

# Section 2

## Project Description

### PREAMBLE

*This section outlines the Proponent's objectives and the proposed development and operation of the Werris Creek Coal Mine Life of Mine (LOM) Project. The coal resource is described and the mining operation and sequence, together with processing activities, are detailed. This section also describes the Project with respect to hours of operation, infrastructure and services, safety, waste management, coal transportation and progressive rehabilitation.*

*The Project is described in sufficient detail to provide the reader with an overall understanding of the nature and extent of activities proposed, how the various activities would be undertaken and to enable an assessment of the potential impacts on the surrounding environment.*

*Details of the safeguards and mitigation measures that the Proponent would implement to protect and manage surface water, groundwater, soil, noise, air quality, Aboriginal heritage, flora and fauna and other components of the local environment are detailed in Section 4 of this document.*



This page has intentionally been left blank



## 2.1 INTRODUCTION

### 2.1.1 Objectives

The Proponent's objectives for the Werris Creek Coal Mine LOM Project (LOM Project) are to:

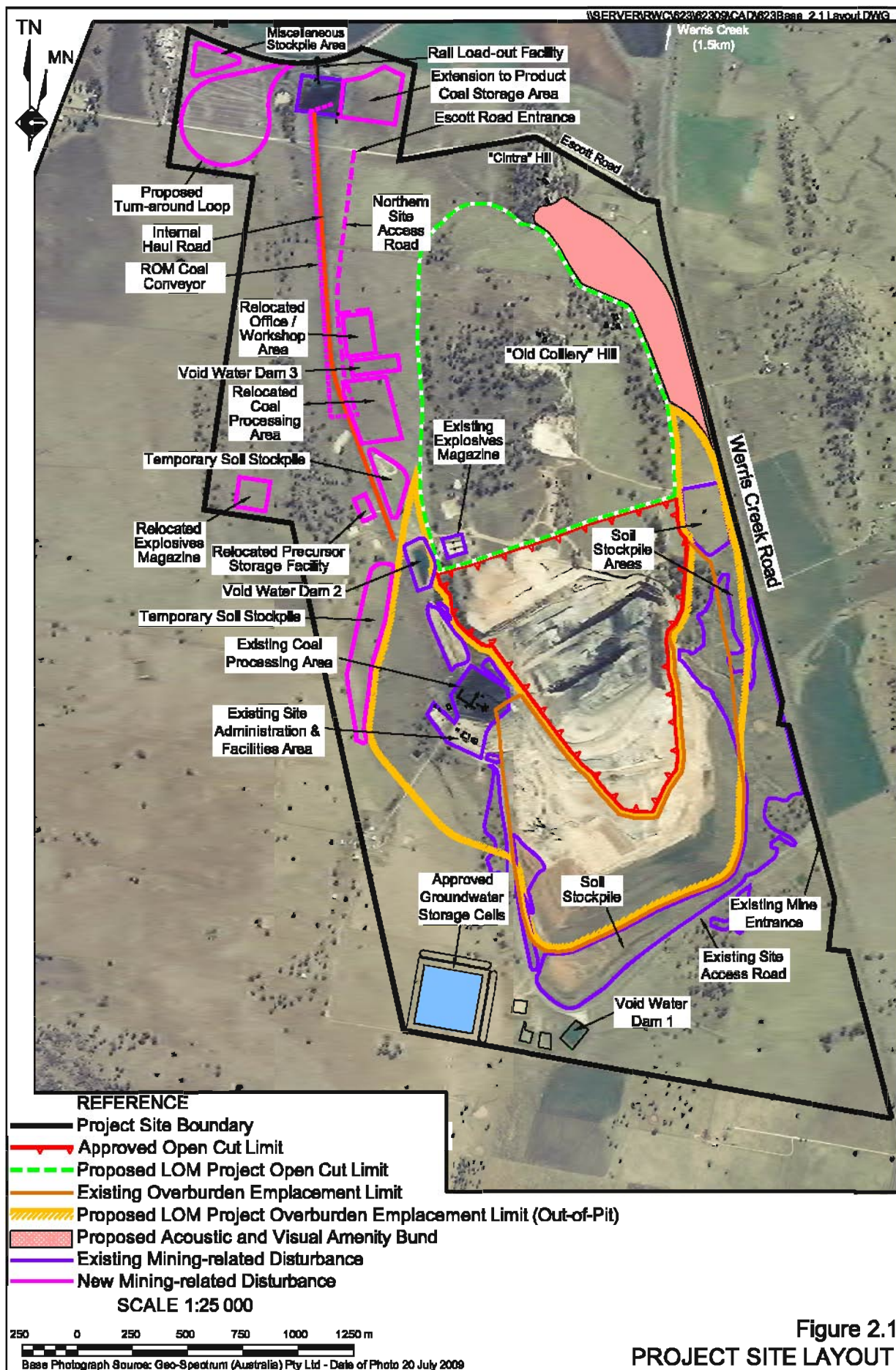
- i) maximise resource recovery and efficiency of mining operations, through the continuation of the open cut mine to the north to recover all available coal resources within the Werris Creek outlier of the Greta Coal Measures;
- ii) maintain the stimulus to the local economies of Werris Creek, Quirindi and their surrounding districts through employment opportunities and the supply of services required for the operation of the coal mine;
- iii) create a final landform that is safe, stable and amenable to a combination of agricultural activities and the re-establishment of ecological activities;
- iv) modify the existing Biodiversity Offset Strategy for the Werris Creek Coal Mine to compensate for additional disturbance to ecological communities resulting from the LOM Project;
- v) undertake all activities in an environmentally responsible manner, employing a level of control and safeguards that would ensure compliance with appropriate criteria/goals or reasonable community expectations at all times; and
- vi) achieve the above objectives in a cost-effective manner and thereby ensure the ongoing viability of the Werris Creek Coal Mine.

### 2.1.2 Overview of the Project

The LOM Project, if approved, would provide for a northerly extension of the Werris Creek Coal Mine, increasing the projected mine life by approximately 15 to 20 years, and involve the following activities (the locations of which are shown on **Figure 2.1**).

- Northerly continuation of the approved open cut mine. The proposed extent of the open cut represents mining of the entire Werris Creek outlier of the Greta Coal Measures, as defined by the sub-crop of the basal G Seam.
- Extension of the out-of-pit overburden emplacement area. The additional volume of overburden removed from the open cut would be placed over the current footprint of the Coal Processing Area and Site Administration and Facilities Area (out-of-pit emplacement) and extend northwards over the completed sections of the open cut (in-pit emplacement). In order to attenuate noise impacts and screen the operation visually from Werris Creek, the overburden emplacement would extend around the eastern and northeastern perimeter of the open cut. This extension of the overburden emplacement is referred to throughout as the "Acoustic and Visual Amenity Bund".





- Relocation of coal processing infrastructure (Coal Processing Area). The primary reason for relocating the Coal Processing Area would be to minimise the haul distance between the extended open cut and the coal processing infrastructure. A relocation of the Coal Processing Area would also be required to allow for a westerly extension of the out-of-pit overburden emplacement (to increase overburden storage capacity). The relocated Coal Processing Area would have an increased ROM coal stockpile (ROM Coal Pad) capacity of 200 000t.
- Production of up to 2.5Mtpa of thermal and Pulverised Coal Injection (PCI) coal for the domestic and international markets. To improve operational flexibility, an increase in the approved hours of operation to 24 hours, 7 day per week is proposed for all activities excluding blasting and road transport of coal from the Project Site.
- An increase in the road transportation of coal to domestic markets to 100 000tpa (from 50 000tpa) to meet the needs of local customers for low ash coal. Up to 95% of road transported coal would be despatched to a specific customer (Pacific Carbon) at Newcastle. An additional 85 000tpa of coal would be transported to Pacific Carbon via shipping containers loaded to rail by front-end loader at the Rail Load-out Facility.
- Increased storage capacity of the Product Coal Storage Area. By extending the pad to the east, the capacity of this stockpile area would be increased to approximately 250 000t.
- Relocation of the administration and workshop areas (Site Administration and Facilities Area). These would be relocated to enable the capacity of the western overburden emplacement area to be increased.
- Construction of a new entrance to the Project Site off Escott Road. The new “Escott Road entrance” would provide for more direct access to the relocated coal processing infrastructure, offices and facilities. The use of Escott Road as the primary access point to the Project Site would require the existing Escott Road and the intersection of Escott Road with Werris Creek Road to be upgraded.
- Construction of a second feed point to the Rail Load-out Facility to allow for product separation and reduced inter-product contamination.
- Construction of a ‘turn-around’ rail loop which would take off from the Werris Creek Rail Siding to the immediate west of the Rail Load-out Facility.
- Continued dewatering the underground workings of the former Werris Creek Colliery (approved under DA 172-7-2004) to enable open cut mining through part of these workings.
- Construction of a third Void Water Dam for the storage of water which accumulates in the open cut.
- The construction of a conveyor to transport coal from the Coal Processing Area to the Product Coal Storage Area is also being considered. The location and operation of this conveyor is identified in the *Environmental Assessment*, however, this activity remains the subject of an ongoing economic feasibility study.



While the rehabilitation objectives and methods would remain consistent with those currently implemented at the Werris Creek Coal Mine, the proposed sequence of rehabilitation, and designated land use on the final landform would be modified slightly from that approved by DA 172-7-2004. In addition, the proposed extension of the open cut area and overburden emplacement would increase the area of native vegetation to be cleared. In order to offset this clearing, a modified *Biodiversity Offset Strategy* (BOS) has been proposed.

### 2.1.3 Approvals Required

The LOM Project will be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979*. As such, the Minister for Planning is the approval authority. Under Part 3A, the application for project approval must be made prior to the receipt of Director-General's requirements for the Project. The application was made in April 2010 (application number 10\_0059).

The following licences and leases, additional to those associated with project approval process, would be required to allow commencement of the LOM Project.

#### **Environment Protection Licence – Department of Environment, Climate Change and Water**

A modification to Environment Protection Licence (EPL) 12290, required under Section 47 of the *Protection of the Environment Operations Act 1997* to develop and operate the Werris Creek Coal Mine, would be required to reflect the likely addition of monitoring points to the licence.

#### **Section 138 Road Permit – Liverpool Plains Shire Council**

Under the *Roads Act 1993*, a permit would be required for the proposed modification to the intersection between Werris Creek Road and Escott Road, modification to Escott Road and construction of a new site entrance to the Project Site from Escott Road.

#### **Water Licence – NSW Office of Water**

A water licence under Part 5 of the *Water Act 1912* (Water Act) would be required for any incidental groundwater in-flow into the open cut. As noted in Section 1.4.3.5, application has been made to the NOW (as the DWE) for an increase in the annual allocation to Licence 90BL252588. The application included justification for an exemption from the Embargo Order on the grounds that failure to supply the water would cause prohibitively high social, economic or national security cost.

Groundwater modelling has indicated that the Werris Creek Coal Mine would have minimal impact on water within the Quipolly Creek alluvium aquifer of the *Water Sharing Plan for the Phillips Creek, Mooki River, Quirindi Creek and Warrah Creek Water Sources 2004* ("the WSP") (RCA, 2010). On the basis that the LOM Project would not draw water from the Quipolly Creek alluvium aquifer of the WSP, no licence would be required under the *Water Management Act 2000*.



## Mining Lease – Industry & Investment NSW

As the coal is owned by the Crown, the Proponent would require a mining lease issued by the I&I NSW, under Section 51 of the *Mining Act 1992* to recover the coal. The Proponent currently holds Mining Lease (ML) 1563. A new mining lease would be required as the proposed open cut extends beyond the existing boundary of ML 1563. It is noted that project approval is a pre-requisite for the granting of a mining lease and the boundary of the extended or new mining lease would be coincident with the Project Site.

Further approvals would be required in accordance with Section 17 of the *Coal Mines Health and Safety Act 2002* (nomination of an Operator of operations) and the *Mining Act 1992* (relating to the preparation of a *Mining Operations Plan*) in order to permit the approved open cut mining activities to commence.

## 2.2 RESOURCE ASSESSMENT

### 2.2.1 Regional Geology

Geologically, the Project Site is located in the Werrie Basin (see **Figure 2.2**) which extends from the Namoi River near Carroll, southwards to where it extends beneath the Tertiary basalts of the Liverpool Ranges in the Willow Tree – Wallabadah area to Blandford. The Mooki Thrust forms the western boundary of the Werrie Basin while Lower Carboniferous rocks known as the Currabubula Formation and comprising a bed of conglomerates over the top of a thin bed of tuffaceous limestones (Pratt, 1996) form the eastern boundary.

Several smaller basins and dome structures have been identified within the Werrie Basin (DMR, 1998) (see **Figure 2.2**). The Colliery Basin, which incorporates the Werris Creek outlier of the Greta Coal Measures deposit targeted by the Werris Creek Coal Mine, is an example of the coal-bearing rocks of Permian age that occur in the centre of the Werrie Basin, and is the target of coal to be mined as part of this proposal. A cross-section oriented approximately north-south through the Werrie Basin (see **Figure 2.2**) illustrates a number of the structures identified in this sub-section.

### 2.2.2 Local Geology and Stratigraphy

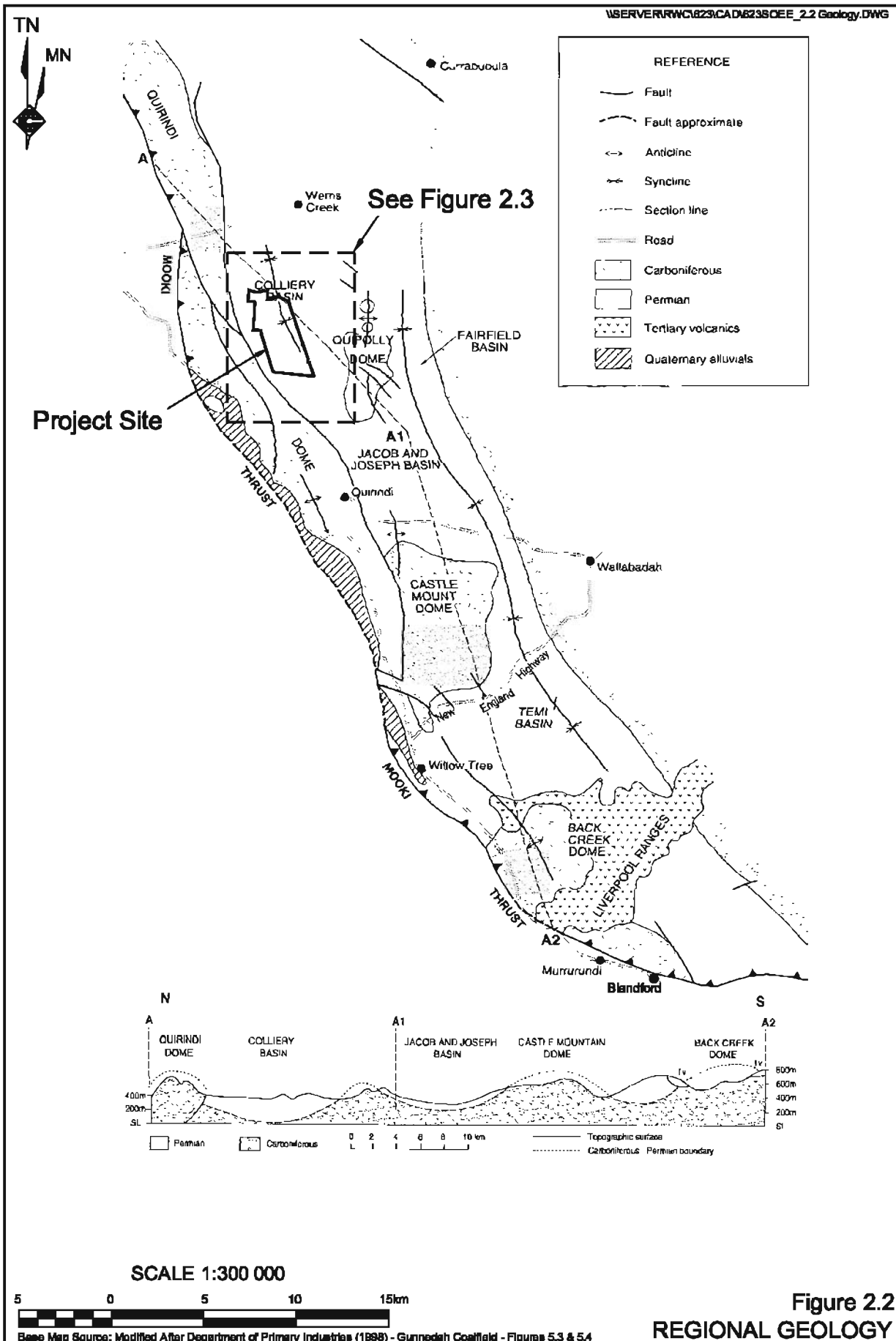
**Figure 2.3**, modified from the Geological Survey of NSW 1:100 000 scale Gunnedah Coalfield Regional Geology (South) Map, illustrates the local setting of the Project Site within the Werris Creek Coal Measures. The Greta Coal Measures which comprise pebble and granular conglomerates, sandstones, mudstones and coal originating in a fluvial to deltaic environment, occur as a small elongate basin-shaped outlier of the Willow Tree Formation (Branagan, 1969).

The general stratigraphic sequence of the local geology is presented in **Table 2.1**.

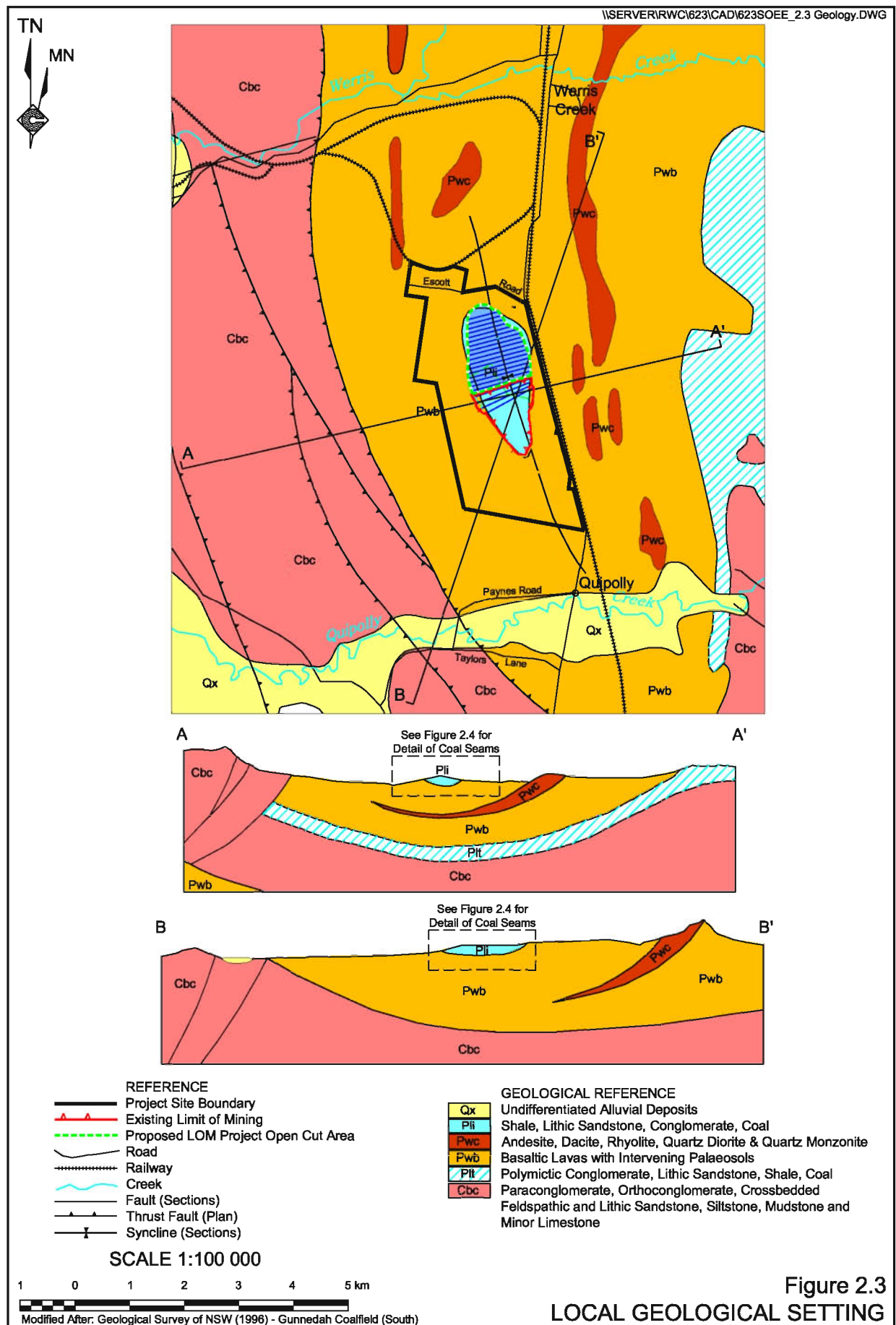
**Figure 2.7** (on p. 2-29) presents the stratigraphic column of the Project Site based on two cored drill holes.











**Table 2.1**  
**General Stratigraphic Sequence**

Age	Rock Type	Strata Type	Occurrence
Quaternary	Unconsolidated sediments	Sands and gravel	Along Quipolly Creek 2.2km from the site
Permian	Greta Coal Measures	Coal seams and interburden strata of sandstones/ siltstone and shales	The proposed open cut mine site covers most of this strata
	Werrie Basalt	Basaltic lava flows with a significant weathered profile of clay. Underlying the coal measures, the clay forms claystone.	Directly underneath the coal measures and completely surrounding them in all directions in most of the valley and lower lying areas
	Acid Volcanics	Andesite, dacite and rhyolite	This occurs in a limited zone and forms the ridges immediately to the east of the mine site and also occurs to the north
	Conglomerates	Conglomerates and lithic sandstones	These strata form the dominant N-S trending ridges to the east
Carboniferous	Rossmore Formation (Quirindi Dome)	Conglomerates and sandstones, siltstones and mudstones	These strata form the dominant N-S trending ridges to the west.

Source: Modified after RCA Australia (2004) – Table 1

### 2.2.3 Exploration

There is an extended history of exploration on and around the site of the Werris Creek Coal Mine. Records show that four boreholes were sunk in 1924 to locate the eastern underground mine entries for the original Werris Creek Colliery (Harper, 1925). There remains evidence of a further two boreholes at the site of underground mine entries on the western side of the syncline, but logs of these holes have not been located. The so-called ‘Cable Bore’ was sunk into the underground workings at approximately the deepest point of the basin (Pratt, 1996), although recent research suggests that this hole may not provide a reliable stratigraphic record of the coal geology.

Exploration Licence (EL) 5993 was granted to Creek Resources Pty Ltd, a company directly associated with the Proponent, on 18 September 2002 covering an area of 531ha. Between February and June 2003, a number of drilling programs were undertaken, with a total of 29 non-cored and five cored drill holes completed. Following the intersection of multiple coal seams in one of the initial holes, exploration focused on the southern end of the Werris Creek outlier of the Greta Coal Measures. The result of the exploration activities was the identification of five primary coal seams (C to G Seams) and two rider coal seams (A and B Seams). A further 36 non-cored boreholes were drilled throughout the second half of 2004 to better define the limit of oxidation (lox) line of the lowest seam (G Seam) and hence the outer perimeter of the Werris Creek Coal Mine. Subsequent to these exploration programs, an eighth coal seam, referred to as the ‘black seam’ (BL Seam) was identified above the A Seam.



Since 2004, a number of exploration campaigns have been undertaken to further the assessment and increase confidence in the geological model for the northern Werris Creek coal resource. Four cored holes and 10 open holes were drilled between June and August 2007. Between February and May 2008, nine fully cored holes were drilled for a total of 947m. A considerable amount of Point Load Index (PLI) and Unconfined Compressive Strength (UCS) testing of the cored samples was undertaken for the last drill program to assist with geotechnical and mining issues. A series of eight 100mm conventional cores was drilled from July 2009 to January 2010 for coal quality scheduling purposes.

**Figure 2.5** identifies the location and type of the exploration completed by the Proponent on EL 5993, EL7422 and ML 1563 since 2003.

## 2.2.4 Resources / Reserves

The total thickness of the coal-bearing sequence, comprising the eight coal seams (Seams BL and A to G) of the synclinal basin, is approximately 190m, although the uppermost coal seams within the sequence (BL Seam, A Seam and B Seam) contain only limited quantities of coal separated by thick interburden layers (typically 30m to 40m).

Significantly greater quantities of coal are present within the C Seam to G Seam. With the exception of the interburden layer between the F Seam and G Seam, which ranges in thickness from 20m to 40m, these seams are generally separated by reduced thicknesses of interburden (typically 2m to 6m). **Figure 2.4** presents the mapped perimeter of the synclinally folded coal seams, and a profile of these as they dip and then rise again to the north, over the area proposed to be mined.

