



Longwalls B4 to B7

Land Management Plan

January 2019



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APPENDICES

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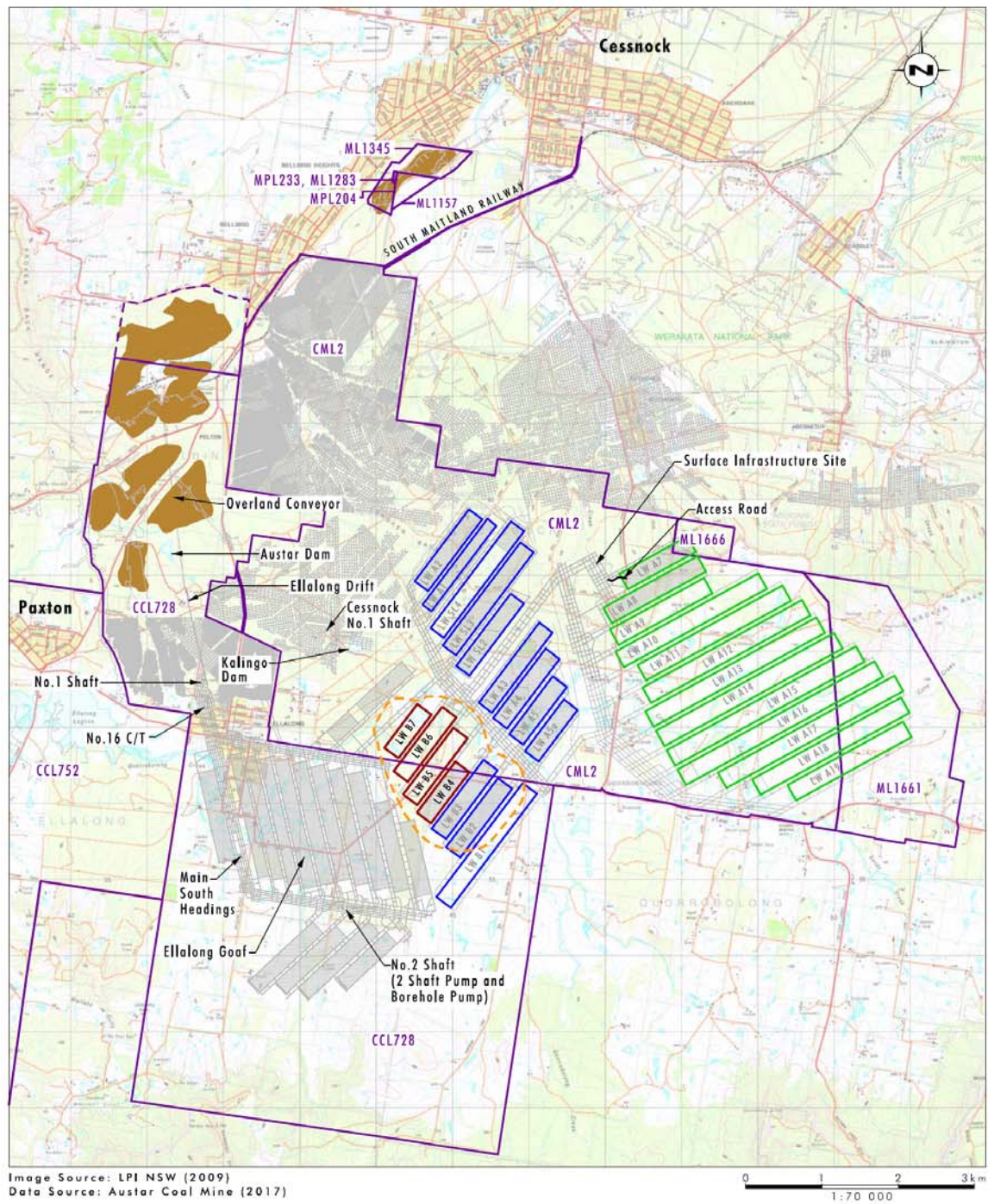
1 INTRODUCTION

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

A modification to the Bellbird South development consent (DA29/95 MOD7) was approved under delegated authority of the Minister for Planning on 25 August 2017. The modification extends the Bellbird South consent area and permits the transfer of coal from three conventional longwall panels (Longwalls B4 to B7) within the Ellalong Colliery and Bellbird South Colliery areas to existing infrastructure for processing and transport of coal.

On the 18 September 2018, the Department of Planning and Environment approved the shortening of Longwall B4 by 279m.

This Land Management Plan (LMP) has been prepared to meet the conditions of Development Consent DA29/95 and to manage the predicted subsidence impacts and environmental consequences on land resulting from secondary extraction of LWB4 – LWB7. The location of Austar's mining areas, and previous mining is shown with the Austar Mine Complex in **Figure 1**.



Legend

- LWB4-B7 Extraction Plan Longwall Panels
- LWB4-B7 Extraction Plan Area
- Bellbird South LWB1-B3 Extraction Plan, Stage 1, Stage 2 and Southland Longwall Panels (DA 29/95)
- Stage 3 Longwall Panels (PA08_0111)
- Approved Reject Emplacement Areas
- Completed Underground Workings
- Mining Lease Boundary
- Austar owned CHPP Land

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FIGURE 1.1

Austar Coal Mine Complex

Figure 1 Austar Coal Mine Complex

1.1 LAND OWNERSHIP AND ACCESS

The Longwalls B4 to B7 Extraction Plan Area (**Extraction Plan Area**) extends underneath Cessnock City Council roads as well as private rural residential land holdings, Austar owned land and Crown land. The Extraction Plan Area is shown in **Figure 2**. It is important to note that Austar will not undertake any monitoring or rectification works on land without landowner permission.

