Table 4B.29
Predicted $PM_{2.5}$ Concentrations – 24-Hour Averages

Location	24 Hour $PM_{2.5}$ Concentrations ($\mu g/m^3$)		
	Background	**Predicted Impact**	**Assessment Criterion**
Scenario 1			
Worst-affected residence/property (R15)	**None assumed**	**19.5**	**25**
Scenario 2			
Worst-affected residence/property (R20)	**None assumed**	**16.4**	**25**
Scenario 3			
Worst-affected residence/property (R20)	**None assumed**	**15.5**	**25**
Source: Modified after Heggies (2010) – Table 29			

Annual average and 24 hour $PM_{2.5}$ concentrations are predicted to satisfy the above criterion at all the modelled residences/properties with the maximum predicted $PM_{2.5}$ concentrations accounting for approximately 40% of the criterion.

Maximum 24-hour $PM_{2.5}$ concentrations are predicted to satisfy the criterion of $25\mu g/m^3$ at all the modelled residences/properties. It is noted that several predicted incremental $PM_{2.5}$ concentrations are greater than 75% of the criterion ($18.7\mu g/m^3$) and an addition of a small background concentration of approximately $7\mu g/m^3$ would result in exceedances of the Project criterion.

Particulate Matter as $PM_{2.5}$ from Coal Transport Operations by Rail

Coal transport operations by rail in Werris Creek are included within the incremental predictions of $PM_{2.5}$ provided in **Tables 4B.28** and **4B.29**. Coal transport operations by rail in Werris Creek associated with the LOM Project are predicted to contribute a maximum of $0.5\mu g/m^3$ and $0.1\mu g/m^3$ to incremental 24 hour maximum and annual average $PM_{2.5}$ concentrations at the nominated residences/properties or approximately 2% and 1.25% of the Project criterion, respectively.

Incremental concentrations of $PM_{2.5}$ (maximum 24-hour average) from emissions from rail transport associated with the LOM Project through Quirindi are shown to be approximately $4\mu g/m^3$ at rail centreline, reducing to approximately $2\mu g/m^3$ at 110m. These results are well below the $PM_{2.5}$ advisory criterion of $25\mu g/m^3$.

Dust Deposition

Based upon the input data and assumptions of the modelling study, **Table 4B.30** presents a summary of the predicted ground-level annual average dust deposition rates at the nominated residences/properties. All modelled dust deposition rates are well below both the incremental and cumulative criteria at all nominated residences/properties.

Table 4B.30
Predicted Dust Deposition Rates

Location	Annual Average Dust Deposition Rates (g/m^2/month)				
	Background	Predicted Impact	Cumulative Impact	Assessment Criterion Incremental	Assessment Criterion Cumulative
Scenario 1					
Worst-affected residence/property (R20)	**0.6**	**0.5**	**1.1**	**2**	**4**
Scenario 2					
Worst-affected residence/property (R20)	**0.6**	**0.6**	**1.2**	**2**	**4**
Scenario 3					
Worst-affected residence/property (R14)	**0.6**	**0.7**	**1.3**	**2**	**4**
Source: Modified after Heggies (2010) – Table 20					

4B.5.6.4 Greenhouse Gas Assessment

The greenhouse gas emissions were calculated in accordance with the appropriate guidelines and protocols. Details of the methodology employed for the greenhouse gas assessment for the LOM Project are outlined in *Section 12* of Heggies (2010). These calculations were based on the anticipated operational activities within the Project Site, which are summarised in **Table 4B.31** and the predicted end uses of product coal from the LOM Project as summarised in **Table 4B.32**.

