Austar Coal Mine

# Stage 3 Modification Preliminary Environmental Assessment

February 2011

Umwelt
Environmental Consultants

# Stage 3 Modification Preliminary Environmental Assessment

**Prepared by**

**Umwelt (Australia) Pty Limited**

**on behalf of**

**Austar Coal Mine**

| | | | |
|---|---|---|---|
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# 1.0 Introduction

## 1.1 Project Overview

Austar Coal Mine Pty Limited (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 (refer to **Figure 1.1**). The mine is an aggregate of the former Ellalong, Southland 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 (see **Figure 1.2**).

The underground mining component within Stage 2 of the Austar Mining Complex is currently being undertaken within Consolidated Mining Lease 2 (CML2) (refer to **Figure 1.1**) under development consent DA 29/95. DA 29/95 was granted by the Minister for Urban Affairs and Planning in 1996, enabling coal extraction from the Greta Seam using a conventional retreat longwall extraction method to a height of up to 4.5 metres.

A modification to DA 29/95 was granted by the Minister for Planning in September 2006 to allow extraction of up to 6.5 metres of coal from two longwall panels (Longwalls A1 and A2) in the Stage 1 area (refer to **Figure 1.1**) using an enhanced form of conventional retreat longwall extraction known as Longwall Top Coal Caving (LTCC). Extraction of coal from Longwalls A1 and A2 (LW A1 and A2) using LTCC technology was completed in November 2008.

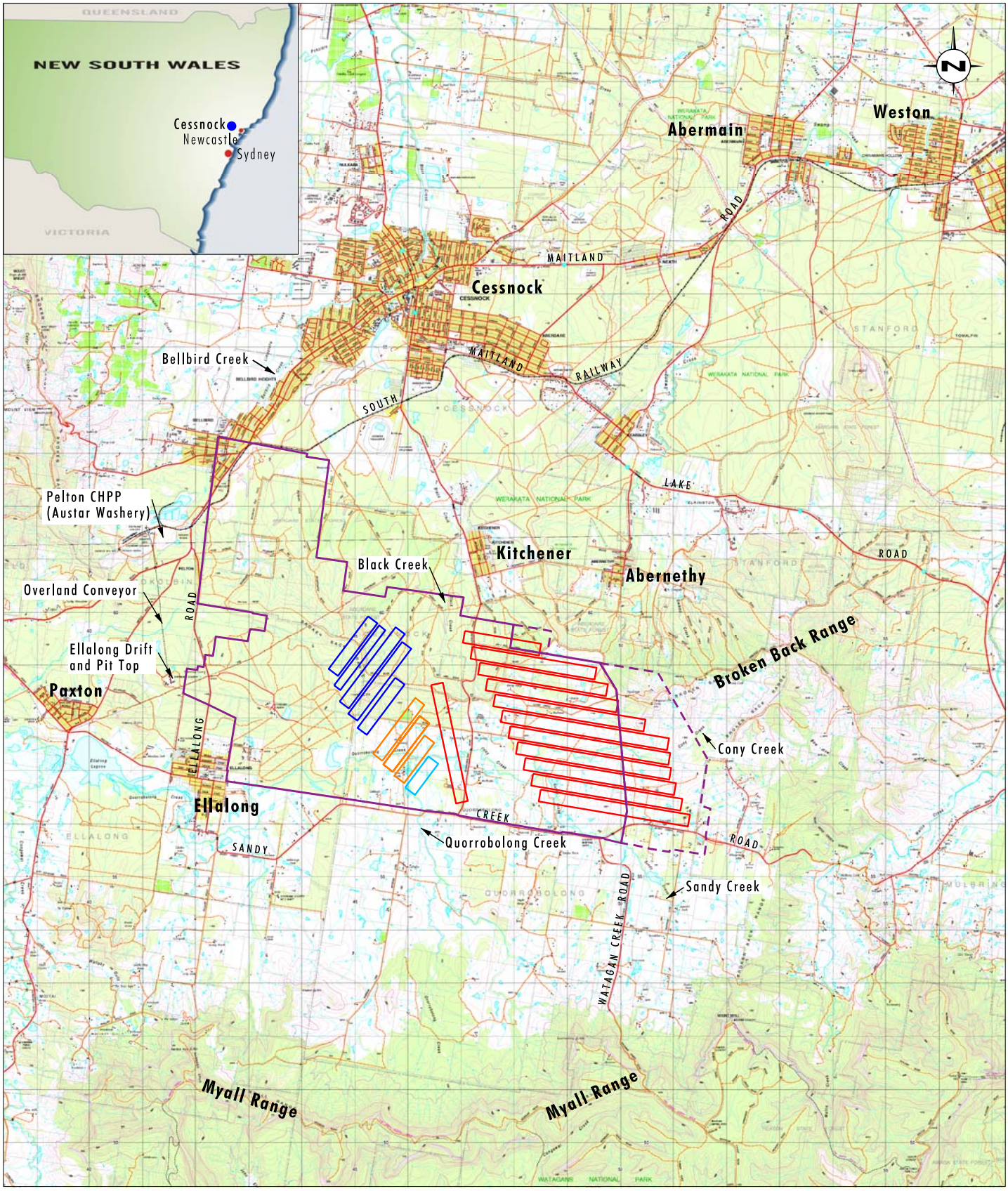
A second modification to DA 29/95 was approved by the Minister for Planning in June 2008 to allow extraction of up to 6.5 metres of coal using LTCC technology in the Stage 2 area (see **Figure 1.1**). At this time Stage 2 comprised Longwalls A3 to A5 (LW A3 to A5).

An additional minor modification of DA 29/95 to vary the length and widths of Longwalls A4 and A5 was approved in 2009, and a further modification to DA 29/95 adding Longwall A5a to the Stage 2 area (refer to **Figure 1.1**) was approved in November 2010. Mining in the Stage 2 area commenced in early 2009. It is envisaged that mining in the Stage 2 area will be completed late in 2012. Mining in Stage 2 is wholly within CML2.

A new project approval (Project Approval 08_0111) was granted by the Minister for Planning in September 2009, enabling longwall mining using LTCC technology in the Stage 3 area and construction and operation of a new Surface Infrastructure Site and access road south of Kitchener (refer to **Figure 1.3**). Underground mining in the Stage 3 area and construction of the new Surface Infrastructure Site are collectively known as the 'Stage 3 Project'. Construction of the Surface Infrastructure Site commenced in December 2009. Longwall mining in the Stage 3 area is scheduled to commence in 2013.

The remainder of Austar operations utilises Austar's existing coal handling and processing infrastructure and facilities. A description of Austar's existing infrastructure and facilities is provided in **Section 2.2**.

To enable more efficient and safer extraction of coal from the Stage 3 area, Austar seeks approval to modify Project Approval 08_0111 to allow the longwalls to be reorientated as per **Figure 1.4**. This modification will include removal of longwall A6, and extraction of coal in longwalls A7 to A19, which are a reorientation of longwalls A7 to A17 shown in **Figure 1.3**. The location of the main headings is proposed to be moved to the west (refer to **Figure 1.4**) and the width of chain pillars is also proposed to be increased to reduce roadway failure risk and in turn subsidence impact risks. The proposed Stage 3 Modification will remain entirely within CML2 and existing lease extension application areas MLA 322 and MLA 333 and




Source: Topo Maps: LPI NSW, Longwall Layout: Austar Coal Mine

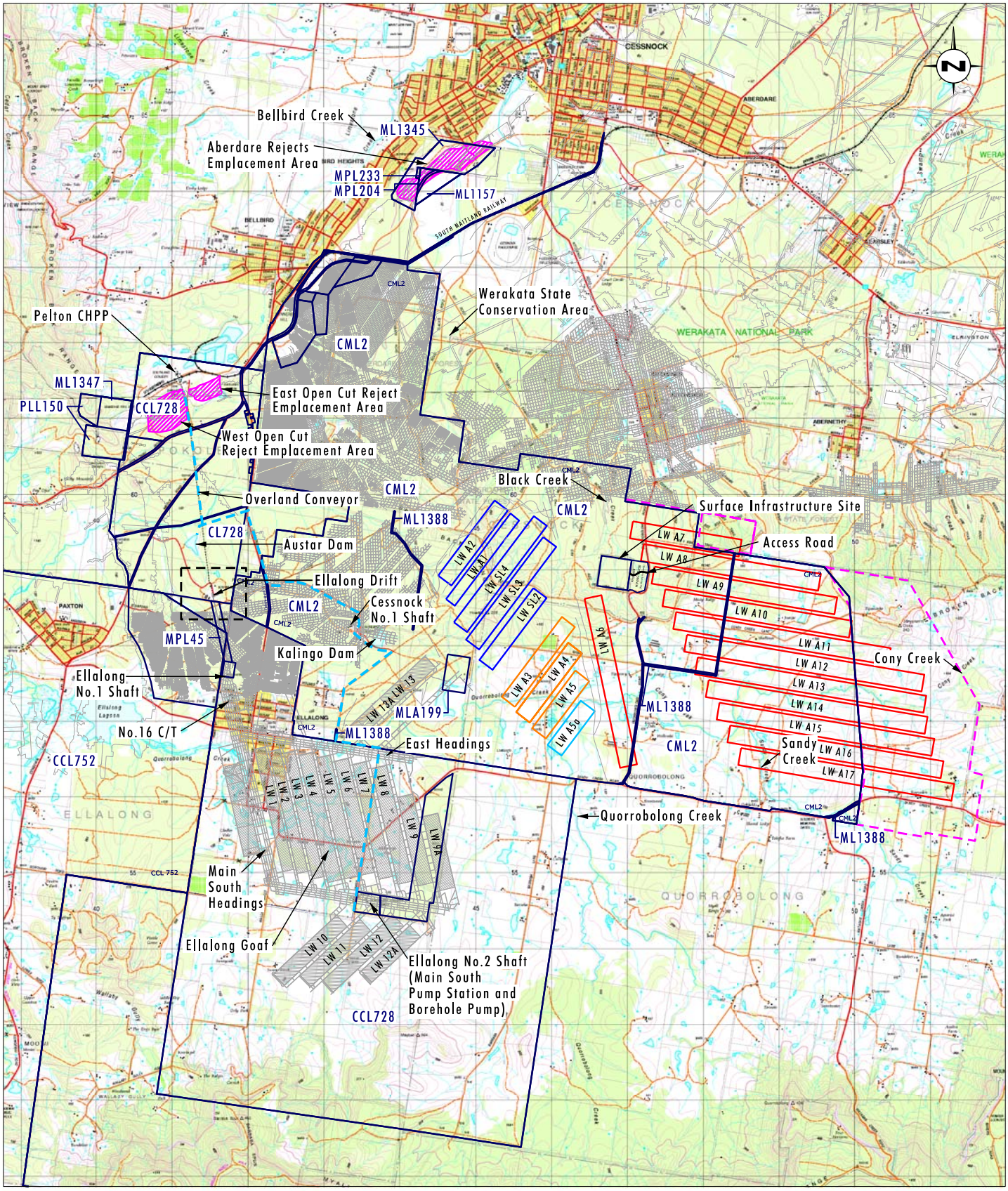
0 1.0 2.0 4km
1:100 000

## Legend

- Layout for Stage 1 Longwall Panels
- Layout for Stage 2 Longwall Panels
- Layout for Stage 2 Extension Longwall Panel
- Conceptual Layout for Stage 3 Longwall Panels as Approved
- Consolidated Mining Lease (CML) 2
- Proposed Stage 3 Extension Boundary

FIGURE 1.1

Locality Plan




Source: Topo Maps: LPI NSW, Longwall Layouts: Austar Coal Mine

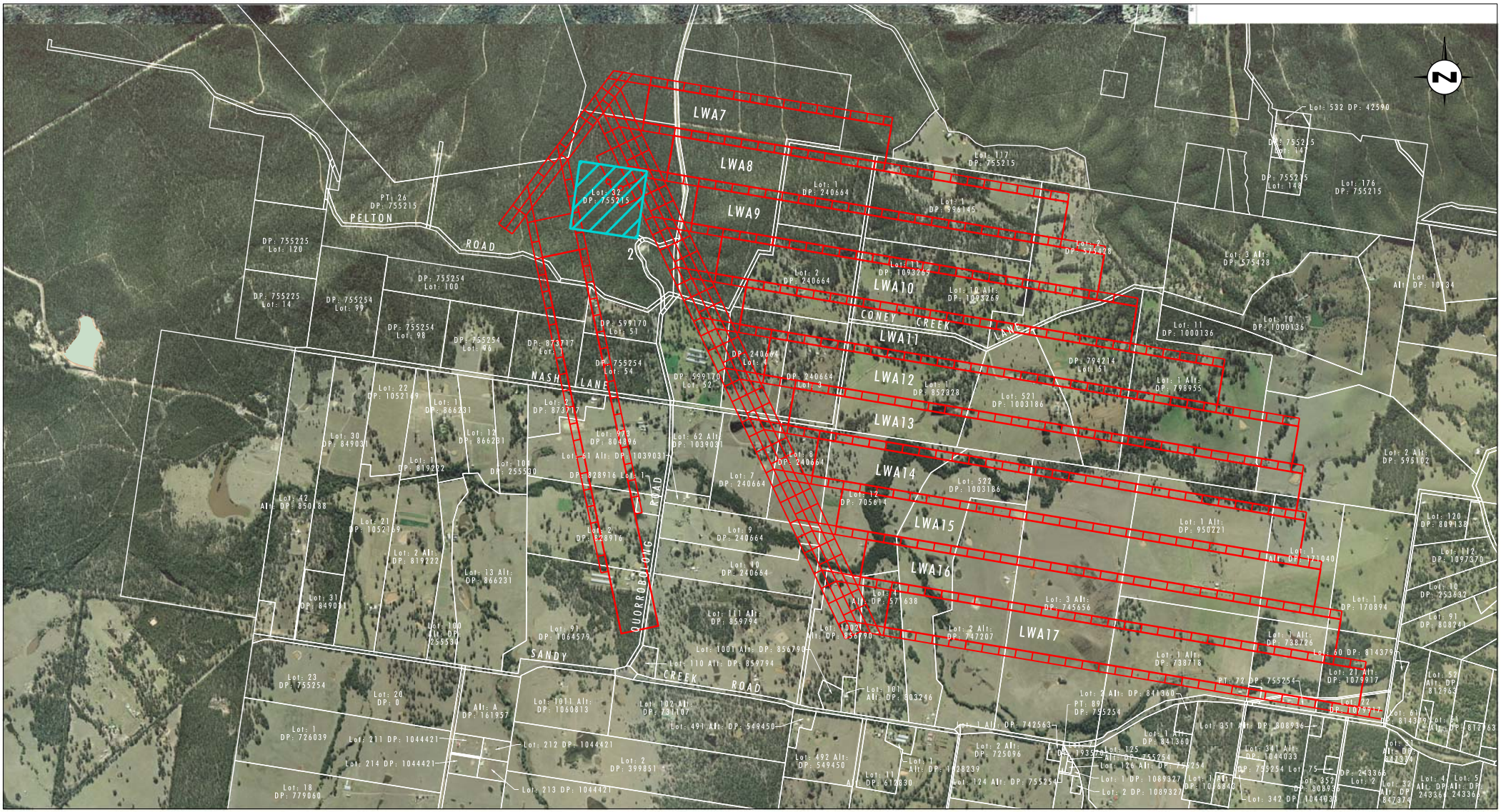
0 1 2 3km
1:70 000

## Legend

- Layout for Stage 1 Longwall Panels
- Layout for Stage 2 Longwall Panels
- Layout for Stage 2 Extension Longwall Panel
- Conceptual Layout for Stage 3 Longwall Panels as Approved
- Proposed Stage 3 Extension Boundary
- Reject Emplacement Areas
- Old Workings
- Mining Leases
- Water Pipeline