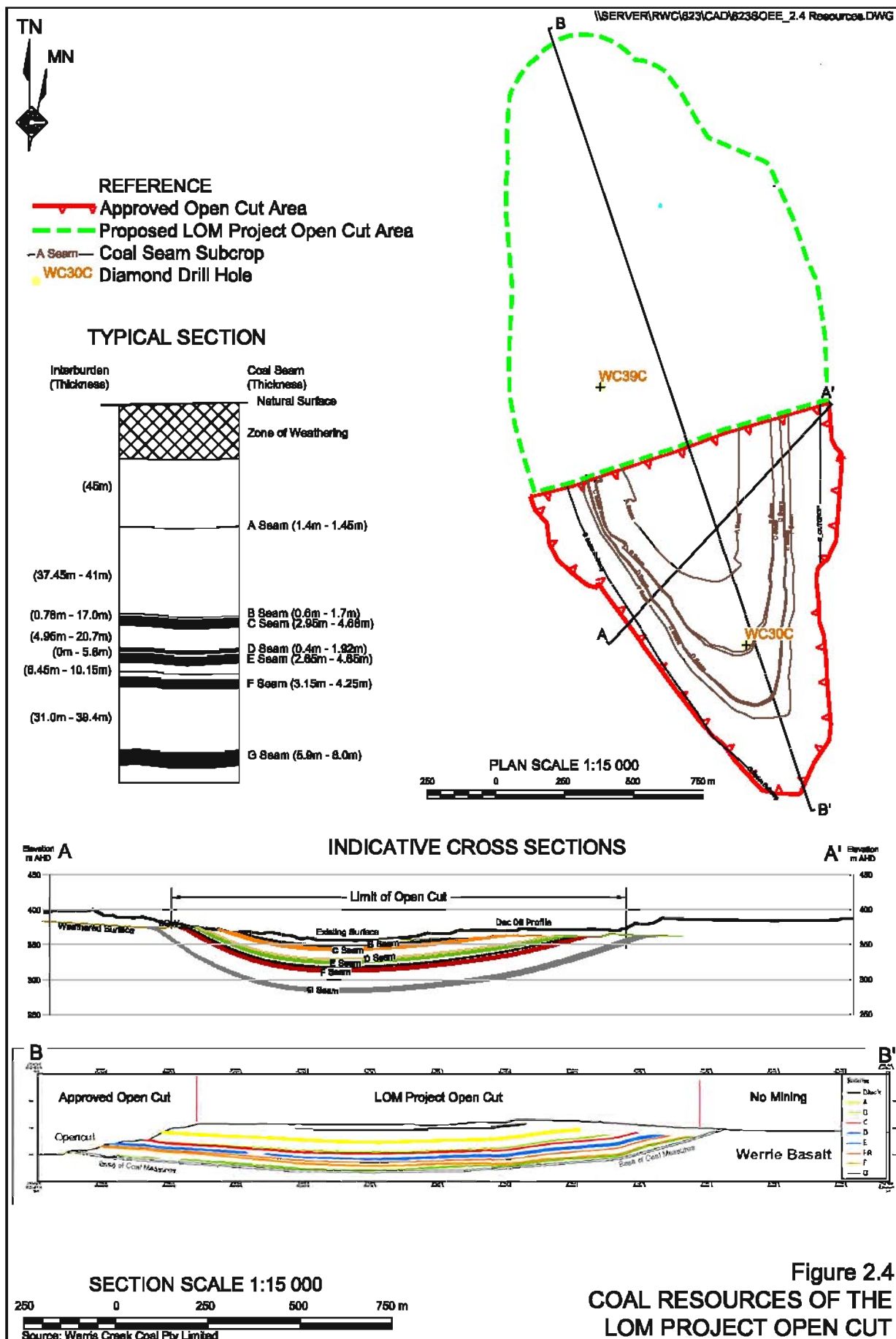
Four Joint Ore Reserves Committee (JORC) compliant resource statements and two reserve statements have been completed for the Werris Creek coal resource since the granting of EL 5993 in 2002. The most recent resource statement was that compiled by Mr Colin Coxhead in June 2008 (Coxhead, 2009) in which the majority of the Werris Creek coal resource (see **Figures 2.3** and **2.4**) was identified as a 'Measured' or 'Indicated' resource. Less than 8% of the coal within the Werris Creek coal resource remains 'Inferred'. Coxhead (2009) reported the coal resources at the Werris Creek site as 37.4 million tonnes (see **Table 2.2**).

**Table 2.2**  
**Werris Creek Coal Resource Summary**

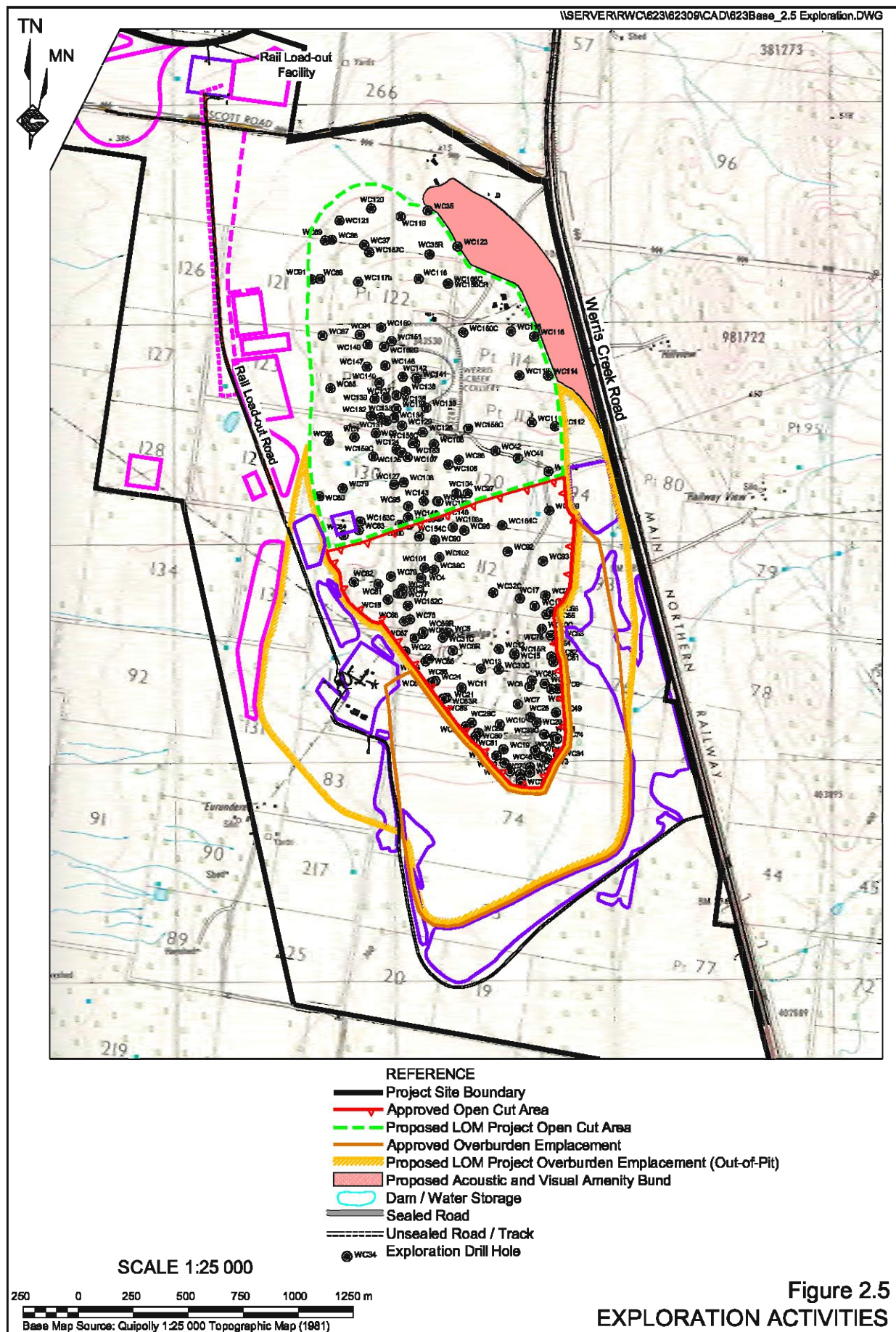
Category	ML 1563	EL5967	EL7422
Measured	22.11 Mt	7.34 Mt	0.51 Mt
Indicated	3.62 Mt	1.17 Mt	-
Inferred	1.57 Mt	1.07 Mt	0.04 Mt
<b>TOTAL</b>	<b>27.30 Mt</b>	<b>9.58 Mt</b>	<b>0.55 Mt</b>
Source: Coxhead (2009)			

The most recent reserve statement was compiled by Minarco-Mineconsult in September 2009 (Minarco-Mineconsult, 2009). Minarco-Mineconsult (2009) identified a proved and probable reserve of 31.98 million tonnes within the Project Site (which incorporates the ML 1563 and the future ML Extension Areas – EL5993 and EL7422) (see **Table 2.3**). Notably, this reserve excludes the remaining coal contained within the area of underground workings of the former Werris Creek Colliery.









**Table 2.3**  
**Werris Creek Coal Reserve Summary**

Proved Reserves	27.61Mt
Probable Reserves	4.38Mt
<b>Proved + Probable</b>	<b>31.98Mt</b>
Source: Minarco-Mineconsult (2009)	

## 2.2.5 Coal Quality

The coal of the Greta Coal Measures (which includes the coal resource within the LOM Project Site) typically has an air-dried moisture of between 3.2% to 6.6%, low total sulphur content and an ash content within the various seams ranging from 7% to 20%. **Table 2.4** presents the typical coal quality of each of the identified seams within the LOM Project Site.

**Table 2.4**  
**Werris Creek Coal Quality**

Coal Seam	Proximate Analysis (% air dried basis)		Specific Energy (kcal/kg) @	Total Sulphur (% adb**) @	Grindability (HGI#)
	Ash	Volatile Matter			
<b>A *</b>	20.0	#	#	#	#
<b>B *</b>	16.0	31	6 552	0.3	44
<b>C</b>	11.9	30	6 640	0.3	47
<b>D</b>	16.5	24	6 251	0.3	48
<b>E</b>	7.4	30	7 066	0.3	50
<b>F</b>	11.9	28	6 700	0.3	49
<b>G</b>	7.8	31	6 995	0.3	47
<b>Total</b>	<b>10.1</b>	<b>30</b>	<b>6 834</b>	<b>0.3</b>	<b>48</b>
* Rider Seam      ** adb = Air dried basis      HGI# = Hardgrove Grindability      @ Weighted average value					
# A seam sample not analysed for coal quality as it does not form a significant part of the reserve					
Source: Modified after RWC (2004) - Table 2.2					

Based on the coal quality analysis listed in **Table 2.4**, the Werris Creek coal resource is able to produce export quality, low to medium ash thermal and Pulverised Coal Injection (PCI) products.

Overall, the coal at Werris Creek can be classified as bituminous, with a maximum vitrinite reflectance value of 0.6. The coal has low volatile matter (<32%), low crucible swell number (1), low total sulfur (<0.35%), low phosphorous (<0.005%) and low chlorine (<0.2%); qualities which make the coal suitable for the PCI coal market. The iron and calcium contents can vary between seams, as well as spatially within seams, with the presence of iron and calcium lowering the ash deformation temperature of the coal. Ash content varies between the seams with the E and G Seams generally having lower ash, the C and F Seams with moderate ash contents, and the Black, A, B and D Seams with high ash. A typical product specification for Werris Creek coal is provided in **Table 2.5**.

## 2.2.6 Spontaneous Combustion Potential

As part of the original Werris Creek Coal Mine development, composite samples from the B Seam to G Seam were prepared and analysed for percentage oxygen on a dry ash free basis. Self Heating Temperatures (SHT) were then calculated using the US Bureau of Mines formula.

$$\text{SHT (Min)} = 139.7 - (6.6 \times \% \text{ oxygen, dry ash free basis})$$

**Table 2.6** presents the calculated SHT values for each seam along with the USBM Guideline Values for assessing spontaneous combustion potential.



**Table 2.5**  
**Werris Creek Coal - Typical Product Specification**

Property	Basis	PCI Product	Thermal Product
Total moisture	air dried basis	12 %	12 %
IM	air dried basis	4.5 %	4.5%
Ash Content	air dried basis	8 %	13-15 %
Volatile Matter	air dried basis	31 %	30 %
Total Sulphur	air dried basis	0.35 %	0.35 %
Specific Energy	(Kcal/Kg, air dried basis)	6 900	6 500
Ash Fusion Temperature (°C)	Initial Deform		1 320
	Hemisphere		1 350
	Flow		>1 500
Grindability (HGI)		52	50
Source: Werris Creek Coal Pty Limited			

**Table 2.6**  
**Werris Creek Coal - Spontaneous Combustion Potential**

Coal Seam	% Oxygen (Dry ash free basis)	SHT (Min)	Spontaneous Combustion Potential
B	11.94	61	High
C	11.28	65	High
D	9.45	77	Medium
E	10.39	71	Medium
F	9.79 - 10.17	73 - 75	Medium
G	10.80	68	High
			USBM Guidelines
			<70
			70 < SHT < 100
			> 100
			High
			Medium
			Low

Source: RWC (2004) – Table 2.3

The SHT (Min) calculations place the coal from the Werris Creek Coal Mine in the medium to high spontaneous combustion potential range. The USBM formula does, however, tend to provide conservative estimates for spontaneous combustion potential. The experience at the Werris Creek Coal Mine to date is that standard practices such as watering coal stockpiles and minimising residence time is adequate to manage the potential for spontaneous combustion.

In support of the above, there have only been relative minor incidences of spontaneous combustion outbreaks at the mine associated with coal stockpiles which were brought under control with bulldozers and water carts being readily available onsite.

## 2.3 MINE PLANNING CONSIDERATIONS

### 2.3.1 Economic

As has been the case at the Werris Creek Coal Mine to date, the extent of open cut mining is ultimately determined by economic aspects such as coal price and mining costs at the time. Both coal price and mining costs determine the limit of the economic stripping ratio, i.e. the volume of overburden and interburden above and between the various coal seams which must be removed to access each tonne of coal. This, in turn, is determined by coal seam thickness and the depth of cover.





At the deepest section of the mine, the open cut would be approximately 190m below ground level with the average overburden/interburden to coal stripping ratio comparatively low (5.4bcm of overburden/interburden per tonne of coal). The depth below ground level would remain relatively consistent over the LOM Project resource area, although as natural surface level rises (to approximately 445m at the “Old Colliery” residence), the depth of the open cut would increase. Despite this increasing depth below ground level through the middle section of the LOM Project resource area, the stripping ratio is anticipated to remain at 5.4 or less as the thickness of coal rises again from the middle of the Project Site towards the north. This stripping ratio is in the lower range when compared to other open cut coal mines throughout New South Wales.

The currently approved limit of mining restricts the recovery of coal to approximately 10.8Mt, which is only 36% of the measured coal resources identified by Coxhead (2009) (see **Table 2.2**). Therefore, beyond the approved limit of mining, there remains at least 26.6Mt of coal available for recovery at an acceptable stripping ratio with the obvious economic benefits to the Proponent (through sale of the coal) and the State (through payment of royalties on the coal), with flow-on benefits to local and regional suppliers, industry and communities.

Other economic factors considered in the development of the Werris Creek Coal Mine LOM Project include the following.

- i) Coal Ash Content. The coal seams are generally low in ash (see Section 2.2.3) and when crushed and sized, the coal is suitable as a thermal coal product without the requirement of further beneficiation. By avoiding the need to wash the coal and the associated expense of constructing and operating a coal washery, the production process is significantly simplified, improving the economic basis for the mining operations.
- ii) Rail Access. The Werris Creek Coal Mine is located adjacent to an active rail siding on the Main Northern Railway Line which directly links the mine to the Port of Newcastle. This minimises the cost of transporting the coal to export markets given the Proponent is not required to construct a new rail siding or haul coal significant distances by road prior to placement on the rail network.

### 2.3.2 Geological

There are no geological impediments to the continued mining of the remaining coal resource to the north, with depth below ground and the stripping ratio remaining relatively consistent with those of the currently approved open cut area. In fact, as the open cut progresses towards the proposed northern limit of the LOM Project resource area, the depth below ground and stripping ratio would reduce as the coal measures rise at the northern end of the basin formation.

### 2.3.3 Environmental

Although the limits of the proposed modified mining area have been set with predominantly economic and geological considerations in mind, the following environmental considerations have influenced the overall mine planning process.

**Figure 2.6** provides a representation of each of the matters discussed in relation to the design of the mine and associated activities.





- Ecological Considerations

The proposed LOM Project open cut, as well as the northerly extension of the out-of-pit overburden emplacement, would increase the area of the White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland community disturbed by the mine, listed as an endangered ecological community (EEC) under the *Threatened Species Conservation Act 1995* (TSC Act) (by approximately 194ha). Approximately 58.5ha of this vegetation contains both a native understorey and an overstorey of eucalypts (condition class 4) with the remaining 135.3ha retaining only a native understorey (condition class 3) (ELA, 2010). Of the area without an overstorey of eucalypts (condition class 3), only 74.6ha is considered to have a sufficiently diverse native understorey to classify as the equivalent critically endangered ecological community (CEEC) listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A small area of Brigalow-Belah Woodland Community vegetation (0.35ha), also an EEC, would also be disturbed by the modified overburden emplacement. An assessment of the local and regional significance of these (and other) communities is described in Section 4B.6.

To avoid and minimise impacts on native vegetation (including the two identified EECs), areas such as the Coal Processing Area, Site Administration and Facilities Area, explosives magazine, Product Coal Storage Area and turn-around rail loop have been preferentially located on land of lower vegetation class, i.e. cleared and cultivated land (Condition Class 1), or grassland without native tree overstorey (Condition Class 3).

To mitigate and offset the additional and unavoidable disturbance, a modification to the Werris Creek Coal Mine *Biodiversity Offset Strategy* (BOS) has been proposed. The proposed LOM Project BOS (discussed in detail in Section 2.14.7) would include a combination of remnant native vegetation and fauna habitat conservation on the Project Site and surrounding properties, the improvement of currently degraded vegetation communities and revegetation of the final landform to link currently isolated remnants of native vegetation and fauna habitat.

- Noise

As the open cut advances progressively closer to the town of Werris Creek, the noise level (without mitigation) received at residences to the north of the Project Site would increase.

The Proponent has attempted to locate all mining-related infrastructure, e.g. the Coal Processing Area and Site Administration and Facilities Area, in such a way that local topography (of "Old Colliery" and "Cintra" Hills) provides a natural acoustic barrier to the town of Werris Creek and the residential receivers located to the south of the town.



In addition, the Proponent has incorporated the construction of the Acoustic and Visual Amenity Bund to the immediate north and northeast of the LOM Project open cut. This structure would be constructed against the “Cintra” Hill and follow the northeastern perimeter of the LOM Project open cut.

The design and construction sequence for the Acoustic and Visual Amenity Bund is discussed further in Sections 2.5.5.5 and 2.5.5.6. The Proponent also plans to implement a noise attenuation program on the mining equipment to further reduce noise emissions from the LOM Project Site. The noise modelling completed to assess the predicted effectiveness of the bund and attenuation of equipment is discussed in Section 4B.3.

- **Visual Amenity**

As for noise, as the open cut advances progressively closer to the town of Werris Creek, the visibility of the operations from town would increase (particularly as the open cut advances through the “Old Colliery” Hill).

By locating site infrastructure to the southwest of “Cintra” Hill, the visibility of these features would be screened from view. Furthermore, the completion of the construction of the Acoustic and Visual Amenity Bund, prior to the advancement of the extended open cut through the top of “Old Colliery” Hill, would reduce the visual impact on vantage points from the town of Werris Creek. Prior to the commencement of bund construction, a screen of native trees and shrubs would be planted in front of the bund footprint. Once constructed, the bund itself would be sown with a cover crop before plantings of native shrub and tree species are undertaken to reduce the visual impact of the bund itself.

- **Blasting (Noise and Vibration)**

As the open cut advances to the north, blasting operations would encroach within 250m of Werris Creek Road and the Main Northern Railway Line. The Proponent has commissioned both geotechnical and vibration assessments of the railway line confirming blasting could be undertaken without vibration related stability impacts on the railway line. On this basis, a Deed of Agreement with ARTC relating to blasting has been established. The Proponent would also continue to implement a road closure management procedure (in consultation with Liverpool Plains Shire Council) to ensure no vehicles enter a 500m exclusion zone when blasts are undertaken.

- **Groundwater**

The open cut would intercept the underground workings area of the former Werris Creek Colliery. As has been previously identified, groundwater has largely filled the underground void spaces (RWC, 2009). In accordance with the approved conditions of DA 172-7-2004, the Proponent would maintain a safe working distance to the workings, both horizontally and vertically in accordance with I&I NSW guidelines, until such time as they have been completely dewatered.

Further detailed descriptions of the existing physical, biological and social environment, and the potential impact(s) of the LOM Project, are provided in Section 4B of this document.



## 2.4 CONSTRUCTION AND DEMOLITION ACTIVITIES

### 2.4.1 Construction Activities

Whilst not strictly a construction phase, the LOM Project would require the relocation and upgrade of new infrastructure on the Project Site. The construction activities to be undertaken include the following.

#### Modification Works

- A second feed point to the Rail Load-out Facility would be installed. This would allow for the separation of the low ash and high ash coal product loading points (preventing contamination issues arising from the use of the one feed point).
- The Product Coal Storage Area would be extended to the east to accommodate the storage of up to 250 000t of coal products.
- If the extension of the out-of-pit overburden emplacement to the west occurs prior to the relocation of the Site Administration and Facilities Area and Coal Processing Area several power poles and line that currently run between the branch line to the Zeolite Australia processing plant and the Site Administration and Facilities Area and Coal Processing Area would be required to be relocated. If the Site Administration and Facilities Area and Coal Processing Area are relocated before the extension of the out-of-pit overburden emplacement, the relocation of this electrical infrastructure would occur at this time.
- The extension of the out-of-pit overburden emplacement would also require the realignment of a 600m section of the current Mine Access Road approaching the existing Site Administration and Facilities Area. This road would ultimately become redundant as an access point to the Project Site, however, would be retained for internal access within the Project Site. Given the low traffic volume on this road, the new section of the road would not be sealed.

#### Relocation Works

- The westerly extension of the out-of-pit overburden emplacement would require the relocation of both the Site Administration and Facilities Area and Coal Processing Area.
- In the case of the Site Administration and Facilities Area, the relocation would involve a replication of facilities (in some cases using the same transportable buildings) at the new location.
- In the case of the Coal Processing Area, the crushing and screening facilities would, with some minor modifications or additions (see Section 2.6.1), be relocated and replicated. The stockpile area would be enlarged to provide for the storage of up to 200 000t of ROM coal.
- The explosives magazine and a pre-cursor storage facility would be relocated to the western side of the rail load-out road.

#### New Construction Works

- A new entrance to the Project Site would be constructed off Escott Road approximately 180m east of the intersection of the rail load-out road and Escott Road ("the Escott Road Entrance"). A new mine access road from the Escott Road Entrance to the Coal Processing Area and Site Administration and Facilities Area ("the Northern Mine Access Road") would also be constructed.



- To accommodate the increased volume of traffic using Escott Road, the intersection between Escott Road and Werris Creek Road would be upgraded.
- A 'turn around' rail loop to the southwest of the existing Rail Load-out Facility would be constructed. Construction would be limited to approximately 1.6km of rail line within cleared and cultivated agricultural land on the "Escott" property with an existing sediment basin to be modified to accommodate the rail alignment. The loop would be required to accelerate current train turn-around times and also to accommodate new generation rail wagons which do not have the ability to be unloaded from both sides (as is the case with current wagons) at the Port of Newcastle.
- A conveyor may be constructed between the Coal Processing Area and Product Coal Storage Area. This would replace the internal road haulage (up to 16 truck loads per hour) currently operating between these two areas, however, is subject to a further economic feasibility study following commencement of the LOM Project.

The activities proposed to decommission existing infrastructure, and modify, relocate or construct new infrastructure, along with the proposed schedule for these activities is presented in the relevant sub-section related to coal processing (Section 2.6), product coal despatch and transportation (Section 2.9) and mine infrastructure and services (Sections 2.7 and 2.8).

#### **2.4.2 Demolition Activities**

Two houses ("Old Colliery" and "Preston Park") which are located within the LOM Project open cut area would be demolished.

A heritage assessment completed by Landsape (Landsape, 2010) has been completed over the Project Site. While noting the moderate local significance of the "Old Colliery" residence (it was occupied by the Deputy Mine Manager during the operation of the Werris Creek Colliery), no sites or items of historic heritage significance at the NSW or national level were identified which would preclude the demolition of these two houses<sup>1</sup>. The process to demolish these houses would be as follows.

1. All items that may be reused or recycled would be removed.
2. Each house would be assessed for the presence of asbestos. If asbestos is present, it would be removed by a qualified contractor and disposed of within a licensed asbestos disposal facility.
3. The houses would be demolished.
4. "Non-putrescible General Solid Waste" would be disposed of within the in-pit emplacement. The remaining waste would be removed from the site by a licensed waste contractor.

---

<sup>1</sup> It is noted that foot and hand prints made within the concrete floor of a tool shed at the Old Colliery residence by the daughters of the Deputy Mine Manager and resident of the "Old Colliery" residence in 1947, have been recovered and presented to Ms Dora Koops (the maker of one set of the foot and hand prints).



## 2.5 MINING OPERATIONS

### 2.5.1 Introduction

The open cut mine extension would continue to be developed using the same conventional haulback mining methods that are used in the current operation. This method involves the following component activities which would generally be undertaken in the following sequence.

1. Vegetation removal.
2. Drainage installation.
3. Soil stripping.
4. Overburden removal and backfill of the open cut or placement within an out-of-pit overburden emplacement.
5. Construction of a series of near horizontal benches through blasting and coal removal.
6. The following sub-sections present information relating to the five component activities of the haulback mining method, as well as anticipated production levels and indicative mining fleet requirements.

### 2.5.2 Vegetation Clearing

As is the current approach, clearing of vegetation on the Project Site would be undertaken on a campaign basis. This has the advantage of ensuring that the extent of clearing undertaken in each campaign is sufficient for the subsequent year of mine development, as well as ensuring that clearing is undertaken during periods when local fauna is unlikely to be nesting, roosting or over-wintering within the trees and shrubs to be cleared, i.e. autumn.

Clearing of the larger vegetation would be undertaken by bulldozer, with the bulldozer blade positioned just above the ground to minimise soil disturbance. The smaller vegetation, i.e. pasture, crop stubble and/or shrubs, would be retained and collected with topsoil during the soil stripping operation.

Given the occurrence of White Box (*Eucalyptus albens*), a listed Koala feed tree species, within the areas of remnant native vegetation to be disturbed, and the known or potential occurrence of a number of threatened fauna species in these areas, an inspection of trees would be undertaken by a qualified ecologist prior to each clearing campaign to identify if Koalas (or other threatened fauna species) are present in trees nominated for clearing. In the event a Koala (or other threatened fauna species) is present, clearing would be suspended until it moves away from the subject area or is relocated by a suitably qualified person.