Table 4B.31
Summary of Project-Related Activity Data Relevant to GHG Emissions

Activity	Quantity
Annual ROM Production (Mt)	2.5
Annual Electricity Consumption (kWh)	2,086,710
Annual Diesel Consumption (kL)	22,604
Annual Explosive Usage (tonnes)	13,722
Employee Vehicle Movements[1]	25, 458
Note 1: Assumed workforce of 93 with 75% working on any one day.	
Source: Modified after Heggies (2010) – Table 32	

Table 4B.32
Predicted End Uses of Product Coal

End Use	Quantity (tonnes) LOM Project
Domestic PCI for Charcoal Production	125,000
Domestic Use in Hospital Furnace	25,000
Steel Making (Coking coal)	250,000
Electricity Generation (Thermal coal)	2,100,000
Total	**2,500,000**
Source: Modified after Heggies (2010) – Table 33	

A summary of the Scope 1, Scope 2 and Scope 3 emission point sources from the Project Site is given in **Table 4B.33**.

Table 4B.33
Summary of Potential Project Greenhouse Gas Emissions

Project Component	Direct Emissions	Indirect Emissions	
	Scope 1	**Scope 2**	**Scope 3**
Fugitive Emissions	Emissions from the release of coal bed methane and CO_2 as a result of the LOM Project.	N/A	N/A
Diesel	Emissions from the combustion of diesel at the LOM Project (stationary energy and transport purposes).	N/A	Estimated emissions attributable to the extraction, production and transport of diesel consumed at the LOM Project.
Explosives	Emissions from explosives used as part of the LOM Project.	N/A	N/A
Electricity	N/A	Emissions associated with the consumption of generated and purchased electricity at the LOM Project.	Estimated emissions from the extraction, production and transport of fuel burned for the generation of electricity consumed at the LOM Project Site and the electricity lost in delivery in the transmission and distribution network.
Combustion of Coal	N/A	N/A	Emissions from the combustion of coal from the LOM Project.
Source: Modified after Heggies (2010) – Table 31			

Calculated Scope 1, Scope 2 and Scope 3 emissions of greenhouse gas resulting from the emissions sources outlined above for the Project are presented in **Table 4B.35**.

Key findings of the greenhouse gas assessment were as follows.

- The total increase from existing operations in combined Scope 1, 2 and 3 emissions for the LOM Project is estimated to be 3.2Mt CO_2-e per annum.
- The total direct (Scope 1) emissions from the LOM Project are estimated to be approximately 0.16Mt CO_2-e per annum, an increase of approximately 85,000tpa when compared against current operations at the Werris Creek Coal Mine.
- The total indirect emissions (Scope 3) from all Scope 3 emissions sources are estimated to be 6Mt CO_2-e per annum for the LOM Project, an increase of approximately 3Mtpa when compared against current operations at the Werris Creek Coal Mine.
- A comparison of the predicted direct (Scope 1) emissions against Australia's 2007 net emissions of 597Mt CO_2-e demonstrates the LOM Project would represent approximately 0.03 % of the total annual Australian emissions (DCC, 2008).
- A comparison of the predicted Scope 1 emissions against NSW emissions in 2007 (162.7Mt CO_2-e) demonstrates that the LOM Project would represent approximately 0.1% of NSW emissions (DCC, 2007).

Table 4B.34
Summary of Greenhouse Gas Emissions from the Project Site

Point Source Scope	Emission Source	Activity Data	Activity Rate	Emission Factor (CO_2-e)		Total Emissions (t CO_2-e/ year)
				Emission Factor	Units	
Scope 1	Fugitive Emissions	2.5	Mt/year	0.045	t CO_2-e/t ROM	112,500
	Diesel Combustion					
	- On-site Mobile Equipment	18,489	kL/year	69.9	kg CO_2-e/GJ	50,450
	- Road Transport	209				
	Explosives	13,722	t/year	0.17	t CO_2-e/t explosive	2,333
	Sub Total Scope 1					**165,283**
Scope 2	Electricity Consumption	2,086,710	kWh/year	0.89	kg CO_2-e/kWh	1,857
	Sub-total Scope 2					**1,857**
Scope 3	Diesel Combustion					
	- On-site Mobile Equipment	18,489	kL/year	5.3	kg CO_2-e/GJ	4,651
	- Road Transport	209				
	- Rail Transport	3,906				
	Electricity Consumption	2,086,710	kWh/year	0.18	kg CO_2-e/kWh	376
	Domestic PCI for Charcoal Production	125,000	t/year	88.43	kg CO_2-e/GJ	298,451
	Domestic Use in Hospital Furnace	25,000	t/year	88.43	kg CO_2-e/GJ	59,690
	Steel Making (Coking coal)	250,000	t/year	90.22	kg CO_2-e/GJ	676,650
	Electricity Generation (Thermal coal)	2,100,000	t/year	88.43	kg CO_2-e/GJ	5,013,981
	Sub-total Scope 3					**6,053,800**
Scope 1, 2 & 3	**TOTAL**					**6,220,939**