Austar has a comprehensive consultation program to facilitate access for monitoring and potential remediation activities within Bellbird South and Stage 3 areas and has been undertaking consultation with landowners within the Extraction Plan Area throughout the modification application process for LWB4 – LWB7, and during preparation of the Extraction Plan. Landholders are also provided regular updates on mining progress.

1.2 RELATED DOCUMENTS

This LMP will fit within Austar’s Environmental Management System as a key component plan to the Longwalls B4 to B7 Extraction Plan. In particular, the following documents, or their future iterations thereof, as required by current development consent are of relevance to land management:

- Aboriginal Cultural Heritage Management Plan (ACHMP);
- Biodiversity Management Plan (BMP);
- Subsidence Monitoring Program (SM Program);
- Water Management Plan (WMP);
- Built Features Management Plan (BFMP); and
- Mining Operations Plan (MOP).

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

1.3 STRUCTURE OF THIS REPORT

The remainder of this LMP is structured as follows:

- | | |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Section 2.0 | Outlines the purpose and objectives of this management plan. |
| Section 3.0 | Describes the existing environment, identifying potential risks to the landscape as a result of secondary extraction in the Extraction Plan Area. Summarises existing management and mitigation measures in place. |
| Section 4.0 | Identifies the potential environmental consequences, as relevant to land management, resulting from secondary extraction in the Extraction Plan Area. |

- Section 5.0 Outlines the monitoring methodologies to be implemented for land management under this LMP.
- Section 6.0 Sets out performance measures and performance indicators relevant to the management of land affected by secondary extraction in the Extraction Plan Area.
- Section 7.0 Sets out a contingency plan for land management, including a Trigger Action Response Plan (TARP)
- Section 8.0 Outlines the reporting, review and responsibilities of this LMP.

2 PURPOSE AND OBJECTIVES

The purpose of this LMP is to provide a framework to manage land that may be affected by subsidence from longwall mining in the Greta coal seam in the Extraction Plan Area at Austar. However, this LMP does not describe additional requirements for the management of watercourses or alluvium within the Extraction Plan Area. These environmental aspects will be managed separately in the Water Management Plan.

2.1 OBJECTIVES OF THE LMP

The objectives of the LMP are to:

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

2.2 REHABILITATION OBJECTIVES

Rehabilitation objectives for land affected by mining in the Extraction Plan Area, as described in the conditions of consent for DA29/95 are presented in **Table 1**.

Table 1 Rehabilitation Objectives (applicable to the Extraction Plan Area)

Feature	Objective
<i>All areas affected by the development</i>	<ul style="list-style-type: none"> • Safe • Hydraulically and geotechnically stable • Non-polluting • Fit for the intended post-mining land use(s)
<i>Areas proposed for native ecosystem re-establishment</i>	<ul style="list-style-type: none"> • Establish self-sustaining ecosystems comprising flora species selected to re-establish and complement local and regional biodiversity
<i>Areas proposed for agricultural or pastoral use</i>	<ul style="list-style-type: none"> • Nominated land capability classification is achieved and is self-sustaining
<i>Other areas affected by the development</i>	<ul style="list-style-type: none"> • Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of local native plant species appropriate for the intended post mining land use(s) (unless DRG agrees otherwise)
<i>Final landforms</i>	<ul style="list-style-type: none"> • Consistent with surrounding topography to minimise visual impacts
<i>Cliffs, minor cliffs and steep slopes</i>	<ul style="list-style-type: none"> • No additional risk to public safety compared to prior to mining
<i>Community</i>	<ul style="list-style-type: none"> • Ensure public safety

Note: These rehabilitation objectives apply to all subsidence impacts and environmental consequences caused by the extraction of LWB4 to LWB7. Where remediation of watercourses is likely to cause environmental consequences greater than those that require rehabilitation, alternative equivalent works may be undertaken within the affected watercourse.

3 EXISTING ENVIRONMENT

3.1 LAND OWNERSHIP

The Extraction Plan Area extends underneath Cessnock City Council roads as well as private rural residential land holdings, Austar owned land and crown land. Landholders, Austar employees and the general public may therefore access these areas.

A Public Safety Management Plan (PuSMP) for the Extraction Plan Area has been developed as part of the Extraction Plan to address public safety risks as a result of secondary extraction in the Extraction Plan Area.

3.2 GENERAL LANDFORM

The Extraction Plan Area surface expression is approximately 277 ha and is located in the suburbs of Quorrobolong and Ellalong, approximately three kilometres east of the township of Ellalong in the lower Hunter Valley of NSW.

The landform within the Extraction Plan Area is situated within the Quorrobolong Creek Catchment, a sub-catchment to the larger Wollombi Brook and ultimately the Hunter River catchment. Quorrobolong Creek forms part of the Congewai Creek Management Zone of the Upper Wollombi Water Source within the Hunter Unregulated and Alluvial Water Sources Water Sharing Plan area. Quorrobolong Creek crosses the northern portion of Extraction Plan Area above the proposed LWB6 and LWB7 and flows west into Ellalong Lagoon. Quorrobolong Creek is ephemeral, however localise areas of ponding occur along its alignment. An unnamed tributary of Quorrobolong Creek drains in a northerly direction through the Extraction Plan Area above LWB1 to LWB4, converging with Quorrobolong Creek upstream of LWB5.

