrobolong Creek approximately 2 km west of LWA12. Sandy Creek originates to the south of the Stage 3 project area and joins Cony Creek at the south-western edge of the Stage 3 project area. Watercourses are managed in accordance with the Austar Watercourse Management Plan.

3.5 Soil Landscapes

Three soil landscapes described below occur within the Project area as shown on Figure 3.

Quarrabolong Soil Landscape

The Quarrabolong Soil Landscape comprises a significant proportion of landscape above the proposed Stage 3 mining area. The Landscape defines the creek lines and associated landforms (flats and lower hill slopes) of the

Quorrobolong Creek, Cony Creek and Sandy Creek systems. These soils have very low permeability and very high strength when dry (Umwelt, 2008). The upper horizons potentially exhibit accelerated erosion if disturbed.

Aberdare Soil Landscape

Aberdare Soil Landscape extends along the crests and hill slopes of the project area to the south of the Werakata State Conservation Area. Alluvial soils are also found along drainage lines. The topsoil and subsoil can be moderately erodible.

Branxton Soil Landscape

The Branxton Soil Landscape occurs only in the northern section of the project area and within the Werakata State Conservation Area. The soils of this landscape include yellow podzolic, red podzolic, yellow soloth soils, alluvial sands and siliceous sands. Excluding alluvial soils, the topsoil is moderately erodible.

3.6 Flora & Fauna

The slopes and ridges within the Stage 3 mining area support an open forest dominated by spotted gum (*Corymbia maculata*) and broad-leaved ironbark (*Eucalyptus fibrosa*) with a sparse to moderately dense shrubby mid-story and grassy ground layer.

The vegetation within the majority of the underground mining area is dominated by grassland and pastures. Much of the area has been logged and grazed and continues to be used for agriculture purposes. The vegetation within the Werakata State Conservation Area is relatively immature due to the majority of vegetation previously being cleared for forestry operations. As a result, the vegetation in the area supports relatively few hollow-bearing trees.

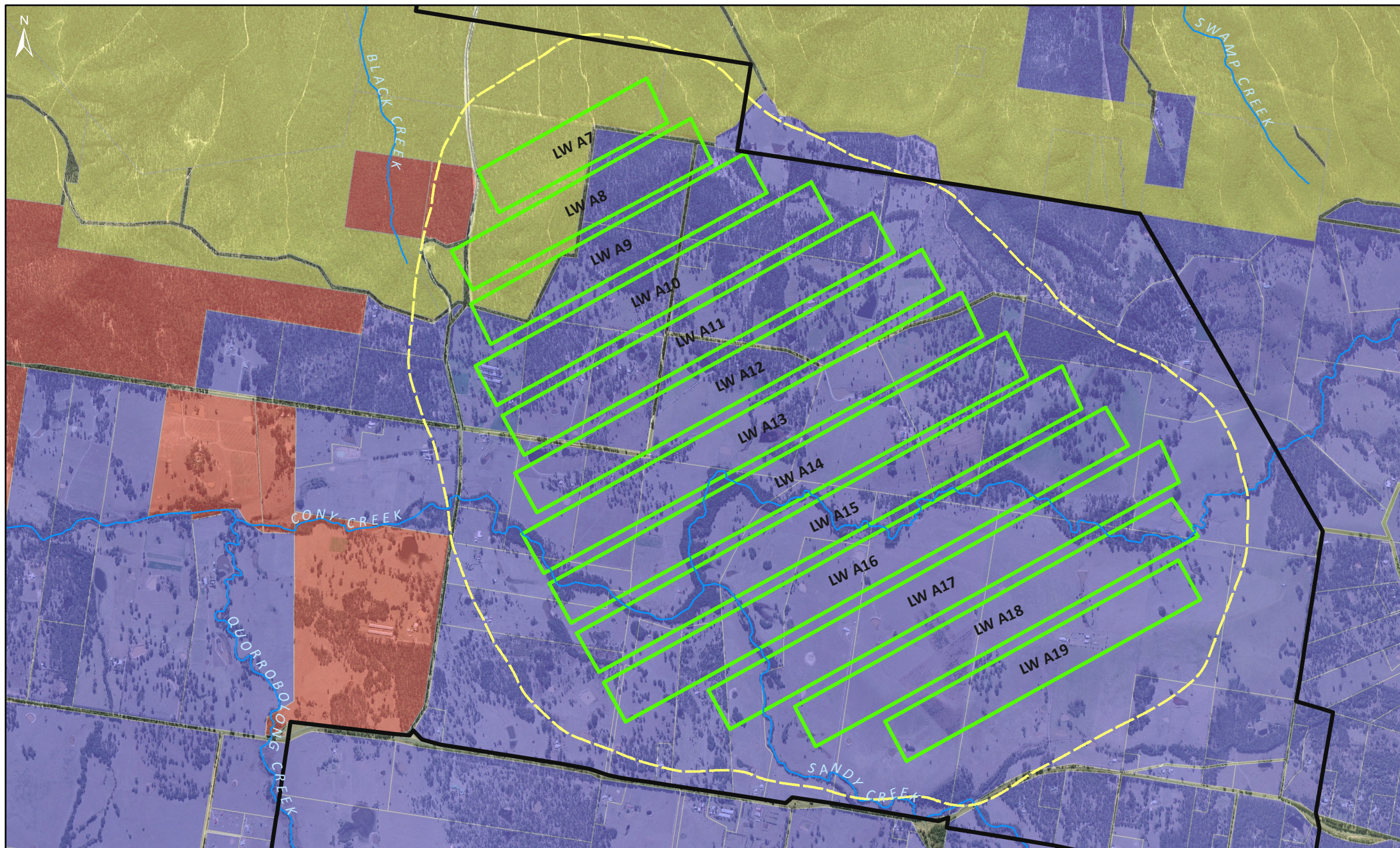
Whilst the completion of the Stage 3 Environmental Assessment illustrated the species and ecological communities present within the Stage 3 mining area, there are no rare or threatened flora or fauna known to occur within the Stage 3 project area that will be significantly impacted by the development (Umwelt 2012 and Umwelt 2013). The study found the following:

- Three confirmed threatened flora species (refer Figure 4) including the heath wrinklewort (*Rutidosia heterogama*) and the small-flower grevillea (*Grevillea parviflora subsp. parviflora*) and the netted bottle-brush (*Callistemon linearifolius*) located in the north west of the Stage 3 area;
- Four Endangered Ecological Communities (refer Figure 4), located generally in the northern extent of the Stage 3 area and within riparian zones of Cony Creek:
 - Hunter Lowland Redgum Forest;
 - Lower Hunter Spotted Gum – Ironbark Forest;
 - River-flat Eucalypt Forest; and
 - Quorrobolong Scribbly Gum Woodland.
- Nine threatened fauna species (including the gang-gang cockatoo, grey-crowned babbler, speckled warbler, powerful owl, squirrel glider, little bentwing bat, eastern bentwing bat, large-footed myotis, and the eastern freetail-bat).

As required under PA08_0111, a Biodiversity Management Plan (BMP) (Umwelt, 2013) has been prepared to manage the potential environmental consequences of second workings on aquatic and terrestrial flora and fauna, with a specific focus on threatened species.

3.7 Weeds

The ecological assessment undertaken for the Stage 3 Environmental Assessment included an assessment of general health and condition of vegetation as well as the presence of weeds. There are very low numbers of invasive species within the privately owned lands and surrounding Werakata State Conservation Area overlying the Stage 3 mining area.



- Mining Lease Boundary
 - Limit of Subsidence (20mm)
 - Creek Lines
 - Stage 3 Longwall Panels
- Land Ownership**
- Austar Coal Mine Pty Ltd
 - Private Landholdings
 - Werakata State Conservation Area / Crown Land

Stage 3 Underground Mining Area - Land Ownership

Austar Land Management Plan

Source: Austar (2012), Umwelt (2011)

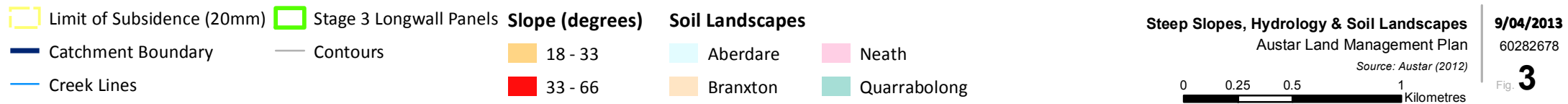
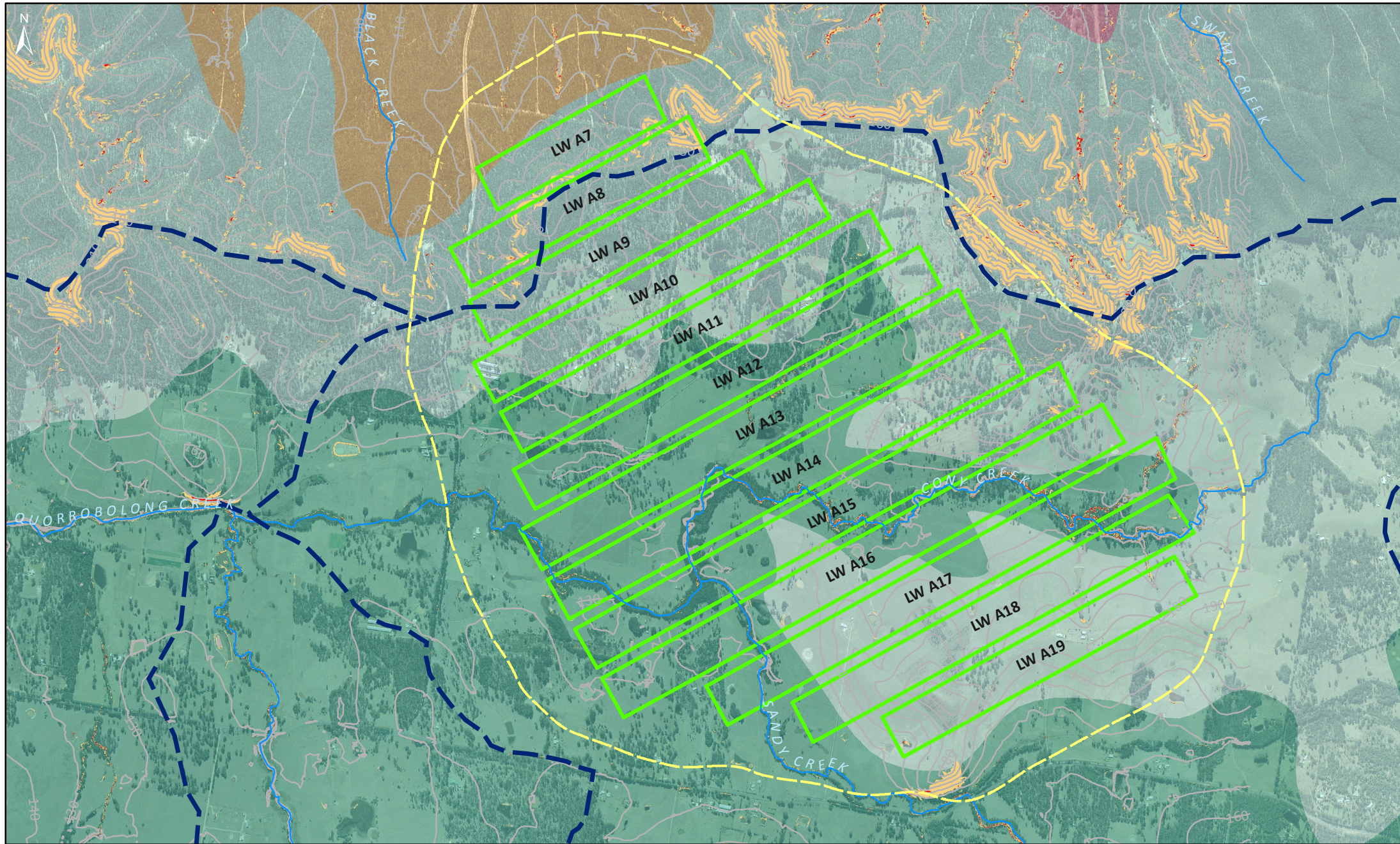