Once felled, the larger material, e.g. logs and larger branches would either be:

- immediately transferred to sections of the final landform awaiting final rehabilitation and designated for the re-establishment of native woodland vegetation; or
- placed in stockpiles for subsequent replacement as part of the Proponent's ongoing rehabilitation program.





Use of the cleared vegetation in the above manner would assist in reducing erosion, promote vegetation establishment and provide fauna habitat.

Smaller branches and any deposited leaf litter, bark, etc. would be retained and collected as part of soil stripping campaigns. The Proponent would allocate areas on top of the final lift of the overburden emplacement for the stockpiling of the cleared vegetation. Placing the vegetation stockpiles on the top lift of the overburden emplacement would ensure that this material is progressively used as proposed in the rehabilitation of the final landform, prior to the rehabilitation of the top lift (thus avoiding the necessity to operate equipment over rehabilitated land at a later stage).

### 2.5.3 Drainage Installation

Once the proposed limit of clearing for each annual campaign has been defined and the vegetation has been cleared, the Proponent would undertake the following.

- Construction of a temporary diversion bank on the upslope boundary of the area to be stripped of groundcover and soil. The diversion bank would divert clean water from upslope areas into natural drainage lines or to designated storage dams within the Project Site.
- Construction of catch drains or banks and/or installation of a sediment fence on the down-slope boundary of the area to be stripped of groundcover and soil. Runoff collected by the catch drains or banks would be directed to sediment basins and/or storage dams from which it would be drawn for dust suppression purposes.

The size and location of these structures has been determined in accordance with Volume 2E of the guideline document “*Soils and Construction: Managing Urban Stormwater*” (DECC, 2008) and is presented, along with all proposed water, erosion and sediment control structures to be installed, in Section 4B.2.4.

### 2.5.4 Soil Stripping

#### 2.5.4.1 Introduction

The soil materials within the proposed areas of disturbance of the Project Site have been assessed by GSS Environmental (GSSE, 2010b) to determine:

- their suitability for use as a final cover material on the post-mining landform; and
- the requirement for specific stripping and stockpiling or erosion control measures.

The assessment was based on field and laboratory examinations of key physical and chemical attributes and is described in greater detail in Section 4B.9. Notably, GSSE (2010b) builds upon a previous assessment of the soils of the Werris Creek Coal Mine site completed by Geoff Cunningham Natural Resource Consultants (GCNRC, 2004).

#### 2.5.4.2 Soil Categorisation and Stripping

Three main soil units have been identified by GSSE (2010b) as occurring on areas of the Project Site that have yet to be disturbed by open cut mining activities.



The soil units described by GSSE (2010b) broadly correspond with the three Soil Mapping Units identified by GCNRC (2004). However, unlike GCNRC (2004), GSSE (2010b) does not recommend the stripping of any of the subsoil for use in rehabilitation on the Project Site. Through the soil balance for the LOM Project Site, GSSE (2010b) have determined that there is enough subsoil already stockpiled to meet future rehabilitation requirements.

Part 7 of the *Specialist Consultant Studies Compendium* provides in detail the physical and chemical attributes of each of the three soil units. A basic description of each soil unit, together with comments on stripping suitability and stripping procedures, is summarised in **Table 2.7**.

**Table 2.7**  
**Soil Stripping Suitability and Procedures**

Layer (Thickness)	Material	Stripping Suitability	Soil Stripping Procedures
Brown Chromosol			
1 (30cm)	Moderate consistence loam to sandy loam	Suitable for stripping for reuse as topdressing in rehabilitation.	Strip to a depth of 30cm.
2 (20cm)	Weak consistence loam to loamy sand	Not recommended for reuse in rehabilitation due to the limiting factor of high clay content.	Do not strip
3 (70cm)	Strong consistence clay	Not recommended for reuse in rehabilitation due to the limiting factor of high clay content.	Do not strip
Stoney Brown Chromosol			
1 (10cm)	Weak consistence loamy sand	Considered unsuitable for stripping and therefore not recommended for reuse as topdressing in rehabilitation due to the high stone content throughout the profile.	Do not strip
2 (10cm)	Weak consistence loamy sand	Considered unsuitable for stripping and therefore not recommended for reuse as topdressing in rehabilitation due to the high stone content throughout the profile.	Do not strip
3 (100cm)	Strong consistence clay	Considered unsuitable for stripping and therefore not recommended for reuse as topdressing in rehabilitation due to the high stone content throughout the profile.	Do not strip
Dark Brown Vertosol (Black Soil)			
1 (30cm)	Moderate consistence silty clay loam to clay	Suitable for stripping for reuse as topdressing in rehabilitation.	Strip to a depth of 30cm.
2 (30cm)	Strong consistence clay	Key limiting factor is the high clay content, massive structure and strong alkalinity.	Do not strip
3 (60cm)	strong consistence clay	Key limiting factor is the high clay content, massive structure and strong alkalinity.	Do not strip
Source: Modified after GSSE (2010b) - Section 3.2			

With the exception of a section of the Project Site where temporary or demountable style buildings would be installed within the relocated Site Administration and Facilities Area and areas where Stoney Brown Chromosol soil is present (which GSSE [2010b] assesses to be unsuitable for stripping), the stripping of topsoil would be undertaken on all sections of the Project Site to be disturbed by the LOM Project. No subsoil material would be stripped from the proposed mining area and the overburden emplacement (as sufficient subsoil resources have already been stripped to satisfy the rehabilitation requirements for the proposed final landform – see Section 2.14).

Due to the generally good structure of the soils, bulldozers and/or open-bowl scrapers would be used for stripping. Soils would be stripped to the depths noted in **Table 2.7** for each soil unit or if in the event that subsoil is stripped, to the base of the subsoil layer. In order to minimise handling, scrapers would dump their loads neatly to form a uniform stockpile that requires little further forming prior to establishment of a vegetation cover. Stripping of soil during periods of excessive soil moisture content, for example following heavy rain, would also be avoided to reduce the likelihood of damage to soil structure.

#### 2.5.4.3 Topsoil and Subsoil Volumes

Recoverable soil volumes within those areas to be disturbed by mining and associated activities are presented in **Table 2.8** based on the stripping depth recommendations presented in GSSE (2010b) and volumes required for rehabilitation works.

Similar to the management of cleared vegetation, the Proponent would allocate areas on top of the final lift of the overburden emplacement for the stockpiling of the majority of the stripped soil. The volume of soil required to be stockpiled is not expected to be large, given the soil would preferentially be respread over sections of the final landform immediately following stripping. This notwithstanding, temporary stockpile areas on the overburden emplacement and immediately surrounding areas of disturbance such as the open cut and infrastructure areas would be maintained. Adequate storage capacity, equivalent to the volume of soil likely to be stripped over a 1 to 1.5 year period of mine operation, would be provided by these areas.

The Proponent currently holds approximately 307 000m<sup>3</sup> of topsoil and 855 000m<sup>3</sup> of subsoil in stockpiles. If these volumes are added to what is expected to be stripped over the LOM Project then there would be approximately 682 000m<sup>3</sup> of topsoil and 855 000m<sup>3</sup> of subsoil available for use in rehabilitation activities over the life of the Project. According to GSSE (2010b), this would provide a surplus of both topsoil and subsoil at the end of mine life. This is based on the following to meet land capability objectives.

- Subsoil replaced at 0.5m depth and topsoil replaced at 0.2m on land to achieve up to a Land Capability Class III.
- Topsoil replaced at 0.2m depth on land to achieve up to a Land Capability Class IV.
- Subsoil replaced at 0.2m depth and topsoil replaced at 0.15m on land to achieve up to a Land Capability Class VI.
- Topsoil replaced at 0.1m depth on land to achieve up to a Land Capability Class VII.



**Table 2.8**  
**Soil Volumes**

Soil Type		Brown Chromosol	Stoney Brown Chromosol	Dark Brown Vertosol	Total
Recommended Stripping Depth (m)		0.3	-	0.3	
Disturbance Areas (ha)	Acoustic and Visual Amenity Bund	3.1	4.3	11.6	18.9
	Open Cut Area	62.5	95.1	22.6	180.2
	Southwest Overburden Emplacement Extension	-	-	15.2	15.2
	Northern Site Access Road	-	-	1.4	1.4
	Extension of Product Coal Storage Area	-	-	8.7	8.7
	Proposed Turn-around Loop	-	-	1.5	1.5
	Miscellaneous Stockpile Area	-	-	1.8	1.8
	Relocated Coal Processing Area	-	-	5.5	5.5
	Relocated Site Administration and Facilities Area	-	-	2.3	2.3
	Relocated Precursor Storage Facility	-	-	1.0	1.0
	Void Water Dam 3	-	-	1.4	1.4
	<b>Total Disturbance Area (ha)</b>	65.6	99.4	73.0	238.0
Volume of Topdressing Available (m <sup>3</sup> )		196 860	-	219 150	416 010
Total Volume with 10% handling Loss (m <sup>3</sup> )		177 174	-	197 235	374 409

Source: GSSE (2010b) – Table 13

Although the post mining land capability is predicted to have capabilities between Class III and Class VII, it is noted that the conceptual final landform for the Project Site (**Figure 2.18**) only requires some Class III land (approximately 37ha) with the rest of the Project Site being established with native vegetation for ecosystem establishment. Section 2.14.4 provides the justification for restricting the area of Class III land to 37ha in the final landform. Areas established with the woodland vegetation would have a range of land capability classes from Class III to Class VII.

#### 2.5.4.4 Soil Stockpiling Methods

Where stockpiling is necessary, topsoil would be stockpiled separately to subsoil, with stockpiles of topsoil not exceeding 2m in height. The individual stockpiles would be constructed using scrapers or bulldozer and trucks and the dimensions of each stockpile would reflect this method of construction. Each stockpile would not be located in natural or created drainage lines. Any stockpile that is to be retained in excess of 3 months would be seeded using a non-persistent cover crop to reduce erosion potential, reduce weed infestation and assist in the maintenance of the biological viability of the soil resource. The stockpile surfaces would be left with a 'rough' but even surface to assist in runoff control and seed retention and germination.

Preference to locate soil stockpiles on the top lift of the overburden emplacement would largely avoid the occurrence of overland and/or concentrated surface water flows which could result in stockpile erosion. However, where natural protection from surface water flows would not be readily achievable, for example where soil is stockpiled adjacent to specific areas of disturbance such as the relocated Coal Processing Area (so that it is available for final rehabilitation of this area at the conclusion of the LOM Project), the Proponent would install upslope protective earthworks such as contour banks and other soil erosion mitigation measures as necessary until a stable vegetation cover is present.



As is the current practice, the soils of each soil unit would be stockpiled separately. This would allow the Dark Brown Vertosol soils (known locally as black soils) to be preferentially used for areas of the final landform designated for the re-establishment of higher quality agricultural land. The Brown Chromosol soils would be used over the remainder of the final landform.

#### **2.5.4.5 Soil Inventory and Reconciliation**

In order to effectively manage the topsoil and subsoil stripped as part of the LOM Project, the Proponent would maintain an inventory of these soils, i.e. the volumes of soil stripped, re-spread and/or stockpiled would be surveyed and recorded throughout the life of the proposal.

The location of the soil stockpiles would be regularly monitored and/or surveyed and the volumes compared to the soil requirements of the different sections of the final landform. This soil inventory would serve several purposes.

- i) It would ensure appropriate volumes of the different soil units are stripped consistently with the soil requirements of the final landform.
- ii) It would identify the age of various soil stockpiles on the Project Site and therefore assist in minimising the length of time soils remained stockpiled.
- iii) It would assist the Proponent in using the most appropriate soils for the different elements of the final landform.

This reconciliation of soil availability and requirements would ensure sufficient topsoil and subsoil from the preferred soil unit would be available for rehabilitation even as the proposed mine nears completion.

### **2.5.5 Overburden/Interburden Removal and Management**

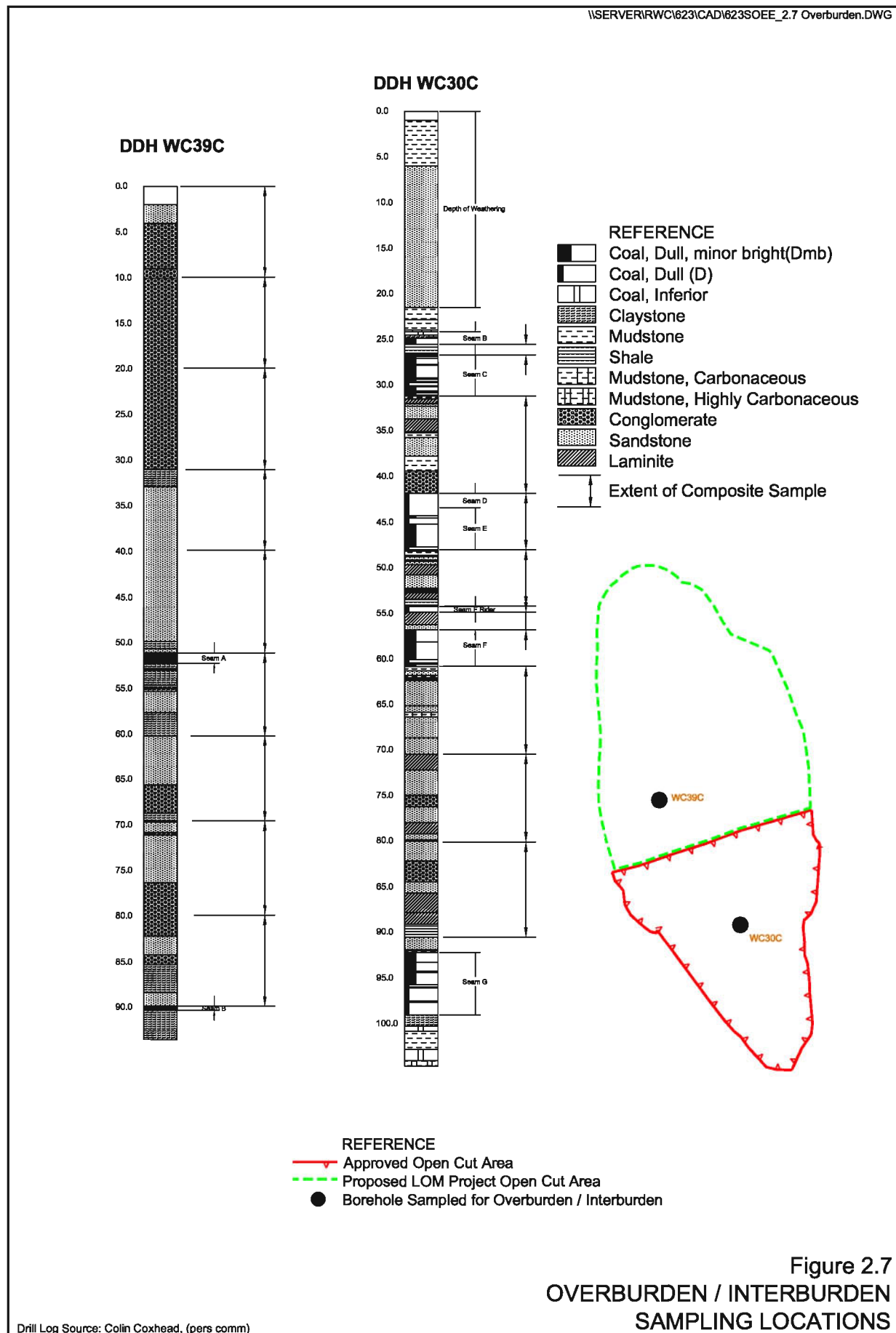
#### **2.5.5.1 Introduction**

The removal of the overburden and interburden represents the main earthmoving component for the mining operation. This sub-section examines the characteristics of the overburden and interburden and its planned removal and management within the overburden emplacement area, the extended out-of-pit emplacement area and the Visual and Acoustic Amenity Bund. The overburden and interburden could technically be considered as a production waste material, however, its management and ultimate rehabilitation is an important component of the overall mining operation.

#### **2.5.5.2 Material Characteristics**

A previous investigation of the physical and chemical characteristics of the overburden and interburden of the Werris Creek coal resource completed by URS (2004) concluded that there is a low potential for both acid formation and soluble salt generation from the overburden and interburden material. As such, there are no specific handling and emplacement requirements for these materials. **Figure 2.7** presents the location of the drill holes from which the overburden / interburden samples were taken.





### 2.5.5.3 Overburden and Interburden Blasting

The majority of overburden and interburden materials would need to be blasted to achieve a level of fragmentation suitable for its subsequent excavation, loading and transportation or bulldozing. It would be the Proponent's objective to minimise the number of blasts by maximising blast size without compromising compliance with the environmental criteria identified in Section 4B.4.3. Based on the proposed open cut design and the mining rate presented in Section 2.5.8, it is projected that an average of 10 blasts would be initiated per month.

Blast design, drilling, loading and firing would be undertaken by the mining contractor or a suitably qualified and experienced blasting engineer holding a shotfirer's certificate issued by the I&I NSW - Mineral Resources (I&I NSW – MR). Each blast would be designed to provide an adequate level of fragmentation with acceptable environmental impact. The safeguards to be implemented with respect to the control of fly rock, air vibration (airblast overpressure) and ground vibration, noise and dust from blasting are presented in Section 4B.4.4.

**Table 2.9** identifies the typical blast design parameters that would be adopted within the proposed open cut mine extension to achieve compliance with relevant guidelines for airblast overpressure and ground vibration at all surrounding residences, the Werris Creek Road and the Main Northern Railway Line.

**Table 2.9**  
**Typical Blast Design Parameters**

Parameter	Details
Bench height	2m to 20m
Blast hole diameter	169mm to 200mm
Blast hole inclination	10° to 30°
Blast hole spacing	3.5m to 6.0m
Burden	3.0m to 6.0m
Stemming	3.0m to 5.0m
Bulk explosive type	ANFO or Emulsion Products
Maximum charge per hole	20kg to 900kg
Maximum Instantaneous Charge <sup>#</sup>	1 200kg
Initiation system	Electronics
<sup>#</sup> The Maximum Instantaneous Charge (MIC) for the initial blasts would be within the lower end of the range provided, with larger MIC used as site specific data allows for more accurate predictions of impacts of the blasts and ensuring satisfaction with DECCW criteria.	
Source: Werris Creek Coal Pty Limited	

The nominated blast design parameters have been determined using conservative predictive formulae. However, given blast design is an evolving outcome-oriented process, refinements to blast design components would be implemented on the basis of monitoring results and the achievement of specific blasting objectives. Subject to operational constraints, less frequent blasts yielding larger volumes could be initiated with similar impacts, as blast-related impacts are primarily related to the Maximum Instantaneous Charge (MIC) and the distance between the blast and the receiver location.





The potential for fly rock, while unlikely, has been considered in the design of the blast parameters. I&I NSW generally recommends a safe exclusion distance of 500m for open cut coal mines (although it is noted that experience since April 2005 suggests that it is highly unlikely for flyrock to be propelled more than 100m from the blast site). To be conservative, and to ensure no impacts on personnel or equipment, the Proponent proposes to maintain a blast exclusion zone of 500m around each blast. All mobile equipment and personnel would be required to be relocated to at least 500m from the site of the blast prior to initiation and remain outside the blast exclusion zone until the shot firer confirms it is safe to re-enter.

Blasting is planned to occur within 500m of the Werris Creek Road and the Main Northern Railway Line (see **Figures 2.8 to 2.11**) and when blasting is to be undertaken within 500m of the road and/or rail line, the safeguards, controls and management measures would be implemented in accordance with existing “*Whitehaven Coal Procedure – Road Closure*” developed by the Proponent in consultation with Liverpool Plains Shire Council and ARTC. A more detailed review of this procedure is provided in Section 4B.4.4.5, however, the following summarises the key features.

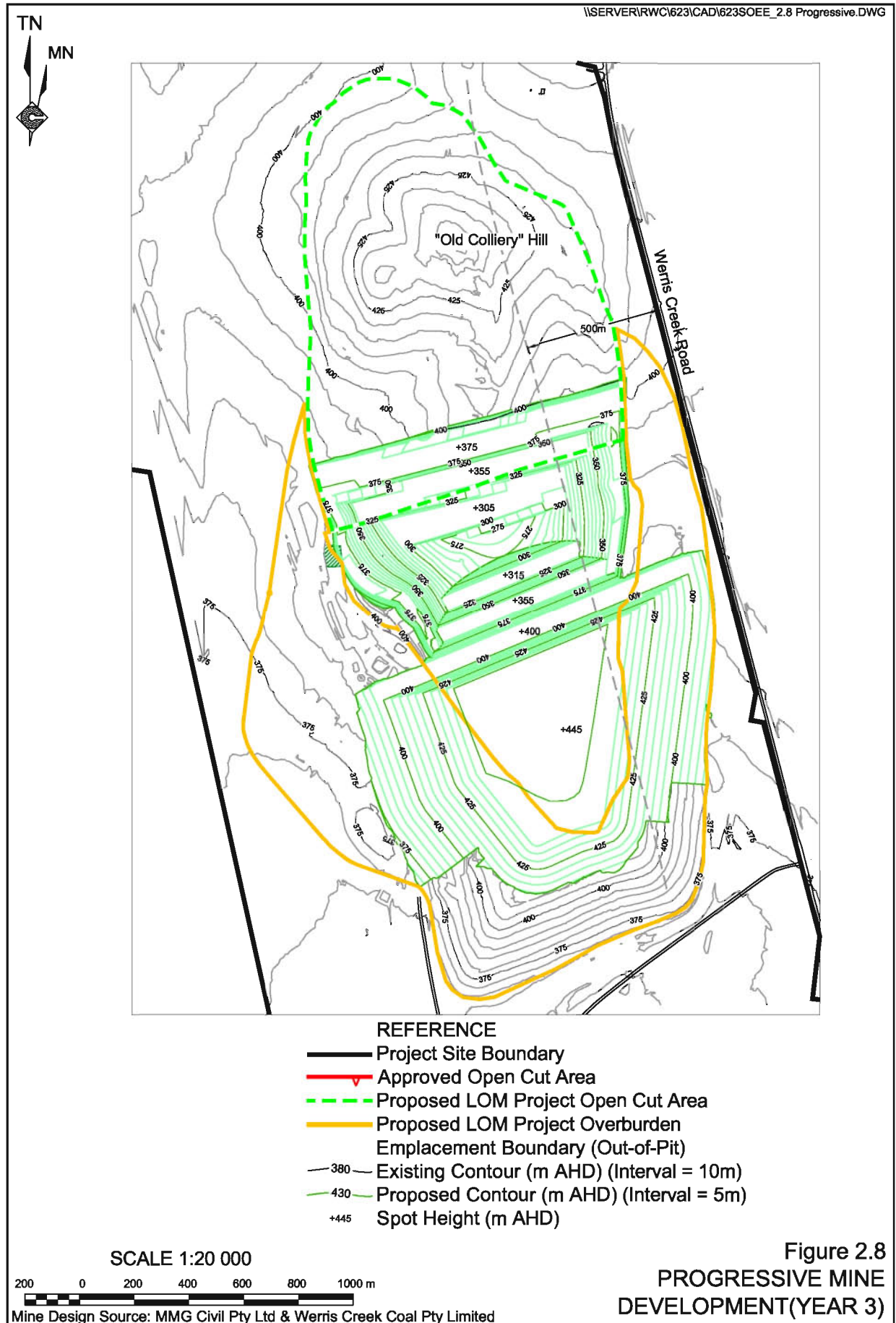
- Blasts would be undertaken between the hours of 9:30am and 2:30pm Monday to Friday, and generally around 1:15pm, i.e. road closures to avoid peak traffic times, and would occur outside the operating hours of school bus services.
- Blasts would avoid timetabled rail movements.
- A rail and road closure protocol for blasting (in association with Liverpool Plains Shire Council and ARTC) would be maintained.
- Adequate warning would be provided to road users in the form of road signs identifying standard blast times.
- Follow-up inspections of the road would be undertaken in the unlikely event it is necessary to remove any debris prior to re-opening of the road.
- A Deed of Arrangement with the ARTC is in place regarding the acceptability of vibration levels to the geotechnical stability of the Main Northern Railway Line.

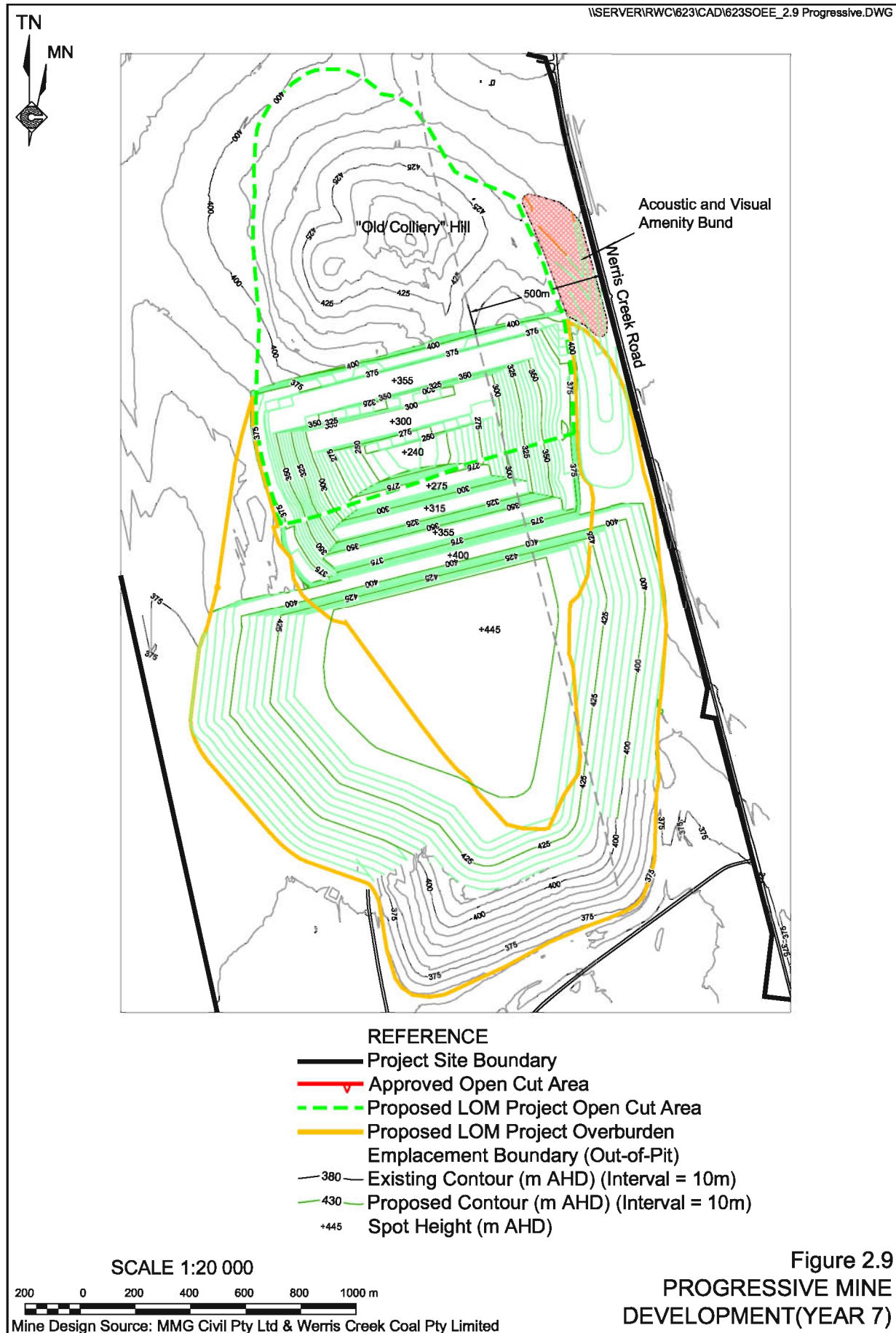
#### **2.5.5.4 Overburden and Interburden Removal**

Virtually all of the overburden and interburden materials would be blasted and removed by conventional haulback methods, i.e. the overburden and interburden would be transported by haul truck to the overburden emplacement area. Where practicable, throw blasting would augment haulback placement of overburden and interburden materials in the mined-out areas of the open cut mine. Throw blasting is designed to project the blasted overburden or interburden into the lower areas of the mine void, thereby minimising the volume to be loaded and transported by haul truck.