The topography of the Extraction Plan Area is generally characterised by low undulating hills and creek flats associated with Quorrobolong Creek and its unnamed tributaries. Elevations within the area range from approximately 115 metres to 160 metres Australian Height Datum (AHD).

3.3 STEEP SLOPES

A steep slope has been defined as areas of land having natural gradients between 1 in 3 (i.e. 33%, or an angle to the horizontal of 18.3°) and 2 in 1 (i.e. 200% or 63.4°). The natural surface gradients above the proposed mining area are typically less than 1 in 3 (i.e. 18° or 33%). Some isolated locations such as the banks of the drainage lines have surface grades greater than 1 in 3.

3.4 CLIFFS/ROCK FACE FEATURES

Cliffs are defined as continuous rock faces, having heights greater than 10 metres and minimum slopes of 2 to 1 and lengths greater than 20 metres. Minor cliffs are defined as continuous or segmented rock faces, having heights greater than 5 metres and minimum slopes of 2 to 1.

There were no cliffs or minor cliffs identified within Extraction Plan Area, based on the Light Detection and Ranging (LiDAR) survey, the orthophotograph of the area, or from the site investigations.

3.5 HYDROLOGY AND DRAINAGE

The Extraction Plan Area is located within the Quorrobolong Creek catchment. Quorrobolong Creek drains in a westerly direction through the northern part of the Extraction Plan Area. An unnamed tributary of Quorrobolong Creek that includes a number of secondary drainage channels drains in a northerly direction through the EP Area. The drainage channels converge into a single drainage channel upstream of Sandy Creek Road and with the unnamed tributary joining Quorrobolong Creek in the north of the EP Area (**Figure 2**).

Both Quorrobolong Creek and its unnamed tributary are ephemeral creeks with flows occurring during prolonged or high rainfall periods.

Several farm dams are located with the Extraction Plan Area associated with the agricultural land uses within the Extraction Plan Area.

3.6 SOIL LANDSCAPE

One soil landscape type is found within the Extraction Plan Area, being the Quorrobolong soil landscape. The main soils within this landscape are the prairie soils occurring in drainage depressions and on lower slopes. They are generally poorly drained, have moderate permeability and the upper horizon has moderate erodibility. The soils are moderately fertile and the main land use is generally grazing on unimproved pasture.

The land and soil capability mapping undertaken for the Upper Hunter Strategic Regional Land Use Plan 2012 indicates the Extraction Plan Area is mapped as Class 2, Class 4 and Class 5 Land and Soil Capability. Class 2 land is considered to be capable of a wide variety of uses such as cropping, grazing, horticulture, forestry or native conservation. Class 4 and 5 land is considered to be land capable of a variety of land uses, such as cropping with restricted cultivation, pasture cropping, grazing, some horticulture, forestry and nature conservation. The definition for each class identified is provided in **Table 2**.

Assessment of the potential subsidence impacts on the land surface and hydrological regime conclude that the risk of surface cracking is low as is the potential for adverse impacts on water availability or erosion. Given the minimal impacts predicted to the land surface and hydrological regime it is unlikely that the longwall mining of Panels LWB4 – LWB7 would have any impact on the current or future land and soil capability.

Visual monitoring of the land surface within the Extraction Plan Area will be undertaken before, during and following mining to determine the need for any subsidence management or remediation measure.

Table 2 Land and Soil Capability Classes

LSC Class	General Definition
	Land capable of a wide variety of land uses (cropping, grazing, horticulture, forestry, nature conservation)
2	Very high capability land (slight but significant limitation): Land has slight limitations. These can be managed by readily available, easily implemented management practices. Land is capable of most land uses and land management practices, including intensive cropping with cultivation.
	Land capable of a variety of land uses (cropping with restricted cultivation, pasture cropping, grazing, some horticulture, forestry, nature conservation)
4	Moderate capability land: Land has moderate to high limitations for high impact land uses. Will restrict land management options for regular, high impact land uses such as cropping, high intensity grazing and horticulture. These limitations can only be managed by specialized management practices with a high level of knowledge, expertise, inputs, investment and technology.
5	Moderate-low capability land: Land has high limitations for high impact uses. Will largely restrict land to grazing, some horticulture (orchards), forestry and nature conservation. The limitations need to be carefully managed to prevent long term degradation

As can be seen in **Figure 2** there are two distinct patterns of land use with the Extraction Plan Area:

1. Predominately full forested land to the north west and south of the Extraction Plan Area, and
2. Cleared land with some remnant forest over the majority of the Extraction Plan Area.

3.7 FLORA AND FAUNA

A total of 220 flora species were identified within the LWB4 – LWB7 Environmental Assessment modification area, of which 175 species are native and 45 introduced.

Of the flora species identified within the Extraction Plan Area, three are listed as threatened species, being the netted bottlebrush (*Callistemon linearifolius*), small flower grevillea (*Grevillea parviflora* subsp. *parviflora*) and heath wrinklewort (*Rutidosis heterogama*). Locations of threatened species are provided in **Figure 3**.

No endangered flora populations were identified occurring within the Extraction Plan Area and based upon the habitats identified, none are expected to occur.

Seven vegetation communities were identified across the Extraction Plan Area as shown in **Figure 3**. The extent of each vegetation community within the Extraction Plan Area is presented in **Table 3**.