FIGURE 1.2

**Austar Mine Complex**



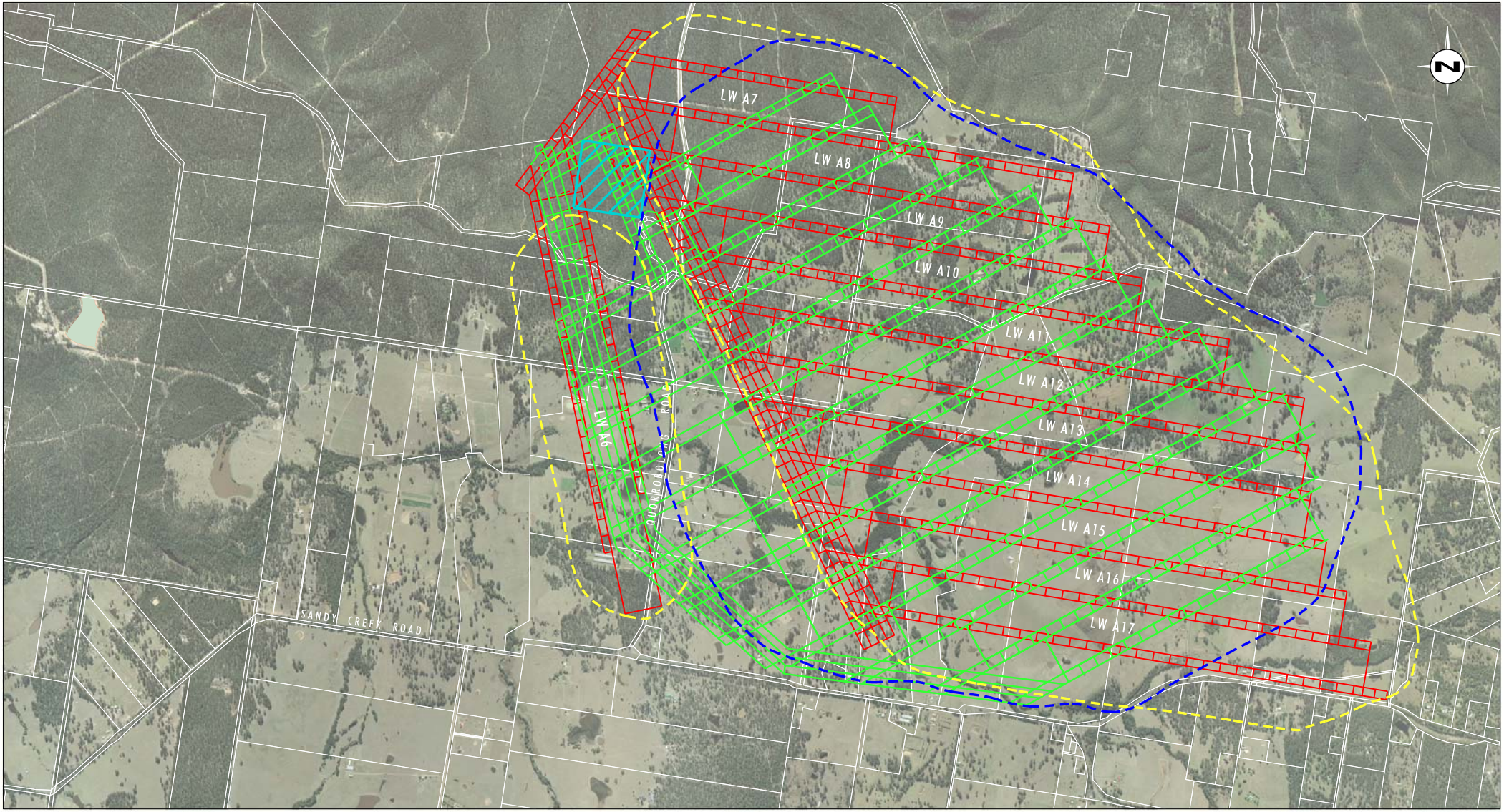

**Source:** Austar Coal Mine, LPI NSW

## Legend

- Austar Stage 3
- Surface Infrastructure Site

FIGURE 1.3

Austar Coal Mine Stage 3




**Source:** Longwall Layout: Austar Coal Mine, Cadastre: LPI NSW, Aerial Photography: AAM Hatch 2006, Subsidence Contours: MSEC

## Legend

- Conceptual Layout for Stage 3 Longwall Panels as Approved
- Proposed Stage 3 Modification Longwall Layout
- 20mm Subsidence Contour for Conceptual Layout as Approved
- 20mm Subsidence Contour for Proposed Stage 3 Modification
- Surface Infrastructure Site

**File Name (A4):** R70_V1/2274_880.dgn

FIGURE 1.4

# Proposed Stage 3 Modification Longwall Layout

involves a change to the Stage 3 mine plan only, with no proposed changes to underground mining method, total approved rate or quantity of extraction, or associated surface infrastructure.

As Project Approval 08_0111 was granted under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act), Austar seeks approval for the modification under section 75W of the EP&A Act. A Minister's consent granted under Part 3A can only be modified by the Minister under section 75W.

## 1.2 Project Justification

### 1.2.1 Geological and Safety Considerations

Following finalisation of the approved Stage 3 mine plan in mid 2008, further geological information has become available regarding the stress orientation, impact of geological structures on east-west orientated panels and approved longwall A6, and improved coal quality in the western area of Stage 3. Based on the geological information gained during Austar's exploration program over the last three years, the proposed modification to the mine plan will result in:

- reduction in overall strata failure and business interruption risk due to alignment of longwall orientation with the principal stress direction;
- reduction in roadway failure risks and subsidence impact risks due to an increase in chain pillar width from 45 metres to 55 metres;
- access to high quality, thick seam coal to the west of approved longwalls A7 to A17 that would otherwise have been sterilised by the approved mine plan thus maximising resource recovery; and
- reduction in risk to longwall production between geologically structured zones in approved longwall A6 by moving the main headings to this location.

### 1.2.2 Surface Impact and Coal Tonnage

As identified by the relevant 20 mm subsidence contours shown in **Figure 1.4**, the area of surface impact from the proposed Stage 3 Modification mine plan will be generally within the envelope of the approved Stage 3 mine plan for the majority of the underground mining area. Surface impacts are proposed to be decreased in the west of the approved Stage 3 area via the removal of Longwall A6, decreased in the south-east and north-west by reorientation of longwall panels, and increased for a section of land between the approved Longwall A6 and the western extent of approved Longwalls A7 to A17.

The land surface area within the 20 mm subsidence contour and the total tonnage of run of mine (ROM) coal estimated to be available for extraction for the Stage 3 conceptual mine plan (as approved) and the proposed Stage 3 Modification mine plan is provided in **Table 1.1**. The proposed modification will result in a reduction in the extent of surface impact due to subsidence, and a minor increase in the estimated tonnage of ROM coal available for extraction. It is noted that the minor increase in total ROM coal extraction over the life of the mine is within the approved annual extraction of 3.6 million tonnes of ROM coal per year over a 21 year mine life.

**Table 1.1 – Proposed Change to Surface Impact Area and Estimated ROM Coal Extraction**

| | Conceptual mine plan (as approved) | Proposed modification mine plan | Proposed Change | Percentage Change |
|---|---|---|---|---|
| Area within 20 mm subsidence contour (ha) | 1350 ha | 1210 ha | -143 ha | - 11% |
| Estimated total ROM coal extraction (million tonnes) | 46.67 Mt | 48.19 Mt | +1.5 Mt | + 3% |

The proposed mine plan modification is therefore anticipated to reduce risk and provide for more consistent production with less interruption, whilst having no significant increase in overall environmental impact levels.

# 2.0 Overview of Existing Operations

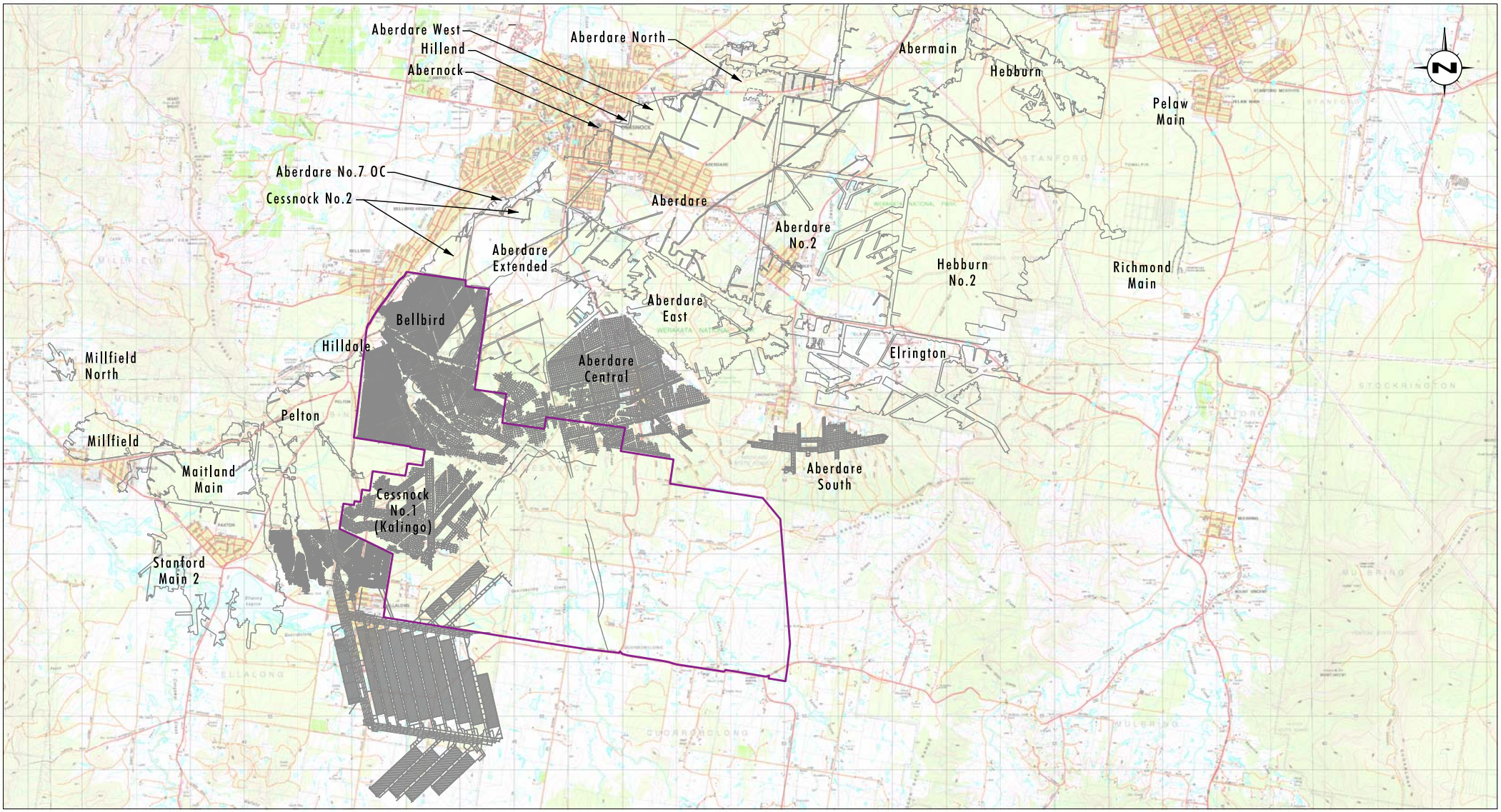
## 2.1 History of Austar Coal Mine

Austar Coal Mine is an amalgamation of several older mines and operates within a number of mining leases and under 12 separate development consents issued by Cessnock City Council between 1974 and 2002; and development consent DA 29/95 granted by the NSW Minister for Urban Affairs and Planning in 1996 as modified in 2006, 2008 and 2010 to provide for LTCC mining in Stage 1 and 2 areas.

Austar mine and its associated infrastructure has a long and productive history. A chronology of mining within the Greta Coal Seam at the site and related activities is presented in **Table 2.1**. The locations of previous underground workings in the area are shown on **Figure 2.1**. The location of infrastructure currently used in the handling and processing of coal from the Austar underground mining operations is shown on **Figure 1.1**. Mining leases currently held by Austar are shown in **Figure 2.2**.

**Table 2.1 – History of Mining Activities at Austar Coal Mine**

| Year | Historical Details |
|---|---|
| 1916 | Underground mining commenced at Pelton Colliery. |
| 1918 | The Pelton Railway was constructed. |
| 1921 | Underground mining commenced at Cessnock No. 1 (Kalingo) Colliery |
| 1960/1961 | Pelton CHPP constructed. |
| 1961 | Underground mining ceased at Cessnock No. 1 Colliery. |
| Late 1960s | Cessnock No. 1 Colliery amalgamated into Pelton Colliery. |
| 1978 | Underground mining commenced at Ellalong Colliery with coal being delivered by overland conveyor to the coal preparation plant, raw and washed coal handling systems and train loading facilities at Pelton Colliery. |
| 1983 | Longwall production commenced at Ellalong Colliery. |
| 1992 | Underground mining ceased at Pelton Colliery. |
| 1994 | High levels of gas (primarily carbon dioxide) encountered in the underground workings at Ellalong Colliery, preventing further mining of additional seams to the south-east. |
| 1995 | Pelton Open Cut Coal Mine established. |
| 1996 | DA 29/95 approved by the Minister for Urban Affairs and Planning and underground operations from the Ellalong Colliery extended into the Bellbird South Colliery area. |
| 1998 | Ellalong and Pelton Collieries amalgamated with Bellbird South Colliery and re-named Southland Colliery. |
| 2003 | Spontaneous combustion event resulting in a fire in the underground workings in Bellbird South. Mine placed in 'care-and-maintenance' for approximately 18 months. |
| 2004 | Yancoal purchased Southland Colliery and changed the name to Austar Coal Mine. |
| 2005 | Austar recommenced underground mining in the former Bellbird South Colliery area. |
| 2006 | DA 29/95 modified to allow Austar to commence underground mining using LTCC technology in the Stage 1 area. |