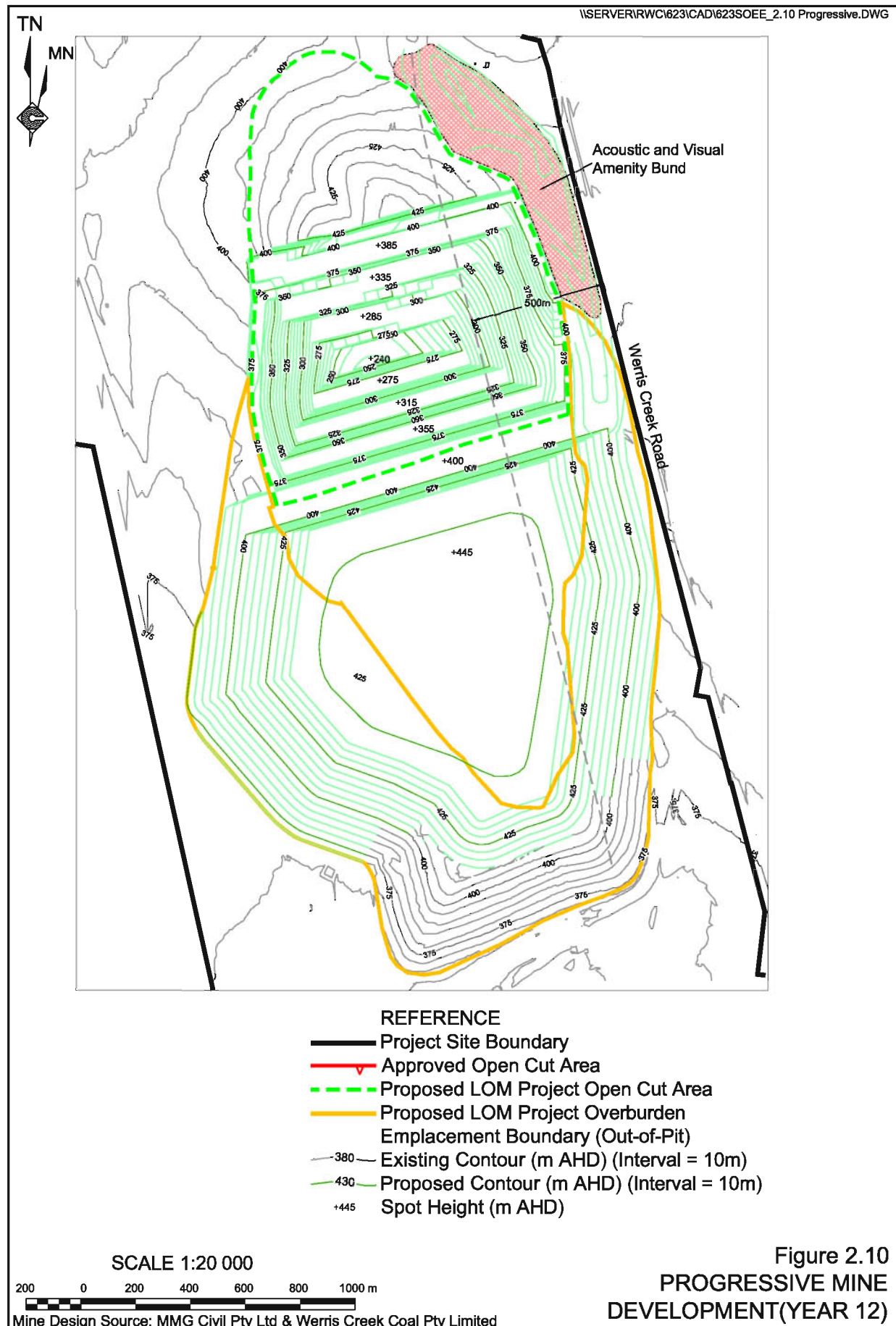
Over the LOM Project, approximately 143Mbcm (178 million loose cubic metres) of overburden and interburden material, additional to that removed as part of the approved mining operations, would be removed. Of this material, the majority (>80%) would be placed within or over the footprint of the limit of mining (in-pit overburden emplacement). The remainder would be placed in an extension of the out-of-pit overburden emplacement to the southwest of the existing limit of mining and within the proposed Acoustic and Visual Amenity Bund to be constructed to the northeast of the proposed limit of mining.

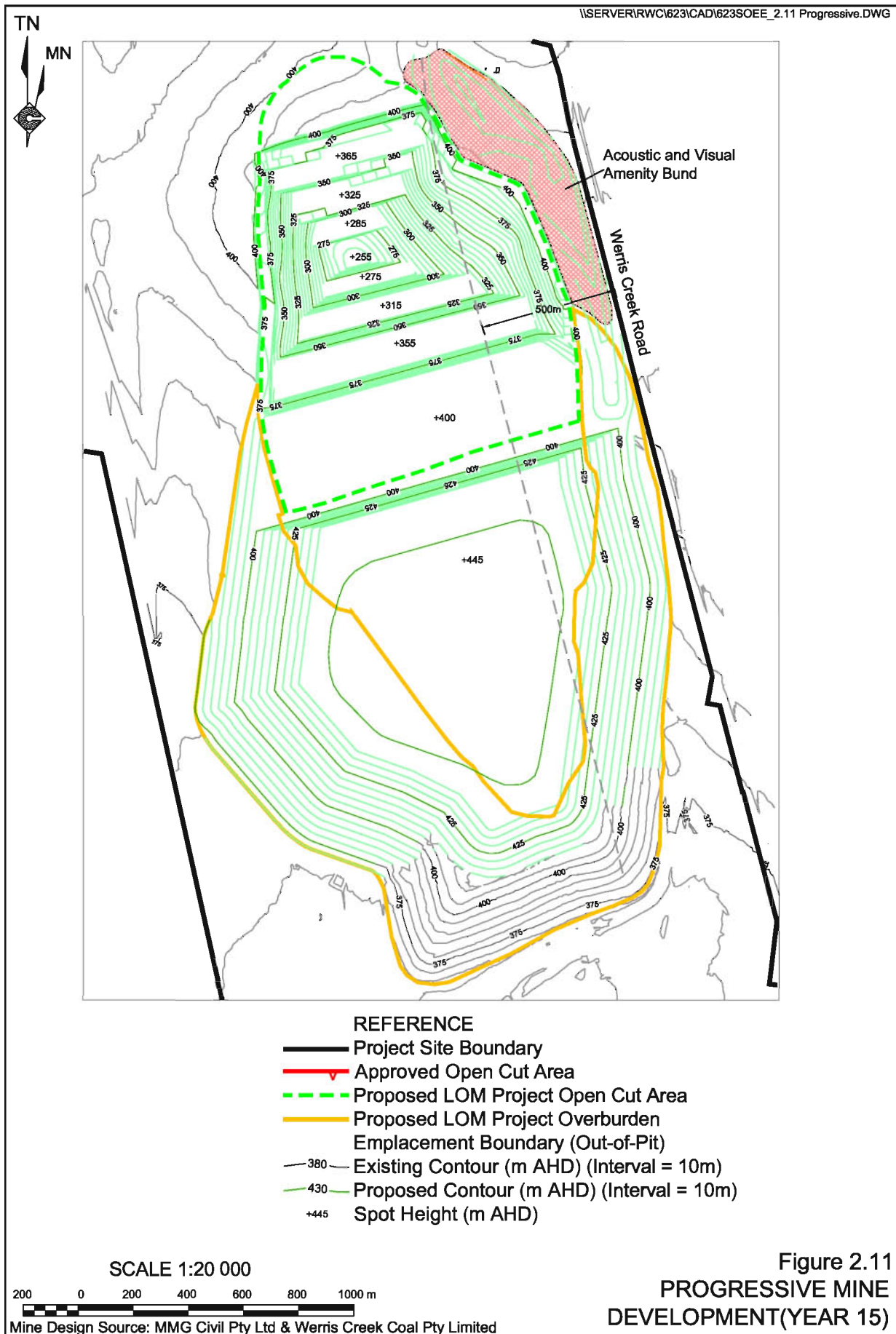












**Figures 2.8 to 2.11** present an indicative illustration of the LOM Project open cut and overburden emplacement development at regular intervals. The eastern, southern and western surfaces of the overburden emplacement would be constructed with comparatively gentle slopes of  $10^\circ$  or less. The toe of the eastern surface of the overburden emplacement would run adjacent to Werris Creek Road, however, would remain at least 25m from the road easement boundary for its entire length. Based on the alignment of Werris Creek Road about the centre of the 25m to 30m road easement, the toe of overburden emplacement would remain at least 35m from the road surface at its closest point (a length of approximately 400m). A continuation of the existing tree screen, which is 5m wide incorporating 2 rows of native trees spaced approximately 4m apart, would provide some visual screening of the overburden emplacement.

The northern surface of the overburden emplacement, which runs into the open cut void would be constructed with steeper slopes which would ultimately be reduced to  $18^\circ$  (1V:3H) or less in the final landform. At its highest point, the overburden emplacement would reach an elevation of approximately 445m AHD (equivalent to the highest point of the "Old Colliery" Hill to be removed). A series of contour banks, similar to those on the existing landform, would be created at approximately 10m vertical intervals on the outer slopes of the emplacement to manage surface water runoff and assist in minimising erosion of these slopes. Section 2.14.4 considers the activities required to create the final landform should the proposed modification represent the final mining activities at the Werris Creek Coal Mine.

#### **2.5.5.5 Acoustic and Visual Amenity Bund**

As noted in Section 2.3.3, the potential for unacceptable noise and/or visual amenity related impacts on the residents of Werris Creek and surrounds would increase as the open cut mine advances north, and in particular, as the "Old Colliery" hill is removed. To mitigate these potential impacts, the Proponent would use overburden and interburden from the open cut mine to construct the Acoustic and Visual Amenity Bund around the northeastern limit of the LOM Project open cut. It is estimated that approximately 3.7Mlcm of material would be required to construct the Acoustic and Visual Amenity Bund as presented on **Figure 2.10**.

Commencing near the top of the "Cintra" Hill (at approximately 415m AHD), the Acoustic and Visual Amenity Bund would rise a further 10m (to 425m AHD) gradually reducing in elevation as it bends around the proposed northeastern limit of the open cut. The height of the bund above ground level would vary from 10m, where it joins "Cintra" Hill, rising to 25m where it bends around the northeastern section of the open cut before reducing to only 5m above ground level where it joins with the out-of-pit overburden emplacement. The bund, which would be approximately 2.2km in length, would be constructed with an outer slope of  $10^\circ$ , to ensure no future profiling is required as part of final landform rehabilitation. The distance between the toe of the bund and the Werris Creek Road easement would gradually increase as the bund is constructed to the north. At its closest point to the road easement (where the bund is between 5m and 10m high), the toe of the bund would be at least 25m from the road easement and at least 35m from the road surface itself. As the bund increases to 20m above ground level, the distance between the road surface and the toe of the bund would increase to at least 50m. A tree screen would be established between the bund and the road easement, which would be immediately covered with available topsoil and sown with a sterile cover crop of pasture grass. Once a grass cover is established, native species would be planted.

The Acoustic and Visual Amenity Bund would be constructed once mining operations reach the base of the “Old Colliery” Hill to ensure noise and visual impacts from operations advancing northwards towards the town of Werris Creek are minimised. Screen plantings would be undertaken in advance of the construction of the Acoustic and Visual Amenity Bund to provide a native vegetation screen at the base of the bund footprint to lessen the visual impacts from Werris Creek.

#### 2.5.5.6 Overburden Removal Schedule

**Figures 2.8 to 2.11** present an indicative illustration of overburden management throughout the life of the LOM Project at approximately 3 to 7 year intervals. The progressive development of the LOM Project (as presented in **Figures 2.8 to 2.11**) is based on an annual production rate of between 1.5Mtpa and 2.5Mtpa.

For the first 3 or 4 years of the LOM Project, it is proposed to place the overburden and interburden within the in-pit emplacement area (see **Figure 2.8**). For years 4 to 5, overburden would be placed both in-pit and out-of-pit overburden emplacement areas (see **Figure 2.9**), at which time the out-of-pit component of the emplacement would reach or approach capacity with most overburden and interburden then managed within the footprint of the open cut.

The proposed open cut would advance to the southern side or base of the “Old Colliery” Hill after approximately 7 to 8 years of mining (see **Figure 2.9**). At this time, overburden placement within the Acoustic and Visual Amenity Bund would commence, being completed prior to the hill top being removed (see **Figure 2.10**).

#### 2.5.6 Coal Recovery

The conventional haulback mining method would be used to overcome the variable dips within the coal seams of the LOM Project open cut area. As for a typical haulback method operation, overburden or interburden would be drilled, blasted and loaded into trucks for haulage to the overburden emplacement areas. A series of horizontal benches would be developed through the exposed coal seams to provide near horizontal working areas for the mining equipment. Based on the synclinal nature of the coal seams, the construction of benches would be undertaken in two similar but distinct ways dependent on whether the coal of the more steeply dipping outer edges of the open cut, or almost flat inner sections are being mined. **Figure 2.12** illustrates the two variations of bench development, with a description of each provided below.

##### Mining the Coal Seams of the Open Cut Outer Perimeter

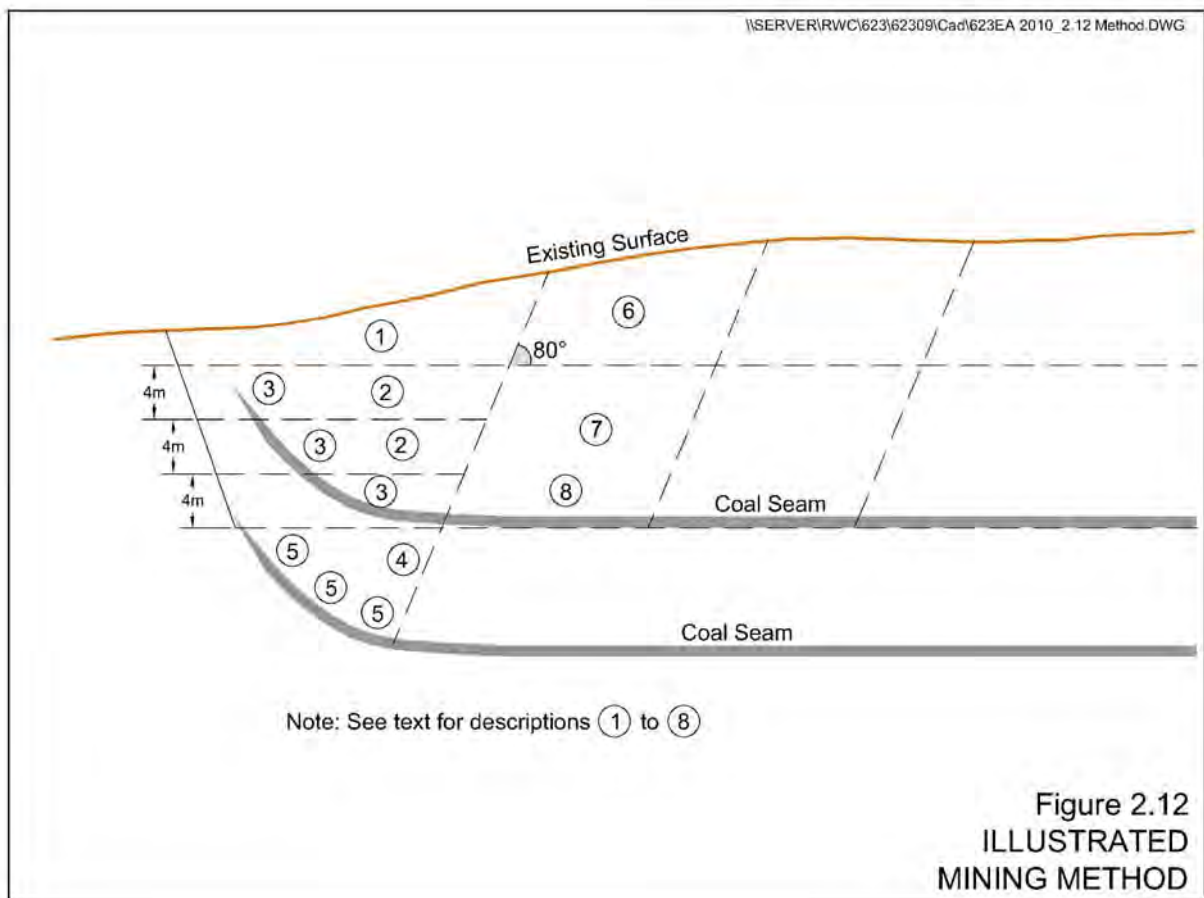
Due to the more steeply dipping nature of the coal seams, the benches would be developed in 4m passes, sufficient to remove the more steeply dipping overburden and coal seams. The excavator would load each pass to trucks which would haul the overburden to the nominated section of the overburden emplacement and the ROM coal to the ROM Coal Pad.

The overburden removal and coal recovery activities identified on **Figure 2.12** are as follows.

1. Topsoil, subsoil and overburden removed to expose the sub-crop of the coal seam.
2. Drill and blast completed to fracture overburden / interburden to a depth of approximately 10m at 30°.
3. Excavator removes the fractured overburden by benching down to expose and then load out the coal.
4. Drill and blast completed to fracture next ~4m of overburden / interburden.
5. Excavator repeats the process by removing overburden to expose and then load out the coal.







### Mining the Coal Seams of the Inner Open Cut Area

As the coal seams flatten out towards the middle of the open cut, mining efficiency can increase by not having to maintain shallow bench heights. The total depth of overburden above or interburden between the coal seams would therefore be removed to allow access to the coal seam by bulldozer for ripping, excavator for loading and trucks for transport of the coal. The bench heights in this case would equal the interburden thickness between seams as the excavator works down through each strip.

The overburden removal and coal recovery activities identified on **Figure 2.12** are as follows.

6. Topsoil, subsoil and overburden removed to the elevation of the sub-cropping coal seam.
7. Drill and blast completed to fracture overburden / interburden to expose the flat section of the coal seam.
8. Exposed coal is ripped, loaded to trucks and transported to the ROM Coal Pad.

Coal would be loaded and transported by haul truck along haul roads connected by a series of ramps to the Coal ROM Pad.

Various thicknesses of interburden and coal seam partings occur throughout the sequence of coal seams. Where these interburden and parting layers are greater than 0.3m thick, they would be mined separately from the coal seams. A thickness of 0.3m represents the practical limit to mining these layers separately. Where the interburden or partings are less than 0.3m thick, they would be mined with the coal. Interburden layers up to 2m thick would be ripped with a bulldozer prior to loading into haul trucks for delivery to the active area(s) of the overburden emplacement. Interburden greater than 2m thick would be blasted for subsequent loading and disposal.

### 2.5.7 ROM Coal Stockpiling

The majority of ROM coal would be transported directly to the ROM Coal Pad with coal immediately adjacent to the roof and floor of each seam (which would inevitably be diluted by the adjoining rock materials during mining) stockpiled separately for use in blending to produce coal products with a higher ash specification. This would allow a clean coal product to continue to be mined and stockpiled from each seam as well as a diluted product.

As is the current practice, a series of temporary ROM coal stockpiles may be used from time to time within the open cut mine area to:

- minimise the transmission of noise during night-time operations; and
- limit the variability in haul truck cycle times and therefore maximise the efficiency of the excavator loading the haul trucks.

### 2.5.8 Mining Rate

Annual coal production, though primarily determined by equipment capabilities, would also be determined by the Proponent's ability to obtain domestic and export coal contracts. It is envisaged that coal production for the LOM Project would average 2Mtpa, with production approaching 2.5Mtpa in response to improved market conditions and similarly reducing below 2.0Mtpa should market conditions be less favorable. Consequently, the projected mine life may be reduced or extended in response to production rate and market conditions.

**Table 2.10** presents the estimated annual recovery from each coal seam, and removal of overburden and interburden, in order to achieve an average annual production rate of 2Mtpa.

### 2.5.9 Mining Equipment

An indicative list of the typical types and numbers of items of earthmoving and mining equipment which would be used throughout the life of the proposed mine based on producing an average of 2Mtpa of coal is presented in **Table 2.11**. Equipment involved in the clearing of vegetation, stripping or replacement of topsoil and subsoil and loading of blast holes would be used, on a campaign basis. In any given 4 to 6 week period, equipment used in these activities may only be used over a 2 to 3 week period. Additional equipment used at the mine includes generators (either freestanding or integrated with various items of equipment) and miscellaneous maintenance equipment, e.g. welders.



**Table 2.10**  
**Indicative Coal Production Throughout the Mine Life\***

Year	Coal Seam							Total Coal
	A*	B	C	D	E	F	G	
2013	20 000	50 000	250 000	130 000	360 000	410 000	780 000	2 000 000
2014	130 000	60 000	280 000	130 000	380 000	440 000	570 000	2 000 000
2015	120 000	60 000	250 000	140 000	390 000	450 000	600 000	2 000 000
2016	180 000	80 000	270 000	130 000	360 000	430 000	560 000	2 000 000
2017	190 000	80 000	260 000	120 000	360 000	430 000	560 000	2 000 000
2018	170 000	100 000	270 000	120 000	360 000	450 000	540 000	2 000 000
2019	170 000	80 000	240 000	110 000	370 000	480 000	530 000	2 000 000
2020	160 000	100 000	250 000	120 000	390 000	500 000	480 000	2 000 000
2021	200 000	120 000	270 000	120 000	410 000	480 000	410 000	2 000 000
2022	170 000	120 000	250 000	120 000	440 000	500 000	400 000	2 000 000
2023	120 000	120 000	230 000	120 000	480 000	530 000	400 000	2 000 000
2024	110 000	130 000	240 000	110 000	430 000	590 000	390 000	2 000 000
2025	80 000	160 000	250 000	120 000	420 000	630 000	350 000	2 000 000
2026	0	140 000	240 000	150 000	410 000	710 000	340 000	2 000 000
2027	0	0	70 000	110 000	320 000	990 000	500 000	2 000 000
2028	0	0	30 000	50 000	150 000	450 000	230 000	910 000
<b>Total</b>	<b>1 820 000</b>	<b>1 400 000</b>	<b>3 650 000</b>	<b>1 900 000</b>	<b>6 030 000</b>	<b>8 470 000</b>	<b>7 640 000</b>	<b>30 910 000</b>
Note *: Includes upper 'Black Seam'								* Units = tonnes
Source: MMG Civil Pty Ltd / Werris Creek Coal Pty Limited								

**Table 2.11**  
**Mining Equipment**

Item	No. on Site <sup>1</sup>	Function	Duration of Use
Excavator (360t)	2	Overburden Excavation/Loading	Full Time
Excavator (190t)	3	Overburden/Coal Excavation/Loading	Full Time
Haul trucks (Cat 785 or equivalent)	15	Overburden/Coal Haulage	Full Time
Bulldozer (D11)	2	Overburden Prime Push, Overburden/Coal Rip/PushUp, Final Landform Development	Full Time
Bulldozer (D10)	2	Clearing, Overburden/Coal Rip/Push Up, Overburden Emplacement/Road Maintenance, Final Landform Development	Full Time
Bulldozer (D9)	2	Product Coal Stockpile and Train Loading	Full Time
Grader	1	Road/Overburden Emplacement Maintenance	Full Time
Fuel/Service Truck	1	Equipment Refuelling/Service	Full Time
Scraper	2	Campaign Topsoil/Subsoil Removal and Replacement	Campaign
Drill Rig	2	Blast hole Drilling	Full Time
Explosives Truck	1	Campaign Loading Blast holes	Campaign
Front-end Loader (FEL)	2	Screening Plant/Product Coal Loading	Full Time
Small FEL	2	Workshop and Stemming	Full Time
Crushing and Screening Plant	1	Coal Size Reduction and Screening	Full Time
Diesel Powered Lighting Tower	7	Lighting for Work After Nightfall	Full Time (at night)
Water Cart	3	Dust Suppression	Full Time
Note 1: The operation of mobile equipment would be restricted under certain adverse meteorological conditions (see Section 4B.3.4.1)			
Source: Werris Creek Coal Pty Limited			



It should also be noted that over time, the number and type of equipment may change based on changing requirements for activities such as vegetation clearing, coal and overburden loading, hauling, drilling and blasting. The equipment listed in **Table 2.11** should therefore be viewed as indicative with any major changes to be documented through the MOP and AEMR process. The Proponent would ensure that the sound power level of replacement equipment would not exceed that of the current fleet (which has been used to predict noise levels received at locations surrounding the Project Site).