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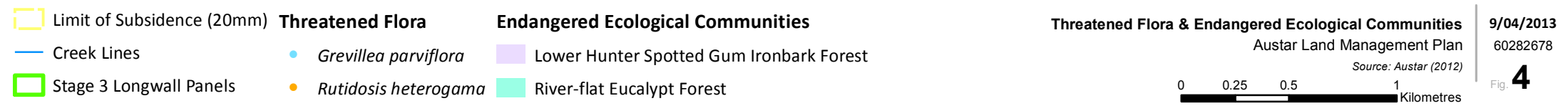
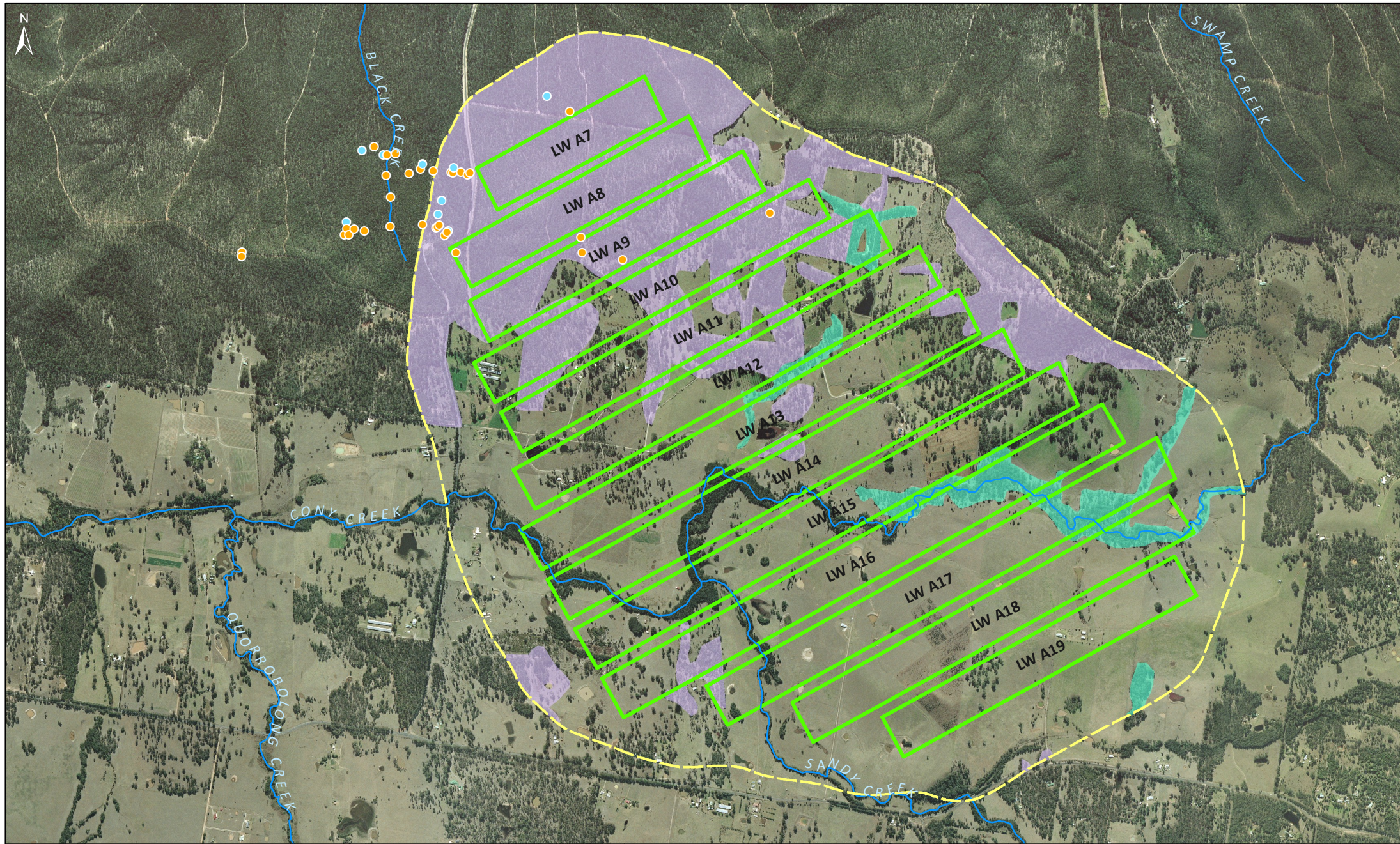
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4.0 Potential Environmental Consequences of Mine Subsidence

Detailed subsidence predictions and impact assessments (MSEC 2008, 2011, 2013) were prepared to inform the original Stage 3 Project Environmental Assessment (EA) (Umwelt 2008) and subsequent project modifications. The purpose of modifying the Stage 3 Project was to allow reorientation of the longwall (LW) panels effecting safer and more efficient extraction of the project area.

Subsidence movements across the Stage 3 project area (as modified) are expected to be reasonably uniform due to the depth of cover which exceeds 400m. Subsidence is predicted to occur in a broad shallow bowl shape that will extend from the north-west (LWA7) to the south-east (LWA19) of the proposed mining area. The predicted maximum surface area that is likely to be affected by subsidence due to Stage 3 mining activities is shown in Figure 2. The maximum predicted total conventional subsidence is expected to range from a minimum of 450mm in the northern extent of the mining area (LW A7), increasing to a maximum of 1775mm (LW A19) in the southern extent of the mining area (MSEC 2013). The project area is predicted to experience maximum tilt of 6.0 mm/m (MSEC 2013). A summary of maximum total conventional subsidence predictions across the Stage 3 underground mining area is provided in Table 2.