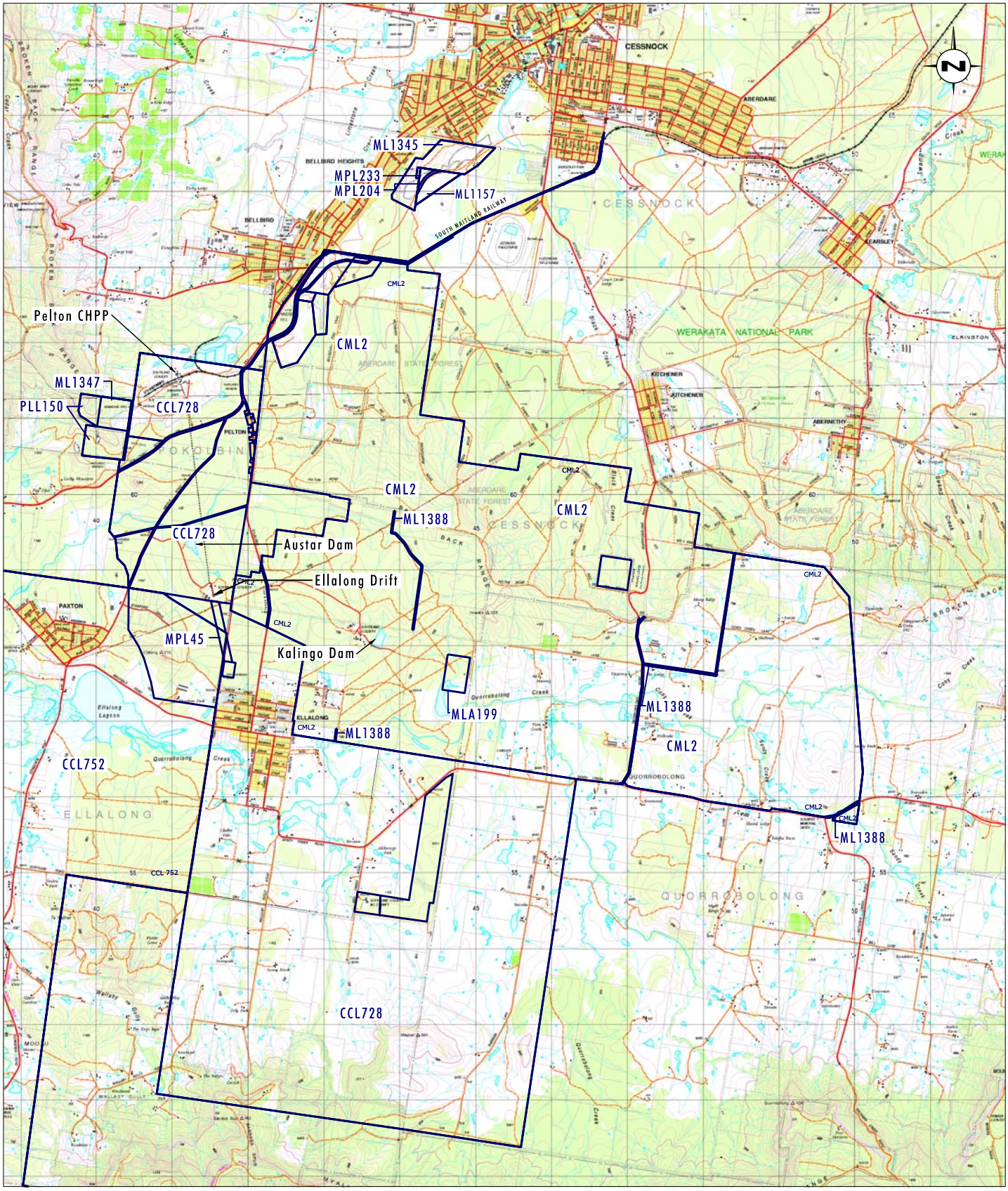

**Source:** Topo Maps: LPI NSW, Mine Workings: Austar Coal Mine

## Legend

- Consolidated Mining Lease (CML) 2
- Previous Underground Workings

FIGURE 2.1

# Previous Underground Workings




Source: Topo Maps: LPI NSW, Mine Leases: Austar Coal Mine

0 1 2 3km
1:70 000

Legend

Mining Leases

FIGURE 2.2

Existing Austar Mining Leases

**Table 2.1 – History of Mining Activities at Austar Coal Mine (cont)**

| Year | Historical Details |
|---|---|
| 2008 | DA 29/95 modified to allow Austar to commence underground mining using LTCC technology in the Stage 2 area. |
| 2009 | DA 29/95 modified to increase the size and dimensions of Longwalls A4 and A5 in the Stage 2 area. |
| 2009 | DA 08_0111 for underground mining using LTCC in the Stage 3 area approved by the Minister for Planning. |
| 2010 | DA 29/95 modified to allow Austar to extract one additional longwall panel (Longwall A5a) using LTCC technology in the Stage 2 area. |

As set out in **Table 2.1**, underground mining commenced at Pelton Colliery in 1916. Pelton Coal Handling and Preparation Plant (CHPP) was constructed in about 1960/1961 for the washing of Pelton Colliery coal. No development consent or other planning approval for the initial construction of Pelton Colliery or the Pelton CHPP has been located. As Pelton Colliery was commenced in 1916 and the CHPP was constructed in 1960-61 before the commencement of planning controls in all likelihood no planning approval for the initial construction exists or was required. Pelton Colliery was amalgamated with the neighbouring Cessnock No.1 Colliery in the late 1960s.

In 1975 development consent for Ellalong Colliery was granted under Part X11 of the *Local Government Act 1919* and the mine was officially opened in July 1979. The 1975 development consent envisaged that coal from Ellalong Colliery would be transported by conveyor from the Ellalong Drift and Pit Top to Pelton CHPP. Longwall production commenced at Ellalong Colliery in 1983.

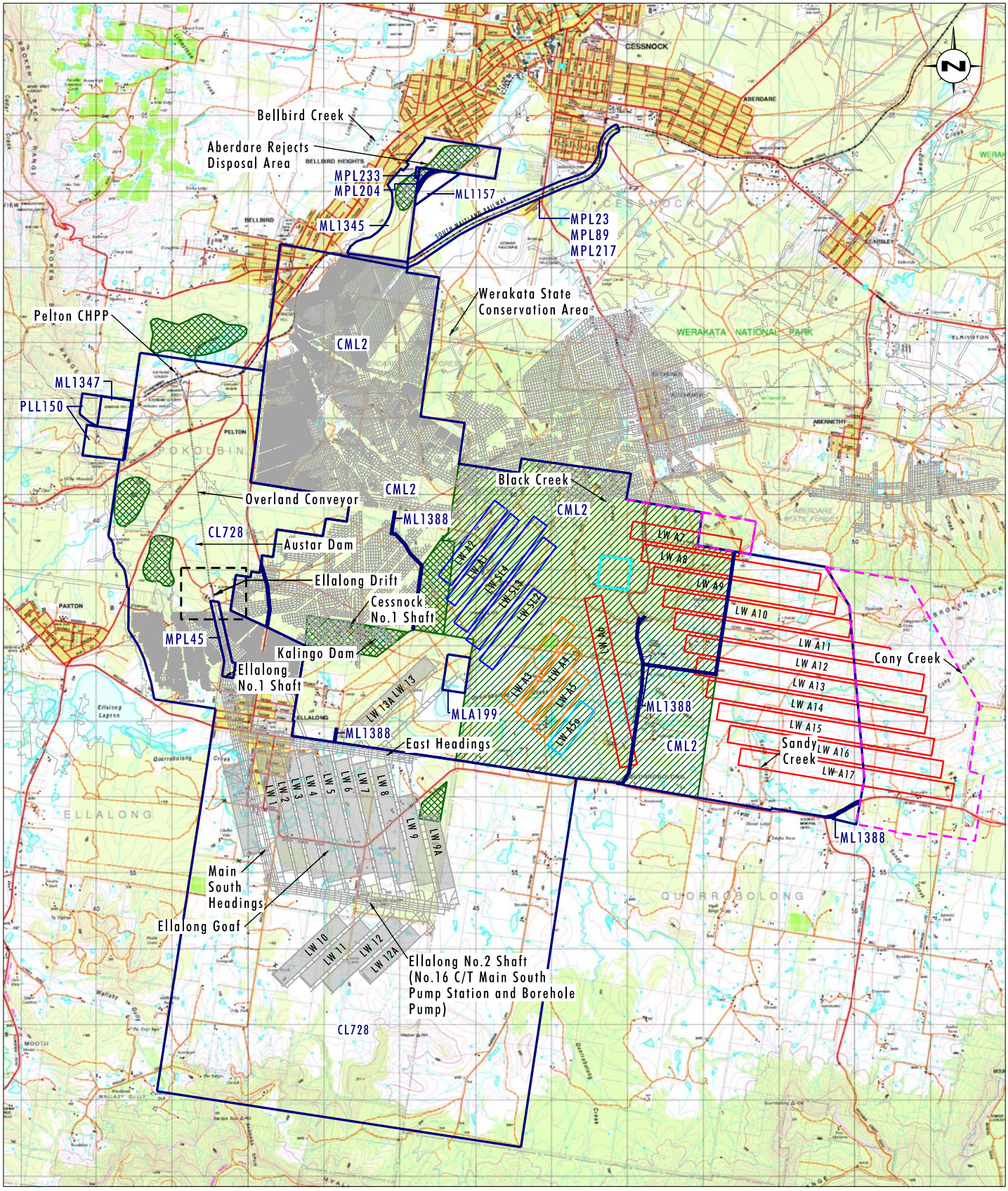
In early 1994 high gas levels were encountered in the southern part of Ellalong Colliery. In 1996 development consent (DA 29/95) was granted by the Minister for Urban Affairs and Planning to extend Ellalong Colliery to the north-east into the Bellbird South area to allow development in an area not affected by high levels of coal seam gas.

The Minister for Urban Affairs and Planning granted development consent (DA 29/95) for mining within CML2 by conventional retreat longwall mining to produce up to 3 Mtpa of product coal with an approved extraction height of up to 4.5 metres. Approximately 98 Mt of coal was identified in the approved Bellbird South Colliery Extension. The approved mining area that formed part of DA 29/95 is shown in **Figure 2.3**.

In 1998 Southland Coal Pty Limited acquired Ellalong and Pelton Collieries and amalgamated them with Bellbird South Colliery. Ellalong, Pelton and Bellbird South Collieries became known as the Southland Colliery. Southland Colliery was operated until 2003 when fire broke out in the underground workings. Subsequently, the mine was placed into receivership and operations were placed on care and maintenance.

Southland Colliery and its associated infrastructure was acquired by Yancoal in December 2004 and was renamed Austar Coal Mine.

Mining proceeded in the reconfigured Stage 1 area (consisting of LW A1 and A2 as shown on **Figure 1.1**) following a modification in 2006 of the 1996 Minister's Consent to allow for the extraction of coal to a height of 6.5 metres using LTCC technology. A further section 96 Modification (Stage 2) was approved by the Minister of Planning in 2008 to allow LTCC extraction of Longwall panels A3 to A5 in Stage 2 (see **Figure 1.1**). An additional minor section 96 (1a) modification to vary the length and widths of Longwalls A4 and A5 was approved in 2009, and a further modification under Section 75W of the EP&A Act adding




Source: Topo Maps: LPI NSW, Longwall Layouts: Austar Coal Mine

0 1 2 3km
1:70 000

## Legend

- Layout for Stage 1 Longwall Panels
- Layout for Stage 2 Longwall Panels
- Layout for Stage 2 Extension Longwall Panel
- Conceptual Layout for Stage 3 Longwall Panels as Approved
- Surface Infrastructure Site
- Proposed Stage 3 Extension Boundary
- Old Workings
- Mining Leases
- Surface Application Area (DA 29/95)
- Subsurface Application Area (DA 29/95)

FIGURE 2.3

**Mining Area Approved under DA 29/95**

File Name (A4): R70_V1/2274_883.dgn

Longwall A5a to the Stage 2 area was approved in November 2010. Extraction of coal using LTCC technology is currently occurring in Longwall A4 within the Stage 2 area.

A new project approval was granted by the Minister for Planning in September 2009, enabling longwall mining using LTCC technology in the Stage 3 area and construction and operation of a new Surface Infrastructure Site and access road south-west of Kitchener (refer to **Figure 1.2**). Construction of the Surface Infrastructure Site commenced in December 2009 and will take approximately 36 months to complete. Longwall mining in the Stage 3 area is scheduled to commence in 2013. A further description of the activities approved under the Stage 3 project approval is set out in **Section 2.3**.

The Austar Mine Complex is located south of the old Aberdare Extended, Cessnock No. 2 and Bellbird mine workings (refer to **Figure 2.1**) and works within the parameters of the Austar Mining Operations Plan using established infrastructure (refer to **Figure 1.2**). The Abermain No. 2, Hebburn No. 2 and Elrington mine workings are all located north-east of Austar, whilst the Maitland Main and Stanford Main workings are located to the west (refer to **Figure 2.1**).

## 2.2 Current Operations, Consents and Approvals

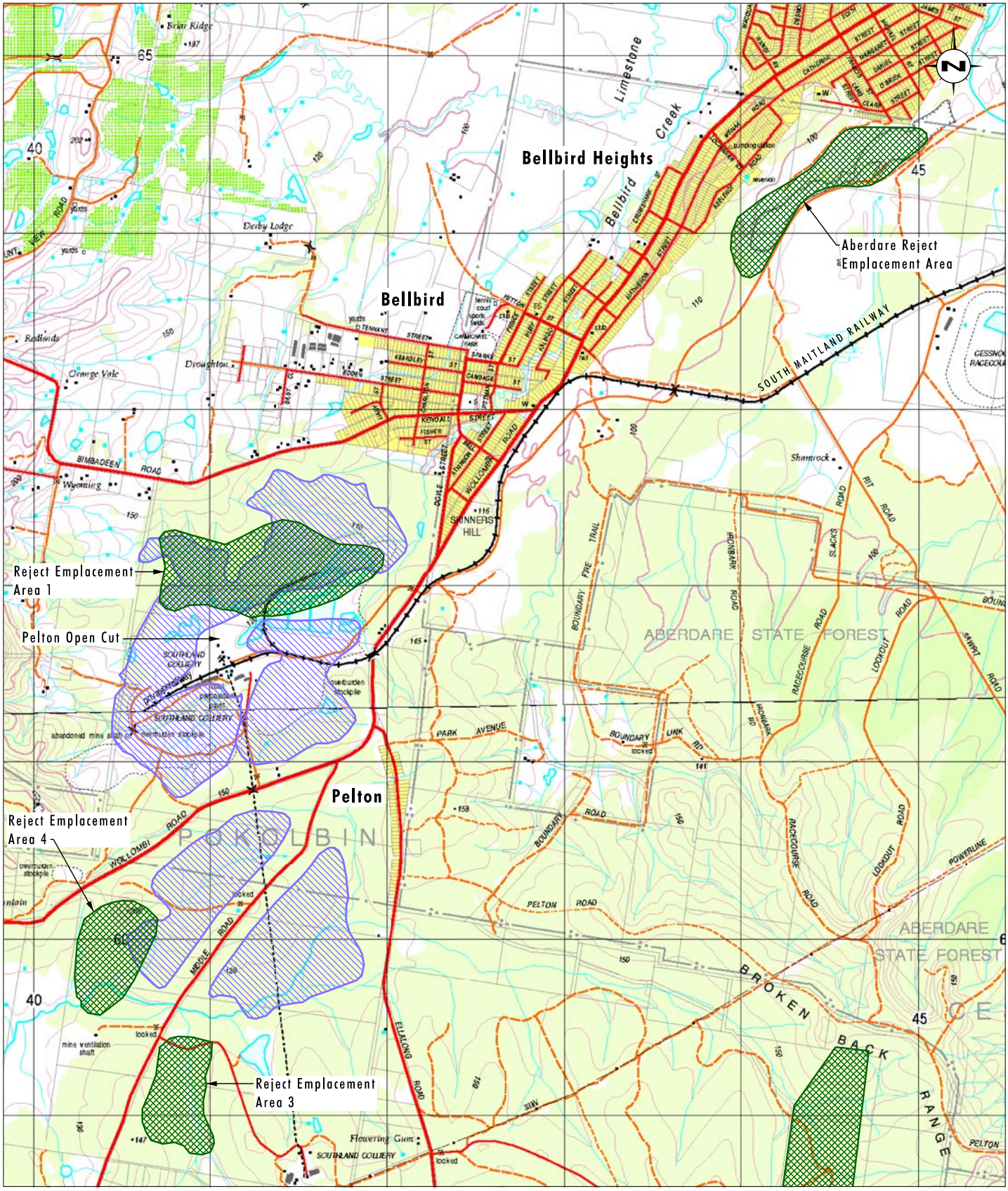
Coal from Austar Coal Mine is bought to the surface at the Ellalong Drift and Pit Top via an underground conveyor through the Ellalong East Headings. Coal is then conveyed to the Pelton CHPP via an overland conveyor system, processed and handled at Pelton CHPP and railed to the Port of Newcastle via Austar Rail Line, the South Maitland Railway and the Main Northern Rail Line. Up to 60,000 tonnes of specialty coal product is also transported by road from Pelton CHPP.

Reject from Pelton CHPP is emplaced at approved emplacement areas at Pelton CHPP and Aberdare Extended. The location of current project emplacement areas is shown on **Figure 1.2**. Additional approved reject emplacement areas are shown on **Figure 2.4**.

A summary of current operations is provided in **Table 2.2**.