### 2.5.10 Mine Dewatering

RWC (2009) noted that approximately 318ML of brackish and almost neutral pH water remained within the underground workings of the Werris Creek Colliery. This estimate has subsequently been revised downward to approximately 200ML based on more recent monitoring of water levels within the underground workings and updated estimates of void space. This will not affect the proposed dewatering and surface management of this water within one or more groundwater storage cells (GWC1 and GWC2) as currently approved under DA 172-7-2004.

In addition to the groundwater currently stored within the underground workings of the former Werris Creek Colliery, groundwater contained within the rock strata may seep into the open cut as it is developed. An assessment of groundwater inflow conducted as part of a groundwater assessment for the LOM Project (RCA, 2010) indicated that evaporative rates would typically approximate or exceed mine inflow rates and it is expected that the open cut would generally be operated as a “dry mine”.

Notwithstanding the fact that significant in-flow of groundwater is unlikely, the Proponent would maintain a sump within the open cut and pump this to one of either the existing groundwater storage cells (200ML Dam) and void water dams (VWD1 & 2); or a new void water dam (VWD3) constructed in the location illustrated on **Figure 2.1**. This water would be used preferentially for dust suppression activities on the Project Site.

Void water dam 3 (VWD3) would be designed and constructed to the same standard as VWD1 and VWD2.

## 2.6 COAL PROCESSING

### 2.6.1 Coal Processing Infrastructure and Operation

The ROM coal does not require washing to achieve the coal quality requirements of the product coal. The ROM coal does, however, require size reduction to meet customer requirements prior to despatch. The Proponent does not propose to vary the crushing and screening operations of the Werris Creek Coal Mine significantly from that which currently operates as follows.

- ROM coal is placed on the ROM pad. It is stockpiled separately dependent on coal quality, i.e. ash content.
- The ROM coal is fed into a breaker for primary size reduction (to <250mm) and subsequently to a crushing and screening plant to reduce the coal to <50mm size, this being the specification for export quality coal. Additional screens would enable a 30mm to 50mm product to be produced.
- The Coal Processing Area would provide storage capacity for up to 200 000t of ROM and crushed and screened product coal at any one time.



Within 2 years of project approval, the Proponent would relocate the Coal Processing Area to the north to enable the westerly construction of the out-of-pit overburden emplacement and reduce the haul distance to the active open cut area. **Figure 2.13** presents the indicative layout of the relocated Coal Processing Area along with a schematic illustration of the crushing and screening process.

To enable the storage of up to 200 000t of ROM coal and crushed coal, the Coal Processing Area would cover an area of approximately 4.0ha (35% larger than the current Coal Processing Area). The site of relocated Coal Processing Area is on flat open terrain on land previously used for grazing of improved and natural pasture. Prior to relocation of the Coal Processing Area, the topsoil layer would be stripped and stockpiled, the exposed ground graded and compacted in preparation of plant installation. The site of the existing Coal Processing Area would be covered by the westerly extension of the overburden emplacement area and as such, once all infrastructure and rubbish is removed. Prior to the placement of overburden over the site of the existing Coal Processing Area, a contaminated site survey would be undertaken and should contamination be identified, this would be remediated or removed. No further rehabilitation works would be required.

## 2.6.2 Coal Processing Rate

Coal crushing and screening is currently undertaken at a rate of approximately 500t/hr, and is generally undertaken at hours consistent with open cut operations. The processing rate of 500t/hr represents close to the maximum throughput rate and therefore in order to facilitate an increase in production, the coal processing plant hours of operation would be increased, with the plant operating 24 hours per day, 7 days per week to reflect proposed open cut operating hours. The potential noise impacts and mitigation measures associated the increased hours of operation of the plant are presented in Sections 4B.3.5 and 4B.3.6.

## 2.7 PROJECT SITE INFRASTRUCTURE

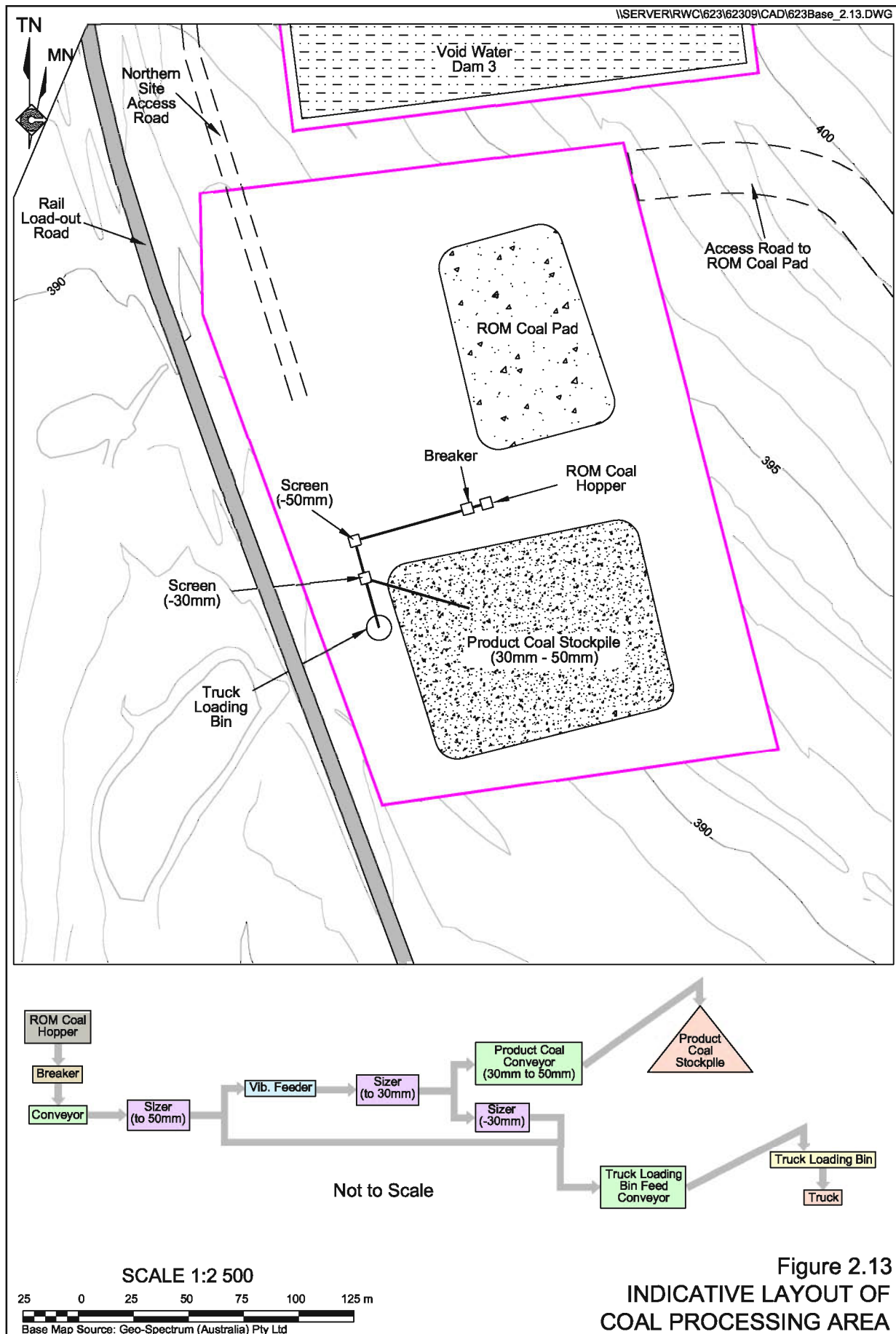
### 2.7.1 Mine Site Access

Whilst the Coal Processing Area and Site Administration and Facilities Area remain in their current locations, the existing mine entrance off the Werris Creek Road would continue to be used. However, prior to the relocation of the Coal Processing Area and Site Administration and Facilities Area, a new mine entrance would be constructed off Escott Road approximately 1.45km west of the intersection with the Werris Creek Road and 180m east of the rail load-out road (see **Figure 2.1**).

Based on the proposed number of vehicle movements to and from the Project Site (see Section 2.9.3), and following a review of the RTA's *Road Design Guide*, the entrance would be constructed as a basic right hand (BAR) / basic left hand (BAL) type intersection in accordance with Figure 2.3 of *Guide to Traffic Engineering Practice - Part 5: Intersections at Grade* (Austroads, 2005). A BAR/BAL intersection would require the additional surfacing of Escott Road to a width that would allow for a stationary left-turning vehicle to be passed by westbound traffic.

Once the Escott Road Entrance is constructed and operational, the existing mine entrance would be closed and locked (although retained for use by Mine Site staff, when required).





### 2.7.2 Mine Access Road

From the Escott Road Entrance, the Proponent would construct the Northern Site Access Road for the movement of all mine-related traffic between Escott Road and the Site Administration and Facilities Area. The Northern Site Access Road would be constructed with an overall width of 9m comprising a 7m wide sealed surface and 1m wide unsealed shoulders. A light vehicle access road would be constructed between the Site Administration and Facilities Area and the Coal Processing Area.

Construction of the Northern Site Access Road would involve the removal and stockpiling of 200mm of topsoil followed by the installation of the required roadside drainage controls and culverts, and the placement of suitable sub-base and base-course materials preferentially sourced from the overburden of the LOM Project open cut.

### 2.7.3 Escott Road – Werris Creek Road Intersection

As part of a Traffic Impact Assessment for the LOM Project completed by Constructive Solutions (Constructive Solutions, 2010), the suitability of the existing Escott Road – Werris Creek Road intersection for the proposed type and volume of traffic to be generated by the LOM Project was reviewed. Constructive Solutions (2010) determined that the intersection in its current form would be inadequate and recommended that the intersection be upgraded to provide for:

- an auxiliary left turn lane (AUL) on the northbound lane of Werris Creek Road (in accordance with *Figure 2.5* of Austroads, 2005);
- a channelized right turn lane (CHR) on the southbound lane of Werris Creek Road (in accordance with *Figure 2.7* of Austroads, 2005); and
- an acceleration lane southbound on Werris Creek Road to accommodate the acceleration of trucks to appropriate merge speed.

*Appendix B* of Constructive Solutions (2010) provides an intersection treatment illustrating these features of the proposed intersection.

The road surface of Escott Road itself would also be upgraded to provide for two 3.5m lanes and 1.0m sealed shoulder on each side.

### 2.7.4 Rail Load-out Road

While a coal conveyor from the Coal Processing Area to the Product Coal Storage Area is being considered, the rail load-out road would continue to be used on the Project Site. The rail load-out road comprises an 8m bitumen seal on a 10m wide formation. Culverts have been installed at each of the existing contour banks that traverse the road alignment.

While the total length of the active component of the rail load-out road would be reduced, it would be maintained in its current form for the life of the LOM Project. In the event the ROM Coal Conveyor is constructed and becomes operational, the use of the Rail load-out Road would be restricted to traffic by mine vehicles and occasional coal haulage during periods when maintenance work is being undertaken on the conveyor.



### 2.7.5 Internal Haul Roads

A network of temporary unsealed haul roads would be maintained for the transportation of topsoil, subsoil, overburden and coal within and from the open cut mine. The Proponent intends to minimise the number of haul roads constructed external to the mine and overburden emplacement footprint, thereby limiting the overall area of disturbance, maintenance costs, and opportunities for dust generation. Haul roads would be maintained in a condition to minimise dust generation through road sheeting and routine watering.

Temporary haul roads between individual benches, the mine floor and areas of overburden placement would typically be 22m to 25m wide and established with a gradient of 10° to 12°. A safety berm, a minimum of half the wheel height of the largest vehicle likely to travel the road, would be positioned on the downslope side of all haul roads where the haul roads are located adjacent to, or traverse, steep slopes.

Sediment-laden runoff emanating from the haul roads would be directed to sumps within the open cut mine or to purpose-built sediment basins adjacent to the haul roads.

### 2.7.6 Coal Conveyor

Following the establishment of the relocated Coal Processing Area, the Proponent may opt to construct a 1.1km long overland conveyor between the Coal Processing Area and Product Coal Storage Area. If constructed, the conveyor would include a feed hopper, a conveyor constructed at ground level which would feed a slinger via a vertical slew chute. The slinger, which would rise to between 15m and 20m above the stockpile area, would allow for the segregation of the different coal products on the Product Coal Storage Area. The conveyor itself would be a free standing structure above ground level with a rated capacity of 600tph.

### 2.7.7 Site Administration and Facilities Area

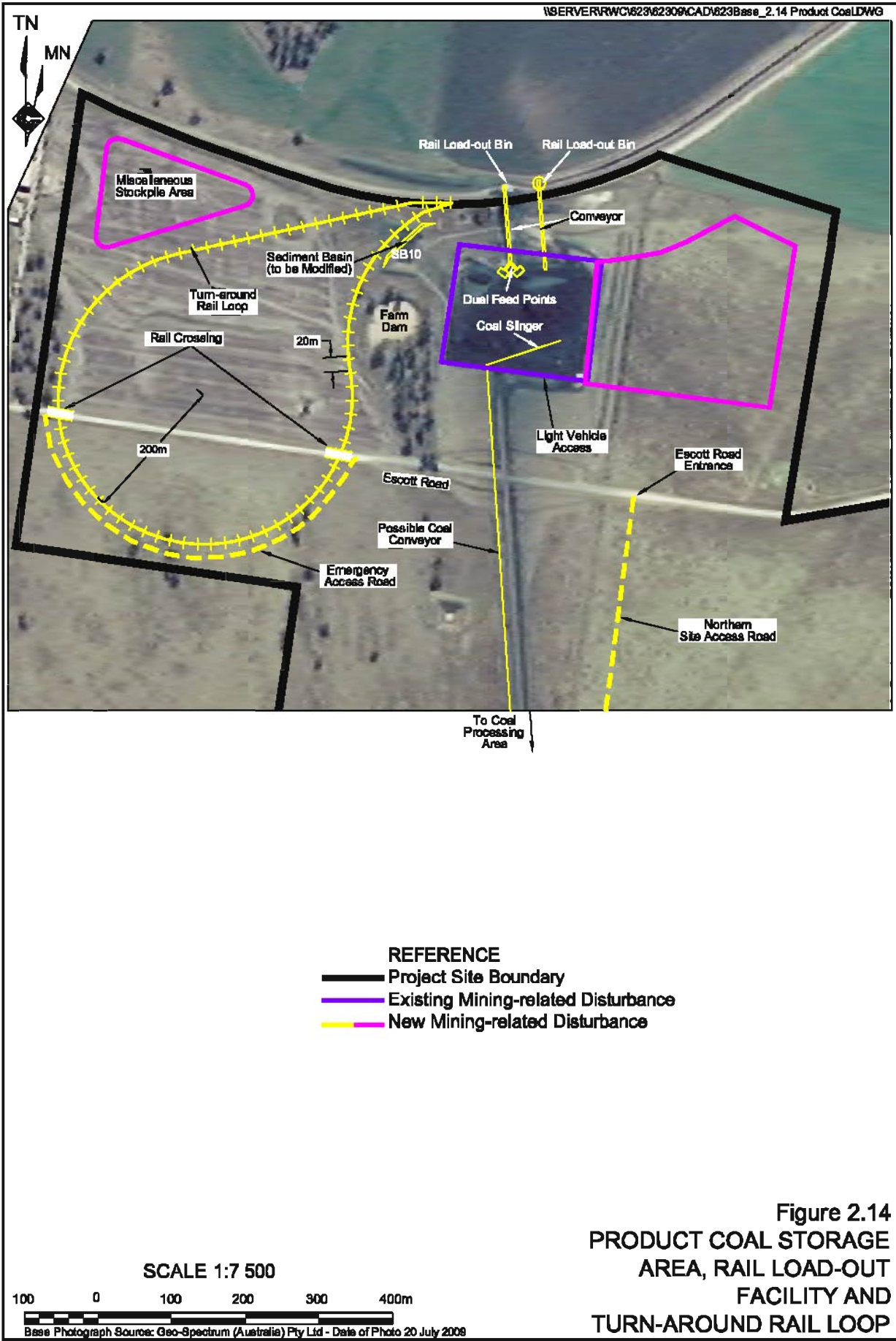
Within 2 years of project approval, the Proponent would relocate the Site Administration and Facilities Area to the north to enable the westerly construction of the out-of-pit overburden emplacement area and reduce the haul distance to the active open cut area. The layout of the buildings and facilities within the relocated Site Administration and Facilities Area would effectively replicate the arrangement of buildings and facilities within the existing Site Administration and Facilities Area.

### 2.7.8 Product Coal Storage Area, Rail Load-out Facility and Turn-around Rail Loop

The Product Coal Storage Area and Rail Load-out Facility would be retained, with some minor variations, at their current location adjacent to the Werris Creek rail siding. To facilitate the more efficient loading of trains, a turn-around rail loop would be constructed taking off from the rail siding immediately west of the Rail Load-out Facility. **Figure 2.14** presents the layout of the modified layout Product Coal Storage Area, Rail Load-out Facility and turn-around rail loop. The layout includes the conveyor and coal slinger arrangement which may be constructed (subject to a further economic feasibility study).







## Product Coal Storage Area

Stockpiles (up to 15m high) of five coal products would be maintained on the Product Coal Storage Area, namely:

- S.A.I.L. coal (a smaller sized coal product);
- low ash;
- high ash;
- high-high ash; and
- nut coal (30-50mm) for domestic markets.

To facilitate the storage of up to 250 000t of product coal within the Product Coal Storage Area, the hardstand pad would be extended by approximately 2.0ha to the east. The Product Coal Storage Area would remain set back at least 100m from the rail siding, thereby avoiding disturbance of the existing drainage line which runs approximately east-west between the Product Coal Storage Area and the rail siding. Trees would be planted around the perimeter of the extended area which would reduce the visual impact and assist in dust control in the medium to longer term.

All surface runoff from within the Product Coal Storage Area would be directed to an existing sediment basin positioned in the northwestern corner of the area using built-up embankments (see **Figure 2.14**). The sediment basin, which would be slightly modified to allow for the construction of the turn-around rail loop, would be regularly inspected and cleaned out when required. Overflow from the sediment basin would naturally flow to SB10 (a licensed discharge point of the Werris Creek Coal Mine) within the Product Coal Storage Area with any further overflow to the natural drainage line from this dam.

## Rail Load-out Facility

The Rail Load-out Facility, currently comprises:

- a coal loading hopper;
- an enclosed conveyor belt;
- a conveyor drive; and
- a 1 000t capacity train loading bin.

DA 172-7-2004 also approves the construction of a second train loading bin and conveyor which has yet to be constructed (see **Figure 2.14**).

Currently, all coal products are loaded to the train loading bin via a single coal loading hopper which has the potential to result in low ash products being diluted/contaminated by the remains of higher ash products previously fed into the hopper. To reduce the occurrence / potential for product contamination, the Proponent proposes to install a second coal loading hopper to the main conveyor. This would allow for low ash and S.A.I.L. coal to be loaded via the new hopper and the higher ash coal to be loaded via the existing hopper.

### Turn-around Rail Loop

A rail loop of approximately 1.6km in length would be constructed off the Werris Creek Rail Siding to the immediate west of the Rail Load-out Facility. The loop would incorporate the minimum required curve radius (200m) and straight (20m). The loop would allow for the about facing of trains without the need to shunt and move locomotives from front to rear and vice versa to load trains. Additionally new generation coal wagons can only allow unloading from one side at the Port of Newcastle, therefore the trains need to be turned rather than reversed which is currently the case.

## 2.8 SERVICES

### 2.8.1 Potable and Ablutions Water Requirements

Potable water, i.e. water for drinking purposes, would be transported from Werris Creek to supplement water sourced from rainwater collected from the Project Site buildings and stored in rainwater tanks. Potable water would be used solely for drinking and based on the current water requirements, it is expected that between 100kL and 120kL would be required each year.

### 2.8.2 Operational Water Requirements

Based on experience at Werris Creek Coal Mine, the Proponent estimates the annual dust suppression water requirements would be as follows.

- Internal roads and exposed areas  
(including roads under construction)-160ML
- Crushing and screening operations @ 0.75L/t processed -2ML
- Processing plant and Rail Load-out Facility hardstand and stockpiles-30ML

Operational water requirements would be sourced preferentially as follows.

- a) Void water and in-pit rainfall runoff stored in the groundwater storage cells and void water dams.
- b) “Dirty” run-off collected within the Project Site sediment basins.
- c) “Clean” water harvested from clean water storages on the Project Site.

### 2.8.3 Electricity

On-site power is currently supplied via a branch line from the existing line which services the Zeolite Australia Pty Ltd processing plant. Based on current power usage, it is anticipated that 1.700GWh would be drawn from the grid each year (based on an average production rate of 2Mtpa). This consumption would increase to approximately 2.1GWh should production increase to 2.5Mtpa.

As the infrastructure requiring power is relocated, additional take-off points, lines or power poles would be installed.

### 2.8.4 Communications

Off-site and on-site communications would be by a combination of the existing phone line to the Site Administration and Facilities Area, mobile communications and 2-way radio.



### 2.8.5 Sewage

Sewage treatment would be undertaken by a septic sewage treatment system approved by Liverpool Plains Shire Council. As is the current practice, effluent is drained via a rubble drain onto a licensed utilisation area on the “Eurunderee” property. The sewage treatment system would be serviced by a waste collection and disposal contractor to remove solid waste (currently every 2 years).

### 2.8.6 Fuel

Fuel storage and refuelling facilities comprising of 2 x 60 000L self-bunded fuel tanks and a refuelling bay would be relocated within the Site Administration and Facilities Area. Although the majority of mobile equipment would utilise this facility, a mobile fuel service truck would be used to service less-mobile equipment within the open cut mine.

Based on experience to date, it is estimated that the various on-site components of the LOM Project would use the following quantities of diesel fuel annually (based on an average production rate of 2Mtpa).

- Mining activities, including on-site power generation via the use of portable gensets and lighting plants, and coal product transportation (to the Rail Load-out Facility (18 700kL<sup>2</sup>).

Annual off-site project-related fuel usage would include:

- rail transportation to the Port of Newcastle (3 900kL<sup>2</sup>);
- road transportation to domestic markets (209kL<sup>2</sup>); and
- private vehicles and deliveries (minor).

In total, the LOM Project will consume approximately 16 500kL of fuel annually.

### 2.8.7 Explosives

#### 2.8.7.1 Bulk Explosives

The current location of the explosives magazine on the Project Site falls within the footprint of LOM Project open cut area. The magazine, which would continue to provide storage for bulk explosives and detonators, would be relocated to the west of the Rail Load-out Road (see **Figure 2.15**).

#### 2.8.7.2 Explosives Precursors

The currently approved location of the precursor storage facility (for the storage and distribution of explosive precursors to service the blasting requirements of the Werris Creek Coal Mine) would have to be relocated to enable the westerly expansion of the out-of-pit overburden emplacement (see **Figure 2.15**). As with the existing precursor storage facility, the relocated facility would include:

- a 35t silo for ammonium nitrate prill (AN) storage;

---

<sup>2</sup> Based on review of consumption at production of 1.2Mtpa, and proportional increase to achieve production of 2.5Mtpa.



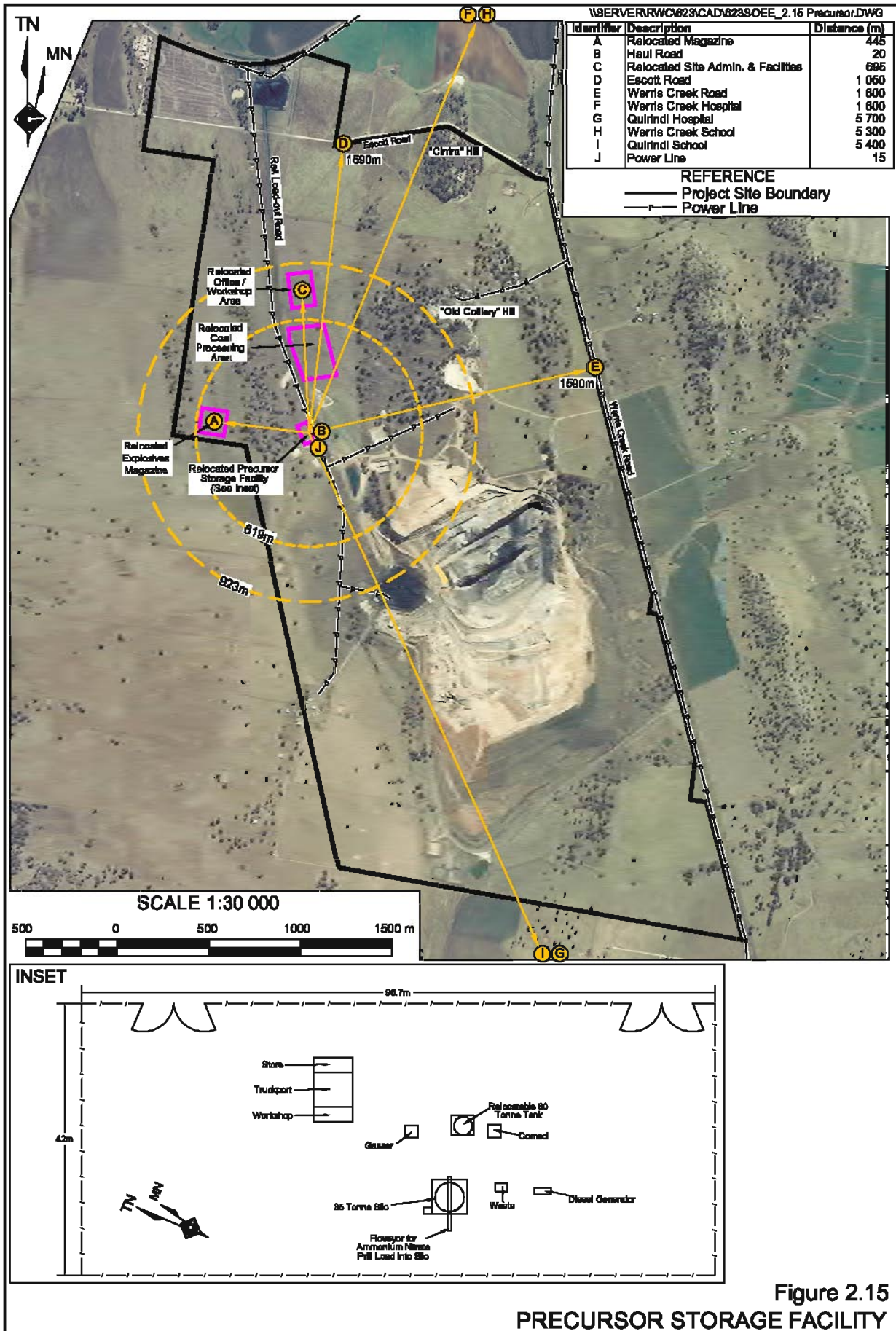


Figure 2.15  
PRECURSOR STORAGE FACILITY





- a relocatable vertical 80t ammonium nitrate emulsion (ANE) storage tank and electric drive pump;
- a gasser tank with 400L maximum capacity;
- Companion Solution (Comsol) tank with a 400L maximum capacity;
- A workshop and storage container with cover between; and
- a 65 KVA diesel generator for use within the plant.