Table 2 Maximum Predicted Total Conventional Subsidence, Tilt and Curvature after the Extraction of Each of the Proposed Longwalls (MSEC 2013, Table 4.2)

Longwalls	Maximum Predicted Total Conventional Subsidence (mm)	Maximum Predicted Total Conventional Tilt (mm/m)	Maximum Predicted Total Conventional Hogging Curvature (km^{-1})	Maximum Predicted Total Conventional Sagging Curvature (km^{-1})
LW A7	450	2.5	0.02	0.03
LW A8	1175	5.5	0.05	0.09
LW A9	1425	6.0	0.05	0.09
LW A10	1500	6.0	0.05	0.09
LW A11	1600	6.0	0.05	0.09
LW A12	1650	6.0	0.05	0.09
LW A13	1675	6.0	0.05	0.09
LW A14	1675	6.0	0.05	0.09
LW A15	1675	6.0	0.05	0.09
LW A16	1675	6.0	0.05	0.09
LW A17	1725	6.0	0.05	0.09
LW A18	1775	6.0	0.05	0.09
LW A19	1775	6.0	0.05	0.09

Separate maximum total conventional subsidence predictions are provided for areas of steep slopes within the Stage 3 underground mining area and are provided in Table 3 (MSEC, 2013). For this assessment steep slopes are defined as an area of land having an angle greater than 18°. Two areas of steep slopes have been identified within the underground mining area, Broken Back Range and a hill above LW A19. Maximum predicted conventional subsidence is expected to reach a maximum of 1600mm at Broken Back Range and 1275mm at the hill above LW A19. Hogging and sagging curvature is expected to have a greater impact on steep slopes in comparison to tilts. Curvature is expected to reach a maximum of 0.09 km^{-1} at Broken Back Range and 0.03 km^{-1} at the hill above LW A19. These results are similar to those typically experienced in the Southern Coalfield and the potential impacts are therefore expected to be limited to isolated and narrow tension cracking (MSEC, 2011).

Table 3 Maximum Predicted Total Conventional Subsidence, Tilt and Curvature at the Steep Slopes Resulting from the Extraction of the Proposed Longwalls (MSEC 2013, Table 5.4)

Location	Longwall	Maximum Predicted Conventional Subsidence (mm)	Maximum Predicted Conventional Tilt (mm/m)	Maximum Predicted Conventional Hogging Curvature (km ⁻¹)	Maximum Predicted Conventional Sagging Curvature (km ⁻¹)
Broken Back Range	After LW A7	350	1.5	0.01	0.01
	After LW A8	1175	5.5	0.05	0.09
	After LW A9	1400	5.5	0.05	0.09
	After LW A10	1500	5.5	0.05	0.09
	After LW A19	1600	5.5	0.05	0.09
Hill above Longwall A19	After LW A16	<20	<0.5	<0.01	<0.01
	After LW A17	50	0.5	<0.01	<0.01
	After LW A18	325	2.5	0.02	<0.01
	After LW A19	1275	4.5	0.03	0.02

Subsidence impacts across the Stage 3 project area are predicted to include surface cracking, subsurface cracking, slope instability, valley closure and uplift, and surface ponding. Environmental consequences of subsidence may include risks to public safety and livestock, landuse impacts, erosion, and changes to vegetation coverage through altered water movement. The subsidence impacts and environmental consequences as relevant to land management activities within the Stage 3 project area are summarised in Table 4.

Table 4 Potential Environmental Consequences Associated with Land Subsidence

Subsidence Impact	Summary of Revised Subsidence Prediction (MSEC 2011, Umwelt 2011)	Potential Environmental Consequence
Surface Cracking	Surface cracking resulting from the extraction of the proposed longwalls is expected to be of a minor nature, which can be easily remedied by infilling with soil or other suitable materials, or by locally regrading and re-compacting the surface. It is possible that the creeks could experience elevated compressive strains as a result of valley closure movements. Some compressive buckling and dilation of the uppermost bedrock could occur beneath the natural surface soils in Cony and Sandy Creeks above and within 250 m of the longwalls. Surface cracking can occur where the uppermost bedrock fractures or buckles and where the depths of cover to bedrock are shallow. Such surface cracking is likely to be filled with the natural surface soils during subsequent flow events.	Cracks in soil surface, causing potential risk to public safety and livestock.
		Increased surface drainage and altered (decreased or increased) agricultural productivity.
		Increased risk of erosion.
		It is unlikely that there would be any net loss of water from the creeks resulting from the extraction of the longwalls.
		Minor potential impacts to archaeological sites are considered in the Austar Aboriginal Cultural Heritage Management Plan (ACHMP).
Slope Instability	The predicted changes in grade are unlikely to result in significant impact on the stability of the steep slopes. Potential impacts would generally result from down slope movement of soils, causing tension cracks to appear at the tops of the slopes and compression ridges to form at the bottoms of the slopes. Potential impacts on the steep slopes within the Stage 3 study area are expected to be similar to those previously observed in the Southern Coalfield. Although no large-scale slope failures have been observed in the Southern Coalfield, tension cracking has been observed at the tops of steep slopes as the result of downslope movements. Cracks resulting from downslope movements at depths of cover similar to those in the Stage 3 study area are generally isolated and narrow, with maximum widths in the order of 50 mm. Larger cracks have been observed at the tops of very steep slopes and adjacent to large rock formations, where maximum crack widths in the order of 100 mm to 150 mm have been observed.	Surface cracking and/or compression ridges increasing the probability of soil erosion and causing a potential risk to public safety unless remediated.
		Landslip of surface terrain, causing a potential risk to public safety.
		Increased risk of erosion and sedimentation of drainage lines.
		Soil loss and exposure of sub-soil.
		Minor potential impacts to archaeological sites are considered in the Austar Aboriginal Cultural Heritage Management Plan (ACHMP).