Source: Modified after Heggies (2010) – Tables 34, 35 and 36

4B.5.6.5 Summary of Impact Assessment

Impacts from Dust Emissions

Quantification of the identified particulate (TSP, PM_{10} and $PM_{2.5}$) generating activities associated with the LOM Project (including from rail transportation activities)for three operational scenarios and the subsequent dispersion modelling of these emissions have indicated that cumulative annual average TSP, $PM_{10,}$ $PM_{2.5}$ and dust deposition levels and 24-hour average PM_{10} concentrations predicted to occur as a result of the LOM Project would generally comply with relevant ambient air quality criteria at the nearest sensitive receptors assuming the proposed mitigation measures are implemented. Therefore, it is unlikely that the LOM Project would have any significant impact on annual average TSP, $PM_{10,}$ $PM_{2.5}$ and dust deposition levels and 24-hour average PM_{10} concentrations in the local area. In order to quantify actual 24 hour concentrations of $PM_{2.5}$ it is proposed that monitoring of $PM_{2.5}$ be undertaken for a 12 month period and then the impacts and mitigation measures be reviewed based on the results.

Dust emissions from rail transport associated with the LOM Project comply with all dust criteria in both Werris Creek and Quirindi with the exception of PM_{10} 24-hour maximum concentrations in some instances in Quirindi. This result represents a worst case assessment as the maximum incremental 24-hour average PM_{10} concentrations being assessed with the maximum 24-hour average background concentration from Tamworth being added. Therefore, the exceedance predicted is dependent on the maximum increment and maximum background occurring within the same 24-hour period and therefore the results of the modelling should be viewed as highly conservative. The Proponent proposes to discuss with the rail transport companies the possibility of the rail transport companies collectively conducting an air quality monitoring campaign to gain an understanding of the air quality impacts of coal transport through Quirindi. These measurements would assist in validating the findings of the air quality assessment presented within this report and provide guidance regarding the requirement or otherwise to continue PM_{10} monitoring or if the rail transport companies may need to implement further mitigation measures over and above those currently implemented by the Proponent.

Impacts from Greenhouse Gas Emissions

The total greenhouse gas emissions for the Project (Scope 1, 2 and 3 emissions) at 0.1% of the NSW greenhouse gas total emission inventory for 2007, and 0.03% of the Australian national emissions for 2007 are small. As such, it is unlikely that greenhouse gas emissions during the course of the LOM Project activities would have any significant impact on the air quality, or make a significant contribution to greenhouse gas emissions and global warming.

4B.5.7 Monitoring

Heggies (2010) reviewed the existing air quality monitoring network for the Werris Creek Coal Mine and considered the current program would be sufficient to monitor annual average TSP, PM_{10} and dust deposition levels from the proposed LOM Project. Monitoring of 24-hour maximum PM_{10} to ensure that the management of operations is proactive rather than reactive requires real time monitoring of PM_{10} concentration.

The Proponent has committed to installing and managing real-time particulate monitors (TEOM or equivalent) prior to commencement of LOM Project operations. The exact number and location of the monitors is to be decided and would be the subject of a detailed Air Quality Monitoring and Management Plan. However, the aim of the real time instruments would be to provide information on increasing particulate concentrations. The real time nature of the instruments would, in conjunction with the measurement of on-site meteorology, allow upwind/downwind concentrations of PM_{10} to be assessed, and mine contributions to ambient concentrations calculated. Should concentrations be noted to be approaching trigger criteria, relevant and contributing project operations would be identified and activity appropriately reduced until such time as the monitoring information provided confidence that concentrations had been reduced.