**Figure 2.15** provides the indicative arrangement of these components of the precursor storage facility which would provide for:

1. appropriate separation distances from Protected Works<sup>3</sup>;
2. natural contours of the site; and
3. the movement of heavy vehicles.

The distribution of the precursor materials would be undertaken in accordance with current procedures, all of which were presented within the *Statement of Environmental Effects* prepared by the Proponent to accompany a modification to DA 172-7-2004 (WCC, 2009), which was approved by the Minister for Planning on 6 October 2009.

In summary:

- Orica-owned Mobile Manufacturing Units (MMUs) stationed at the site would be loaded with specified volumes of explosive precursors.
- The MMUs would transport the product to the blast site where the substances would be sensitized and discharged into the blast holes. The precursors are not classified as explosive until sensitized, i.e. mixed as blended following discharge into blast holes.

Prior to the commissioning of the precursor storage facility, the site security plan would be updated and submitted to WorkCover. The security plan would include procedures and systems to manage security risks including:

- theft, possible sabotage, or unexplained loss of explosives or precursors;
- unauthorised access to explosives or precursors; and
- establishment and maintenance of security perimeter fencing and lighting.

The security plan would demonstrate that explosives are stored in a supervised area, such as a secure store or site.

---

<sup>3</sup> Australian Standard 2187.1 – 1998 identifies two categories of protected works; land uses from which explosives (or explosive pre-cursors) should be adequately separated from, these are as follows:

1. Class A: Public street, road or thoroughfare, railway, navigable waterway, public recreation or sports ground or other place where the public is accustomed to assemble, open place of work in another occupancy, radio or television transmitter, main electrical substation, private road which is the principal means of access to a church, chapel, college, school, hospital or factory.
2. Class B: Dwelling house, public building, church chapel, college, school, hospital, theatre or other building or structure where the public is accustomed to assemble, shop, factory, warehouse, store, building in which any person is employed in any trade or business, depot for the keeping of flammable or dangerous goods, major dam.

The relocated precursor storage facility would be located approximately 1 600m from the nearest public road and would be accessed via the Rail Load-out Road. Access would also be created for the MMUs direct to the mining areas (blast location). Both the Rail Load-out Road and MMU access route(s) would be maintained as private access points and there would be no engagement with other traffic apart from mine site vehicles.

AN and ANE would continue to be transported to the precursor storage facility in bulk via the current route from the Orica manufacturing facility at Liddell, via the New England Highway. The proposed relocation of the precursor storage facility would not result in any additional loading of the public road network in terms of transport of bulk material.

The potential environmental risks posed by the facility have been reviewed and assessed in Section 4B.13.

## **2.9 TRANSPORTATION**

### **2.9.1 Introduction**

The majority of coal produced would continue to be sold to export markets and delivered via the Main Northern Railway Line from Werris Creek Coal Mine to the Port of Newcastle. An increased amount of coal (up to 100 000tpa) would be despatched by road to local markets and other domestic customers.

### **2.9.2 Coal Transportation by Rail**

#### **2.9.2.1 Transport to Coal Product Storage Area**

Between 5 000t and 7 000t of coal would be transported daily to the Product Coal Storage Area via the rail load-out road using (initially at least) road-registered semi-trailers. The trucks would carry an average of 30t per load, requiring between 160 and 230 loads per day. Based on cycle time of 15 minutes<sup>4</sup>, up to four trucks would be required in coal haulage activities, with a maximum of 32 truck movements occurring in any one hour.

Trucks carrying product coal would be permitted to travel at a maximum speed of 80km/hr along the rail load-out road on the Project Site. A requirement for trucks to travel at <20kph through the intersection with Escott Road, after giving way to any approaching traffic travelling along Escott Road, would be retained.

As noted in Section 2.7.6, the LOM Project includes as a component a conveyor between the relocated Coal Processing Area and the Rail Load-out Facility. This conveyor would replace the road haulage of coal, however, actual construction of the conveyor may be delayed as a viable economic case is made for the capital expenditure required.

#### **2.9.2.2 Transport from the Rail Load-out Facility**

Coal would continue to be loaded into train wagons via the Rail Load-out Facility on the Werris Creek Rail Siding off the Main Northern Railway Line. The coal would be loaded into the train loading bin by one of two coal loading hoppers (see Section 2.7.8) and conveyor.

---

<sup>4</sup> Notably, the majority of the truck cycle time would be taken by loading and unloading. As such, the reduced haul distance would have minimal effect on cycle time.



Currently and until the turn-around rail loop is constructed, the rail wagons would continue to be shunted from the Main Northern Railway Line onto the siding beyond the train loading bin and then be loaded from the overhead bin as they move forward and return towards the Main Northern Railway. Once on the main rail line, the locomotives would then relocate to the southern end of the train for the return journey to Newcastle. The largest train loaded by the Proponent would comprise of up to 72 wagons with a total capacity of 5 400t, taking up to approximately 2 hours to load. This system would be replaced with the turn-around loop described in Section 2.7.8, allowing for trains to be loaded with a minimum of shunting.

During loading periods, the bulldozers would operate continuously to keep the train loading bin near full. The Proponent anticipates a maximum of three trains would be despatched daily, 7 days per week (although on very rare occasions a fourth train may be loaded and despatched in one day). On average, 11 trains would be despatched each week.

In addition to the loading and despatch of coal from the Rail Load-out Facility, a small amount of coal would be loaded and despatched from the Project Site in 1 100t shipping containers bound for the Pacific Carbon facility at Newcastle. To satisfy maximum demand from Pacific Carbon, approximately 85 000t of coal (representing an average of 6 shipping container loads per month) would be loaded and despatched in this fashion. The remaining 95 000t of coal required by Pacific Carbon would be transported by road (see Section 2.9.3). In the event that Pacific Carbon requirements for coal increase, the additional quantity of coal would be transported by rail.

### **2.9.3 Coal Transportation by Road**

Domestic coal would be transported by road to local destinations including the Newcastle Pacific Carbon facility. The delivery of coal to these domestic markets would be by a range of truck configurations carrying an average of 30t. Based on the despatch of up to 100 000t of coal per year and an average truck capacity of 30t, it is anticipated that between 0 and 50 truck movements would occur daily (0 to 25 loads per day), averaging approximately 12 truck movements (6 loads) per day over 6 days per week throughout the life of the mine. **Figure 2.16** presents the road transport routes from the Project Site.

The majority of heavy vehicles would turn right onto Werris Creek Road and right again at Taylors Lane to the south of the Project Site. The trucks would travel west on Taylors Lane before joining the Kamilaroi Highway and either continuing south to the Newcastle Pacific Carbon facility (up to 95% of all road transport), or travel north towards Gunnedah. Domestic supplies destined for Tamworth or further north on the New England Highway would make their way through the town of Werris Creek.

Except under exceptional circumstances, e.g. in the event an emergency supply of coal is requested by a domestic customer, the despatch of coal carrying trucks from the Project Site would be restricted to 7:00am to 6:00pm Monday to Friday and 7:00am to 2:00pm Saturday.

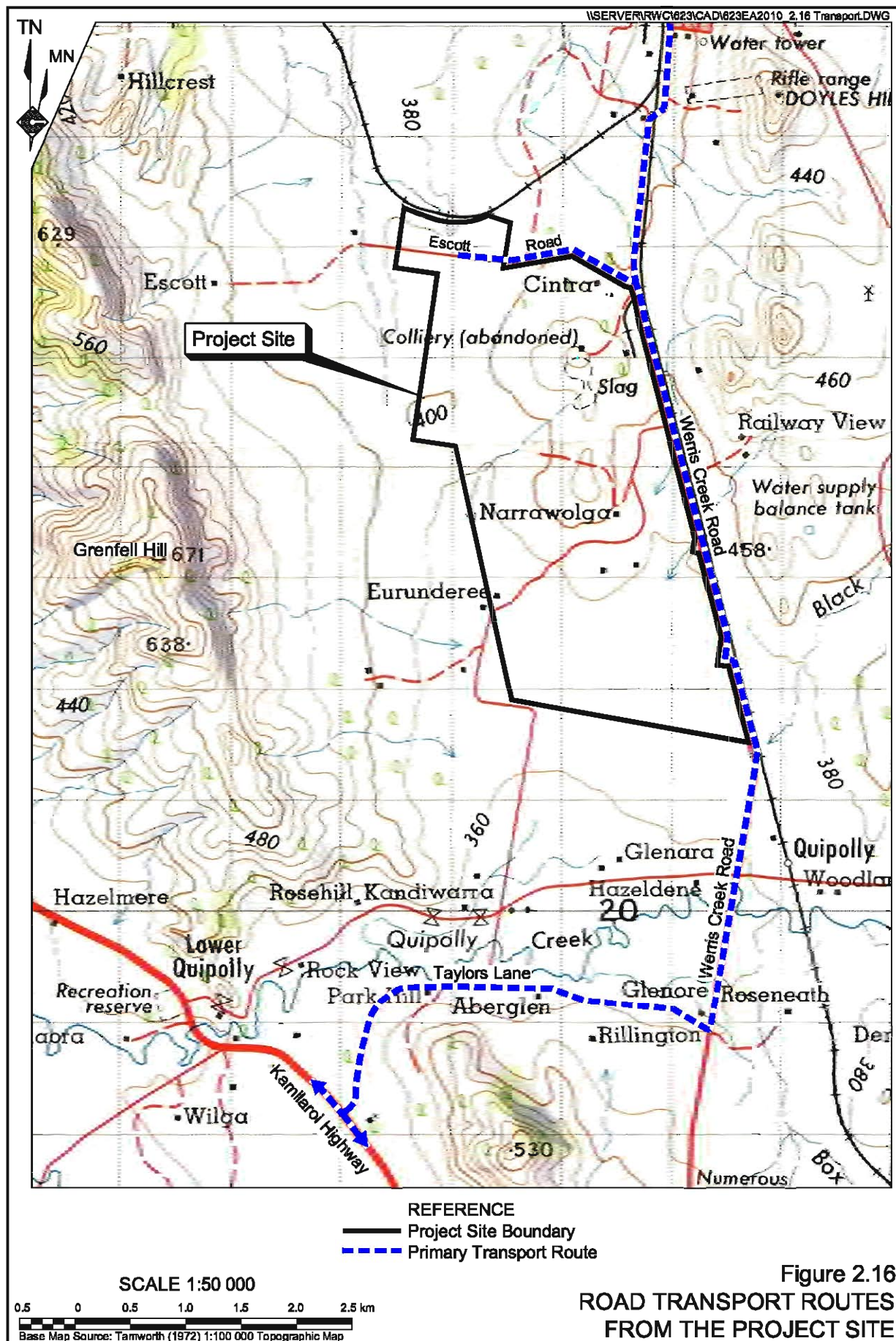
## **2.10 WASTE MANAGEMENT**

### **2.10.1 Nature of Wastes**

The principal wastes that would be generated by the LOM Project can be categorised as non-production and production wastes.







Non-production wastes would include:

- general domestic-type wastes from the on-site buildings and routine maintenance consumables;
- oils and grease; and
- sewage.

Production wastes would comprise of:

- overburden and interburden from the development of the open cut mine; and
- potentially contaminated water from the heavy equipment maintenance facility, washdown pad and fuel farm.

## **2.10.2 Management of Non-production Wastes**

### **2.10.2.1 Domestic-type Wastes and Routine Maintenance Consumables**

All general wastes originating from the site office, amenities and ablutions buildings, together with routine maintenance consumables from the daily servicing of equipment such as grease cartridges, would be disposed of in 240L or similar mobile garbage bins located adjacent to the various buildings. These bins would generally be collected daily and the contents placed in large waste storage receptacles or dumpsters positioned adjacent to the heavy vehicle maintenance building to await removal by a licensed industrial waste collection contractor. Industrial waste collection would be undertaken fortnightly or more frequently, if required.

A separate collection system would be adopted for paper and cardboard to enable these to be recycled. These and other recyclables such as ferrous and non-ferrous metals, plastics and glass would be despatched off site at appropriate intervals.

#### **2.10.2.2 Oils and Grease**

Routine maintenance of mining and earthmoving equipment would generally be undertaken in the workshop building within the Site Administration and Facilities Area, or at equipment maintenance facilities away from the mine. Within the workshop building, waste oils and grease would be collected and pumped to bulk storage tanks by oil evacuation pumps. Emergency or breakdown maintenance of equipment may also be necessary within the open cut area or on the overburden emplacement. Under these circumstances, oils and grease would be pumped from this equipment to a tank on the service vehicle using an evacuation pump and then transferred to the bulk storage tank at the workshop building. All parts and packaging used in emergency or breakdown maintenance would be collected and transferred to the workshop building for disposal or recycling.

Waste oils and grease would be stored in a bunded area at the workshop building and be collected by a licensed waste contractor approximately once every two months for recycling.

#### **2.10.2.3 Sewage**

The Proponent would maintain adequate toilet and hand-washing facilities within the Site Administration and Facilities Area for the site workforce and visitors. As noted in Section 2.8.5, effluent would be drained onto a licensed utilisation area on the "Eurunderee" property, with solid waste collected and disposed of by a licensed waste collection and disposal contractor as required.



### 2.10.3 Production Waste

Management of overburden and interburden has previously been described in Section 2.5.5. The management of water contaminated by hydrocarbons is described in Section 4B.12.4.4.

## 2.11 HOURS OF OPERATION AND MINE LIFE

### 2.11.1 Hours of Operation

It is proposed to establish the Werris Creek Coal Mine as a 24 hour, seven day week operation as part of the LOM Project. The only exceptions to the proposed 24 hour operations would be:

- blasting: which would be restricted to between 9.00am and 5.00pm, Monday to Friday; and
- road transport of coal haulage: with the despatch of coal carrying trucks from the Project Site would be restricted to 7:00am to 6:00pm Monday to Friday and 7:00am to 2:00pm Saturday.

The Proponent notes that activities such as vegetation clearing, soil stripping and rehabilitation would generally be undertaken during daylight hours.

### 2.11.2 Mine Life

Based on the ROM coal quantities identified in **Table 2.10** and an average production rate of 2Mtpa, the LOM Project would extend the life of the Werris Creek Coal Mine by approximately 15 to 20 years. The estimated mine life is, however, based on the current world coal price and demand, both of which are factors beyond the Proponent's control.

## 2.12 EMPLOYMENT

### 2.12.1 Construction

Infrastructure modification, relocation and construction activities would require a temporary workforce to be employed for the period of each activity. Construction contracts would generally be issued on a tender basis, with preference given to suitably experienced local/regional contractors, where economically viable.

For the initial 1 to 2 years of the LOM Project, it is anticipated that a construction workforce of between 5 and 20 full-time equivalent persons would be employed.

### 2.12.2 Operations

Werris Creek Coal Mine currently provides employment for approximately 80 full-time equivalent personnel. At any given time, there are likely to be an additional 5 to 10 persons employed on a casual basis.

It is anticipated that an additional 10 full-time personnel would be required should the LOM Project be approved.



## 2.13 SAFETY/SECURITY MANAGEMENT

### 2.13.1 Introduction

The Proponent recognises that the proximity and visibility of the proposed Werris Creek Coal Mine from the Werris Creek Road, Escott Road, areas of the town of Werris Creek and adjacent rural properties would necessitate the implementation of procedures and controls to protect the safety of the public in general, as well as local landowners and land users. Measures would also be required to ensure the security of the mine facilities and equipment from unauthorised access or use by visitors to the mine, contractors or employees.

It is the Proponent's policy that each person employed on or visiting the Project Site is provided with a safe and healthy working environment and, to achieve this, proposes to implement a recruitment, induction and training program to achieve the following objectives.

- To ensure compliance with statutory regulations and maintain constant awareness of new and changing regulations.
- To eliminate or control safety and health hazards in the working environment in order to achieve the highest possible standards for occupational safety in the mining industry.
- To ensure the suitability of prospective employees to appropriate employment through a structured recruitment procedure.
- To provide relevant occupational health and safety information and training to all personnel.
- To develop and constantly review safe working practices and job training.
- To conduct regular safety meetings and provide an open forum for input from all employees.
- To provide effective emergency arrangements for all employees, and general public protection.
- To maintain good morale and safety awareness through regular employee assessment and counseling (if required).
- To ensure all contractors adopt the Proponent's policy objectives and maintain safety standards at all times while working on its facilities.
- To develop public awareness of the safety standards and objectives at the Werris Creek Coal Mine.

Central to all aspects of site security and safety at the Werris Creek Coal Mine would be:

- the adoption of a pro-active approach to employee and public safety;
- strict compliance at all times with the requirements of the:
  - Coal Mine Health and Safety Act 2002;
  - (a) Coal Mine Health and Safety Regulation 2006;
  - (b) Dangerous Goods Act 1975;
  - (c) Occupational Health and Safety Act 2000 (and Regulation 2001);
  - (d) all other relevant legislation and Australian Standards;



- (e) WorkCover Authority; and
- (f) I&I NSW - Mineral Resources.
- the prioritisation given to addressing any safety issues identified by an Inspector or Mine Safety Officer or authorised government official (as specified in the *Coal Mine Health and Safety Act 2002*); and
- maintaining an Occupational Health and Safety Policy to cover all component activities at the mine.

The Proponent is required under the *Coal Mine Health and Safety Act 2002*, to develop and implement a Health and Safety Management System and a Major Hazard Management Plan for the Werris Creek Coal Mine.

### 2.13.2 Safety/Security Measures

The Proponent would implement the following measures in association with the development of the LOM Project.

- Erection and/or the maintenance of minimum 1.2m high stock fencing around the areas of activity within the Project Site.
- Maintenance of a lockable gate at the junction of the existing mine access road and the Werris Creek Road. The gate would be locked, with access restricted to mine personnel following the establishment of the new site entrance off Escott Road.
- Signs identifying blasting procedures and times would be installed.
- Employee induction in safe working practices and regular follow-up safety meetings and reviews.
- Installation of bunds along the margins of all internal haul roads to a height of half the wheel height of the largest mobile equipment on site.
- Implementation of appropriate controls with respect to the use of explosives to ensure compliance with statutory requirements at all times.
- Ensure all earthmoving equipment complies with the Mine Mechanical Engineers Minimum Requirements for Mechanical Apparatus and is fitted with appropriate safety equipment, e.g. rollover protection structures and seatbelts, an operating reversing alarm (or other approved warning device) and an approved location and method of operation for the fire suppression system, which would be maintained in a good condition and operated safely at all times.
- Ensure all size reduction and screening equipment at all times complies with all relevant requirements and standards.
- Strictly complying with all mining lease, project approval and licence conditions.
- Ensure all trucks transporting product coal from the mine, both to the Rail Load-out Facility and domestic customers, are roadworthy, well maintained and are driven in a safe and courteous manner.



## **2.14 REHABILITATION**

### **2.14.1 Introduction**

The Proponent would continue to implement a progressive approach to the rehabilitation of disturbed areas at the mine to ensure that, where practicable, areas where mining or overburden placement are completed, are quickly shaped and vegetated to provide a stable landform. The progressive formation of the post-mining landform and the establishment of a vegetative cover would also minimise the visibility of mine-related activities from surrounding properties and from the Werris Creek Road and the town of Werris Creek.

The LOM Project would require modification to the currently approved final landform (to account for the extension to the open cut and out-of-pit overburden emplacement), however, the proposed rehabilitation procedures would remain consistent with those currently implemented at the mine.

The following sub-sections:

- outline the rehabilitation objectives of the Proponent with respect to the rehabilitation of the Project Site (Section 2.14.2);
- provide an overview of the strategic management of rehabilitation, which includes the categorisation of rehabilitation domains, establishment of a rehabilitation hierarchy, and establishment of completion criteria, performance indicators and monitoring programs (Section 2.14.3);
- describe the proposed final land use and landform (Sections 2.14.4 and 2.14.5);
- describe the procedures to be applied to each component of the mine, water management structures and other areas of disturbance associated with the mining and coal processing operations (Section 2.14.6);
- describe the proposed rehabilitation maintenance procedures, post-mining management and noxious weed management (Sections 2.14.7 and 2.14.8); and
- describe the proposed LOM Project Biodiversity Offset Strategy (Section 2.14.9).

### **2.14.2 Objectives**

The Proponent's rehabilitation objectives remain unchanged from those of the approved operations by maintaining a progressive approach to the rehabilitation of disturbed areas within the Project Site. Particular emphasis would be placed on the re-establishment of native woodland vegetation, specifically the White Box Yellow Box Blakely's Red Gum (Box Gum) Woodland ecological community which has been identified on the Project Site as an endangered ecological community. The restoration of this woodland community would compensate for those areas disturbed by the mine development, link currently isolated remnant pockets of this community, and provide a greater area and more diverse native fauna habitat and wildlife corridors.

The Proponent's rehabilitation objectives are divided into three specific categories, namely:

- integrating landscapes;
- achieving sustainable growth and development; and
- establishing the final land use.



The specific objectives associated with each category are as follows.

### **Integrated Landscapes**

- To provide an ecological community corridor across the Proponent's land holdings and the Quipolly Creek Catchment linking with sub-regional habitat corridors.
- To reduce the visibility of mine-related activities from adjacent properties, Werris Creek and the local road network.
- To blend the created landforms with the surrounding topography.
- To provide a low maintenance, geotechnically stable and safe landform with minimal erosion.

### **Sustainable Growth and Development**

- To achieve a soil profile capable of sustaining the specified final land use.
- To establish native vegetation with the species diversity commensurate to each relevant ecological community.

### **Final Land Use**

- To re-instate Class III Land Capability commensurate with the agricultural land use on and around the Project Site.
- To re-instate woodland ecological communities commensurate with the remnant woodland vegetation disturbed by LOM Project activities.
- Undertake habitat augmentation to improve and promote corridors for fauna movement linking adjacent remnant woodland vegetation with the rehabilitation of the Project Site.

## **2.14.3 Strategic Rehabilitation Management**

### **2.14.3.1 Rehabilitation Domains**

**Figure 2.17** illustrates the indicative rehabilitation domains. Domains have been identified based on processes and use prior to rehabilitation. A description of each domain is given below.

#### **Domain 1 – Infrastructure Areas (D1)**

This domain would include the Administration and Workshop Area, the Coal Processing Area, the Rail Load-out Facility, the Product and ROM Coal Storage Areas, the Explosives Magazine, the Precursor Storage Facility, the Northern Site Access Road and any other miscellaneous buildings or roads (excluding haul roads).

#### **Domain 2 – Water Management Infrastructure (D2)**

This domain includes all clean and dirty water dams, diversion drains and associated infrastructure.

#### **Domain 3 – Overburden Emplacement Areas (D3)**

This domain would include all overburden emplacement areas both in-pit and out-of-pit, including the Acoustic and Visual Amenity Bund and soil stockpile locations.





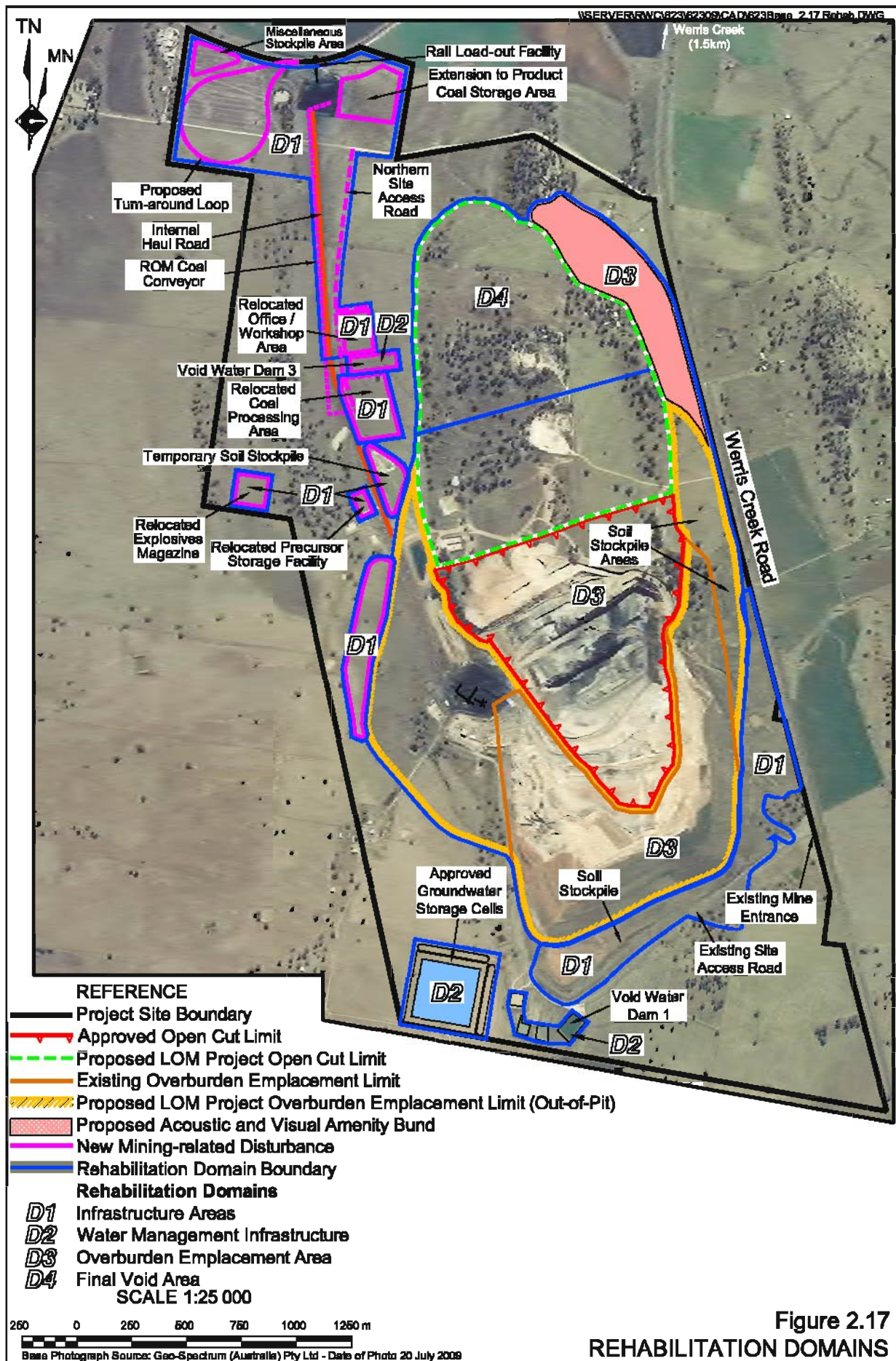


Figure 2.17  
REHABILITATION DOMAINS



## Domain 4 – Final Void Area (D4)

The final void area would include the post mining void, low wall, highwall and any associated access.