**Table 2.2– Summary of Approved Operations**

| | **Approved Operations** |
|---|---|
| Approved Production | • Production of 3.6 Mtpa of ROM coal per year |
| Operating Hours | • 24 hours, 7 days per week |
| Number of Employees | • 200 to 275 |
| Mining Methods | • Conventional retreat long wall mining and LTCC |
| Infrastructure | • Drift sites at Ellalong and Pelton Collieries;<br>• CHPP at Pelton;<br>• Overland conveyor from Ellalong to Pelton CHPP;<br>• Rail loading facility and rail spur adjacent to Pelton Colliery;<br>• Various ventilation and access shafts – (including Ellalong No.1 Shaft, Ellalong No.2 Shaft, an upcast ventilation fan at Shaft No. 3 and Downcast at Shaft No. 4 both located at the Kalingo infrastructure site, and new upcast and downcast shafts under construction at the Stage 3 Surface Infrastructure Site) (refer to **Figure 1.2**);<br>• Offices and amenity buildings at Ellalong and Pelton Collieries, No. 1 and No. 2 shafts, and new offices and amenities to be constructed at the Stage 3 Surface Infrastructure Site; |




Source: Topo Maps: LPI NSW

0 0.5 1.0 1.5km

1:30 000

## Legend

- Reject Emplacement Area (DA 29/95)
- Reject Emplacement Area (DA 74/75/79)

FIGURE 2.4

## Reject Emplacement Areas

**Table 2.2– Summary of Approved Operations (cont)**

| | **Approved Operations** |
|---|---|
| | • Water management systems including: drains, diversion banks, sedimentation, treatment and clean water dams, lime treatment plant and water treatment plant;<br>• Electrical sub-stations and compressors;<br>• Nitrogen inertisation plant; and<br>• Diesel and emulsion fluid storage area and dispatch system. |
| Coal Processing | • All coal is processed at the Pelton CHPP which has a nameplate capacity of 600 tonnes per hour. The plant currently processes up to approximately 520 tonnes per hour giving it a functional production capacity of approximately 4.2 million tonnes per year. |
| Tailings and Reject Management | • Reject and tailings are emplaced at the disused Aberdare Extended Open Cut voids, and at Pelton Colliery in approved areas shown in **Figure 1.1**. As shown on **Figure 2.4**, additional reject emplacement areas have development consent and may be utilised if required. |
| External Coal Transport | • Product coal can be transported by rail to the Port of Newcastle at a rate of up to 3.0 Mtpa (using up to 6 trains per day). Up to 60,000 tonnes per annum can be transported by road. |
| Underground Access | • Main mine entrance is at the Ellalong Drift and Pit Top, Middle Road, which runs off Wollombi Road. |

Since purchasing the mine in December 2004, Austar has been implementing a program of continuous improvement for its operations. This program is being undertaken principally through the ongoing development and review of the following Austar environmental management documents:

- Mining Operations Plan (MOP);
- Site Water Management Plan (SWMP);
- Voluntary Pollution Reduction Program (PRP) that is being implemented as part of Environment Protection Licence (EPL) 416;
- Environmental Management Strategy (EMS); and
- Environmental Monitoring Program (EMP).

## 2.3 Stage 3 Project - Project Approval 08_0111

Austar received approval from the Minister for Planning in September 2009 to undertake the Stage 3 Extension to Underground Mining and Associated Infrastructure under project approval 08_0111. The description of the project approved under project approval 08_0111 is set out in **Table 2.3** below.

**Table 2.3 – Austar Coal Mine – Stage 3 Project Description As Approved**

| | |
|---|---|
| **Project** | Stage 3 of the Austar Coal Mine, which involves:<br>• extraction of up to 3.6 million tonnes of run of mine (ROM) coal a year for 21 years using Longwall Top Coal Caving technology from Longwall Panels A6 to A17; and<br>• construction and operation of new pit top facilities off Quorrobolong Road south of Kitchener including an access road, upcast and downcast ventilation shafts, main ventilation fan, bathhouse, workshop, electricity substation and distribution line, service boreholes, offices and store. |
| **Operation of the Austar Mining Complex** | The Project will use the existing and approved infrastructure and facilities at the existing Austar Mining Complex as described below to handle, process and transport ROM coal from longwalls A6 to A17. These activities involve the continued operation of:<br>• the Ellalong Drift and associated infrastructure;<br>• the Pelton Coal Handling Preparation Plant for the washing and handling of coal;<br>• the Austar Railway Line which links to South Maitland Railway to transport up to 3 million tonnes of product coal per annum;<br>• road transport of up to 60,000 tonnes of specialty coal product per annum; and<br>• emplacement of reject material from Austar's mining operations at Pelton Open Cut and other sites as approved in the Mining Operation Plan. |
| **Stage 3 Project and Austar Mine Complex Areas** | • Stage 3 area including the proposed Stage 3 mining area and the new Surface Infrastructure Site which is located 6 to 8 kilometres south of Cessnock. The location of Stage 3 area is shown on **Figure 1.3**. Cadastral details for the Surface Infrastructure Site and properties above the Stage 3 mining area are listed in **Appendix 1**; and<br>• the Austar Mining Complex as shown on **Figure 1.2** which includes the existing infrastructure and facilities that will be used by the project. |

# 3.0 Description of Proposed Modification

## 3.1 Proposed Mine Plan Changes

The proposed Stage 3 Modification will involve:

- the modification of the mine plan as per **Figure 1.4**, including:
  - removal of longwall A6;
  - extraction of coal in longwalls A7 to A19, which are a reorientation of longwalls A7 to A17 shown on **Figure 1.3**;
  - movement of the Stage 3 main headings and limit of longwalls to the west;
  - increase in longwall void widths from 227 metres to 237 metres; and
  - increase in chain pillar width from 45 metres to 55 metres.
- no change to the life of the operation described in **Table 2.3**;
- no change to the rate of coal extraction described in **Table 2.3**;
- no change in the method of coal extraction described in **Table 2.3**;
- mining remains within Consolidated Mining Lease 2 (CML 2) and existing lease extension application areas (MLA322, and MLA333);
- no change to the new pit top facilities off Quorrobolong Road south of Kitchener described in **Table 2.3**;
- no change to the number of properties above the Stage 3 mining area as listed in **Appendix 1**;
- no change to the operation of the Austar Mining Complex as described in **Table 2.3**;
- no change to the processing and handling of coal from that approved;
- no change to the method of transport of coal from that approved;
- no change to the manning levels of the operation from that approved; and
- no change to the hours of operation from that approved.

As shown in **Figure 1.4**, the area of surface impact will be generally within the envelope of that previously approved for the majority of the underground mining area. Surface impacts are proposed to be decreased in the west of the approved Stage 3 area via the removal of Longwall A6, decreased in the south-east and north-west by reorientation of longwall panels, and increased for a section of land between the approved Longwall A6 and the western extent of approved Longwalls A7 to A17.

## 3.2 Mining Methodology

No change to mining methodology or the rate of extraction is proposed as a part of the Stage 3 Modification. Austar will extract up to 3.6 Mtpa of ROM coal using LTCC technology.

## 3.3 Hours of Operation

Underground mining in the Stage 3 area will be a 24 hour, seven day per week operation.

## 3.4 Project Timing and Life of Operation

Based on current project timing, Austar intends to lodge the draft environmental assessment (EA) for the Stage 3 Modification in Quarter 2 2011. Approval for the project is sought by November 2011, allowing for commencement of mining within the modified Stage 3 area to commence uninterrupted.

## 3.5 Employment

Currently approximately 200 people are employed at Austar with the size of the workforce being limited by the fact that the mine cannot operate at full production due to export restrictions at the Port of Newcastle. At full production of 3.6 Mt per year, there will be employment for approximately 275 people in addition to a range of contractors. It is envisaged that the existing equipment and workforce extracting coal from Stage 1 and 2 will be utilised in Stage 3.

# 4.0 Planning Considerations and Consultation

## 4.1 Planning Considerations

Austar has been advised by the Department of Planning (DoP) that the proposed alteration to the longwall layout described in **Section 3** will constitute a modification to Project Approval 08_0111. Austar requests that the Minister modifies the existing Stage 3 Project Approval 08_0111 under section 75W of the EP&A Act.

In addition to approval under Part 3A of the EP&A Act, the modification may also require approvals under a number of additional Acts or assessment under State planning policies. The additional Acts and policies relevant to this project are listed in **Table 4.1** with an indication of any approvals likely to be required.

Section 75W of the EP&A Act provides for the modification of planning approvals issued under Part 3A of the Act as follows:

> (2) The proponent may request the Minister to modify the Minister's approval for a project. The Minister's approval for a modification is not required if the project as modified will be consistent with the existing approval under this Part.
> (3) The request for the Minister's approval is to be lodged with the Director-General. The Director-General may notify the proponent of environmental assessment requirements with respect to the proposed modification that the proponent must comply with before the matter will be considered by the Minister.
> (4) The Minister may modify the approval (with or without conditions) or disapprove of the modification.

What is proposed under this modification is not a radical transformation of what has been already approved under the Stage 3 Project Approval 08_0111. As described in **Section 3.1**, the following essential elements will remain unaltered by the proposed modification:

- no change to the life of the operation from that approved;
- no change to the rate of coal extraction from that approved;
- no change in the method of coal extraction from that approved;
- mining remains within Consolidated Mining Lease 2 (CML 2) and existing lease extension application areas (MLA322, and MLA333);
- no change to the new pit top facilities off Quorrobolong Road south of Kitchener described in **Table 2.3**;
- no change to the number of properties above the Stage 3 mining area as listed in **Appendix 1**;
- no change to the operation of the Austar Mining Complex as described in **Table 2.3**;
- no change to the processing and handling of coal from that approved;
- no change to the method of transport of coal from that approved;
- no change to the manning levels of the operation from that approved; and
- no change to the hours of operation from that approved.

It is considered that the Minister for Planning therefore has the power to modify the Development Consent under section 75W EP&A Act.

**Table 4.1 - Other Potentially Relevant Acts and State Planning Policies**

| Planning Provision | Comments | Relevant Licences/ Approvals/Assessments |
|---|---|---|
| **Commonwealth Legislation** | | |
| *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) | Threatened species and a number of migratory species listed in the EPBC Act have been recorded in the general vicinity of the project area and an assessment of the impacts of the project on these species is required. This assessment will be completed as part of the ecological assessment. | The need for a preliminary Referral to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) will be assessed to determine whether the approval of the Commonwealth Minister is required. |
| **NSW Legislation – State Environmental Planning Policies** | | |
| State Environmental Planning Policy 33 | SEPP No. 33 requires the consent authority to consider whether an industrial proposal is a potentially hazardous industry or a potentially offensive industry. A hazard assessment is completed for potentially hazardous development to assist the consent authority to determine acceptability. | The existing Austar operations are not considered as hazardous or offensive, and the proposed modification will not change operations; a hazard assessment is not considered necessary. |
| State Environmental Planning Policy 44 | SEPP No. 44 restricts a Council from granting development consent for proposals on land identified as core koala habitat without preparation of a plan of management. | While Cessnock Local Government Area (LGA) is listed in Schedule 1 of the SEPP, no core or peripheral koala habitat has been identified within the project area. The provisions of SEPP 44 do not apply and a koala plan of management is not required for the project |
| State Environmental Planning Policy (Major Projects) 2005 | As discussed above, this project is of a class of development listed in the SEPP. The project therefore requires approval under Part 3A of the EP&A Act and the Minister for Planning will be the consent authority. | Assessment under Part 3A of the EP&A Act. |

**Table 4.1 - Other Potentially Relevant Acts and State Planning Policies (cont)**

| Planning Provision | Comments | Relevant Licences/ Approvals/Assessments |
|---|---|---|
| **NSW Legislation – Acts** | | |
| *Mining Act 1992* | Under this Act, a ML is required before any mining can take place. | Austar currently holds CML2 which covers the majority of the Stage 3 Modification area. The remainder of the area is subject to Mining Lease Applications MLA 332 and MLA 333. Austar received copies for execution in late February 2011. The Stage 3 Modification does not require a change to CML2 MLA 332 or MLA 333. |
| | The revised Austar Mining Operations Plan (MOP) is required to be submitted to the Department of Industry & Investment (DII) for their approval prior to the commencement of mining. | Approval of a Mining Operations Plan by the DII. |
| | A revised Austar Subsidence Management Plan (SMP) is required to be submitted to and approved by the DII. | Approval of a Subsidence Management Plan by the DII. |
| *Protection of the Environment Operations Act 1997* (PoEO Act) | The PoEO Act is administered by the Department of Environment, Climate Change and Water (DECCW) and requires licences for environmental protection including waste, air, water and noise pollution control. | The need for a new licence or variation to the existing EPL for the Stage 3 Modification will be assessed, with further details given in the EA. If approval to the modification is granted then section 75V EPA Act requires that an EPL be issued |

## 4.2 Authority Consultation

Consultation has begun between Austar and DoP, DECCW and DII in relation to the Stage 3 Modification. It is expected that this consultation shall continue as necessary throughout the life of the Stage 3 Modification Project. In addition to these key agencies, the following agencies will be consulted during preparation of the EA:

- Land and Property Management Authority (LPMA);
- NSW Office of Water (NOW);
- NSW Heritage Office;
- Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPC);
- NSW Premier's Department;

- Hunter-Central Rivers Catchment Management Authority; and
- Cessnock City Council.

The Commonwealth DSEWPC will be consulted regarding the project and if required, a Preliminary Referral made under the EPBC Act, to confirm whether the project is a controlled action under the EPBC Act.

Consultation with the above authorities will be ongoing throughout the EA phase of the project.

## 4.3 Community Consultation

Austar has had ongoing consultation with the local community since mining operations recommenced in 2005. Since that time consultation has been undertaken with landholders, local community groups and residents in neighbouring towns. The Austar Community Consultative Committee has also been meeting on a quarterly basis since February 2007 under the guidance of an Independent Chair, approved by the Director-General of the DoP. The Committee has one representative from Council and four representatives from the local community.

Community consultation for the proposed Stage 3 Modification commenced in late 2010 via letters to all potentially affected landholders, a community meeting at Austar Coal Mine, and subsequent discussions with individual landholders. Community consultation will continue throughout the preparation of the EA for the project to build on the previous work undertaken. Consultation methods will include community meetings, letters and briefings, and individual discussions. Project information will also be made available on the Austar Coal Mine website.

The objectives of the community consultation program are to:

- initiate and maintain open communication with the community on all aspects of the proposed modification, particularly landholders and key stakeholder groups;
- identify community issues and concerns in relation to the proposed modification;
- proactively respond to, and work with the community to develop appropriate solutions and strategies to minimise negative impacts and maximise the positive impacts associated with the proposed modification; and
- satisfy any EA requirements for the socio-economic aspects of the proposed modification.

Key areas of community interest identified to date include:

- subsidence impacts on private property, including built structures and farming areas;
- impacts on flooding and drainage; and
- vibration impacts.

The results of the community consultation program will be documented in the EA for the project.

# 5.0 Preliminary Environmental Assessment

## 5.1 Environmental and Community Context

### 5.1.1 Nature of the Site and Surrounds

The Stage 3 area is located in the lower Hunter Valley, approximately 10 kilometres south of Cessnock and approximately 5 kilometres east of the village of Ellalong (refer to **Figure 1.1**). Other nearby villages include Kitchener, Aberdare, Pelton, Paxton and Bellbird.

The topography of the project area comprises three main morphological units (Epps and Associates 1988). These include:

- the Broken Back Range;
- alluvial flats and associated creeks; and
- the intervening, undulating lands.

The Broken Back Range is a major landform extending from west of Pokolbin to Mulbring. It is characterised by steeply sloping land reaching a height of RL 228 metres.

The project area is predominantly located immediately to the south of Broken Back Range. The area encompasses the gentle south facing lower slopes of the Broken Back Range and the extensive creek flat of the Quorrobolong Creek system.

The climate of the Lower Hunter Valley is described as warm temperate, characterised by seasonal variations from hot wet summers to mild dry winters. Rainfall is summer dominant, often occurring as short duration high intensity storms. The area receives an average of approximately 780 mm of rainfall per annum over an average of 109 rain days per year.

The soil types occurring within the project area are mapped on the 1:25,000 Quorrobolong and Cessnock Soil Landscapes Map Sheet.

Preliminary analysis based on soil landscape mapping undertaken by the Soil Conservation Service (1991), indicates that a section of the project area is located within the Quorrobolong Soil Landscape. The yellow podzolic soils of this landscape occur across the floodplains of Cony Creek, Sandy Creek and their tributaries. The A horizon consists of dark brown loamy sand, overlying a bleached yellow/orange $A_2$ horizon. The B horizon is characterised by brown sandy clay (HLA 1995:4.6 and Kovac & Lawrie 1991:316). These soils can be highly dispersive and erodible.