Subsidence Impact	Summary of Revised Subsidence Prediction (MSEC 2011, Umwelt 2011)	Potential Environmental Consequence
	While in most cases, impacts on steep slopes are likely to consist of surface cracks, there remains a low probability of large-scale downslope movements. Experience indicates this probability is extremely low due to the significant depth of cover in the study area.	
Surface Ponding	Maximum subsidence predictions for Stage 3 mining indicate that negligible changes to remnant surface ponding are likely. The potential impact to remnant ponding would be confined to existing flow paths, paddocks and dams, with no predicted impact on access routes to or within the properties along Cony Creek (Umwelt 2011). The upper bound (or worst case) subsidence predictions indicate that significant changes to surface ponding in the area to be undermined are possible (MSEC 2011). However whilst the upper bound subsidence predictions indicate that an increase to remnant surface ponding is possible, the likelihood of this occurrence is minimal, as comparisons of observed subsidence in earlier stages of mining at the site have been less than the maximum predicted subsidence.	Altered surface flow, increased erosion and localised changes in water availability.
		Altered soil moisture or nutrient distribution patterns.
		Decreased productivity on agricultural lands due to increased erosion and/or changes in soil moisture and nutrient distribution patterns.

5.0 Monitoring

5.1 Monitoring Methodology

General landform condition inspections will be undertaken on a regular basis to assess subsidence related impacts in accordance with the Austar Subsidence Monitoring Program (SM Program). General condition monitoring will only be conducted with the agreement of the relevant landowner (National Parks and Wildlife Service or private landholders).

The general condition monitoring activities will identify:

- Surface cracking particularly around edges of extraction void, travelling abutments and steep slopes;
- Surface humps near centre of extracted panels, travelling abutments and topographic lows of adjacent steep slopes;
- Step changes in land surface;
- Slope, boulder and tree instability; and
- General vegetation condition and % ground cover.

Where remedial works are required following subsidence impacts, additional monitoring will be undertaken to identify the progress of revegetation activities and confirm the success and adequacy of remediation and repair works. The timing and degree of additional monitoring activities will be dependent on the nature of remediation works required.

However as a minimum, follow-up monitoring activities will be undertaken on a quarterly basis until the success of remedial works is adequately demonstrated. Where sensitive environmental features are identified (e.g. threatened species or habitats) additional monitoring requirements may be established in consultation with affected landholders (e.g. NPWS or private landholders).

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6.0 Objectives, Performance Measures, Indicators and Criteria

Detailed objectives, performance measures, indicators and criteria for the management of land have been developed for the Stage 3 underground mining area and are presented in Table 5.

Monitoring will be used to assess the impact of the operations against these performance measures and indicators as detailed in Section 5.0.

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Table 5 Objectives, Performance Measures, Indicators and Criteria

Objectives	Performance Measure	Performance Indicator	Criteria
Rehabilitate landform, landuse and ecosystem function to that existing pre-mining and consistent with the surrounding landform.	Inspect & Identify Regular inspections of the subsidence zone in accordance with the Subsidence Monitoring Program (SM Program) to identify surface cracking, erosion points, compression ridges on steep slopes, surface ponding, steep slope instability.	Results of monitoring undertaken in accordance with SM Program	SM Program implemented. Any surface cracks, erosion points, compression ridges, surface ponding areas, or steep slope instability, are identified by the SM Program to allow assessment.
	Assess & Plan Identified surface cracking, erosion points, compressions ridges, surface ponding areas, steep slope instability are assessed to identify appropriate remedial measures and any constraints.	Assessment of SM Program results and planned remedial measures completed.	All identified impacts are assessed and specific remedial measures developed. Management measures of the Extraction Plan are followed: - Public Safety Management Plan - Aboriginal Cultural Heritage Plan (ACHMP) - Biodiversity Management Plan (BMP) – including management of any clearing activities required.
	Consult Landholder is consulted in relation to the requirements and nature of remedial measures required.	Record of landholder consultation.	Consultation with landholder regarding proposed remedial measures undertaken.
	Landform Remedial Measures The assessed landform surface cracking, erosion points, and compressions ridges, areas of drainage impact (e.g. surface ponding) are remediated as necessary.	Austar Ground Disturbance Permit (GDP) completed. Landform remediated and prepared for vegetation establishment.	Erosion and sediment controls are implemented for remedial works. Topsoil is conserved during remedial works and reused in vegetation establishment. Landform subsidence impact repaired commensurate with size and scale of impact (e.g. Major landform impact by filling or ripping the soil and re-compacting, Minor surface cracking may be remediated through infilling with soil or other suitable material).

Objectives	Performance Measure	Performance Indicator	Criteria
		Capacity of land to drain freely confirmed. No unplanned ponding of water.	Landform (including existing drainage contours) is free draining, except for purpose built dams and structures. This may include filling using imported material and/or earthworks to reshape the land and re-establish the natural drainage pathway.
	Vegetation Establishment Remediated areas revegetated with species selected based on the existing land use and surrounding vegetation.	% Ground Cover Species Mix Monitoring of vegetation success	Ground cover comparable to pre-mining environment is re-established following remediation activities. For pasture areas: Remediated areas revegetated with species selected based on the existing land use (i.e. pasture) and surrounding vegetation. For areas within the Werakata State Conservation Area: Remediated areas revegetated with native species selected based on the surrounding vegetation and biodiversity planting list (refer to Appendix B). All works are undertaken with the consent of the NSW National Parks and Wildlife Service Ecosystem function is rehabilitated to that existing pre-mining and consistent with the surrounding landform.
Minimise erosion risk.	Controlling erosion risk where access constraints impact on the success of remediation techniques (e.g. areas of steep slopes, pasture areas too wet for access).	Results of regular survey and monitoring. Integrity of bunds or erosion control devices.	Suitable erosion and sediment control devices, or a diversion bank are erected to minimise erosion risk from subsidence cracks where remediation is not immediately undertaken. All control devices constructed in accordance with the 'Blue Book' (DECCW, 2008). No identifiable rill or sheet erosion.

Objectives	Performance Measure	Performance Indicator	Criteria
Public safety hazards are managed and reduced to no more than those existing pre-mining.	General landform public safety impacts are remediated. Identified slope instability issues are managed.	Inspection results indicate no public safety hazards post mining.	Areas of steep slopes and general landform have been inspected during SM Program activities. Public Safety Management Plan implemented where necessary based on SM Program results. (E.g. warnings, signs and barriers put in place to limit access in areas deemed unsafe due to mass movement, or excessive cracking at crest of slope, say) General landform condition impacts remediated in accordance with this LMP. Whilst the risk has been assessed as very low, if slope instability occurs or is recognised as potentially having an increased risk during extraction, a geotechnical engineer will be engaged to assist and measures developed and implemented to mitigate the risk. (e.g. securing of potentially unstable rock masses where required, or any areas of mass movement that have already occurred with be assessed, stabilised and revegetated as soon as practicable.)