The rehabilitation objectives described in Section 2.14.2 relate to all rehabilitation domains with the exception of the re-instatement on Class III land capability, which only relates to part of Domain 1 – Infrastructure Areas.

### 2.14.3.2 Rehabilitation Hierarchy

The rehabilitation hierarchy for the LOM Project follows a modified rehabilitation hierarchy based on I&I NSW's model but is aligned to the rehabilitation objectives in Section 2.14.2 and as outlined in the *Landscape Management Plan* (AECOM 2010). A summary of each phase of the rehabilitation hierarchy based on AECOM (2010) is as follows.

#### Decommissioning

Decommissioning is not specifically covered in AECOM (2010), as only a small percentage of land is disturbed by infrastructure. Specific details of decommissioning completion criteria would be covered in the *Mine Closure Plan*. In general, the decommissioning phase of the rehabilitation hierarchy involves the cessation of usage of infrastructure, as well as its demolition, removal and any remediation of the land that may be required. Specific decommissioning activities that relate to completion criteria at this stage in the rehabilitation hierarchy are outlined in Section 2.14.6.2.

#### Integrated Landscapes

The integrated landscapes phase of the rehabilitation hierarchy (similar to the Landform Establishment phase under I&I NSW's guidelines) involves the earthworks required to cover and/or profile all or part of each domain to create a landform suitable for the proposed final land use and which blends with the adjacent topography. This stage would also include the construction of any drainage structures needed for the area. Specific procedures relating to landform establishment that relate to completion criteria at this stage of the rehabilitation hierarchy are outlined in Section 2.14.6.

#### Sustainable Growth and Development

Specific procedures relating to sustainable growth and development that relate to completion criteria at this stage of the rehabilitation hierarchy are outlined in Section 2.14.6. The sustainable growth and development phase (similar to I&I NSW Growth Media Development phase) of the rehabilitation hierarchy involves the emplacement of soil on the area and preparation of the soil for revegetation including fertiliser or ameliorant application and ripping or scarifying the soil. It also covers (similar to I&I NSW Ecosystem Establishment phase) the revegetating of the rehabilitated landform and biodiversity offset areas with native species commensurate with the targeted final land use.

#### Final Land Use

The final land use phase (similar to I&I NSW Ecosystem Development phase) of the rehabilitation hierarchy occurs once monitoring shows that there is adequate vegetation over the area. An area may be in this stage for a long period of time, depending on what the final land use outcome is. During this stage, the area would continue to be monitored and would not reach its nominated sustainable end land use until monitoring determines that the completion criteria summarised in **Table 2.12** have been met.



**Table 2.12**  
**Strategic Rehabilitation Completion Criteria, Associated Performance Indicators and Monitoring Strategy**

Page 1 of 2

Rehabilitation Objective	Completion Criteria	Performance Indicator	Monitoring Strategy
Integrated Landscapes	The landform morphology fits in with the surrounding landscape.	Slopes are at or less than 10° for out-of-pit emplacement area and less than 18° for final void.	<i>Annual Rehabilitation Plan</i> prepared by mine surveyors.
	The rehabilitated area does not represent an erosion hazard.	Erosion does not exceed 0.3m (gully) deep.	Quarterly visual inspection by Environmental Officer.
Sustainable Growth Development – Woodland Ecological Community	Appropriate native plant species richness is present for the restored ecological community.	Native plant species numbers (per 400m <sup>2</sup> ) approximate: <ul style="list-style-type: none"> <li>Box Gum Woodland ≥15</li> <li>Other Woodland ≥20</li> <li>Brigalow Woodland ≥5 (including <i>Acacia harpophylla</i>)</li> <li>Derived Native Grassland ≥15</li> </ul>	Vegetation monitoring (EFA score) by ecologist to determine native plant species richness.
	Appropriate density/structure of native overstorey species is present.	Over Storey cover range between: <ul style="list-style-type: none"> <li>Box Gum Woodland: 0-25%</li> <li>Other Woodland: 6-40%</li> <li>Brigalow Woodland: 0-25%</li> </ul>	Vegetation monitoring (EFA score) by ecologist to determine over storey structure.
	Appropriate density/structure of native mid storey species is present.	Mid Storey cover range between: <ul style="list-style-type: none"> <li>Box Gum Woodland: 0-5%</li> <li>Other Woodland: 6-25%</li> <li>Brigalow Woodland: 0-5%</li> </ul>	Vegetation monitoring (EFA score) by ecologist to determine mid storey structure.
	Appropriate native groundcover is present.	Bare ground and litter does not exceed: <ul style="list-style-type: none"> <li>Box Gum Woodland: 55%</li> <li>Other Woodland: 55%</li> <li>Brigalow Woodland: 65%</li> <li>Derived Native Grassland: 50%</li> </ul>	Vegetation monitoring (EFA score) by ecologist to determine native plant species richness.
Sustainable Growth Development – Agricultural Land	The existing pasture/crop meets the required land capability class.	Land capability for pasture achieves at least Class III Land Capability.	Land capability assessment by an Agronomist.
Land Use	The area and its sustainability is consistent with the intended land use.	Establish areas of rehabilitation consistent approval conditions. Land use classifications to include: <ul style="list-style-type: none"> <li>Rehabilitation of Box Gum Woodland and Derived Native Grassland.</li> <li>Rehabilitation of Brigalow Woodland.</li> <li>Agricultural land.</li> <li>Biodiversity Offset Area.</li> </ul>	<i>Annual Rehabilitation Plan</i> to quantify areas. <i>Biodiversity Offset Management Plan</i> to be audited every 3 years. Biennial land capability assessment by an agronomist for Class III land.

**Table 2.12 (Cont'd)**  
**Strategic Rehabilitation Completion Criteria, Associated Performance Indicators**  
**and Monitoring Strategy**

Page 2 of 2

Rehabilitation Objective	Completion Criteria	Performance Indicator	Monitoring Strategy
Land Use (Cont'd)	There are no potential hazards that are not consistent with the intended land use.	The site is free of safety or environmental hazards including: <ul style="list-style-type: none"> <li>holes, tunnels or unstable areas;</li> <li>mining infrastructure or debris; or</li> <li>hazardous materials.</li> </ul>	Quarterly visual inspection by Environmental Officer.
	The soil pH is representative of the intended land use.	pH levels are within the range generally acceptable for plant growth (5.0 to 8.5) until data from analogue sites is available.	Annual soil analyses by Environmental Officer.
	Exotic weeds or vegetation is not competing or impacting on the intended land use.	Noxious weeds are not present within rehabilitation or biodiversity offset areas until data from analogue sites is available.	Quarterly visual inspection by Environmental Officer.
	Feral pests are not impacting on the intended land use.	Feral pests are not present within rehabilitation or biodiversity offset areas until data from analogue sites is available.	Quarterly visual inspection by Environmental Officer.

Source: Adapted from Table 13, AECOM (2010).

### 2.14.3.3 Strategic Rehabilitation Completion Criteria, Associated Performance Indicators and Monitoring Strategy

The strategic rehabilitation completion criteria, associated performance indicators and monitoring strategy for the Project are summarised in **Table 2.12**. While the rehabilitation criteria are based on the I&I NSW model, it has been modified to align with the rehabilitation objectives outlined in Section 2.14.2 and the rehabilitation hierarchy discussed in 2.14.3.2. As discussed in AECOM (2010), the rehabilitation criteria aim to achieve the following.

- The ongoing refinement of completion criteria and monitoring programs that would facilitate lease relinquishment following mine closure.
- Alignment with rehabilitation and biodiversity offset area objectives.
- The facilitation of continuous improvement in restoration management practices of the rehabilitation and biodiversity offset areas.

Specific rehabilitation criteria and a monitoring program would be outlined in a relevant management plan to be submitted and approved after project approval. The rehabilitation criteria would be continually refined through monitoring and revised through a relevant updated management plan to be approved by DoP and I&I NSW.

The rehabilitation monitoring strategy for the Project would generally be in accordance with the current monitoring program. The objective of the monitoring program would be to evaluate the restoration progress of the mine rehabilitation towards fulfilling ecological community land use objectives and closure criteria (AECOM, 2010). The purpose of monitoring activities would be to ensure the sustainable re-colonisation and ongoing management of native flora and fauna, and to guide continual improvement of rehabilitation practises (AECOM, 2010).



#### 2.14.4 Final Land Use

The Proponent currently envisages two principal uses of the rehabilitated landform following successful vegetation establishment (see **Figure 2.18**).

- i) Re-establishing the following woodland ecological communities.
  - Box Gum Woodland and Derived Native Grassland (EEC equivalent).
  - Brigalow-Belah Woodland (EEC equivalent).
  - Shrubby White Box Woodland.
- ii) Class III capable agricultural land.

The post-mining land use has been assigned considering the pre-mining land use(s), the pre-mining capability class of the land, the soils available and the final landform created. For example, over the footprint of the Rail Load-out Facility and Product Coal Storage Area of the mine, 37ha of Class III land has been identified. This area has been chosen for the re-establishment of land capable of maintaining agricultural activities, in preference to the upper terrace of the overburden emplacement, so as not to isolate this land from the surrounding agricultural lands. The upper terrace of the overburden emplacement would be surrounded on all sides by native vegetation to be incorporated into the LOM Project *Biodiversity Offset Strategy* (see Section 2.14.9) which would limit accessibility of this land and therefore viability as agricultural land. The proposed location of the agricultural land would also directly link with other agricultural land on the "Cintra" property which is expected to continue grazing and cropping operations over the life of the mine and into the future. The entire footprint of the open cut and overburden emplacement would be used to establish ecological communities.

The allocation of final land use reflects the fact that while the majority of the pre-mining land use was for agriculture, much of the land over the coal measures was of lower land capability and would be more appropriate as native vegetation.

The benefits of the proposed final land use for the subsequent landowner, local community and the State are as follows.

- More land would be returned to native vegetation than currently exists, therefore improving local biodiversity and improving links through corridors with other remnant vegetation.
- The re-establishment of threatened ecological communities assists in protecting and enhancing the existing threatened ecological communities in the area.
- The location for the establishment of land capable of maintaining agricultural activities would directly link with other agricultural land which enhances the accessibility and viability of this land.
- The establishment of the majority of the land for ecological communities ensures that the land could also be used for recreational purposes. This would result in the land being potentially more accessible to the local community than if it was re-established back for agricultural purposes.

#### 2.14.5 Final Landform

**Figure 2.18** presents the conceptual final landform for the LOM mine area. **Figure 2.19** presents representative cross sections across the final landform. The principal features of the final landform, as presented on **Figure 2.18**, are as follows.

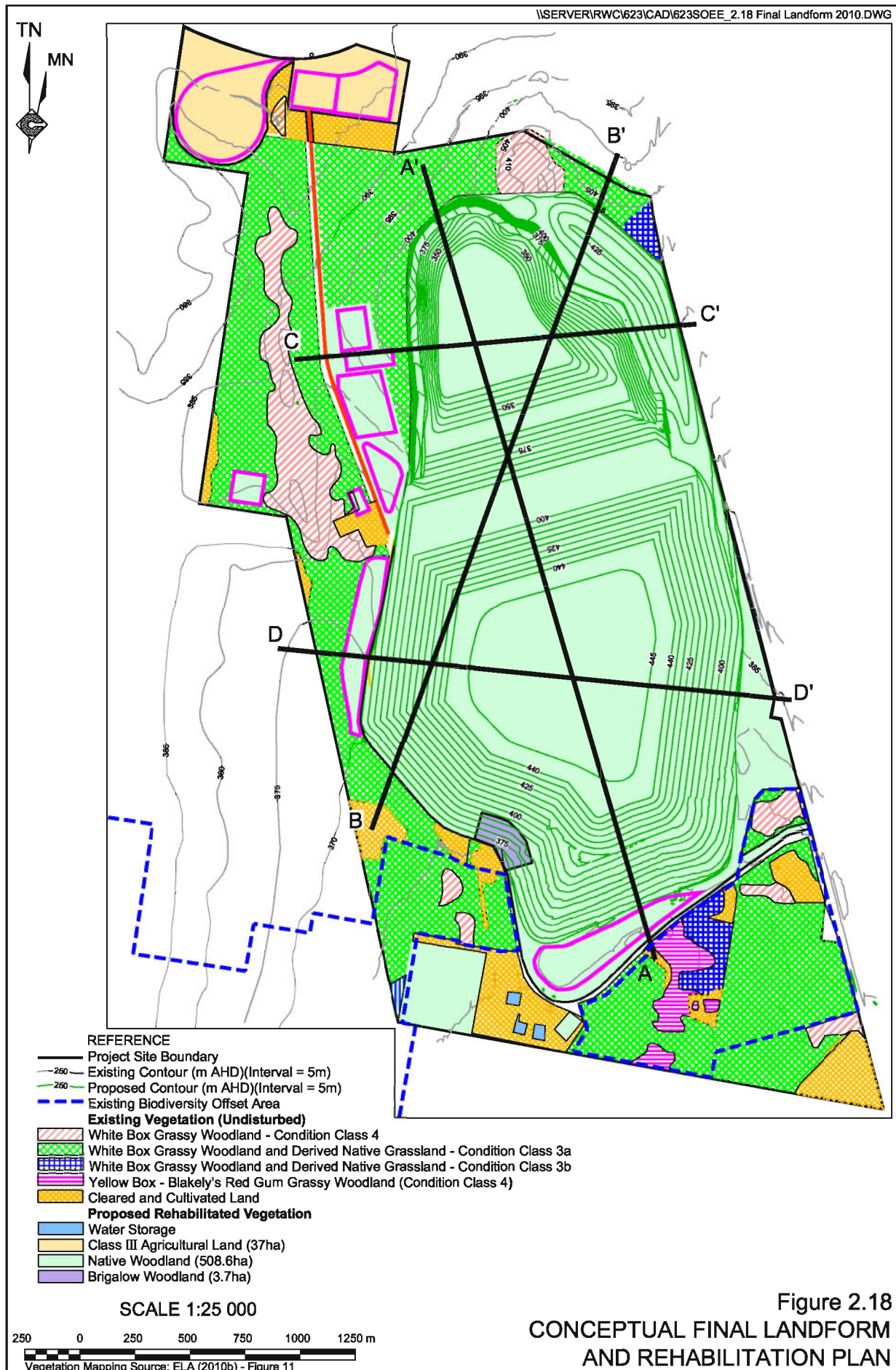
- A hill rising to 445m AHD would be created over the location of the localised hillocks and swales which existed in the pre-mining environment at a similar elevation to that of “Old Colliery” Hill. The upper surface of the hill would be generally flat, however, would be shaped with minor rises and swales to create an undulating terrain. Slopes around the constructed plateau would be approximately 10° or shallower.
- A woodland ecological community with similar traits to those of the EECs identified on the Project Site would be established on the rehabilitated landform on the gentler slopes of the overburden emplacement area. Steeper slopes of the rehabilitated landform (including the final void) would be established with a woodland ecological community commensurate to a native shrubby open forest consisting of species amenable to steeper slopes.
- The creation of a ridge between the “Cintra” Hill and the overburden emplacement around the northwestern perimeter of the open cut area would be created through the retention of the Acoustic and Visual Amenity Bund and the partial backfilling of the void to the point of equilibrium to avoid groundwater inflows. This would be profiled to appear as a natural extension to the southeast of the “Cintra” Hill.
- The rehabilitation concept for the final landform for the LOM Project differs from the concept that is currently approved in that the flat surfaces on the top of the hill would no longer be rehabilitated back to a Land Capability Class III suitable for agriculture. Instead the Class III agricultural land has been moved to the footprint of the Rail Load-out Facility and Product Coal Storage Area.

The final landform has been designed to re-establish the final land uses of Class III Land Capability / Class 2 Agricultural Suitability land linking with adjacent existing agricultural land use areas, while separate to but adjoining woodland ecological communities that are common in many rural situations across the NSW Wheat Belt (see Section 2.14.5).

The final landform would also incorporate a series of contour banks. As is the current practice, the banks would be constructed on both the elevated (plateau) and depressed (final void) sections of the final landform. The spacing and ultimate dimensions of these structures would be a function of the final slopes and catchment areas and would be determined at the time of installation. Contour bank spacing would be constructed in accordance with standard requirements for the construction of low flow contour banks provided by Landcom (2004) and DECC (2008e).







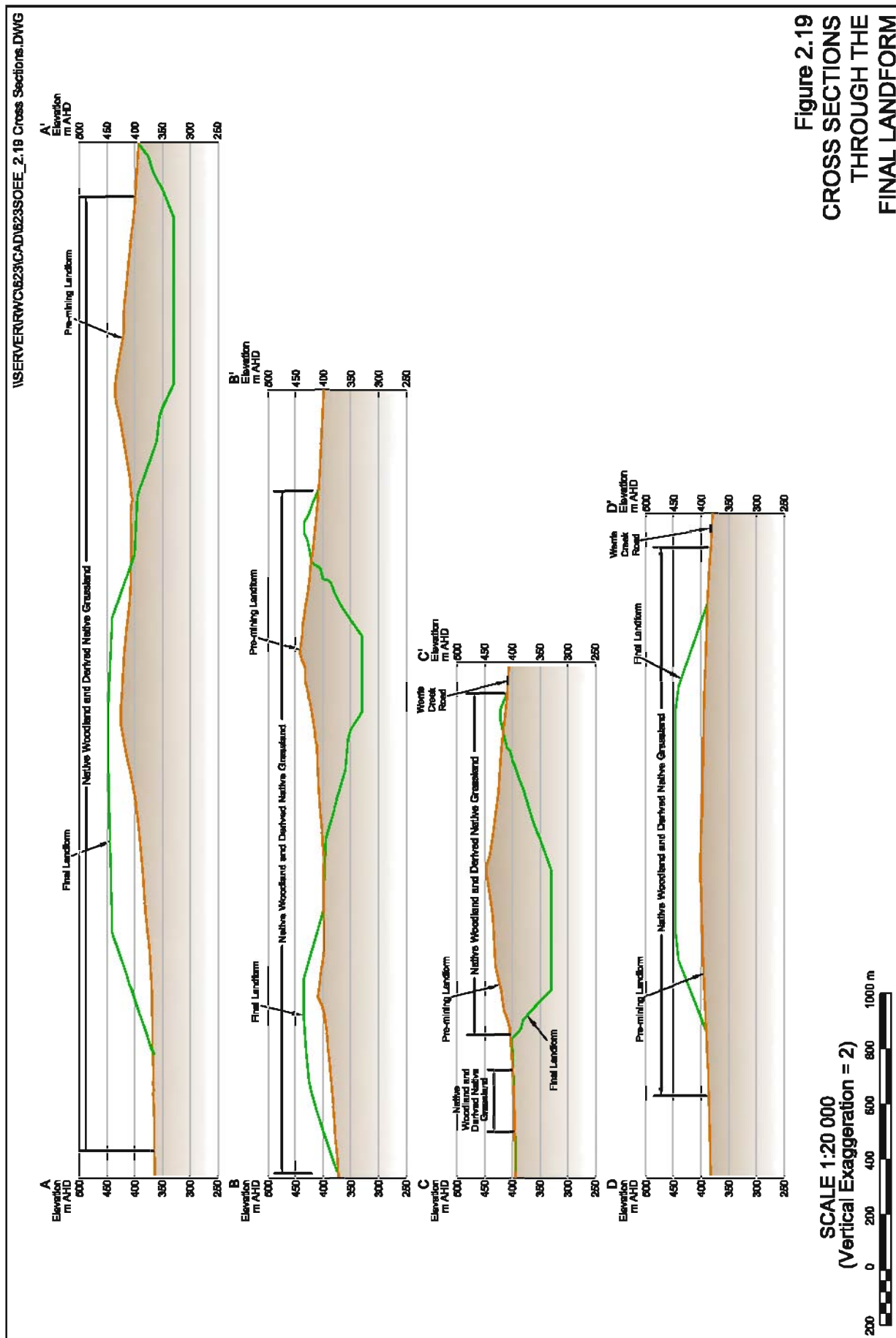


Figure 2.19  
CROSS SECTIONS  
THROUGH THE  
FINAL LANDFORM

With the exception of the void water and groundwater storage cells, the final landform of the site would incorporate the retention of existing sediment basins and storage dams for sediment management until all revegetated areas are sustainable. The void water dams (VWD1 & VWD3) and groundwater storage cells would be drained, with the banks pushed in and covered with topsoil to be rehabilitated to a woodland ecological community.

## **2.14.6 Rehabilitation Methods and Procedures**

### **2.14.6.1 Introduction**

The rehabilitation procedures to be implemented for the proposed LOM Project would not vary significantly from those currently implemented and documented in the *Landscape Management Plan*, MOP and annually updated in AEMR for the mine. The following sub-sections provide a summary of the specific methods adopted by the Proponent to meet the objectives described in Section 2.14.2, and achieve the conceptual final landform described in Section 2.14.3 and the principal land uses described in Section 2.14.5 (see **Figure 2.18**) by following the rehabilitation hierarchy set out in Section 2.14.3.2.

#### **2.14.6.2 Decommissioning Activities**

Decommissioning activities would be undertaken upon cessation of mining and processing activities. The following structures and facilities would be decommissioned and removed prior to final rehabilitation of the Project Site.

- The Rail Load-out Facility, conveyor (if constructed) and turn-around loop.
- The Coal Processing Area.
- Various fuel storage, workshops, offices and ablutions structures.
- Roads not to be maintained in the final landform.

#### **Rail Load-out Facility and Turn-around Rail Loop**

Prior to the cessation of mining and rail loading activities, the Proponent would attempt to identify a buyer for the facility in its entirety or in part. Should the Proponent successfully negotiate the sale, the Rail Load-out Facility would be deconstructed.

Should the sale of the Rail Load-out Facility not be negotiated, the structure would be separated into smaller sections with parts on-sold as scrap metal and any useable elements transported to a storage facility off site.

The turn-around loop would be removed and the land rehabilitated to provide Class III agricultural land. Any residual material including fill and ballast would be recycled as a first preference or otherwise disposed of in the void of the open cut. Usable materials such as rails and sleepers would be recycled where possible or sold for scrap.

#### **Coal Conveyor and Coal Processing Plant**

As for the Rail Load-out Facility, the re-use at another site or sale of the coal conveyor and/or coal processing infrastructure (or component parts) would be the preference of the Proponent. Should such a relocation or sale not eventuate, the structure would be separated into smaller sections with parts on-sold as scrap metal and any useable elements transported to a storage facility off site.



### Miscellaneous Buildings and Structures

The majority of buildings and structures erected/constructed on the Project Site are demountable and therefore would simply be dismantled, washed down with high powered water sprays and transported off site.

Any hydrocarbon storage facility would be pumped out. A thorough assessment of the soil directly below and surrounding the fuel storage facility and refuelling area would be conducted to ensure any contaminated soil would be identified. Any contaminated soil classified as “Restricted Solid Waste” (under NSW DECCW Waste Classification Guidelines 2009) would be excavated to be treated on site within a specific bioremediation area or disposed of at an appropriately licensed facility. The fuel storage facility would be on-sold or re-used at another site.

### Roads

The Proponent intends to remove the majority of Project Site roads (some roads may be retained to provide ongoing access to the Project Site lands). The Project Site roads to be removed would be decommissioned (and rehabilitated) as follows.

- i) The roads would be closed with a lockable gate used to prevent access from the Werris Creek Road and/or Escott Road.
- ii) The bitumen seal would be ripped and removed by truck and disposed within the final mine void.
- iii) All compacted sub-base and base-course material would be ripped, excavated and disposed of in the final mine void or recycled, if appropriate.
- iv) The roads would be rehabilitated through further ripping, the respreading of topsoil and reseeding with pasture species or native tree and shrub species depending on the land use designated for that section of the road.

#### 2.14.6.3 Integrated Landscapes

Integrated landscapes, as described in Section 2.14.3.2, involves the earthworks required to create the planned final landform. Landform shaping would be required for each of the four rehabilitation domains and would involve separate procedures for each.

#### Overburden Emplacement and Final Void (Domains 3 and 4)

Given the in-pit placement of overburden within the open cut, landform establishment for these two domains would involve the same rehabilitation procedures.