The lower slopes of Broken Back Range are located within the Aberdare Soil Landscape. This brown podzolic soil is characterised by poorly structured dark brown loamy sand to clayey sand A horizons, overlying a dark brown light clay B horizon (HLA 1995:4.6). The topsoil and subsoil of brown podzolic soils can also be highly erodible. The ramifications of these soil characteristics will be assessed during preliminary studies.

Much of the soil within the Cessnock City Council LGA is of low fertility and highly erodible (Cessnock City Council 2003).

The project area is surrounded by rural residences, forests and abandoned mine workings. Werakata State Conservation Area is located to the north and east of the mine plan and surrounds the proposed new surface infrastructure site. Farms and forested areas are situated to the south of the site.

### 5.1.2 Land Ownership

Land ownership within the Stage 3 area and surrounds is shown on **Figure 5.1**. As indicated on **Figure 5.1**, Austar owns all the land where approved surface facilities are located, with proposed mining areas under land owned by Austar, owned privately or owned by the Crown. The northern portion of the mine plan extends underneath the Werakata State Conservation Area and Crown land. As shown on **Figure 5.1**, much of the land surrounding the project area is currently State Conservation Area and rural land holdings.

During the EA preparation, ongoing consultation will be undertaken to ensure that issues raised by residents and nearby landholders are addressed in the EA and mine planning process.

Where possible, each landholder within the Stage 3 area will be consulted regarding the project. The potential interaction of each property with the conceptual mine plan will be discussed with each landholder.

Prior to any property being subsided greater than 20 mm, a Property Subsidence Management Plan (PSMP) will be developed in consultation with each affected landholder. This plan will detail the mining subsidence development specific to each property and the management processes that will be employed during mining. This will include detailed recording of pre-mining condition of surface and natural features and a pre-damage report for each house by a structural engineer. The PSMP will provide impact predictions for each identified feature requiring management and a summary of the management measures to be adopted.

### 5.1.3 Land Use

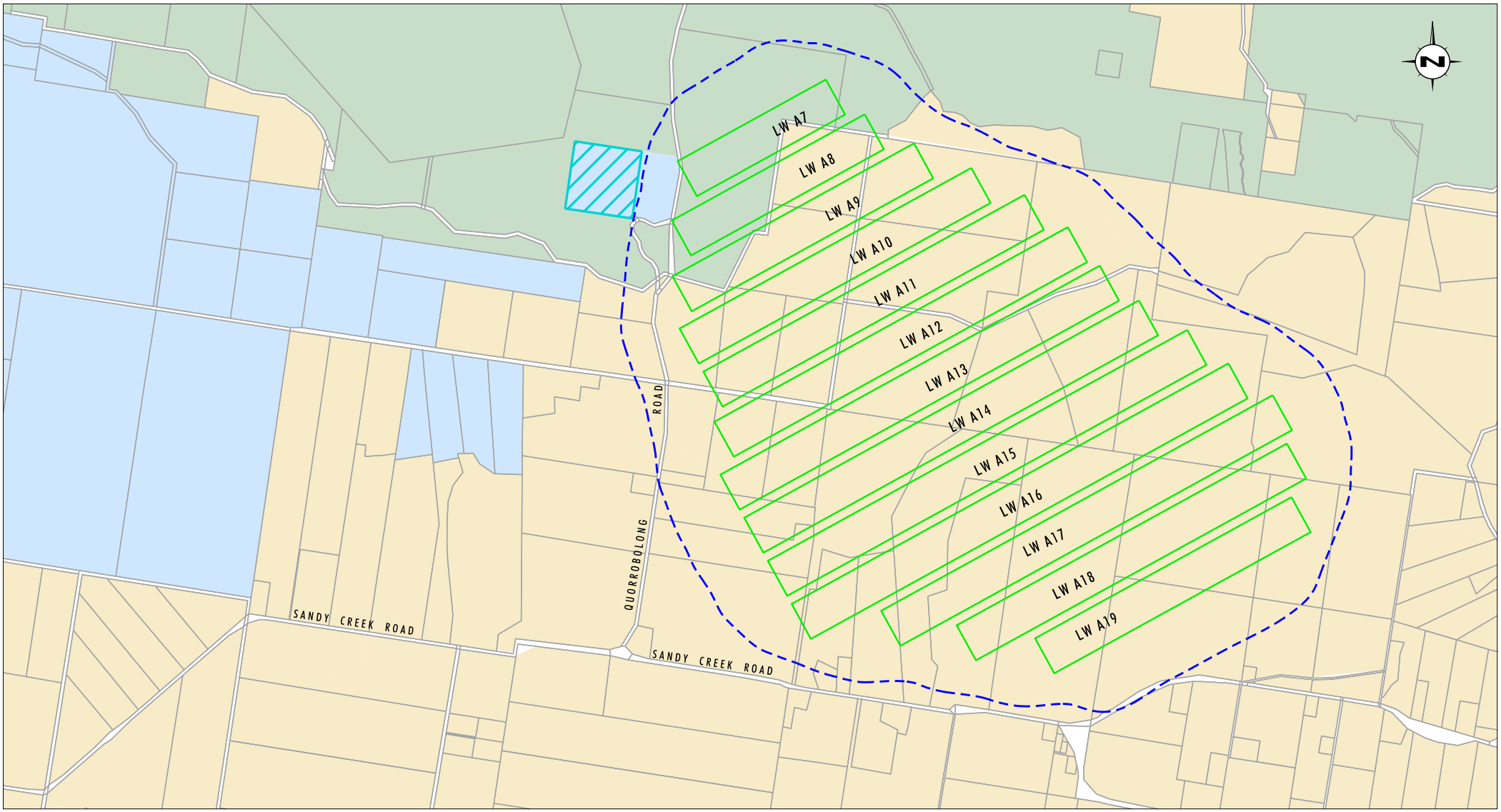
The dominant land uses within and adjacent to the project area include grazing, forestry and mining. The Stage 3 Modification underground mining area will be located within CML2, MLA 332 and MLA 333. Land to the north of the mining lease is currently part of the Werakata State Conservation Area. Land to the south of the mining lease consists of rural cattle grazing and poultry production.

Beef cattle grazing and horse grazing are undertaken on undulating land surrounding the project area to the east and south. Residential development is present at Kitchener, Abernethy, Bellbird, Paxton, Pelton and Ellalong.

## 5.2 Preliminary Environmental Risk Analysis

To assist in identifying the key environmental and community issues that require further assessment, a preliminary environmental risk analysis has been completed for the change in impact created by the project modification and is included in **Appendix 2**. The risk analysis was undertaken in accordance with *AS/NZS 4360:2004 Risk Management*. The risk matrix, consequence table and likelihood table used for the assessment is included in **Appendix 2**.

Consistent with AS/NZS 4360, environmental risks have been categorised as low, medium, high or extreme. As shown in **Appendix 2**, the majority of activities are rated as low or medium level risks, with few high risks and no extreme risks. It is expected that with the completion of further studies, assessment and development of mitigation measures as outlined in **Section 5.3**, most of these high risks will be able to be reduced to medium level risks, due to better definition of potential impacts and effective implementation of management and mitigation measures.




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

0 0.5 1 1.5km
1:32 000

## Legend

- Proposed Stage 3 Modification Longwall Layout
- 20mm Subsidence Contour for Proposed Stage 3 Modification
- Surface Infrastructure Site
- Austar Owned Land
- Werakata State Conservation Area / Crown Land
- Privately Owned Land

FIGURE 5.1

# Land Ownership

**File Name (A4):** R70_V1/2274_885.dgn

The preliminary environmental risk analysis included in **Appendix 2** also identifies those issues considered to require further assessment. The scope of further assessment required for these issues as part of the EA report is discussed in further detail in **Section 6**. Where appropriate, the proposed controls contained in the preliminary environmental risk analysis will be included in the draft Statement of Commitments in the EA report. No further assessment is considered necessary for some potential environmental issues that have low risk as indicated in **Appendix 2** and **Section 6**. The necessity for assessment for each of the environmental issues assessed in the risk assessment is summarised in **Table 5.1**.

**Table 5.1 – Environmental Issues Requiring Further Assessment**

| Environmental Issue | Further Assessment Required? |
|---|---|
| Topography | Yes |
| Surface Improvements | Yes |
| Public Infrastructure | Yes |
| Land Use and Agricultural Productivity | Yes |
| Erosion & Sediment Runoff | Yes |
| Surface Water Flows | Yes |
| Groundwater Flows | Yes |
| Ecology | Yes |
| Cultural Heritage | Yes |
| European Heritage | Yes |
| Visual Amenity | No |
| Water Demand | No |
| Greenhouse Gas and Energy | No |
| Air Quality | No |
| Noise | No |

# 6.0 Key Environmental and Community Issues

## 6.1 Subsidence

As the proposed Stage 3 Modification involves a change to the Stage 3 mine plan, it is considered that potential subsidence impacts are likely to be one of the key issues to be understood for the project. A draft subsidence assessment has been prepared for the EA by Mine Subsidence Engineering Consultants Pty Ltd (MSEC).

The key issues relating to subsidence impacts are likely to be potential:

- landholder concern about subsidence impact on their house and land, including the potential loss of agriculturally productive land;
- impact on creeks and drainage lines above the extraction area, including post-mining changes to flood hazard;
- impact on Aboriginal cultural heritage sites;
- impact on historic heritage sites;
- ecological impact, including impacts on aquatic ecology in affected drainage lines;
- impacts on infrastructure (e.g. Sandy Creek Road, Quorrobolong Road, access tracks, powerlines and farm dams); and
- impact of subsidence remediation works if required.

Preliminary subsidence predictions have been developed by MSEC for the Stage 3 Modification. A summary of the preliminary subsidence assessment findings for Stage 3, the assessment methodology to be used for the project, and subsidence results for Stages 1 and 2 are provided in **Sections 6.1.1** to **6.1.3**.

Preliminary subsidence impacts on vibration, surface water, groundwater, ecology, cultural heritage and historic heritage are described in **Sections 6.2** to **6.7**.

### 6.1.1 Preliminary Subsidence Assessment

MSEC (2010) has prepared a draft assessment of subsidence levels for the proposed Stage 3 Modification mine plan. The analysis provides an initial indication of overall systematic subsidence and valley related movements based on the maximum predicted subsidence case. An assessment of upper bound (worst case) subsidence has also been undertaken for risk assessment purposes. Comparisons between the maximum predicted subsidence parameters resulting from the extraction of the Stage 3 longwalls, based on the Approved and Modified mine plans, is provided in **Table 6.1**.

**Table 6.1 – Maximum Predicted Total Conventional Subsidence Parameters Resulting from the Extraction of the Stage 3 Longwalls Based on the Approved and Modified Mine Plans (Source: MSEC, 2010)**

| Layout | Maximum Predicted Total Conventional Subsidence (mm) | Maximum Predicted Total Conventional Tilt (mm/m) | Maximum Predicted Total Conventional Hogging Curvature (1/km) | Maximum Predicted Total Conventional Sagging Curvature (1/km) |
|---|---|---|---|---|
| Approved Stage 3 Mine Plan | 1925 | 6.7 | 0.06 | 0.12 |
| Proposed Stage 3 Modification mine plan | 1850 | 6.5 | 0.05 | 0.1 |

As set out in **Table 6.1**, the analysis indicates that maximum predicted subsidence parameters, for the proposed Stage 3 Modification mine plan, are similar to but slightly less than those based on the approved Stage 3 mine plan. The reason for this is that, although the longwall void widths are proposed to be increased from 227 metres to 237 metres being consistent with the Stage 2 mining area, the chain pillars are also proposed to be increased from 45 metres to 55 metres. The maximum predicted subsidence in the Stage 3 Modification area is governed by pillar compression, due to the high depths of cover above the proposed longwalls and the structural integrity of the Branxton Formation. As a result, the reduction in subsidence resulting from the larger chain pillar widths resulting in reduced chain pillar compression is greater than the increased subsidence resulting from the larger void widths.

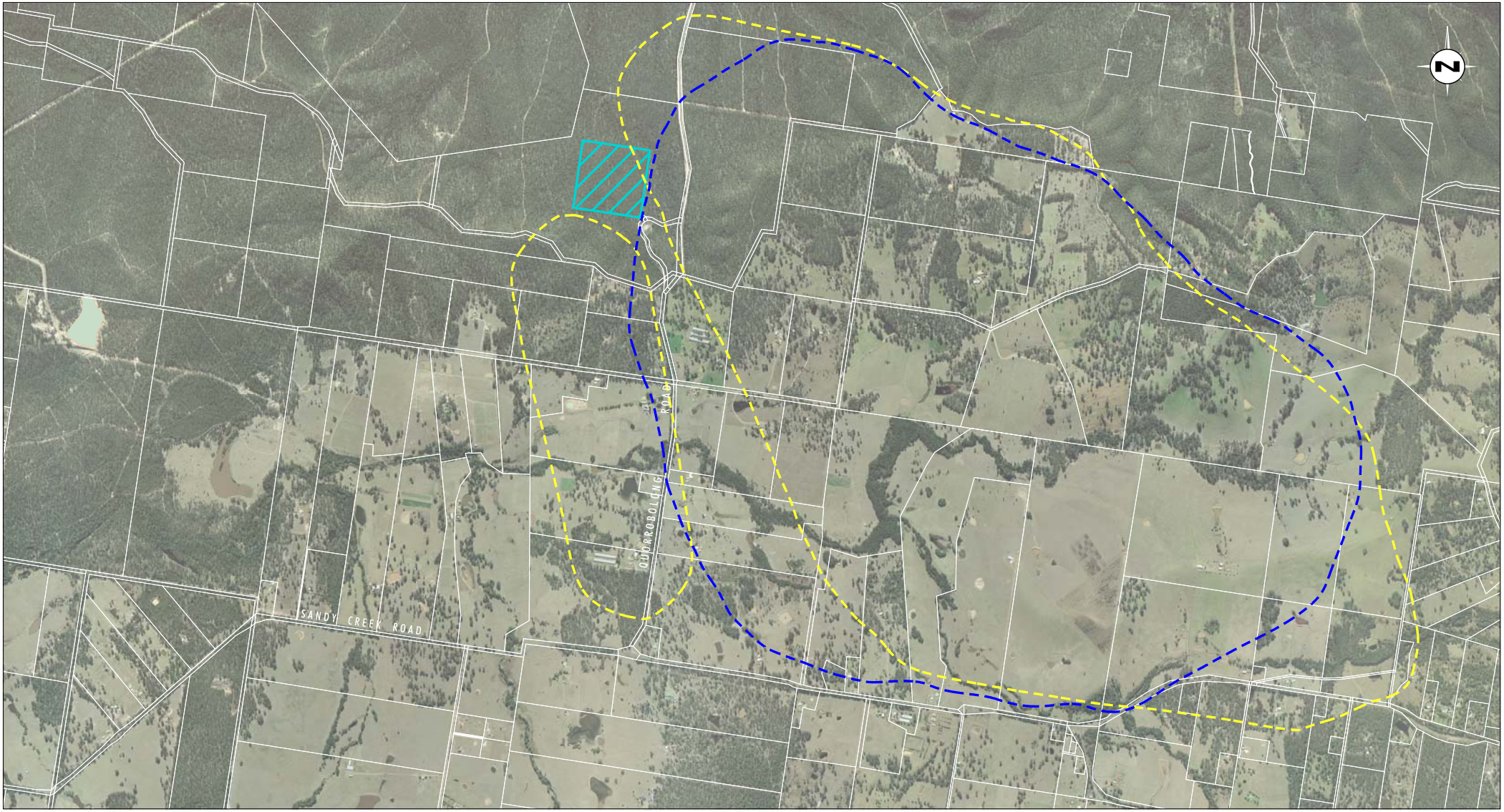
An assessment of subsidence at each house within the 20mm subsidence contour for the proposed Stage 3 Modification mine plan has been conducted. Based on the data provided in MSEC (2010), it is expected that all residential dwellings will remain within the Safe, Servicable and Repairable (SSR) limits, even if the upperbound subsidence levels were realised. Subsidence impacts on the whole are predicted to be similar to, or slightly less than those set out in MSEC (2008), although impacts at specific locations may either decrease or increase depending on their location relative to the proposed Stage 3 Modification mine plan.