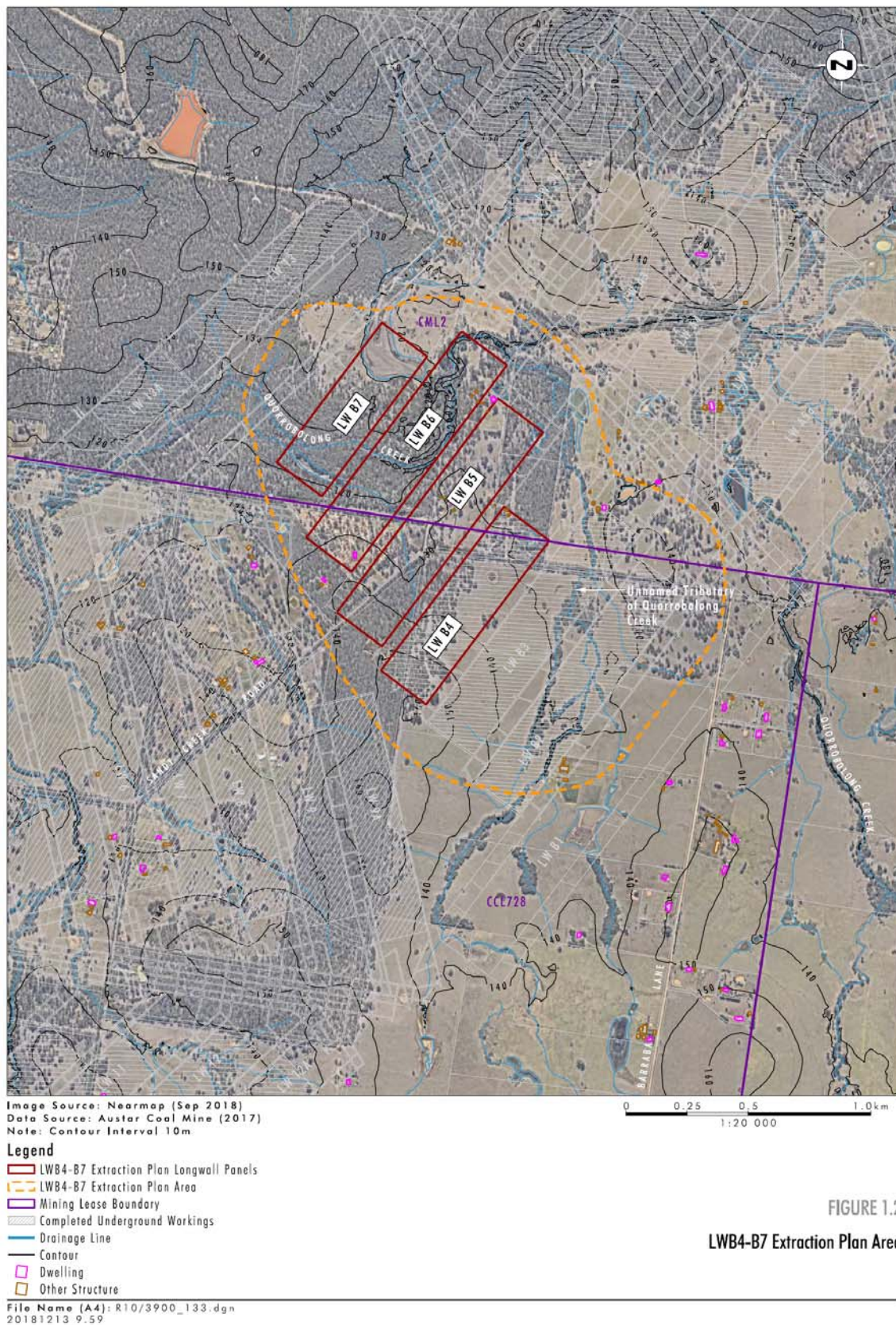


FIGURE 1.2

LWB4-B7 Extraction Plan Area

Figure 2 Extraction Plan Area and Topography and Land Use Context

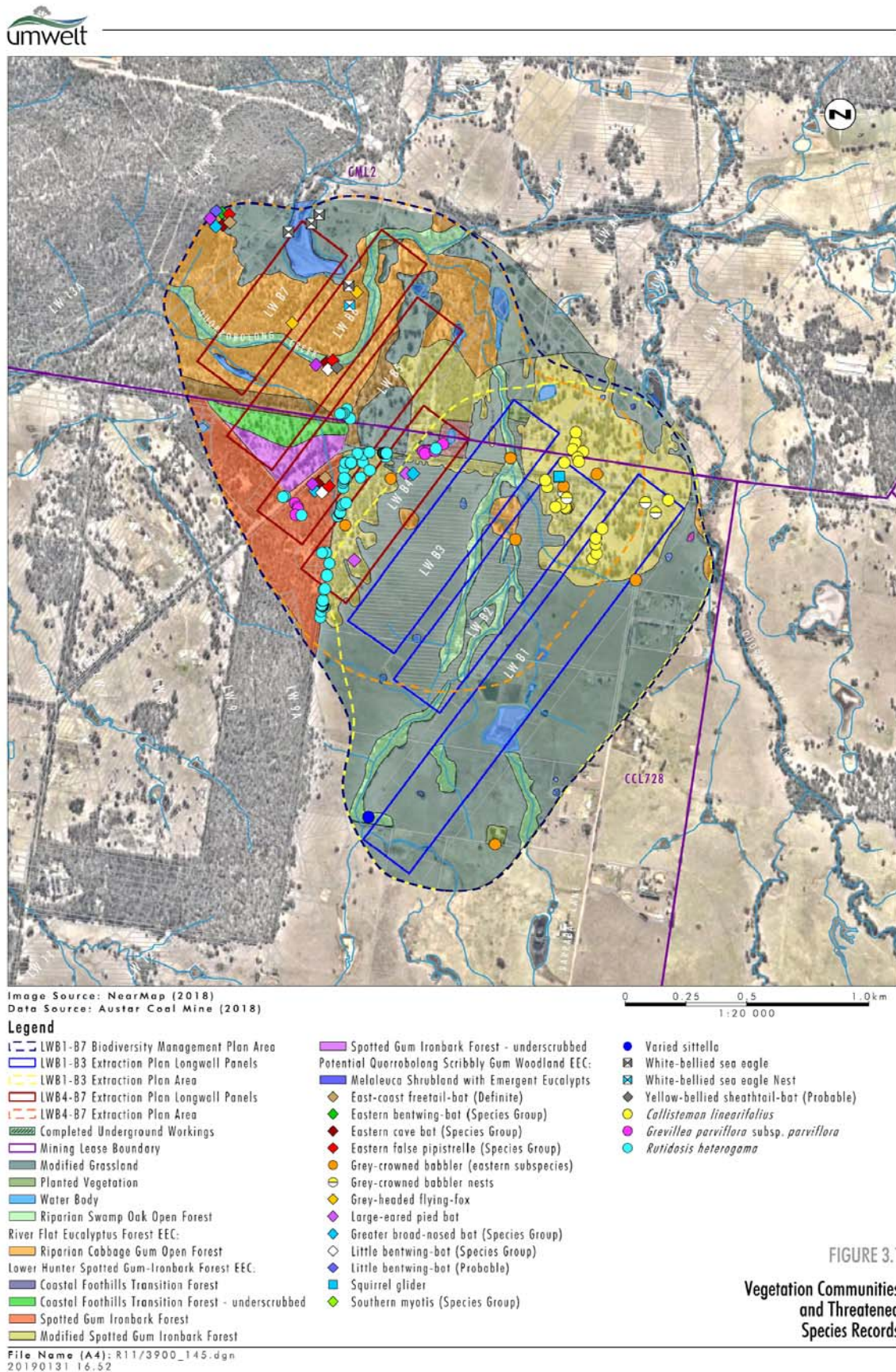


FIGURE 3.1

**Vegetation Communities
and Threatened
Species Records**

Figure 3 Extraction Plan Area Vegetation Communities and Threatened Species Records

Table 3 Vegetation Communities

Vegetation Community	Status
Riparian Swamp Oak Open Forest	-
Riparian Cabbage Gum Open Forest	River-flat Eucalypt Forest EEC (BC Act)
Coastal Foothills Transition Forest	Lower Hunter Spotted Gum – Ironbark Forest EEC (BC Act)
Coastal Foothills Transition Forest – underscrubbed	
Spotted Gum – Ironbark Forest	
Modified Spotted Gum – Ironbark Forest	
Spotted Gum Ironbark Forest – underscrubbed	
Melaleuca shrub land with emergent Eucalypts	Potential Quorrobolong Scribbly Gum Woodland EEC (BC Act)
Grassland	-
Planted Vegetation	-

*BC Act – *Biodiversity Conservation Act 2016*

In addition there are approximately 6.5ha of water bodies (farm dams) located in the Extraction Plan Area.

Of the seven vegetation communities identified within the Extraction Plan Area, two were considered consistent with Threatened Ecological Communities (TECs) listed under the *Biodiversity Conservation Act 2016* (BC Act) and one was considered potentially consistent with a TEC listed under the BC Act. These were *River-flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* EEC (Riverflat Eucalypt Forest EEC) and the *Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion* EEC (Lower Hunter Spotted Gum – Ironbark Forest EEC) and potential *Quorrobolong Scribbly Gum Woodland in the Sydney Basin Bioregion* EEC (potential Quorrobolong Scribbly Gum Woodland EEC). No TECs were identified as being consistent with any listings under the EPBC Act.