In order to quantify actual impacts relating to $PM_{2.5,}$ it is recommended that the Proponent undertake monitoring of $PM_{2.5}$ at one location for a 12 month period (and potentially longer if the monitoring results support its continuation).

4B.6 BIODIVERSITY

The biodiversity assessment for the Project was undertaken by Eco Logical Australia Pty Ltd (ELA, 2010a). The full assessment is presented in Volume 2, Part 5 of the Specialist Consultant Studies Compendium. Relevant information from the assessment is summarised in the following subsections.

4B.6.1 Introduction

Based on the risk analysis undertaken by R.W. Corkery & Co Pty Limited for the Project (Section 3.3 and **Table 3.6**) the potential impacts on flora and fauna requiring assessment and their unmitigated risk rating are as follows.

- Removal of native flora and fauna habitat due to land clearing activities resulting:
  - in reduction in threatened fauna habitat (high risk);
  - loss of threatened vegetation species communities (high risk) and/or
  - reduction in species diversity (high risk).
- Disturbance to threatened flora and/or threatened fauna habitat as a result of project operations, e.g. noise, dust etc. resulting in the deterioration of habitat and/or stress to native species (low risk).
- Reduction in threatened aquatic vegetation numbers (low to moderate risk).

In addition, the Director-General's Requirements issued by the DoP identified "Biodiversity" as one of the key issues that requires assessment at the Project Site. The assessment of impacts on biodiversity is required to include.

- an accurate quantification of any vegetation clearing;
- a detailed assessment of potential impacts on terrestrial or aquatic threatened species or populations or their habitats, endangered ecological communities and groundwater dependent ecosystems;
- a detailed description of the measures that would be implemented to avoid or mitigate impacts on biodiversity; and
- an offset strategy to ensure the project maintains or improves the biodiversity values of the region in the medium to long term.

The following subsections describe and assess the existing threatened species and their habitat, identify the ecological management issues, proposed safeguards and mitigation measures for the threatened species and their habitat, provide an assessment of the proposed LOM Project BOS and provide an assessment of the residual impacts of the LOM Project on local biodiversity following implementation of the proposed safeguards, mitigation measures and offset strategies.

4B.6.2 Study Methodology

4B.6.2.1 Desktop Review

The Project Site and surrounding lands have been the subject of numerous ecological studies since the original development application to develop the Werris Creek Coal Mine was lodged in 2004. In addition to these mine specific studies, various regional studies of flora and fauna have been completed and the government agencies responsible for managing biodiversity at a State and Commonwealth level (DECCW and DSEWPaC) maintain databases that provide information on threatened native flora and fauna, and recorded occurrences of these.

In order to develop an understanding of the local setting, which would influence the field survey and overall assessment of significance of any impact on local biodiversity, ELA (2010) reviewed the following datasets and previous studies.

- Current vegetation, soil and landscape mapping, as well as other available GIS data provided by NSW government agencies and authorities.
- The atlas of NSW Wildlife (maintained by DECCW). A search of this database was completed to identify those threatened ecological communities, populations and species, and migratory species recorded from within a 10km radius of the Project Site.
- The EPBC Act Protected Matters Search Tool (maintained by DSEWPaC). A search of this database was completed to identify those matters of national environmental significance that may occur in a 10km radius of the Project Site.
- Previous fauna survey and assessment reports (including pre-clearance survey reports) of the Werris Creek Coal Mine Site including:
  - Countrywide Ecological Service (CES) (2004, 2008 and 2009);
  - Ecotone (2009); and
  - ELA (2009a &2009d).
- Previous flora survey and assessment reports including:
  - Geoff Cunningham Natural Resource Consultants (GCNRC) (2004, 2005 and 2009); and
  - ELA (2009c, 2009d & 2009e).
- Regional vegetation mapping reports prepared for the Namoi Catchment (ELA, 2009b, 2009c & 2010a).
- A regional groundwater dependent ecosystem mapping report for the Namoi Catchment (SKM, 2010).
- The Namoi Catchment Action Plan(NCMA, 2007), which includes a description of local biodiversity values, their current health and targets for catchment management.