### 6.1.2 Environmental Assessment Methodology

There are a number of natural features and items of surface infrastructure in the vicinity of the proposed mining area that may be affected by subsidence from the proposed longwall mining. A detailed Subsidence Assessment for the project will be provided with the EA, which will include assessment of the subsidence impacts of the thirteen longwall panels associated with the Stage 3 Modification mine plan.

The potential 'Affectation Area' is the surface area that is likely to be affected by subsidence from mining in accordance with the conceptual mine plan. This area is defined as the surface area bounded by the predicted 20 mm subsidence contour, which by definition, is the 30 degree angle of draw line from the goaf edges of the proposed longwall panels to the surface. An estimate of the potential 'Affectation Area' is shown on **Figure 6.1**.

The subsidence impact assessment that will be included in the EA will consider all the major natural features and items of surface infrastructure within the Affectation Area. In addition, all other natural features and items of surface infrastructure outside of this area, which may




Source: Longwall Layout: Austar Coal Mine, Cadastre: LPI NSW, Aerial Photography: AAM Hatch 2006, Subsidence Contours: MSEC

0 0.5 1 1.5km
1:32 000

## Legend

- 20mm Subsidence Contour for Conceptual Layout as Approved
- 20mm Subsidence Contour for Proposed Stage 3 Modification
- Surface Infrastructure Site

FIGURE 6.1

# Subsidence Affection Area

be subjected to far field movements and are sensitive to these movements, will be considered in the assessment.

The Calibrated Incremental Profile Method developed by MSEC will continue to be used to predict the systematic subsidence, tilt and strain profiles for the proposed longwalls and has been used for the Stage 1, Stage 2 and Stage 3 assessments completed to date.

Both Maximum Predicted and Upper Bound subsidence will be modelled and reported in the subsidence assessment for the proposed Stage 3 Modification. Subsidence monitoring in longwalls A1 to A3 in the Stage 1 and Stage 2 areas has shown that actual subsidence and tilt in the Stage 1 and Stage 2 areas to date are less than the Maximum Predicted subsidence, and well below the Upper Bound subsidence. It is therefore proposed that the Maximum Predicted subsidence case be used for the purpose of environmental impact assessment, and Upper Bound subsidence be used for risk assessment purposes in the Environmental Assessment for the proposed Stage 3 Modification. Further information on actual subsidence data is provided in **Section 6.1.3**.

### 6.1.3 Comparison of Subsidence Predictions to Actual Subsidence

Included in **Table 6.2** are the Maximum Predicted subsidence parameters for Stage 1 (longwalls A1 and A2) and for Stage 2 (longwall A3 only). The Maximum Predicted case was determined using the calibrated Incremental Profile Method by MSEC and is documented in the subsidence reports for the Austar Stage 1 and Stage 2 Statements of Environmental Effects. Upper Bound cases were also determined during initial assessments by increasing the predicted systematic subsidence parameters such that the maximum subsidence of 65% of effective extracted seam thickness is achieved above the longwalls. This resulted in subsidence predictions much higher than maximum predicted and was used for risk assessment purposes in the Stage 1 and Stage 2 areas.

**Table 6.2 – Actual vs Maximum Predicted Subsidence Parameters**

| LW | Maximum Predicted Subsidence (mm) | Actual Subsidence | Maximum Predicted Tilt (mm/m) | Actual Tilt (mm/m) | Maximum Predicted Tensile Strain (mm/m) | Actual Tensile Strain (mm/m) | Maximum Predicted Compressive Strain (mm/m) | Actual Compressive Strain (mm/m) |
|---|---|---|---|---|---|---|---|---|
| A3 | 295 | 157 | 1.5 | 0.7 | 0.2 | 0.2 | 0.4 | 0.4 |
| A1+A2 | 1380 | 1008 | 7.5 | 6.5 | 1.5 | 2.5 | 2.0 | 2.2 |

From this it can be seen that actual subsidence and tilt are less than maximum predicted and that tensile and compression strains only have a small variation to maximum predicted, being within survey tolerance and potentially associated with disturbed markers (review of the data shows tensile and compressive strain pairs between markers suggesting this is the case). It is also noted that Upper Bound subsidence parameters are far in excess of actual measured across all parameters.

To date Austar has only extracted two adjacent LTCC panels (A1 and A2) with a total void width of 414 metres (including the chain pillar), however the profiles obtained are consistent with subsidence monitoring from Ellalong Colliery where multiple panels have been extracted. This displays that the subsidence is again controlled by the chain pillar compression and the Branxton Sandstone unit which dominates the overburden sequence. The body of available subsidence measurements indicates that subsidence will remain at or below the Maximum Predicted amounts.

## 6.2 Vibration

As discussed in MSEC (2010), the settlement of the ground during and following longwall mining generally occurs as a series of gradual movements over time. These movements generally cannot be detected by people on the ground surface. However, occasionally movements in the rock layers immediately above the longwall can result in vibration in the ground which can be observed as a minor effect on the surface.

As discussed in **Section 4**, vibration has been raised as a part of Austar's ongoing community consultation program as an area of potential community concern. A desktop vibration assessment, incorporating results from the subsidence impact assessment and monitoring data from the Stage 2 mining area and Ellalong Colliery will be undertaken. No guideline criteria specifically relating to ground vibration as a result of underground mining are available for use in assessment of ground vibration at Austar Coal Mine. It is therefore proposed to use the following two more general guidelines to provide guidance for vibration criteria for human response and structural damage respectively:

- *Assessing Vibration: a technical guideline* (NSW DECC, 2006); and
- *British Standard BS 7385:1993 Part 2 – Evaluation and Measurement for Vibration in Buildings.*

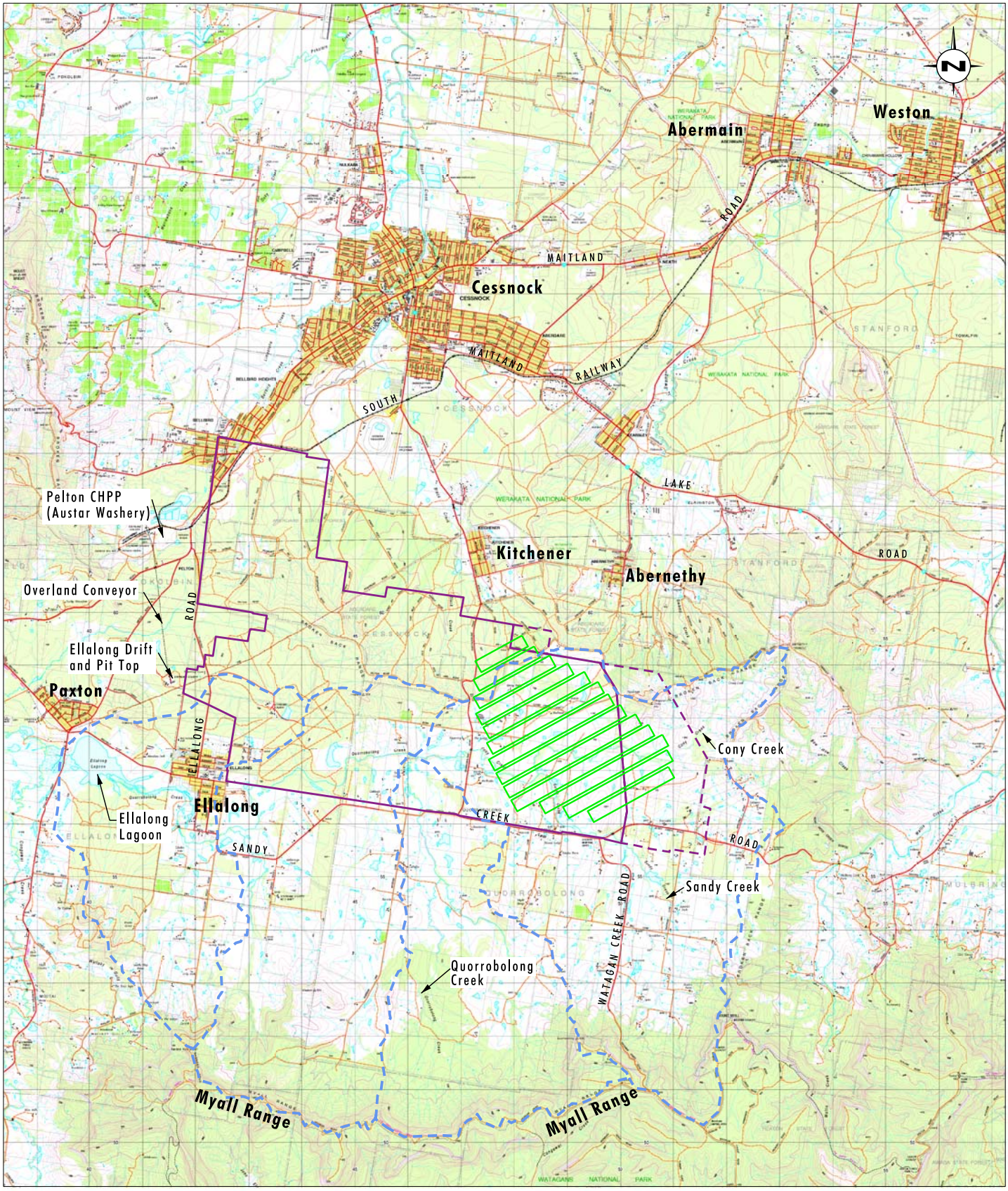
Vibration impacts as a result of the proposed Stage 3 Modification are expected to be similar to those previously identified in the Stage 3 project Subsidence Impact Assessment (MSEC, 2008). Ongoing subsidence monitoring in the Stage 2 area has indicated that vibration events are typically less than 15 mm/s, which is the guideline value for transient vibration to ensure minimal risk of cosmetic damage to residential buildings under *BS 7385:1993*. Only one event has been recorded in excess of this value, at 15.9 mm/s. The subsidence monitoring program for the Stage 2 mining area will be extended to include the Stage 3 mining area to enable ongoing monitoring of vibration events.

## 6.3 Surface Water

The Stage 3 mining area is located within the Sandy Creek/Cony Creek drainage system, which forms part of the Quorrobolong Valley (refer to **Figure 6.2**). The Quorrobolong Valley upstream of Ellalong Lagoon (including Quorrobolong, Sandy Creek and Cony Creeks) is approximately 87 $km^2$ and mainly comprises State Conservation Area and cleared agricultural land. The drainage system through the valley conveys runoff from the Broken Back and Myall Ranges to the west, past the township of Ellalong and into Ellalong Lagoon (approximately 7 kilometres downstream of the mining area). Overflows from Ellalong Lagoon flow into Congewai Creek, which flows in a westerly direction until the confluence with Wollombi Brook. Wollombi Brook flows in a northerly direction into the Hunter River, 10 kilometres upstream of Singleton.

A detailed Flooding and Drainage Assessment for the Stage 3 Project was conducted in 2008, including preparation of a detailed RMA-2 flood model of the Quorrobolong Valley upstream of Ellalong Lagoon. The detailed flood model has been updated and a full assessment of changes to subsidence impacts on surface drainage is currently underway. Preliminary results for maximum predicted subsidence show that:

- there will be no significant change to catchment boundaries;
- there will be no significant change to channel alignment or bank stability;




Source: Topo Maps: LPI NSW, Longwall Layout: Austar Coal Mine

0 1.0 2.0 4km
1:100 000

## Legend

- Proposed Stage 3 Modification Longwall layout
- Consolidated Mining Lease (CML) 2
- Proposed Stage 3 Extension Boundary
- Catchment Boundary

FIGURE 6.2

Catchment Plan

- there will be no significant change to in channel ponding or out of channel ponding; and
- groundwater availability to riparian vegetation is not likely to substantially change as a result of mining.

A full assessment of subsidence impacts on flooding and drainage within the Quorrobolong Valley as a result of the proposed Stage 3 Modification will be provided in the EA for the project.

## 6.4 Groundwater

A comprehensive groundwater assessment for the Austar Mining Complex was prepared as a part of the original Stage 3 EA. This assessment identified four main areas of potential impact to be considered including:

- impacts to the alluvial aquifers of Quorrobolong Creek and its tributaries;
- impacts on the fractured rock aquifer associated with the Branxton Formation;
- impacts on the fractured rock aquifer associated with the Greta Coal Seam; and
- regional impacts.

The groundwater assessment concluded that the potential for vertically interconnected cracking to extend from the mining goaf (resulting from longwall extraction) to the surface is negligible. Therefore the impact of proposed mining on the alluvium and fractured rock aquifer associated with the Branxton Formation is likely to be negligible. Furthermore, due to the geomorphology of the Quorrobolong Valley and its underlying geology, the potential for upsidence or valley closure impacts to adversely impact on groundwater in the shallow alluvium is also considered to be negligible. Impacts on the aquifer associated with the Greta Coal Seam and regional impacts were also considered to be negligible.

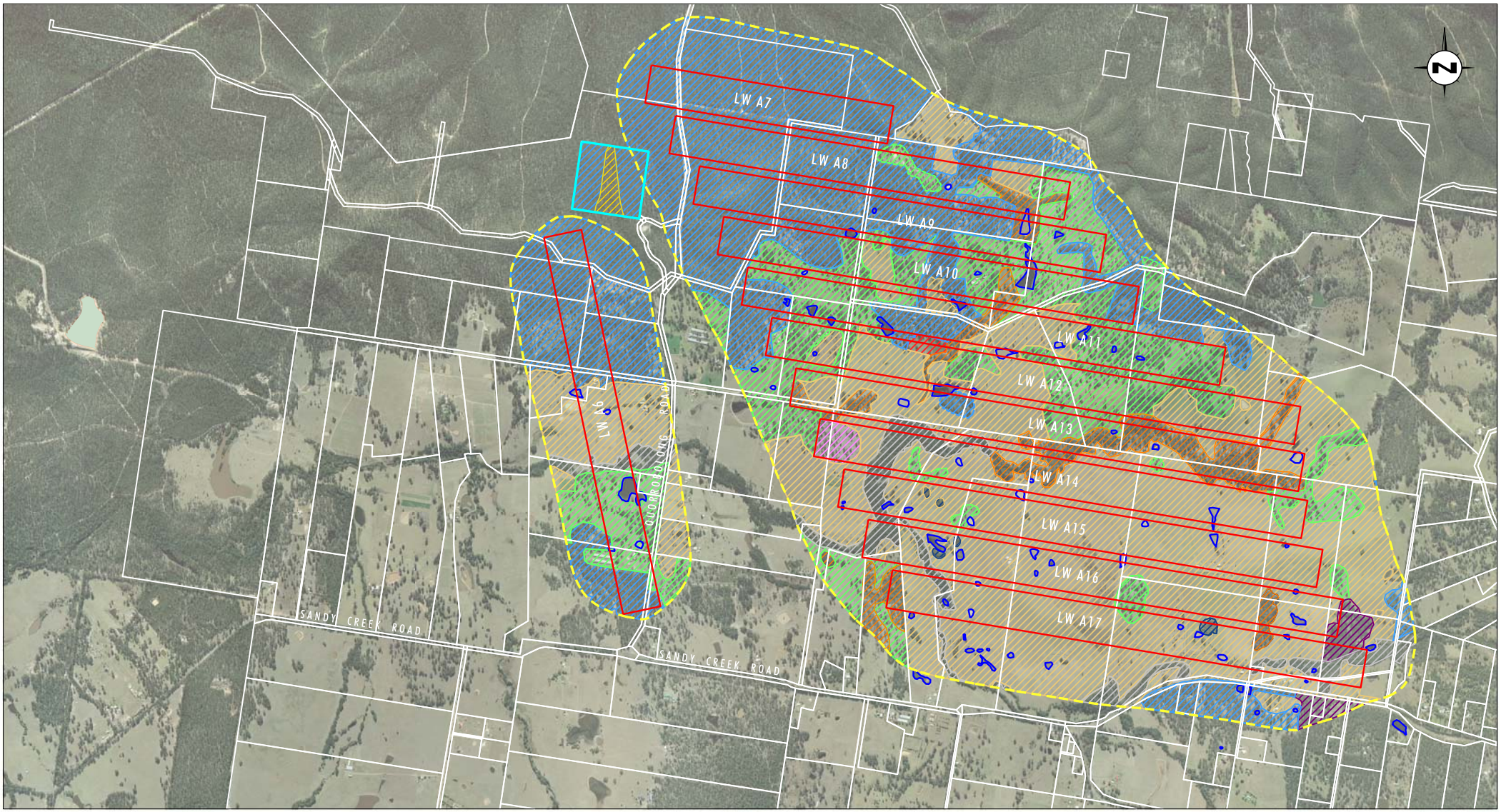
As discussed in **Section 6.1**, according to MSEC (2010), the maximum predicted subsidence parameters, based on the proposed Stage 3 Modification mine plan, are similar but slightly less than those based on the approved Stage 3 mine plan. It is therefore considered that the proposed Stage 3 Modification is unlikely to have impacts on aquifers beyond those set out in the groundwater assessment conducted for the Stage 3 EA.