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7.0 Contingency Plan

In the event the performance measures provided in Section 6.0 are considered to have been exceeded, or are likely to be exceeded, Austar will undertake the following:

- Report the likely exceedance of the performance indicator to the relevant agencies as required under the development consent or legislation after becoming aware of the exceedance;
- Assess public safety and where appropriate implement safety measures in accordance with site procedures;
- Identify an appropriate course of action with respect to the identified impact, in consultation with appropriate specialists and relevant agencies;
- Submit the proposed course of action to any relevant government agencies for consultation/approval (if required);
- Implement the adopted course of action, consistent with other relevant management plans to the satisfaction of the appropriate agencies (if required); and
- Review the effectiveness of this LMP to adequately manage subsequent potential impacts within the limits of the project approval.

7.1 Trigger Action Response Plan

The following Trigger Action Response Plan (TARP) identifies the proposed contingency strategies in the event of unexpected variations or impacts to rehabilitation outcomes. A risk-based approach has been used to assess the potential consequences and mitigation measures. Table 6 outlines the key identified risks, triggers and proposed mitigation measures.

Table 6 Proposed mitigation measures to reduce key risks

Risk	Trigger	Proposed Mitigation Measure
Surface subsidence impacts are greater than predicted.	Data obtained from the subsidence monitoring program indicates exceedance of predicted levels and significant subsidence-induced surface impacts requiring remediation. Significant steep slope stability issues identified.	Assess public safety and where applicable, implement additional safety measures in accordance with the Public Safety Subsidence Management Plan (PSMP) or as otherwise necessary to prevent injury or harm to any person. A geotechnical engineer will be engaged to investigate contributing factors to the exceedance and develop measures to mitigate the risk. Remedial actions will be implemented based on the outcomes of investigations and undertaken in consultation with the landowner and relevant government agencies as required. A review of the SM program and a general landform inspection will be undertaken to assess the adequacy of remedial actions.
Wind and water erosion.	Visual monitoring indicates areas of persistent erosion.	Erosion and sedimentation controls will be employed during rehabilitation activities, including repair of subsidence areas. Where persistent issues are identified additional controls may be employed including planting of vegetation and/or minor re-contouring of the landform to improve local drainage characteristics.

Risk	Trigger	Proposed Mitigation Measure
Poor vegetation establishment success.	Monitoring data indicates non-compliance with performance criteria in terms of remediation of subsidence impacts.	Review species mix used to ensure alignment with the seasonal conditions of the site. Where possible, use native species associated with the target vegetation communities. Seed collection / obtainment program undertaken to ensure adequate resources of seed are available during the life of the project. Undertake follow up maintenance and/or replanting activities where required.
Major storm event resulting in flooding, geotechnical instability, major erosion and/or widespread damage to rehabilitated areas.	Weather event resulting in severe storms and/or localised flooding. Monitoring program indicates lack of adequate ground cover.	Design final landforms, structures and revegetation to be sympathetic to existing landform to cope with major storm events. Review maintenance procedures on sediment structures and undertake repairs where required. Undertake follow up maintenance and/or replanting activities where required.
Severe and/or prolonged drought leading to widespread failure of revegetation.	Monitoring and vegetation assessments highlight inadequate ground cover and or paucity in species diversity / distribution.	Selection of drought-tolerant species for revegetation. Selection of species aligned to desired vegetation community. Time plantings to take advantage of ideal weather conditions. Ensure use of appropriate soil ameliorants, ground cover and maintenance activities during any further revegetation efforts.

8.0 Manage, Report and Review

Should significant amendments to this document be required as a result of operational changes, statutory requirements or following an internal audit/review, the amendments will be made in consultation with relevant stakeholders and to the satisfaction of the Department of Planning and Infrastructure (DP&I).

8.1 Annual Review

Condition 3, Schedule 7 of the PA (08_0111) provides the requirements for Annual Review (AR) as follows:

3. Each year, the Proponent shall review the environmental performance of the mine complex to the satisfaction of the Director-General. This review must:

- a) *describe the works that were carried out in the past year, and the works that are proposed to be carried out over the next year;*
- b) *include a comprehensive review of the monitoring results and complaints records of the mine complex over the past year, which includes a comparison of these results against*
 - *the relevant statutory requirements, limits or performance measures/criteria;*
 - *the monitoring results of previous years; and*
 - *the relevant predictions in the EA and Extraction Plan;*
- c) *identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;*
- d) *identify any trends in the monitoring data over the life of the mine complex;*
- e) *identify any discrepancies between the predicted and actual impacts of the mine complex, and analyse the potential cause of any significant discrepancies; and*
- f) *describe what measure will be implemented over the next year to improve the environmental performance of the mine complex.*

The Annual Environmental Management Report (AEMR) is the primary reporting tool for Austar and this report incorporates the information listed above and meets the requirements of the AR. Following submission to relevant statutory authorities AEMR's are currently made available on the Austar website.

8.2 Audits and Review Findings

This LMP will be audited under the scope of any external environmental compliance audits. Condition 4, Schedule 7 of PA 08_0111 requires this plan be reviewed within 3 months of submission of an external environmental compliance audit, incident report or Annual Review. An internal review of this LMP will be conducted in response to:

- An incident recorded as a result of the operations that potentially affects the long term management or productivity of land in general;
- A significant change in operation that may affect the implementation of this management plan;
- Statutory requirements or directions/conditions of approvals requiring such action; or
- Recommendations as a result of internal or external audits.

A review and any associated amendments to this plan will be based on:

- Comparison of results of subsidence monitoring to predicted subsidence;
- Review of monitoring results under this LMP and confirmation that observed impacts are within predicted limits; and
- Review of monitoring and management practices under this plan and their adequacy to capture and address the environmental consequences of secondary extraction.