A total of 123 fauna species were recorded within the LWB4-B7 Modification area, including 11 frog species, 11 reptile species, 74 bird species and 27 mammal species.

Of the 123 fauna species identified, 15 were threatened, including:

- three threatened bird species, the grey-crowned babbler (*Pomatostomus temporalis temporalis*), varied sittella (*Daphoenositta chrysoptera*) and white-bellied sea eagle (*Haliaeetus leucogaster*), all listed as vulnerable under the BC Act;

- eleven threatened mammal species listed as vulnerable under the BC Act, the grey-headed flying fox (*Pteropus poliocephalus*), squirrel glider (*Petaurus norfolcensis*), little bentwing-bat (*Miniopterus australis*), eastern bentwing-bat (*Miniopterus schreibersii oceanensis*), east-coast freetail-bat (*Mormopterus norfolkensis*), yellow-bellied sheath-tail bat (*Saccolaimus flaviventris*), eastern falsistrelle (*Falsistrellus tasmaniensis*), southern myotis (*Myotis macropus*), eastern cave bat (*Vespadelus trougtoni*), large-eared pied bat (*Chalinolobus dwyeri*) and greater broad-nosed bat (*Scoteanax rueppellii*). The large-eared pied bat (*Chalinolobus dwyeri*) and grey-headed flying-fox (*Pteropus poliocephalus*) are also listed as vulnerable under the EPBC Act; and
- although not recorded during surveys undertaken for the proposed modification, a single record of the koala (*Phascolarctos cinereus*) has been identified on the OEH database within the LWB4-B7 Modification Area. The koala is listed as vulnerable under both the BC Act and the EPBC Act.