A desktop review of the proposed modifications and their potential impacts to groundwater will be undertaken and provided in the EA for the project.

## 6.5 Ecology

### 6.5.1 Preliminary Overview of Impacts

A comprehensive Ecological Survey and Assessment for the Stage 3 Project was undertaken by Umwelt in 2007 and 2008. The survey and assessment identified seven vegetation communities within the Stage 3 mining area, as shown in **Figure 6.3**. Two threatened flora species were recorded in the survey area, being heath wrinklewort (*Rutidosis heterogama*) and small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*). Both species are listed as vulnerable under the *Threatened Species Conservation Act 1995* (TSC Act) and the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).




**Source:** Longwall Layout: Austar Coal Mine, Cadastre: LPI NSW, Vegetation Communities, Umwelt 2008
Aerial Photography: AAM Hatch 2006

0 0.5 1 1.5km
1:32 000

## Legend

- Conceptual Layout for Stage 3 Longwall Panels
- 20mm Subsidence Contour
- Surface Infrastructure Site
- Spotted Gum - Ironbark Forest
- Red Gum - Grey Box Forest on Drainage Flats
- Quorrobolong Scribbly Gum Woodland
- Swamp Oak Riparian Forest
- Derived Grassland with Scattered Canopy Trees
- Derived Grassland
- Woolybutt Open Forest
- Riparian Red Gum Forest
- Dam

FIGURE 6.3

# Vegetation Communities - Stage 3 Approved

**File Name (A4):** R70_V1/2274_888.dgn

Three Endangered Ecological Communities were identified within the Stage 3 underground mining area, being:

- Lower Hunter Spotted Gum-Ironbark Forest;
- River-flat Eucalypt Forest; and
- Quorrobolong Scribbly Gum Woodland.

A total of nine threatened fauna species listed as vulnerable under the TSC Act have also been previously recorded in the assessment area, with one of these species, the grey-headed flying fox (*Pteropus poliocephalus*), also being listed as vulnerable under the EPBC Act.

The results of the survey and assessment of potential impacts at upper bound levels of subsidence indicated that potential impacts on ecological values as a result of subsidence were likely to be low and would be controllable and manageable (Umwelt, 2008a).

Ongoing monitoring of riparian vegetation and changes in creek channel morphology as a result of subsidence in the Stage 2 area has indicated negligible change to riparian vegetation or channel morphology. This monitoring program will be extended to include monitoring locations in the Stage 3 Modification area.

As described in **Section 6.1**, the maximum predicted subsidence parameters, based on the proposed Stage 3 Modification mine plan, are similar to but slightly less than those based on the approved Stage 3 mine plan. Similarly, flooding and drainage impacts as a result of the proposed Stage 3 Modification mine plan are expected to be similar to those for the approved Stage 3 mine plan. The impacts of the proposed Stage 3 Modification on the ecological values of the area are likely to be similar to those previously assessed for the Stage 3 Project.

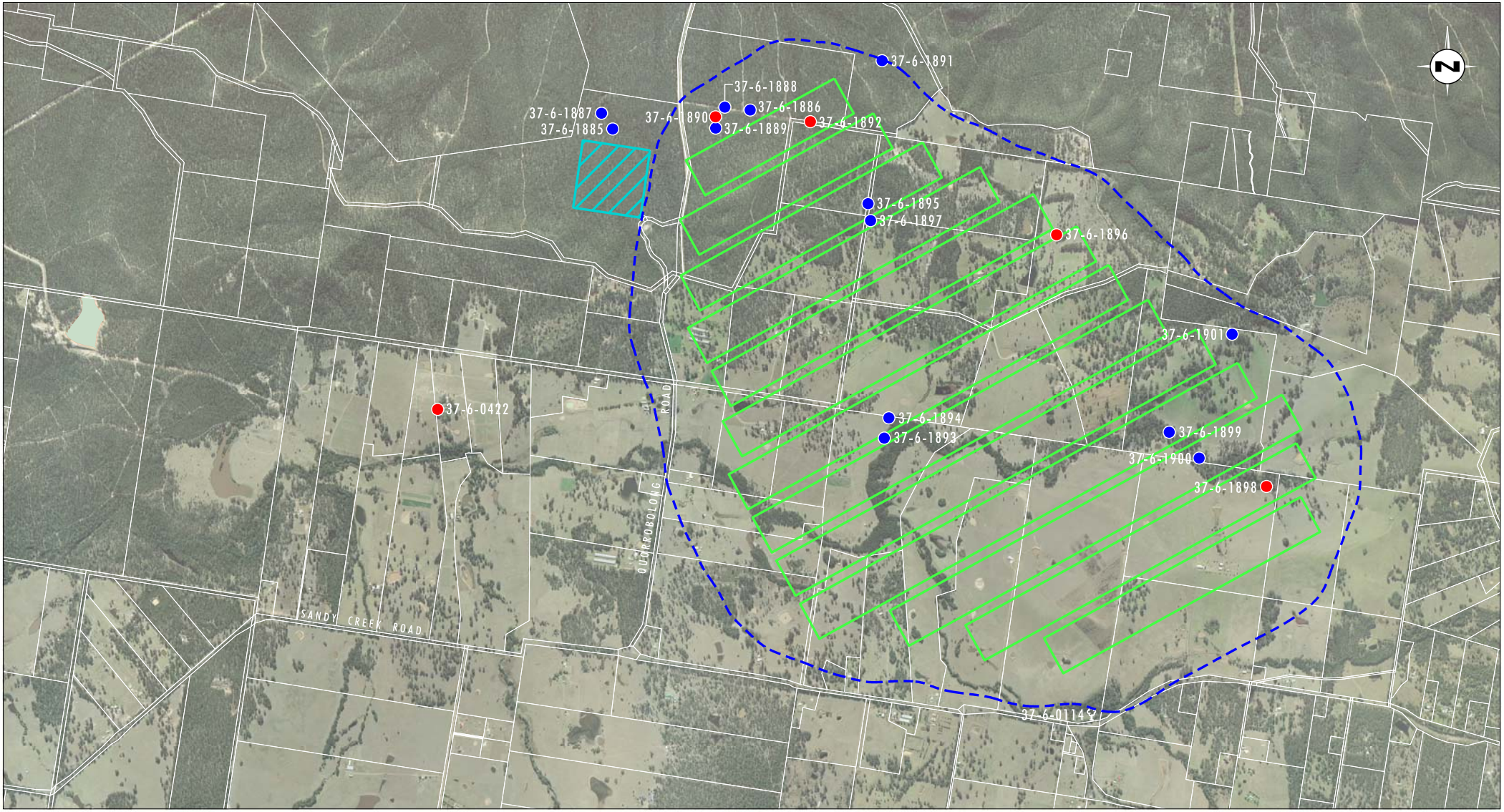
### 6.5.2 Ecological Assessment Methodology

The existing ecological assessment for Stage 3 will be updated to take into consideration the proposed Stage 3 Modification. The revision will comprise a component of field work to survey areas not included in the previous mine plan, a revision of ecological database searches (to capture the larger area, and also to identify any species added since the 2008 searches), recognition of any newly listed threatened species or communities where relevant and updating of existing vegetation mapping. The Ecological Assessment Report (Umwelt, 2008a) will then undergo a thorough revision to capture the outcomes and implications of these further investigations. The report will include assessments impacts under the EP&A Act and the EPBC Act for any threatened species, populations or endangered ecological communities (EECs) that were recorded or are likely to occur within the study area, and presentation of agreed impact mitigation measures that may be required to minimise any adverse impacts of the proposed Stage 3 Modification on the significant ecological values of the study area.

## 6.6 Cultural Heritage

### 6.6.1 Preliminary Overview of Impacts on Known Cultural Heritage Sites

A detailed Aboriginal Cultural Heritage Assessment was undertaken for the Stage 3 Project in 2007 and 2008. This assessment identified a number of sites of Aboriginal cultural and archaeological significance (refer to **Figure 6.4**). These sites included 16 artefact scatters




**Source:** Longwall Layout: Austar Coal Mine, Cadastre: LPI NSW, Aerial Photography: AAM Hatch 2006, Subsidence Contours: MSEC

## Legend

- Proposed Stage 3 Modification Longwall Layout
- 20mm Subsidence Contour for Proposed Stage 3 Modification
- Surface Infrastructure Site
- Carved Tree
- Isolated Find
- Artefact Scatter

FIGURE 6.4

## Archaeological Sites in the Stage 3 Area

**File Name (A4):** R70_V1/2274_889.dgn

and isolated finds and one grinding groove. Aboriginal stakeholders identified that all sites are of cultural significance, and that the grinding groove is of high cultural significance.

The maximum predicted mine subsidence movements for the archaeological sites based on the approved Stage 3 mine plan and the proposed Stage 3 modification mine plan are shown in **Table 6.3**.

**Table 6.3 – Maximum Predicted Total Conventional Subsidence Parameters for the Archaeological Sites Resulting from the Extraction of the Stage 3 Longwalls (Source: MSEC, 2010)**

| Location | Layout | Maximum Predicted Total Conventional Subsidence (mm) | Maximum Predicted Total Conventional Tilt (mm/m) | Maximum Predicted Total Conventional Hogging Curvature (1/km) | Maximum Predicted Total Conventional Sagging Curvature (1/km) |
|---|---|---|---|---|---|
| Artefact Scatters and Isolated Finds | Approved Stage 3 Mine Plan | 1925 | 6.7 | 0.06 | 0.12 |
| | Proposed Stage 3 Modification mine plan | 1850 | 6.5 | 0.05 | 0.10 |
| Grinding Groove Site | Approved Stage 3 Mine Plan | 1450 | 3.5 | 0.03 | 0.13 |
| | Proposed Stage 3 Modification mine plan | 250 | 1.5 | 0.02 | <0.01 |

As shown in **Table 6.3**, the maximum predicted mine subsidence movements at the grinding grove site for the proposed Stage 3 Modification mine plan are much less than those for the approved Stage 3 mine plan. According to MSEC (2010), the assessed level of impact for the grinding groove site reduces as a result of the proposed longwall modifications.

As shown in **Table 6.3** the maximum predicted mine subsidence movements for the proposed Stage 3 Modification mine plan are predicted to be similar to, but slightly less than those predicted based on the approved Stage 3 mine plan for artefact scatters and isolated finds.

### 6.6.2 Cultural Heritage Assessment Methodology

A detailed assessment of the potential impacts of the proposed Stage 3 modification on Aboriginal heritage values will be undertaken as a part of the EA for the project. This assessment will build on the previous Stage 3 Cultural Heritage Assessment and ongoing due diligence inspections within the Austar Mining Complex.

The aim of the Aboriginal cultural heritage assessment will be to identify the Aboriginal heritage values of the areas within the proposed Stage 3 Modification 20mm subsidence contour which were not able to be accessed for survey as a part of the original Stage 3 assessment, and to provide appropriate management strategies for any additional Aboriginal heritage sites/areas/values which may be identified. The assessment report will also revise the impact assessment of the Stage 3 project where necessary, based on the revised subsidence impact assessment to be provided by Mining Subsidence Engineering Consultants (MSEC). To achieve this, the following tasks will be completed:

- searches of the AHIMS site and report registers, to identify and include any additional Aboriginal archaeological investigations and/or recorded sites in the local area since completion of the Stage 3 assessment report (Umwelt, 2008b);
- development of an assessment methodology in conjunction with registered Aboriginal stakeholders, including a detailed archaeological survey strategy;
- archaeological survey to identify and record any surface archaeological features within accessible properties;
- assessment of the archaeological (scientific) significance of all identified archaeological sites and features in accordance with the assessment criteria set out by the DECC guidelines (1997).
- integration of any Aboriginal stakeholder statements on the cultural value of the 75W modification area and/or any additional Aboriginal archaeological sites recorded;
- assessment of potential impacts resulting from the mine plan modification, based on the revised subsidence information provided by MSEC; and
- identification of available management options for all identified Aboriginal cultural heritage sites and areas within the 75W modification area; and provision of identification of and strategies.

In accordance with Austar's commitment to conduct Aboriginal cultural heritage and archaeological surveys of the land surface within the Stage 3 area as access became available, Austar has sought access to all previously unsurveyed properties falling within the 20 mm subsidence contour. Austar has received a positive response from landholders, and at this stage it appears that over 80 per cent of the total area within the 20 mm subsidence contour will be available for survey as a part of the Aboriginal cultural heritage assessment.

### 6.6.3 Consultation with the Aboriginal Community

Following discussions with DECCW and DoP, as directed by DoP the Aboriginal stakeholder consultation strategy for the 75W modification assessment will be conducted in accordance with the *Interim Community Consultation Requirements for Applicants* (DEC 2004). The consultation strategy is a continuation of the consultation program for the Stage 3 project which started in December 2006, and will include:

- an initial project meeting to identify the range of upcoming Aboriginal heritage works and to seek Aboriginal stakeholder input for the methodology of the planned works;
- involvement in the development of the assessment methodology, which will be based on discussions at the initial project meeting and a subsequent survey methodology workshop, and provided to Aboriginal stakeholders for comment;
- participation in archaeological fieldwork;

- post-survey project meeting to identify the results of the survey, and provide Aboriginal stakeholders with the opportunity to provide preliminary comment on cultural significance, impact assessment and management options;

- preparation of a cultural values assessment and/or provision of comment on cultural values and provision of comment on appropriate management strategies for the project; and

- involvement in the finalisation of the assessment report, which will be provided to Aboriginal stakeholders for a minimum comment period of 21 days, after which all comments will be included and addressed in the final Aboriginal cultural heritage assessment report.

## 6.7 Historic Heritage

A detailed Historic Heritage Assessment for the Stage 3 Project was undertaken by Umwelt in 2007 and 2008. The assessment identified a number of historic heritage items in the vicinity of the Stage 3 Project area, including two bridges, two quarries, one ford, three culverts, an historic artefact scatter, fencing, cut trees and stumps, a railway embankment, and a possible house site. All items identified were considered to be of local, or no heritage significance with no or low archaeological research potential, and no sites were assessed as having State heritage significance. The Historic Heritage Assessment concluded that there was unlikely to be any direct or indirect impacts on the identified potential historic heritage items within the assessment area (Umwelt, 2008c).

Subsidence impacts on historic heritage items as a result of the proposed Stage 3 Modification have been identified as being similar to, but slightly less than those predicted as a result of the approved Stage 3 mine plan (MSEC, 2010). A desktop review of subsidence impacts on historic heritage items based on the results of the Subsidence Impact Assessment will be undertaken and included in the EA for the proposed Stage 3 Modification.