- Materials suspected of being chemically unfavourable for revegetation would be buried a minimum of 2m below the final rehabilitated land surface.
- The overburden emplacement would be designed and constructed to avoid the exposure of large rocks on the final surface. This would be achieved by placing a layer of friable or weathered materials between the subsoil and topsoil and the more competent overburden and interburden materials below.
- The overburden emplacement would be profiled to create final slopes with gradients of 10° or less.
- Slopes such as ramps left in situ may exceed 10° but not exceed 18°.



- The open cut void may be back-filled to approximately 330m AHD, a level which is predicted to remain at least 5m above the recovering groundwater table (RCA, 2010).
- The final faces of the open cut void would be left with a slope angle not exceeding 18°.
- Where possible, the landform would be shaped to form undulating profiles in order to blend in with natural landforms of the surrounding environment.
- Contour banks would continue to be progressively installed on the rehabilitated landform.

### **Infrastructure Areas (Domain 1)**

Following decommissioning, the rehabilitation procedures would involve the following.

- The hardstand surface would be ripped and the upper surface scraped and placed within the overburden emplacement area.
- Material contaminated with hydrocarbons would be segregated and removed for remediation.
- The remaining surfaces would be profiled to match the surrounding topography prior to soil replacement and revegetation.

### **Water Management Infrastructure (Domain 2)**

Landform establishment procedures for water management structures would be assessed on a case by case basis to determine the most appropriate strategy. Generally, the outer banks of all water management structures would be topsoiled immediately after construction and seeded with appropriate cover and perennial pasture species. Specialised treatments such as sodding, bitumen/jute meshing or rock-lining may be utilised on those structures carrying the largest volumes of water or where an adequate cover of pasture species cannot be attained.

Where practicable, native tree and shrub species would be planted around the water storages that are to be retained in the final landform. This would enhance the filtration ability of these structures and surrounding areas, minimise the potential for erosion, as well as encouraging their use by native mammal, reptile, amphibian and bird species.

#### **2.14.6.4 Soil Management for Sustainable Growth and Development**

The rehabilitation procedures for soil management during the sustainable growth and development stage of the rehabilitation hierarchy are summarised below. These would be the same or similar for each rehabilitation domain.

- Soil would be placed on the shaped landform. Soil would be preferentially sourced from areas being stripped in advance of mining or, if no such materials are available, from previously established stockpiles.
- The soil would be respread in accordance with the recommendations outlined in GSSE (2010b).
- Soil would not be respread when moist, to avoid excessive compaction, or too dry to avoid excessive dust and wind erosion.



- The subsoil would be first spread on then topsoil would then be spread over the subsoil layer on an even but roughened surface which would be ripped along the line of the contour to break any compacted and/or smooth surfaces. Ripping would also assist the keying of the soil, maximise aeration and infiltration and minimise erosion.
- If required, soil would be ameliorated prior to revegetation to prevent surface crusting, increase moisture and organic content, and/or buffer surface temperatures to improve germination.
- Finally, previously cleared and stockpiled vegetation would then be spread over those areas designated for native woodland re-establishment as coarse woody debris and stag trees.

The thickness of subsoil and topsoil replaced has been determined based on the:

- thicker soil layers being replaced in areas designated for agricultural land uses;
- volumes of the various soils stripped on the Project Site; and
- the recommendations of GSSE (2010b).

**Table 2.13** presents the proposed thicknesses for replacement of soils, the highest land capability class that may be attained and the volume of soil required for resspreading.

**Table 2.13**  
**Final Landform Subsoil and Topsoil Replacement**

Final Land Use	Land Capability	Area (ha)	Subsoil Thickness (m)	Topsoil Thickness (m)	Subsoil Volume (m <sup>3</sup> )	Topsoil Volume (m <sup>3</sup> )
Agriculture	III	37.0	0.5	0.2	185 000	74 000
Native Vegetation Establishment	IV	119.5	0.0	0.2	0	239 000
	VI	286.5 <sup>1</sup>	0.2	0.15	504 860	322 950
	VII	69.2	0.0	0.1	0	69 200
<b>TOTAL</b>		<b>500.41</b>	<b>0.7</b>	<b>0.65</b>	<b>649 860</b>	<b>705 550</b>
Note 1 – Does not include the 37.13ha that has already had soil spread over the final landform.						
Source: Modified after GSSE (2010b) – Table 15						

Although the post mining land capability is predicted to have capabilities between Class III and Class VII, it is noted that the conceptual final landform plan (**Figure 2.18**) for the Project Site only requires some Class III land with the rest of the Project Site being established with native vegetation for ecosystem establishment. Areas established with the woodland vegetation would have a range of land capability classes from Class III to Class VII.

An inventory of soils would continue to be maintained at the mine to ensure that adequate soil resources remain available for the selective use of the soil resources as outlined in **Table 2.13**.



#### 2.14.6.5 Revegetation for Sustainable Growth and Development

##### Agricultural Land

At this stage of the rehabilitation hierarchy, the topsoiled surfaces of areas designated for agricultural land (see **Figure 2.18**) would be sown with a mixture of pasture species appropriate to the season. The seed mixture would be determined by the intended crop or agricultural activities proposed for the land.

##### Woodland Ecological Communities

All areas of the final landform designated for the establishment of woodland ecological communities (see **Figure 2.18**), would be excluded from stock.

The flatter areas on top of the final landform, as well as the outer slopes of the overburden emplacement have been specifically targeted for the restoration of native vegetation communities for the following reasons consistent with the Proponent's rehabilitation objectives.

- These areas would provide opportunity to promote linkages with remnant vegetation retained to the west, south and east of the Project Site.
- Establishment of a corridor of vegetation in this area would promote fauna colonisation and enhance the biodiversity values of the final landform. It would also provide valuable linkages with the adjacent biodiversity offset areas established by the Proponent.
- It would provide a natural screen to ongoing operations elsewhere on the Project Site.

Woodland revegetation would be undertaken via a combination of direct seeding and tubestock planting. Seed and tubestock would, subject to commercial availability and seasons, be of local provenance. Species selection would include a combination of over-storey, middle-storey and under-storey strata and be selected from the species lists provided in the *Landscape Management Plan*.

The Proponent has already commenced rehabilitation of the woodland ecological communities on the eastern slopes of the overburden emplacement.

#### 2.14.6.6 Final Land Use

During the final land use stage of the rehabilitation hierarchy, the established vegetation would be monitored in accordance with the procedures summarised in **Table 2.12**. If monitoring determines that any replanting or maintenance activities are required, these would be conducted in accordance with the procedures set out in Section 2.14.7. Weed management of rehabilitated areas would also be maintained (see Section 2.14.8)

### 2.14.7 Rehabilitation Maintenance and Post-Mining Management

#### 2.14.7.1 Rehabilitation Maintenance

The Proponent would maintain an ongoing rehabilitation monitoring program in accordance with existing procedures. This includes general assessment of vegetation establishment and re-seeding, as and when required. All drainage controls would be inspected on a regular basis and maintenance works undertaken, as and when required. Grazing would be excluded across the areas subject to rehabilitation to provide optimum conditions for vegetation establishment and fauna habitation.





The overburden emplacement areas would be regularly inspected to identify areas of localised subsidence or excessive erosion and ameliorative measures implemented, as required. This would include actions such as importation of additional overburden, subsoil and topsoil to remediate and stabilize the affected area. The final landform has been designed to effectively minimise the potential for this to occur and notably over the life of the rehabilitated areas to date, there has been no incidence of localised subsidence in the emplacement area that has required rectification.

#### **2.14.7.2 Post-Mining Management**

The overall success of mine rehabilitation would be measured by qualified ecologists who would be able to make comparisons of rehabilitated areas with control plots established in the Biodiversity Offset Areas. This work has already commenced in accordance with the Werris Creek Coal Mine *Landscape Management Plan*. This process is to be further defined in the *Mine Closure Plan* for the site which would be completed prior to mine cessation.

The Proponent would maintain responsibility for the management of the Project Site until such time as one of the following events occurs.

- a) Another party acquires the mining lease over the Project Site (and accepts the remaining rehabilitation liability) from the Proponent. In this case, the responsibility for the management of the rehabilitation of the land would become the responsibility of the acquirer of the lease.
- b) I&I -NSW deem the nominated closure criteria (documented in the Mine Closure Plan) for the site to have been achieved and mining lease is relinquished. In this case, it is deemed no ongoing land management liability remains over the site.

Critically, the Proponent would continue to monitor and maintain the rehabilitation on the Project Site until either (a) or (b) occurs.

#### **2.14.8 Noxious Weed Management**

The Proponent monitors noxious weeds on a regular basis with an external weed spraying contractor engaged to undertake weed management campaigns across the site. Any specific targeted noxious weed campaign would continue to be undertaken utilising best practice methodologies and in consultation with Industry & Investment NSW (Agriculture), the Livestock Health and Pest Authority and Liverpool Plains Shire Council.

#### **2.14.9 Offset Strategies**

##### **2.14.9.1 Summary of Impacts**

The development of the LOM Project as proposed would require the clearing of an additional 194ha of the *Threatened Species Conservation Act 1979* (TSC Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed endangered ecological community (EEC) White Box Yellow Box Blakely's Red Gum Woodland community (Grassy White Box Woodland and Derived Native Grassland) comprising:

- 58.5ha of Condition Class 4 vegetation, i.e. where both a native understorey and an overstorey of eucalypts exist; and
- 135.3ha of Condition Class 3, i.e. where a native understorey exists without a native overstorey.



Notably, the Class 3 vegetation has been further categorised as Class 3a (74.6ha), being those areas which reach the threshold for consideration as a Critical Endangered Ecological Community (CEEC) under the EPBC Act, and Class 3b (60.7ha), being those areas not meeting this threshold for consideration under the EPBC Act.

The LOM Project would also require a small area (0.35ha) of the Brigalow community to be removed, which is listed as an EEC under the NSW TSC Act and a TEC under the Commonwealth EPBC Act.

#### **2.14.9.2 Biodiversity Offset Requirements**

There are currently no direct guidelines or criteria for designing and/or implementing a biodiversity offset strategy and therefore the style of offset may vary from direct conservation of native vegetation/habitat to contributions to ongoing conservation programs or research.

This notwithstanding, for the purposes of this *Environmental Assessment*, the proposed biodiversity offset has been considered against the guidelines for the assessment of biodiversity offset proposals in NSW provided in the *Principles for the use of Biodiversity Offsets in NSW* presented as Appendix II of the *Guidelines for Biodiversity Certification of Environmental Planning Instruments – Working Draft* published by the Department of Environment and Climate Change (DECC, 2008e), and those of the Commonwealth Department of Environment, Water, Heritage and the Arts (DEWAH, 2007).

DECC (2008e) requires that, in order to adequately compensate for the disturbance, the offset must:

- address impacts remaining after mitigation or prevention measures have been undertaken;
- meet all regulatory requirements;
- never reward ongoing poor performance;
- complement other government programs such as national parks and reserves;
- be underpinned by sound ecological principles;
- aim to result in a net improvement in biodiversity over time;
- be enduring, i.e. they must offset the impact of the development for the period that the impact occurs;
- be agreed upon prior to the impact occurring;
- be quantifiable, i.e. the impacts and benefits must be reliably estimated;
- be targeted, i.e. they must offset the impacts on a “like for like or better” basis;
- be located appropriately, i.e. they must offset the impact in the same region;
- be supplementary, i.e. beyond existing requirements and not already funded by another scheme; and
- be enforceable, i.e. through development consent conditions, licence conditions, covenants or a contract.



DEWHA (2007) requires that the offset should meet the following principles.

- Environmental offsets should be targeted to the matter protected by the EPBC Act that is being impacted.
- A flexible approach should be taken to the design and use of environmental offsets to achieve long-term and certain conservation outcomes which are cost effective for proponents.
- Environmental offsets should deliver a real conservation outcome.
- Environmental offsets should be developed as a package of actions - which may include both direct and indirect offsets.
- Environmental offsets should, as a minimum, be commensurate with the magnitude of the impacts of the development and ideally deliver outcomes that are 'like for like'.
- Environmental offsets should be located within the same general area as the development activity.
- Environmental offsets should be delivered in a timely manner and be long lasting.
- Environmental offsets should be enforceable, monitored and audited.

#### **2.14.9.3 The Proposed LOM Project Biodiversity Offset Strategy**

**Figure 2.20** presents the proposed offset strategy for the LOM Project which would compensate for the LOM Project-related disturbance by conserving vegetation and habitat of similar biodiversity value. In summary, the proposed LOM Project Biodiversity Offset Strategy (LOM Project BOS) provides for:

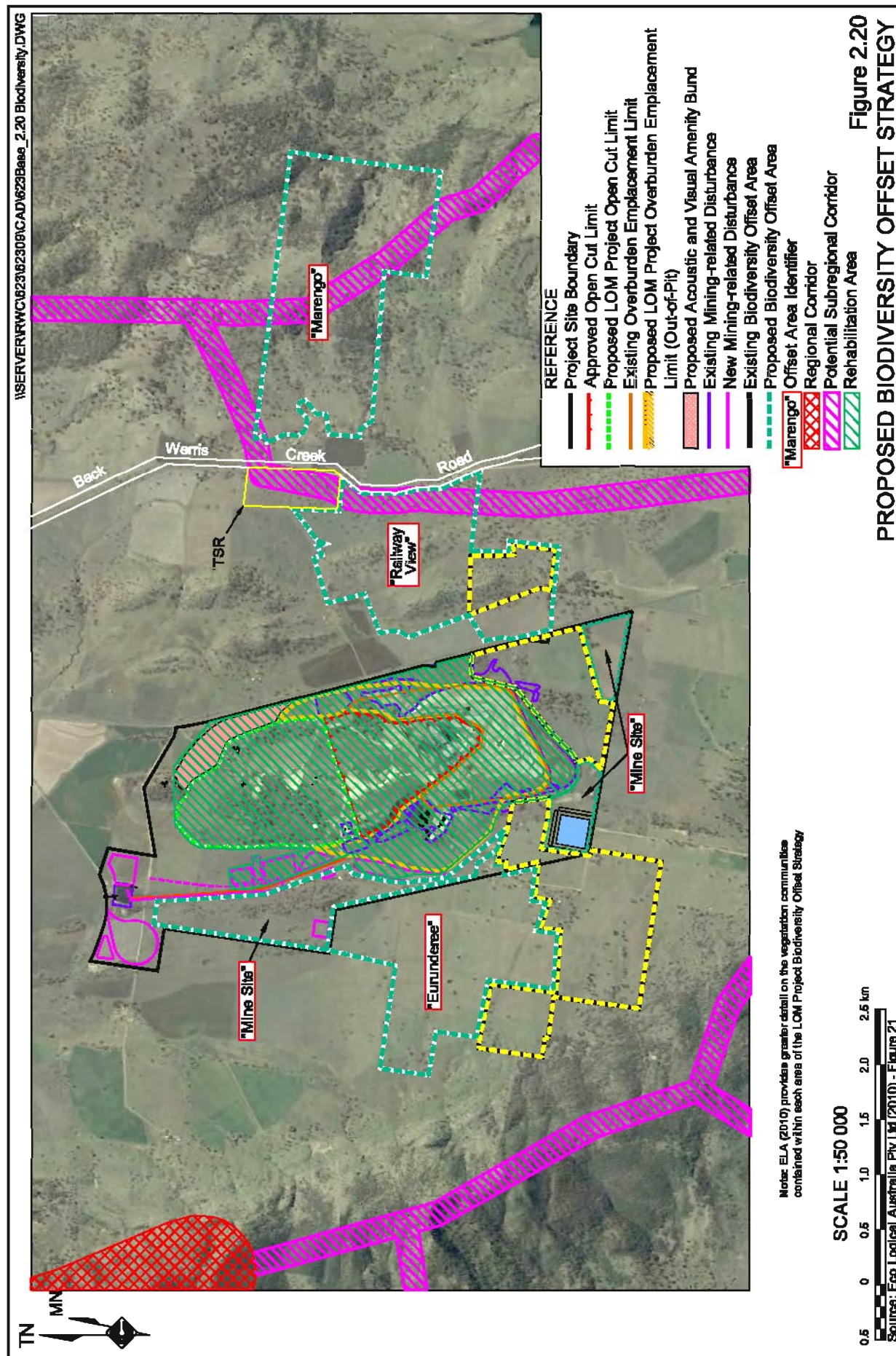
- rehabilitation of the Project Site;
- a package of covenanted offset properties where existing biodiversity values would be enhanced and areas of degraded land revegetated;
- in perpetuity biodiversity management of these properties; and
- a 20 year monitoring plan for the offset properties and revegetation areas.

The offset strategy builds on the existing BOS for the Werris Creek Coal Mine (see **Figure 2.20**) which already provides a 362.5ha offset area (310ha remnant vegetation and 52.5ha of rehabilitation), established as a requirement of the existing development consent for the Werris Creek Coal Mine. The existing BOS completes important linkages to identified regional conservation corridors.

#### **Rehabilitation**

The proposed rehabilitation of the Project Site is described in Sections 2.14.2 to 2.14.6. The emphasis placed on the rehabilitation of native vegetation would ultimately result in an increase in the area of native vegetation locally as well as assist in the linkage of remnant areas of the Grassy White Box Woodland and Derived Native Grassland to the north, south and southwest of the open cut.





### Additional Land to be Conserved In Perpetuity Under Covenant

The LOM Project BOS incorporates areas of extant Grassy White Box Woodland and Derived Native Grassland on the Project Site and on properties immediately adjacent to the Project Site (“Railway View”, “Eurunderee” and “Marengo”) (‘like for like’ EEC vegetation). The proposed LOM Project BOS also provides for the conservation of other native vegetation communities which provide important habitat not available in the derived native grassland areas and mine rehabilitation.

**Table 2.14** provides a summary of the properties, vegetation types, area and condition class included in the proposed LOM Project BOS. Given the different classification of threatened ecological communities provided by the TSC Act and EPBC Act, the offset ratios provided by the proposed LOM Project vary.

**Table 2.14**  
**Vegetation Offsets, Impacts and Offset Ratios**

Property	Grassy White Box Woodland and Derived Native Grassland					Other Vegetation (cleared land)	Total Extant Vegetation		Total Offset Lands
	Class 4 (Grassy White Box Woodland)	Class 3 (Derived Native Grassland)		Total Class 3 & 4 Box Gum			TSC Act	EPBC Act	
		TSC Act	EPBC Act	TSC Act	EPBC Act				
“Railway View”	44.2	101.3		145.5		29.6 (14.3)	175.1		189.4
“Marengo”	44.8	57		101.8		182.3	284.1		284.1
Project Site	31	87.4		118.4		0 (35.2)	118.4		153.6
“Eurunderee”	0	202		202		0 (9.8)	202		211.8
Total Offset	120	447.4		567.4		211.9 (59.3)	779.6		838.9
Total Impact	58.5	135.3	74.6	193.8	133		193.8	133	
Offset Ratio	2.1	3.3	6.0	2.9	4.3		4.0	5.9	
Source: Modified after ELA (2010) – Table 13									

Source: Modified after ELA (2010) – Table 13

The total LOM Project BOS area is 838.9ha of which the overall conserved extant vegetation is 779.6ha made up of 567.4ha of Grassy White Box Woodland and Derived Native Grassland (condition class 3 and 4) and 211.9ha of other native vegetation. The cleared or exotic pasture dominated Grassy White Box Woodland (condition class 1 & 2) within the LOM Project BOS includes 59.3ha. This is in addition to the 454.0ha of rehabilitation works to be undertaken on the final landform post mining. Considered in its totality (including the existing Werris Creek Coal Mine BOS of 362.1ha), the total restoration package of ecological communities principally Grassy White Box Woodland would approximate 1 655ha.

This final conservation corridor of 1 655ha, which would be contiguous in the landscape, would create a migration link between two existing sub-regional corridors (see **Figure 2.20**). Importantly, this provides security for biodiversity that is not currently provided for in the area.

### In Perpetuity Biodiversity Management

The biodiversity offset would be secured in the long term by notation on title, and the offset areas managed in accordance with a management plan to be developed in consultation with DECCW, DoP and the Commonwealth Department of Sustainability, Environment, Water Populations and Communities (DSEWPaC).



## LOM Project BOS Monitoring

A monitoring package to assess the improvement/enhancement of biodiversity values and condition of the conserved remnant would be undertaken for a period of 20 years or a lesser period, if deemed acceptable by the Director-General. The monitoring program would be based on the collection of a detailed baseline flora and fauna inventory and continuation of the current monitoring program undertaken as part of the existing BOS. The full details of the monitoring project would be developed following approval of the proposed LOM Project BOS, and detailed in a *Landscape Management Plan* for post mining management.

## 2.15 DEVELOPMENT ALTERNATIVES

### 2.15.1 Introduction

The Director-General's Requirements for the LOM Project (see **Appendix 2**) require that the *Environmental Assessment* include an analysis of any feasible alternatives to carrying out the proposed development. The fact that the LOM Project is an extension of an existing operation that has been underway for over 5 years effectively reduces the range of alternatives that need to be considered given the knowledge and experience gained to date. The consideration of feasible alternatives to the activities proposed relate principally to:

- overburden emplacement design (Section 2.15.2);
- hours of operation (Section 2.15.3);
- design and location of ancillary infrastructure (Section 2.15.4); and
- final rehabilitation options (Section 2.15.6).

### 2.15.2 Overburden Emplacement Design

The overburden emplacement area has been designed to minimise the footprint of the mining operation by maximising the volume of overburden and interburden replaced within and over the open cut void. However, the need to maintain sufficient void space to operate the mining equipment, and the natural swell factor of the overburden and interburden once removed, necessitate that an out-of-pit component of the overburden is required. Options to further reduce the total footprint of the out-of-pit overburden emplacement considered during the LOM Project design phase (and the reasons why these options were rejected) are as follows.

- Increase the overburden emplacement height.

By increasing the number of lifts, the total area of disturbance required beyond the limit of the open cut would be reduced. However, the total reduction in the area of impact would be relatively minimal compared against the increased visibility of the overburden emplacement from vantage points 360° around the Project Site. There would also be an added cost associated with hauling the overburden higher and for these reasons, the maximum height of the overburden emplacement has been retained at 445m AHD.





- Do not construct the Acoustic and Visual Amenity Bund.

The construction of the Acoustic and Visual Amenity Bund increases the area of total impact, as well as the cost associated with the management of overburden material. However, the construction of the Acoustic and Visual Amenity Bund is considered a necessary component of the LOM Project as it provides an acoustic and visual screen. Initial noise modelling undertaken without the inclusion of the Acoustic and Visual Amenity Bund predicted noise levels exceeding noise criteria by greater than 5dB(A) at locations to the north of the Project Site (including within the town of Werris Creek).

In addition, without the presence of this vegetated structure, unobstructed views of the mining operation would be available from the town of Werris Creek. On the basis of the noise and visibility mitigation provided by the Acoustic and Visual Amenity Bund, the added cost and disturbance associated with its construction is considered a necessary component of the LOM Project.

### **2.15.3 Hours of Operation**

Hours of operations at the Werris Creek Coal Mine currently vary depending on the type of activity undertaken. Overburden removal and management, maintenance and coal loading to trains is currently licensed for 24 hours 7 days per week, whereas other operations such as drilling, internal transport of coal products to ROM stockpiles, on-site processing and coal transport to the Rail Load-out Facility are currently not licensed between the hours of 4am and 7am Monday to Friday and between 2:00pm Saturday and 7:00am Monday. Further restrictions are placed on activities such as rehabilitation and blasting. The Proponent has proposed to increase the hours of operation for all activities except blasting and road haulage of coal from the Project Site to 24 hours per day, 7 days a week.

An alternative to these increased hours of operations would be to continue the current hours of operation which restricts standard mining and processing operations between the hours of 4:00am and 7:00am. While acknowledging that there may be some benefit to local amenity of a ceasing of operations for a period during the night, the reality is that the Proponent is currently licensed to, and undertakes overburden removal and management through the night. As such, the restrictions on other activities between 4:00am and 7:00am do not provide any real benefit to surrounding residences given that all operations are currently approved to continue into the night-time period and one of the more significant activities is already approved to operate 24 hours per day. Therefore, under the assumption that the LOM Project can meet the required noise criteria during the currently approved hours of operation, the added hours of operation would not result in any additional noise-related impact.

In fact, by increasing the hours of operation, it follows that production would be increased and the general progression of the mine accelerated. This would reduce the life of the mine over time which would be seen by some local residents as a positive impact.

### **2.15.4 Design and Location of Ancillary Infrastructure**

As part of the LOM Project, it is proposed to relocate the Coal Processing Area and Site Office and Facilities Area to the north of their current location. Retaining these facilities in the current location was not an option due to the requirement to extend the out-of-pit overburden emplacement over these areas.





Initially, the relocated Coal Processing Area was to be located to the north of the relocated Site Office and Facilities Area as this would have minimised the average haul distance between the open cut and the ROM pad. However, the relative locations of the relocated Coal Processing Area and Site Office and Facilities Area were swapped (moving the Coal Processing Area to the south) to place the noisier coal processing activities more distant from the town of Werris Creek (thereby reducing the noise levels received at residences to the north of the Project Site).

The relocation of the Product Coal Storage Area to a location adjacent to the Coal Processing Area has also been considered. This would provide for the movement of the noise generating activities such as bulldozer and truck operations to a location more distant from the town of Werris Creek. However, the relocation of the Product Coal Storage Area would require additional disturbance to vegetation classified as meeting the definition of Grassy White Box Woodland and Derived Native Grasslands (an EEC). While the option to relocate the Product Coal Storage Area may be the subject of a future modification to the LOM Project approval (should it be granted), given the noise assessment for the LOM Project illustrates that noise criteria can be met, the Proponent has decided to minimise impacts on local biodiversity.

### **2.15.5 Final Rehabilitation Options**

Initially, it was the Proponent's intention to retain a water filled void in the final landform. However, following requests from the NSW Office of Water and Department of Planning to consider the potential to backfill the open cut void to an elevation which would prevent the inflow and accumulation of groundwater within the open void, an analysis of the costs and benefits of such an approach was considered.

Groundwater recovery modelling completed by RCA (2010) has predicted that backfilling the void to 325m AHD should ensure that no groundwater accumulates in the open void. The Proponent considers backfill to this elevation economically feasible and has therefore committed to such a strategy.