4B.6.2.2 Field Survey

The following provides an overview of the field survey work completed by ELA over the Project Site and surrounding properties between April and July 2010. ELA (2010) provides a more detailed description of the survey methods and coverage. **Figure 4B.21** provides an illustrated summary of the complete survey effort over the Project Site completed by GCNRC, CES, Ecotone and ELA between 2004 and 2010.

Preliminary Field Assessment

A preliminary site assessment was conducted by four ELA ecologists on 19 April 2010 to identify access constraints and optimal locations for the placement of harp traps, Anabat recording devices, hair tubes and avifauna survey sites.

While detailed flora surveys were not undertaken, dominant species, structure, and composition of vegetation communities were noted and compared to vegetation mapping previously completed on the Project Site (GCRNC, 2004, 2005 & 2009).

Flora

Quadrat, transect and random meander survey techniques were used to categorize vegetation communities and identify flora species on the project Site. Quadrats of 20m x 20m and 50m transects were surveyed to record presence of all vascular flora species, along with cover and abundance for each species using a modified Braun-Blanquet scale (measures of cover and abundance were taken to determine species dominating each stratum). Habitat features such as hollow-bearing trees, fallen timber and foliage coverage, were also identified and quantified (where relevant). The locations of the quadrats and transects were chosen to include representative areas of the most dominant (or otherwise significant) vegetation communities previously mapped over the Project Site, namely:

- Community 1 - Cleared and cultivated / pasture lands;
- Community 3 - Brigalow community;
- Community 4 - White Box Yellow Box Blakely's Red Gum woodland community; and
- Community 6 - Tumbledown Gum community.

Random meander traverses focused on pasture land communities to determine their correlation with Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) condition thresholds and to identify any derived native grasslands that may conform with the NSW *Threatened Species Conservation Act1995* (TSC Act) endangered ecological community listings. These communities included:

- Community 1 - Cleared and cultivated / pasture lands; and
- Community 2 - Cleared land – uncultivated.

Species were identified to the lowest taxonomic level possible.