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# 8.0 Abbreviations

| | |
|---|---|
| **AHIMS** | Aboriginal Heritage Information Management System |
| **Austar** | Austar Coal Mine |
| **CHPP** | coal handling and preparation plant |
| **CML2** | Consolidated Mining Lease 2 |
| **DA** | Development Application |
| **DECCW** | Department of Environment, Climate Change and Water |
| **DSEWPC** | Department of Sustainability, Environment, Water, Populations and Communities |
| **DoP** | Department of Planning |
| **DII** | Department of Industry and Investment |
| **EA** | environmental assessment |
| **EECs** | Endangered ecological communities |
| **EP&A Act** | Environmental Planning and Assessment Act 1979 |
| **EPBC Act** | Environmental Protection and Biodiversity Conservation Act 1999 |
| **EPL** | Environmental Protection Licence |
| **$km^2$** | kilometres squared |
| **LGA** | Local Government Area |
| **LTCC** | Longwall Top Coal Caving |
| **Mt** | mega tonne (one million tonnes) |
| **ML** | Mining Lease |
| **mm** | millimetres |
| **mm/m** | millimetres per metre |
| **Mt** | million tonnes |
| **MOP** | Mining Operations Plan |
| **MSEC** | Mine Subsidence Engineering Consultants Pty Ltd |
| **Mtpa** | million tonnes per annum |

| | |
|---|---|
| **NPWS** | National Parks and Wildlife Service |
| **PoEO Act** | Protection of the Environment Operations Act 1997 |
| **RL** | reduced level |
| **ROM** | run of mine |
| **SEPP** | State Environmental Planning Policy |
| **SMP** | Subsidence Management Plan |
| **SSR** | safe, serviceable and repairable |
| **SWMP** | Site Water Management Plan |
| **t** | tonnes |
| **tpa** | tonnes per annum |

# APPENDIX 1

# Austar Coal Mine Stage 3 Properties

# Table 1 – Austar Coal Mine Stage 3 Properties

Lot 1 Alt DP 171040
Lot 1 Alt DP 738718
Lot 1 Alt DP 738726
Lot 1 Alt DP 798955
Lot 1 Alt DP 950221
Lot 1 DP 170894
Lot 1 DP 240664
Lot 1 DP 828916
Lot 1 DP 852328
Lot 1 DP 873717
Lot 1 DP 996145
Lot 10 Alt DP 1093269
Lot 10 DP 240664
Lot 100 DP 755254
Lot 1002 Alt DP 856790
Lot 11 DP 1093269
Lot 111 Alt DP 859794
Lot 12 DP 705614
Lot 2 Alt DP 595102
Lot 2 Alt DP 747207
Lot 2 DP 240664
Lot 2 DP 575428
Lot 2 DP 828916
Lot 2 DP 873717
Lot 21 Alt DP 1079917
Lot 22 DP 1079917
Lot 3 Alt DP 745656
Lot 3 DP 240664
Lot 32 DP 755215
Lot 4 Alt DP 571638
Lot 4 DP 240664
Lot 51 DP 599170
Lot 51 DP 794214
Lot 52 DP 599170
Lot 521 DP 1003186
Lot 522 DP 1003186
Lot 54 DP 755254
Lot 61 Alt DP 1039031
Lot 62 Alt DP 1039031
Lot 7 DP 240664
Lot 8 DP 240664
Lot 9 DP 240664
Lot 91 DP 1064579
Lot 973 DP 804896
Pt 26 DP 755215
Pt 72 DP 755254

# APPENDIX 2

# Stage 3 Modification Preliminary Environmental Risk Assessment

# Appendix 2 - Preliminary Environmental Risk Analysis

A preliminary environmental risk assessment has been undertaken for the project to identify the key issues which warrant further detailed assessment and discussion. The methodology used for this process follows the general principles outlined in Australian Standard *AS/NZS 4360:1999 Risk Management and Environmental Risk Management – Principles and Process* (Standards Australia, 2000). The results of the risk assessment are included below.

The method used for the environmental risk assessment encompasses the following key steps:

1. Establish the context for the risk assessment process.

2. Identify environmental risks.

3. Analyse risks.

4. Evaluate risks to determine significant issues.

Each of these steps is discussed further below.

### 1.1.1 Establish the Context

The risk assessment undertaken for the project considers risks to the natural environment and members of the public. The project was considered to be the processes and activities described in Section 3.0 of the Preliminary Environmental Assessment, and consist of the following activities:

- re-orientation of the east-west aligned longwall panels to a northeast-southwest direction;

- removal of the planned longwall A6 panel to be replaced with main headings;

- extension of the longwall panels slightly further to the west in place of where the main heading were planned; and

- an increase in the chain pillar width across the area.

### 1.1.2 Risk Identification

Risk identification involves identifying the environmental risks to be managed, and in its simplest form involves the analysis of the severity and frequency of potential impacts and the operational processes underlying any impact.

In order to provide a systematic framework to identify environmental risks, the following basic process was used:

1. Select a component of the surrounding environment that may be impacted by the Project.

2. Identify the activities described in Section 3.0 of the Preliminary Environmental Assessment that may affect the value.

3. Identify the potential environmental impacts (positive or negative, acute or chronic) for each value, as a result of these activities.

### 1.1.3 Risk Analysis

Risks are typically analysed by combining possible consequences and their likelihood, in the context of existing measures to control the risk. The consequence and likelihood of each risk determines the level of risk.

Each risk was assessed using the Austar qualitative ranking of consequence and likelihood provided in **Table 1**.

## Table 1 – Risk Ranking Matrix

| CONSEQUENCE | | | | | | | |
|---|---|---|---|---|---|---|---|
| **5** | **4** | **3** | **2** | **1** | | | |
| **Insignificant** | **Minor** | **Moderate** | **Major** | **Catastrophic** | | | |
| No Injuries | First Aid treatment | Medical treatment required | Extensive injuries | Death | **People** | | |
| No environmental effects | Could affect the Environment | Water, soil or air likely to be affected for the short term | Water, soil or air affected badly. Damage or death to flora or fauna | Long term damage to water, soil or air. Damage or death to significant numbers of flora or fauna | **Environment** | | |
| Under $5K damage | $5K to $50K Damage | $50K to $100K Damage | $100K to $500K Damage | Above $500K Damage | **Equipment Damage** | | |
| Less than one (1) day | One (1) days delay | Two (2) days delay | Less than one (1) week & greater than two (2) days delay | Greater than one (1) weeks delay | **Production Loss** | | |
| **15** | **10** | **6** | **3** | **1** | **Almost Certain** Is expected to occur in most circumstances | **A** | **LIKELIHOOD** |
| **19** | **14** | **9** | **5** | **2** | **Likely** Will probably occur in most circumstances | **B** | |
| **22** | **18** | **13** | **8** | **4** | **Moderate** Has occurred at some time | **C** | |
| **24** | **21** | **17** | **12** | **7** | **Unlikely** Could occur at some time | **D** | |
| **25** | **23** | **20** | **16** | **11** | **Rare** May occur only in exceptional circumstances | **E** | |

| PRIORITY OF ACTIONS | | |
|---|---|---|
| **E** | Extreme Risk | Consider stopping work (Designed Out) |
| **H** | High Risk | Should be reduced as soon as possible (introduce a hard barrier immediately, implement a permanent barrier as soon as possible) |
| **M** | Moderate Risk | Manage responsibility & action dates must be specified (introduce a soft barrier SWP) |
| **L** | Low Risk | Manage by routine procedures (Toll box talks) |

The level of risk assessed assumes that existing environmental management controls employed by Austar will remain in place. Consideration was also given to the need for further assessment of new risks that are associated only with the modification of Stage 3. This allows those key risks requiring further investigation to be identified whilst also identifying those risks that have adequate existing controls.

Although the risk rating does not quantify the actual value of the risk for a particular aspect, it allows a relative comparison between issues. This enables risks to be prioritised, facilitates informed decisions about treating risks and also helps to determine whether a risk is acceptable.

**Table 2** shows the format used for the preliminary environmental risk assessment.

**Table 2 - Format for Preliminary Project Environmental Risk Assessment**

| **Activity** | **Aspect** | **Potential Impact** | **Status and Proposed Control** | **Risk Assessment** | **Further Assessment Requirements** | **Key Issue** |
|---|---|---|---|---|---|---|
| Identifies the project's activities that may affect the Environmental Value. | Category of Environmental Impact that the activity may affect. | This describes any change to the environment, whether adverse or beneficial, wholly or partly resulting from the project's activities. | Details current understanding of the existing environment and existing controls. | Risk Assessment results based on methodology outlined above. | Details of further assessments required as part of the Environmental Assessment (EA) process. | Identifies if the issue will require further assessment during the EA. |

### 1.1.4 Risk Evaluation

Risk evaluation concerns setting priorities for decisions about risk. The purpose of risk evaluation is to compare risks against significance criteria to determine the degree of assessment required. The application of significance criteria will reduce the number of activities that require specific management attention and provides an opportunity to prioritise environmental issues based on predetermined criteria.

Although guidelines and regulations provide great detail on risk identification and characterisation, there is less guidance on what constitutes an acceptable level of risk. This is because the development of risk acceptance criteria is subjective and is not an exact science or based on a complex formula. For each risk assessment process there is a degree of flexibility in defining its own criteria to determine which impacts are potentially "significant" and which are not. For the purposes of this Preliminary Environmental Assessment, significant risks have been defined as those with a risk rating of high or extreme, as defined by **Table 1**.

It is important to note that certain impacts associated with the Project's activities may be predetermined as significant by State or Federal legislation. These 'regulated' impacts, whilst not always rated as significant based on risk score alone, will also require further assessment to be undertaken.

## Austar Coal Mine – Stage 3

## Preliminary Environmental Risk Analysis

| Activity | Aspect | Potential Impact | Status and Proposed Control | Risk Assessment | | | Further Assessment Requirements | Key Issue |
|---|---|---|---|---|---|---|---|---|
| | | | | C | L | R | | |
| Underground Mining | Water Demand | Water for mining. | There are no proposed changes to water demand within the modification to the approved Stage 3 project. | | | | As there are no proposed changes to water demand no further assessment is required. | No |
| | Energy Use | Emission of greenhouse gas emissions. | There are no proposed changes to energy use within the modification to the approved Stage 3 project. | | | | As there are no proposed changes to energy use no further assessment is required. | No |
| | Gas drainage and venting of mine air | Emission of greenhouse gas emissions. | There are no proposed changes to gas drainage and venting of mine air within the modification to the approved Stage 3 project. | | | | As there are no proposed changes to gas drainage and venting of mine air no further assessment is required. | No |
| | Gas drainage and venting of mine air | Degradation of air quality | There are no proposed changes to gas drainage and venting of mine air within the modification to the approved Stage 3 project | | | | As there are no proposed changes to gas drainage and venting of mine air no further assessment is required | No |
| | Noise Generation | Degradation of noise amenity (cumulative). | There are no proposed changes to noise generating activities | | | | As there are no proposed changes to noise generating activities no further assessment is required. | No |
| | Dewatering | Changes to groundwater flow and quality. | Subsidence has the potential to affect both shallow and deep aquifers. The changes to groundwater flow due to the Stage 3 Modification will be assessed. | 4 | D | L | Subsidence impacts on groundwater will be assessed. | Yes |

| Activity | Aspect | Potential Impact | Status and Proposed Control | Risk Assessment | | | Further Assessment Requirements | Key Issue |
|---|---|---|---|---|---|---|---|---|
| | | | | C | L | R | | |
| Subsidence and subsidence remediation works | European Heritage | Disturbance of sites of European heritage significance. | Subsidence predictions have been developed which show a slight reduction in impact to historic sites. No surface works are anticipated in subsidence area. Whilst impacts are unlikely, a desktop analysis of European heritage values will be undertaken. | 4 | D | L | An assessment of the potential changes to impacts of the project on European heritage values is required. | Yes |
| | Ecology | Loss of native flora and fauna, loss of forest, riparian and aquatic habitat. | Subsidence has the potential to impact on ecological values. An ecological survey of the project area will be completed. A full assessment of the potential changes to impacts due to the Stage 3 Modification project on ecological values will also be completed. | 4 | D | L | An assessment of the potential changes to impacts of the Stage 3 Modification project on ecological values is required. | Yes |
| | Surface Improvement | Damage to residential dwellings, garages, fences, contour banks, dams, access tracks, irrigation pipelines etc. | Subsidence has the potential to impact surface improvements. A full assessment of the potential changes to impacts on surface improvements due to the Stage 3 Modification will be undertaken. | 3 | C | H | An assessment of the potential impact of the modification to the Approved Stage 3 project on surface improvements is required. | Yes |
| | Public Infrastructure | Damage to public utilities including roads, water, power, telecommunications. | Subsidence has the potential to impact a range of public infrastructure. A full assessment of the potential changes to impacts on all public services due to the Stage 3 Modification will be undertaken. | 3 | C | H | An assessment of the potential changes to impacts due to the Stage 3 Modification project on public infrastructure is required. | Yes |
| | Vibration | Increased vibration events due to mining | Underground mining has the potential to create vibration events as the land subsides. The Stage 3 Modification will not increase vibration potential over what is already approved. As vibration is an issue of community concern, a desktop vibration assessment will be undertaken as a part of the EA. | 4 | E | L | An assessment of the potential vibration impacts associated with the Stage 3 Modification project is required. | Yes |

| Activity | Aspect | Potential Impact | Status and Proposed Control | Risk Assessment | | | Further Assessment Requirements | Key Issue |
|---|---|---|---|---|---|---|---|---|
| | | | | C | L | R | | |
| | Cultural Heritage | Disturbance of Aboriginal places or objects. | Subsidence predictions have been developed which show a slight reduction in impact to the Grinding Groove. Subsidence has the potential to impact on cultural heritage values. A cultural heritage management plan will be developed. Further surveys and an assessment of the potential impacts of the project on cultural heritage values will also be completed. | 4 | D | L | An assessment of the potential impacts of the modification to the approved Stage 3 project on cultural heritage values of the project area is required. The assessment will be completed in consultation with the local Aboriginal community. | Yes |
| | Erosion and sediment runoff | Sedimentation of local waterways. | If required, remediation works will be undertaken in areas impacted by subsidence to return the land to a stable landform, reducing the potential for erosion. Further details of subsidence remediation techniques and rehabilitation measures will be included in the EA. | 3 | B | H | Further details of subsidence remediation techniques and rehabilitation measures will be included in the Environmental Assessment report. | Yes |
| | Surface Water Flows | Alteration to natural overland drainage flow.<br>Surface water capture. | Subsidence has the potential to change existing water flow and quality to ephemeral creeks. Changes to channel stability and ponding impacts are possible. Drainage line remediation works may be required. The changes to surface water flow impacts due to the Stage 3 Modification and likely remediation requirements will be assessed. The potential for loss of surface water flows due to cracking will also be assessed. | 3 | D | M | Subsidence impacts on surface water flows will be assessed. | Yes |
| | Groundwater | Alteration to groundwater level or quality | Subsidence has the potential to affect both shallow and deep aquifers. The changes to groundwater flow due to the Stage 3 Modification will be assessed. | 4 | D | L | Subsidence impacts on groundwater will be assessed. | Yes |

| Activity | Aspect | Potential Impact | Status and Proposed Control | Risk Assessment | | | Further Assessment Requirements | Key Issue |
|---|---|---|---|---|---|---|---|---|
| | | | | C | L | R | | |
| | Visual Amenity | Aesthetics of exposed earthworks and top soil stockpiles. | Visual impacts associated with subsidence and subsidence remediation works will be localised and short-term in nature. Due to the local undulating topography and the lack of nearby residences, visual impacts will be minimal. | 1 | C | L | No further assessment is required. | No |
| | Land use and agricultural productivity | Impact on land use, land capability and agricultural suitability. | Subsidence remediation works may result in disturbance of land resulting in a short-term loss of agricultural productivity in some areas. Further assessment of the potential change in impacts of subsidence on land use due to the Stage 3 Modification will be included in the EA. | 4 | C | M | Further assessment of changes to land use impacts due to the Stage 3 Modification will be included in the Environmental Assessment. | Yes |
| | Topography | Alteration to existing topography. | The changes to impacts of subsidence on the expected landform associated with the Approved Stage 3 project and the potential for localised subsidence impacts such as landslips will be subject to further assessment. | 4 | C | L | An assessment of subsidence impacts on topography is required. | Yes |

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