The locations of threatened fauna species recorded within the Extraction Plan Area are shown on **Figure 3**. A range of potentially occurring threatened fauna species were also identified on the basis of the presence of potential habitat and local records. A full list of threatened fauna species within the Extraction Plan Area is referred to in the Biodiversity Management Plan (BMP).

As required under DA29/95, a BMP (Umwelt, 2017) has been prepared to manage the potential environmental consequences of second workings on aquatic and terrestrial flora and fauna, with a specific focus on threatened species.

4 POTENTIAL ENVIRONMENTAL CONSEQUENCES OF MINE SUBSIDENCE

Detailed subsidence predictions and impact assessment (MSEC903, 2017 & MSEC966, 2018) have been prepared by Mine Subsidence Engineering Consultants (MSEC) as part of the Extraction Plan Area for LWB4 – LWB7 in the Greta coal seam at Austar.

The predicted subsidence for the proposed panels has been determined using the Incremental Profile Method, which has been calibrated for local conditions using the monitoring data from the previously extracted panels in Stage 1, Stage 2, Stage 3 and Bellbird South at the mine. A summary of the maximum predicted values of total conventional subsidence, tilt and curvature, due to the extraction of LWB1 to LWB7 is shown below in **Table 4**.

Table 4 **Maximum Predicted Total Subsidence Effects due to the Extraction of LWB1 to LWB7**

Longwall	Layout	Maximum Predicted Total Vertical Subsidence (mm)	Maximum Predicted Total Tilt (mm/m)	Maximum Predicted Total Hogging Curvature (km ⁻¹)	Maximum Predicted Total Sagging Curvature (km ⁻¹)
LWB1 to LWB7	Approved (MSEC903)	1,350	5.5	0.05	0.06
	Modified (MSEC966)	1,275	5.0	0.04	0.06

If tension cracks were to develop, as a result of the extraction of the proposed panels, it is possible that soil erosion could occur if these cracks were left untreated. It is possible, therefore, that some remediation might be required, including infilling of surface cracks with soil or other suitable materials, or by locally regrading and re compacting the surface. In some cases, erosion protection measures may be needed, such as the planting of additional vegetation in order to stabilise the slopes in the longer term.

The requirement and methodology for any erosion and sediment control and remediation techniques would be determined in consideration of the: potential impacts when unmitigated, including potential risks to public safety and the potential for self-healing or long-term degradation; potential impacts of the control/remediation technique, including site accessibility; and consultation with relevant stakeholders.

Environmental consequences of subsidence may include risks to public safety, livestock, land use impacts, erosion, water quality impacts from the erosion, and changes to vegetation coverage through altered water movement. An example of subsidence crack repairs conduct within the NSW Coalfields are shown in **Figure 4**. The subsidence impacts and environmental consequences as relevant to land management activities with the Extraction Plan Area are summarized in **Table 5**.



1. Excavator digs to remediate surface cracking



2. Area compacted and re filled



4. Area re seeded



3. Rehab Completed

Figure 4. Typical Subsidence Crack Repairs

Table 5. Potential Environmental Consequences Associated with Land Subsidence

Subsidence Impact	Summary of Subsidence Predictions	Potential Environmental Consequence
Surface Cracking	Surface cracking resulting from the extraction of the proposed LWB4 – LWB7 panels is expected to be of a minor nature, which can be easily remediated by infilling with soil or other suitable materials, or by locally regrading and re compacting the surface.	Cracks in soil surface, causing potential risk to public safety and livestock.
		<p>Increased risk of erosion. Water quality impacts from erosion.</p> <p>Remediation activities require clearing of native vegetation.</p>
Slope Instability	The potential impacts would generally result from the downslope movement of the surface soils, causing tension cracks to appear at the tops and sides of the slopes and compression ridges could possibly form at the bottoms of the slopes.	Surface cracking and/or compression ridges increases the probability of soil erosion, potential risk to public safety and livestock and changes to vegetation coverage.
		<p>Soil loss and exposure of sub-soil</p> <p>Remediation activities require clearing of native vegetation.</p>
Surface Ponding	Localised increased ponding areas could occur along the tributaries, as a result of the proposed mining of LWB4 – LWB7 panels.	Changes to vegetation coverage resulting in reduction in land available for agricultural purposes (e.g. grazing, cropping)
		Changes to ponding results in loss of native vegetation.
		Altered surface flow and increased erosion

5 MONITORING

General landform condition inspections will be undertaken on a monthly basis within the active subsidence area (approximately 100m in front and 400m behind the longwall face position) to assess subsidence related impacts in accordance with the Austar Subsidence Monitoring Program (SM Program), Built Features Management Plans (BFMPs) and Public Safety Management Plan (PuSMP). In addition to the above, additional inspections may occur at the request of landholders based on their observations. General condition monitoring will only be conducted with the agreement of the relevant landowner.

The general condition monitoring activities will identify:

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

General condition monitoring results will be reviewed against the objectives, performance measures, indicators and criteria for the management of land in **Table 6**.

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

However as a minimum, follow up monitoring activities will be undertaken on a quarterly basis until the success of remedial work is adequately demonstrated with reference to the objectives, performance measures, indicators and criteria for the management of land in **Table 6**. Where sensitive environmental features are identified (e.g. threatened species or habitats) additional monitoring requirements may be established in consultation with affected landholders and in accordance with the Biodiversity Management Plan.

6 OBJECTIVES, PERFORMANCE MEASURES, INDICATORS AND CRITERIA

Detailed objectives, performance measures, indicators and criteria for the management of land have been developed for the Extraction Plan Area and are presented in **Table 6**.