References

- Austar (2008), Mining Operations Plan, Austar Coal Mine Pty Ltd, May 2008
- Austar (2013), Site Water Management Plan – Erosion and Sediment Control Plan, April 2013
- Austar (2013), Public Safety Management Plan, Austar Coal Mine Pty Ltd, May 2013
- Austar (2013), Subsidence Monitoring Program, Austar Coal Mine Pty Ltd, May 2013
- Department of Environment and Climate Change (DECC), (2008), Managing Urban Stormwater: Soils and Construction, Volume 2E Mines and Quarries, June 2008
- Landcom (2004) Managing Urban Stormwater: Soils and Construction Volume 1 “Blue Book”. Landcom 2004
- MSEC (2008), The prediction of subsidence parameters and the assessment of mine subsidence impacts on natural features and surface infrastructure resulting from the extraction of proposed Austar Longwalls A6 to A17 in support of a Part 3A Application., Mine Subsidence Engineering Consultants, September 2008
- MSEC (2011), Stage 3 – Longwalls A7 to A19 Subsidence Predictions and Impact Assessments for Natural Features and Surface Infrastructure in Support of a Modification to the Development Consent, Mine Subsidence Engineering Consultants, Report No. MSEC484 Revision A, May 2011
- MSEC (2013) Stage 3 – Longwalls A7 to A10, The Effects of the Proposed Modified Commencing End of LWA8 and Modified Finishing Ends of LWA7 to LWA10 in Stage 3 of the Austar Coal Mine on the Subsidence Predictions and Impact Assessments, Report No. MSEC650 Revision A, October 2013
- MSEC (2013) Austar Coal Mine – Stage 3: Revision of Predicted Subsidence Parameters for Longwalls A7 to A19 Based on Modified Longwalls A7 to A10, Report no. MSEC650-01, October 2013
- Umwelt (2008), Austar Coal Mine Project – Stage 3 Environmental Assessment, prepared by Umwelt (Australia) Pty Limited on behalf of Austar Coal Mine Pty Ltd, October 2008.
- Umwelt (2011), Austar Coal Mine Project – Stage 3 Modification Environmental Assessment, prepared by Umwelt (Australia) Pty Limited on behalf of Austar Coal Mine Pty Ltd, September 2011
- Umwelt (2013), Biodiversity Management Plan, prepared by Umwelt (Australia) Pty Limited on behalf of Austar Coal Mine Pty Ltd, 2013
- Umwelt (2013), Austar Aboriginal Cultural Heritage Management Plan (ACHMP), prepared by Umwelt (Australia) Pty Limited prepared on behalf of Austar Coal Mine Pty Ltd, 2013
- Umwelt (2013) Austar Coal Mine LWA7-A10 Modification Stage 3 Area – Environmental Assessment, October 2013
- Umwelt (2013) Austar Coal Mine LWA7-A10 Modification Stage 3 Area – Ecological Assessment, October 2013.

Appendix A

Approval Conditions

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Appendix A Approval Conditions

Table A1 Conditions of Project Approval 08_0111 (as modified)

Condition No.	Condition Requirement	Addressed in LMP														
Schedule 3, Condition 4(e)	Include a Land Management Plan, to manage the potential environmental consequences of second workings on steep slopes and land in general.	This LMP														
Schedule 3, Condition 5	In addition to the standard requirements for management plans (see condition 2 of schedule 7), the Proponent shall ensure that the management plans required under condition 4(e) above include:															
	(a) a program to collect sufficient baseline data for future Extraction Plans;	Section 5.0														
	(b) a revised assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this approval;	Sections 4.0														
	(c) a detailed description of the measures that would be implemented to remediate predicted impacts; and	Section 6.0														
	(d) a contingency plan that expressly provides for adaptive management.	Section 7.0														
Schedule 6, Condition 1	The Proponent shall achieve the rehabilitation objectives in Table 6 to the satisfaction of the Executive Director, Mineral Resources. <table><tr><th colspan="2">Table 6: Rehabilitation Objectives</th></tr><tr><th>Domain</th><th>Rehabilitation objective</th></tr><tr><td>Surface Infrastructure Site</td><td>Revegetate the cleared portion of the site with a structured native vegetation community similar to that existing pre-mining, or other landuse approved by the Director-General</td></tr><tr><td>Biodiversity offset area</td><td>Additional objectives/criteria to be set through condition 4 below Implement the offset strategy described in the EA and shown conceptually in Appendix 5</td></tr><tr><td>Land affected by the project (including watercourses and steep slopes)</td><td>Additional objectives/criteria to be set through condition 4 below Rehabilitate landform, landuse and ecosystem function to that existing pre-mining and consistent with the surrounding landform Reduce safety hazards to no more than those existing pre-mining Minimise erosion risk</td></tr><tr><td>Built features</td><td>Repair/restore/replace to pre-mining condition or better, unless a claim under the <i>Mine Subsidence Compensation Act 1961</i> is made for the repairs, restoration or replacement</td></tr><tr><td>Community</td><td>Minimise the adverse socio-economic effects associated with mine closure</td></tr></table>	Table 6: Rehabilitation Objectives		Domain	Rehabilitation objective	Surface Infrastructure Site	Revegetate the cleared portion of the site with a structured native vegetation community similar to that existing pre-mining, or other landuse approved by the Director-General	Biodiversity offset area	Additional objectives/criteria to be set through condition 4 below Implement the offset strategy described in the EA and shown conceptually in Appendix 5	Land affected by the project (including watercourses and steep slopes)	Additional objectives/criteria to be set through condition 4 below Rehabilitate landform, landuse and ecosystem function to that existing pre-mining and consistent with the surrounding landform Reduce safety hazards to no more than those existing pre-mining Minimise erosion risk	Built features	Repair/restore/replace to pre-mining condition or better, unless a claim under the <i>Mine Subsidence Compensation Act 1961</i> is made for the repairs, restoration or replacement	Community	Minimise the adverse socio-economic effects associated with mine closure	Section 2.4
Table 6: Rehabilitation Objectives																
Domain	Rehabilitation objective															
Surface Infrastructure Site	Revegetate the cleared portion of the site with a structured native vegetation community similar to that existing pre-mining, or other landuse approved by the Director-General															
Biodiversity offset area	Additional objectives/criteria to be set through condition 4 below Implement the offset strategy described in the EA and shown conceptually in Appendix 5															
Land affected by the project (including watercourses and steep slopes)	Additional objectives/criteria to be set through condition 4 below Rehabilitate landform, landuse and ecosystem function to that existing pre-mining and consistent with the surrounding landform Reduce safety hazards to no more than those existing pre-mining Minimise erosion risk															
Built features	Repair/restore/replace to pre-mining condition or better, unless a claim under the <i>Mine Subsidence Compensation Act 1961</i> is made for the repairs, restoration or replacement															
Community	Minimise the adverse socio-economic effects associated with mine closure															
Schedule 6, Condition 2	To the extent that mining operations permit, the Proponent shall carry out rehabilitation progressively, that is, as soon as reasonably practicable following the disturbance. <i>Note: The offset area is described in the EA and shown conceptually in Appendix 5.</i>	Section 6.0														
Schedule 7, Condition 2	The proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:															
Schedule 7, Condition 2(a)	Detailed baseline data;	Section 3.0														
Schedule 7, Condition 2(b)	A description of: - The relevant statutory requirements (including any relevant approval, licence, or lease conditions);	Section 2.0 Appendix A														