Monitoring will be used to assess the impact of the operations against these performance measures and indicators as detailed in **Section 5**.

Table 6. Objectives, Performance Measures, Indicators and Criteria

Objectives	Performance Measure	Performance Indicator	Criteria
All areas affected by the development - Hydraulically and geotechnically stable, Non-polluting, Fit for the intended post-mining land use(s)	Inspect & Identify Regular inspections of the subsidence zone in accordance with the SM Program, BFMP and PuSMP to identify surface cracking, erosion points, compression ridges on steep slopes, surface ponding and steep slope instability	Results of monitoring undertaken in accordance with SM Program, BFMP and PuSMP	SM Program, BFMP and PuSMP implemented. Any surface cracking, erosion points, compression ridges on steep slopes, surface ponding areas and steep slope instability are identified to allow assessment.
Areas proposed for native ecosystem re-establishment - Establish self-sustaining ecosystems comprising flora species selected to re-establish and complement local and regional biodiversity	Assess & Plan Identified surface cracking, erosion points, compression ridges, surface ponding areas and steep slope instability are assessed to identify appropriate remedial measures and any constraints.	Assessment of SM Program results and planned remedial measures completed.	All identified impacts are assessed and specific remedial measures developed. Management measures of the Extraction Plan are followed: -BFMP -Aboriginal Cultural Heritage Management Plan (ACHMP) -Biodiversity Management Plan (BMP) – including management of any clearing activities required. -Water Management Plan (WMP)
Areas proposed for agricultural or pastoral use - Nominated land capability classification is achieved and is self-sustaining	Consult Landholder is consulted in relation to the requirements and nature of remedial measures required	Record of landholder consultation	Consultation with landholder regarding proposed remedial measures undertaken.
Final landforms - Consistent with surrounding topography to minimise visual impacts. Incorporate relief patterns and design principles consistent with	Landform Remedial Measures The assessed landform surface cracking, erosion points and compression ridges, areas of drainage impact (e.g. surface ponding) are remediated as necessary.	Landform remediated and prepared for vegetation establishment. Capacity of land to drain freely confirmed.	Erosion and sediment control are implemented for remedial works. Topsoil is conserved during remedial works and reused in vegetation establishment. Landform subsidence impact repaired commensurate with size and scale of impact (e.g. major landform impact by

Objectives	Performance Measure	Performance Indicator	Criteria
natural drainage.		No unplanned ponding of water.	<p>filling or ripping the soil and re compacting, minor surface cracking may be remediated through infilling with soil or other suitable material).</p> <p>Landform (including existing drainage contours) is free draining except for purpose built dams and structures. This may include filling using imported material and/or earthworks to reshape the land and re-establish the natural drainage pathway. Landform is consistent with surrounding topography to minimise visual impacts.</p>
	Vegetation Establishment Remediated areas revegetated with species selected based on the existing land use and surround vegetation.	Percentage Ground Cover Species Mix Monitoring of vegetation success	<p>Ground cover comparable to pre-mining environment is re-established following remediation activities.</p> <p>For pasture areas: Remediated areas revegetated with species based on the existing land use (i.e. pasture) in consultation with landholder. Nominated land capability classification is achieved and is self sustaining.</p> <p>For native ecosystem re-establishment: Remediated areas revegetated with native species based on the surrounding vegetation. Ecosystem function is self sustaining and trending towards that existing pre mining as described in the BMP.</p>

Objectives	Performance Measure	Performance Indicator	Criteria
<p>All areas affected by the development are safe.</p> <p>Cliffs, minor cliffs and steep slopes - No additional risk to public safety compared to prior to mining</p> <p>Community - Ensure public safety</p>	<p>General landform public safety impacts are remediated. Identified slope instability issues are managed.</p>	<p>Inspection results indicate no public safety hazards post mining.</p>	<p>Areas of general landform have been inspected during SM Program, BFMP and PuSMP activities.</p> <p>PuSMP implemented where necessary based on SM Program results.</p> <p>General landform condition impacts remediated in accordance with this LMP.</p>

7 CONTINGENCY PLAN

In the event the performance measures provided in **Section 6** are considered to have been exceeded, or are likely to be exceeded, Austar will undertake the following:

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

7.1 TRIGGER ACTION RESPONSE PLAN

The following Trigger Action Response Plan (TARP) identifies the proposed contingencies strategies in the event of unexpected variation or impacts to rehabilitation outcomes. A risk based approach has been used to assess the potential consequences and mitigation measures. **Table 7** outlines the key identified risks, triggers and proposed mitigation measures.

Table 7. Proposed Mitigation Measures to Reduce Key Risks

Risk	Trigger	Proposed Mitigation Measure
Surface subsidence impacts are greater than predicted	Data obtained from subsidence monitoring program indicates exceedance of predicted levels and significant subsidence induced impacts requiring remediation.	Assess public safety and where applicable, implement additional safety measures in accordance with the PuSMP or as otherwise necessary to prevent injury or harm to any person. Remedial actions will be implemented based on the outcomes of investigations and undertaken in consultation with landowner and relevant government agencies as required. A review of the SM program and a general landform inspection will be undertaken to assess the adequacy of remedial actions.
Wind and water erosion	Visual monitoring indicates sites of persistent wind or water erosion	Erosion and sediment controls will be employed during rehabilitation activities, including repair of subsidence areas. Where persistent issues are identified, additional controls may be employed including planting of windbreaks and/or minor re contouring of the landform to improve local drainage characteristics.