Condition No.	Condition Requirement	Addressed in LMP
	- Any relevant limits or performance measures/criteria;	Section 6.0
	- 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;	Section 6.0
Schedule 7, Condition 2(c)	A description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	Section 6.0
Schedule 7, Condition 2(d)	A program to monitor and report on the: - Impacts and environmental performance of the project; - Effectiveness of any management measures;	Section 5.0
Schedule 7, Condition 2(e)	A contingency plan to manage any unpredicted impacts and their consequences;	Section 7.0
Schedule 7, Condition 2(f)	A program to investigate and implement ways to continually improve the environmental performance of the project over time;	Section 8.0
Schedule 7, Condition 2(g)	A protocol for managing and reporting any: - Incidents; - Complaints; - Non-compliances with statutory requirements; and - Exceedences of the impact assessment criteria and/or performance criteria; and	
Schedule 7, Condition 2(h)	A protocol for periodic review of the plan.	
Schedule 7 Condition 3	<i>3. Each year, the Proponent shall review the environmental performance of the mine complex to the satisfaction of the Director-General. This review must:</i> <i>g) describe the works that were carried out in the past year, and the works that are proposed to be carried out over the next year;</i> <i>h) include a comprehensive review of the monitoring results and complaints records of the mine complex over the past year, which includes a comparison of these results against</i> <i>the relevant statutory requirements, limits or performance measures/criteria;</i> <i>the monitoring results of previous years; and</i> <i>the relevant predictions in the EA and Extraction Plan;</i> <i>i) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;</i> <i>j) identify any trends in the monitoring data over the life of the mine complex;</i> <i>k) identify any discrepancies between the predicted and actual impacts of the mine complex, and analyse the potential cause of any significant discrepancies; and</i> <i>l) describe what measure will be implemented over the next year to improve the environmental performance of the mine complex.</i>	

Condition No.	Condition Requirement	Addressed in LMP
Schedule 7 Condition 4	Within 3 months of the submission of an: (a) audit under condition 7 of schedule 7; (b) incident report under condition 6 of schedule 7; and (c) Annual Review under condition 3 of schedule 7, the Proponent shall review, and if necessary revise, the strategies, plans, and programs required under this approval to the satisfaction of the Director-General. <i>Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the project.</i>	

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Appendix B

Species to be used for revegetation in the Werakata State Conservation Area

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Appendix B Species to be used for Revegetation in the Werakata SCA

Table B1 outlines the species that may be used in the revegetation component of the rehabilitation program within the Werakata State Conservation Area (SCA).

Table B1 Species that may be used in revegetation program within the Werakata SCA

Common Name	Taxonomic Name
Canopy	
Spotted gum	<i>Corymbia maculata</i>
Cabbage gum	<i>Eucalyptus amplifolia</i> subsp. <i>amplifolia</i>
Large-fruited grey gum	<i>Eucalyptus canaliculata</i>
Narrow-leaved ironbark	<i>Eucalyptus crebra</i>
Thin-leaved stringybark	<i>Eucalyptus eugenioides</i>
Broad-leaved ironbark	<i>Eucalyptus fibrosa</i>
Grey box	<i>Eucalyptus moluccana</i>
Grey gum	<i>Eucalyptus punctata</i>
Forest red gum	<i>Eucalyptus tereticornis</i>
Turpentine	<i>Syncarpia glomulifera</i> subsp. <i>glomulifera</i>
Shrub Stratum	
Silver-stemmed wattle	<i>Acacia parvipinnula</i>
Coffee bush	<i>Breynia oblongifolia</i>
Blackthorn	<i>Bursaria spinosa</i> subsp. <i>spinosa</i>
Broom bitter pea	<i>Daviesia genistifolia</i>
Gorse Bitter Pea	<i>Daviesia ulicifolia</i>
Healthy Parrot Pea	<i>Dillwynia retorta</i>
Ground Stratum	
Threeawn speargrass	<i>Aristida vagans</i>
Blue flax lily	<i>Dianella caerulea</i>
Wiry panic	<i>Entolasia stricta</i>
Love creeper	<i>Glycine tabacina</i>
Star Goodenia	<i>Goodenia rotundifolia</i>
Purple Coral Pea; Waraburra	<i>Hardenbergia violacea</i>
Blady grass	<i>Imperata cylindrica</i> var. <i>major</i>
Wattle Mat-rush	<i>Lomandra filiformis</i>
Many-flowered mat-rush	<i>Lomandra multiflora</i> subsp. <i>multiflora</i>
Kangaroo grass	<i>Themeda australis</i>

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