Risk	Trigger	Proposed Mitigation Measure
Poor vegetation establishment success	Monitoring data indicates noncompliance with performance criteria in terms of remediation of subsidence impacts	<p>Review species mix used to ensure alignment with seasonal conditions of the site.</p> <p>Where possible use native species associated with the target vegetation communities.</p> <p>Undertake follow up maintenance and/or replanting activities where required.</p> <p>Follow management processes in the BMP in relation to provision of offsets where Secretary of DPE determines it is necessary in accordance with DA29/95 conditions.</p>

8 PLAN IMPLEMENTATION

8.1 REPORTING FRAMEWORK

8.1.1 Annual Review / Annual Environmental Management Report (AEMR)

The Annual Review / AEMR is prepared to summarise Austar's environmental performance for the reporting year and is prepared in accordance with Schedule 5 Condition 5 of DA29/95 (as modified) and to satisfy Mining Lease conditions.

Performance in accordance with this LMP, as a key component plan of the Extraction Plan, will be reported using timings and protocols as the main Extraction Plan.

8.1.2 Regular

The results of the monitoring undertaken in accordance with the LMP will be provided to the relevant landowner at a frequency agreed in the individual BFMPs.

8.2 REVIEW OF THE LMP

Review of the LMP, and revision if necessary, shall occur where unpredicted impacts and/or environmental consequences are identified through the monitoring and management strategies proposed in the LMP.

Review of the LMP is also required following any modification to DA29/95, or if directed by the Secretary of DPE.

Any revision to the LMP must be completed to the satisfaction of the Secretary of DPE.

8.3 ROLES AND ACCOUNTABILITIES

Detailed below are key personnel involved with implementing this LMP to manage subsidence, their roles and responsibilities.

Role	Responsibilities
Operations Manager (OM)	<ul style="list-style-type: none">• Make appropriate resources available for the implementation of the Extraction Plan, including this LMP• Notify and liaise with DRG Inspectors (if required)

Role	Responsibilities
Environment and Community Superintendent (ECS)	<ul style="list-style-type: none"> • Owner of the Extraction Plan • Liaise with Government Agencies and Community members in relation to subsidence matters and the Extraction Plan subsidence predictions and monitoring program • Ensure that all environmental monitoring and reporting is undertaken in accordance with the Extraction Plan and sub environmental management plans • Train remediation contractors on mitigation measures for remedial works • Liaise with Government Agencies in relation to environmental consequences of subsidence and proposed management strategies • Liaise with Landholders in relation to environmental consequences of subsidence and in relation to access for the Extraction Plan monitoring program and any remediation works • Manage / implement subsidence management actions required by the Extraction Plan in relation to general landform • Notify and liaise with neighbours and community in relation to mining timing and monitoring performance • Review and update the LMP as required
Technical Services Manager (TSM)	<ul style="list-style-type: none"> • Liaise with Government Agencies and Community members in relation to subsidence matters and the Extraction Plan subsidence predictions and monitoring program • Coordinate Registered Mine Surveyor to ensure subsidence monitoring is undertaken in accordance with the Extraction Plan • Review subsidence monitoring data against predictions and TARPs in order to trigger any actions required on the basis of subsidence results • Participate in review and update of the LMP • Provide support and guidance in relation to subsidence effects to Environment & Community Superintendent
Registered Mine Surveyor (RMS)	<ul style="list-style-type: none"> • Ensure that all subsidence monitoring is completed to the requirements of the Subsidence Monitoring Program and provided to the TSM for review • Liaise with the Environment & Community Superintendent to gain required access for subsidence monitoring • Provide training for subsidence impact measurements and observations in accordance with SM program

9 REFERENCES

MSEC (2017), Longwalls B4 to B7, *Subsidence Predictions and Impact assessments for the Natural and Built Features in Support of the Extraction Plan for Longwalls B4 to B7 at the Austar Coal Mine*, Report No. MSEC903, Revision A.

MSEC (2018), *Austar Coal Mine – Modified Finishing End of LWB4, Review of Subsidence Effects, Subsidence Impacts and Environmental Consequences*, Report No. MSEC966.

Umwelt (2017), *Austar Coal Mine – LWB4-B7 Modification, Environmental Assessment*, May 2017.

Appendices

Appendix A

Stakeholder Contact Details

Austar Coal Mine LWB4 to LWB7 Extraction Plan Stakeholder List

Position	Name	Phone
AUSTAR		
Mine Manager	Brian Wesley	4993 7356
Technical Services Manager	Bill Farnworth	4993 7279
Environment and Community Superintendent	Carly McCormack	4993 7334
Mine Surveyor	Matthew Wright	4993 7206
Austar After Hours	Control Room	4993 7220
GOVERNMENT		
SA NSW (24hr Emergency Hotline)	-	1800 248 083
SA NSW	-	4908 4300
Cessnock City Council After Hours Contact Number (Emergency)	-	4940 7816
Cessnock City Council Operations – Works Delivery Manager	Geoff Bent	4993 4284
Cessnock City Council Design Delivery Manager	Katrina Kerr	4993 4281
Department of Industry – Lands and Forestry - Crown Land	Melanie Osborne	4937 9332
Ausgrid – Manager of Customer Supply, Planning and Reliability, Lower Hunter	Pat Boyle	4910 1701
Telstra – Senior Technical Specialist	Mark Schneider	8851 2297
Land and Property Information - Senior Surveyor, Hunter Survey Infrastructure & Geodesy,	Joel Edwards	4925 9983
WaterNSW (groundwater monitoring bores)	Rod Gleeson	4904 2684
LANDHOLDERS	Refer to Austar internal contact register	