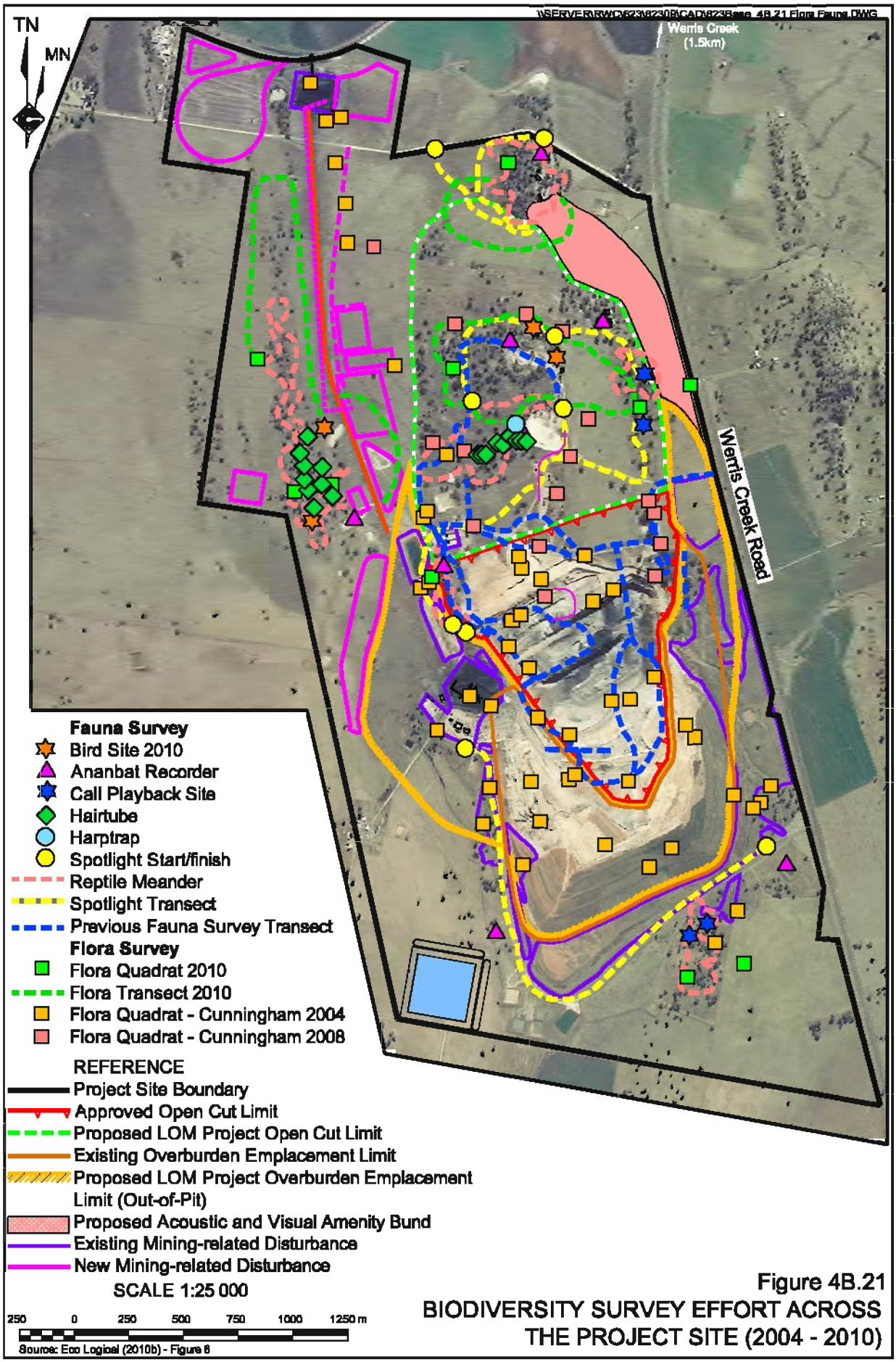


Figure 4B.21
BIODIVERSITY SURVEY EFFORT ACROSS THE PROJECT SITE (2004 - 2010)

Groundwater Dependent Ecosystems

Two types of groundwater dependent ecosystem (GDE) were considered as potentially occurring within the local area, namely:

- terrestrial vegetation that is supported by groundwater either permanently or seasonally; and
- ecosystems that are maintained by groundwater base flows in rivers and streams.

Satellite imagery and vegetation maps of the Werris Creek and Quipolly Creek lines were assessed for terrestrial vegetation and base flows in streams that may be groundwater dependent. Health and condition of the vegetation located along the two creeks was then completed in April and July 2010.

Avifauna Surveys

A total of eight morning and six evening surveys were conducted for diurnal birds at four locations across the Project Site. The four locations covered a range of habitat types with each survey focusing on an area of approximately 1ha for approximately 20 minutes. Diurnal birds were also surveyed continuously during daytime hours while traversing suitable habitat within the Project Site.

Nocturnal bird call playback and spotlighting were undertaken over four nights across three stratification units. Spotlighting was conducted by two people from a vehicle travelling at approximately 5km/hr along existing vehicle access tracks, vegetation remnants maintaining hollow-bearing trees and in transit to call playback sites.

Mammal Surveys

Ground dwelling and arboreal mammals were surveyed using hair tubes, spotlighting, habitat assessments and opportunistic sightings over a 5 day / 4 night period.

Surveys for microbat species involved the use of harp traps over two consecutive nights at one location and ultrasonic Anabat detectors over four nights in eight locations.

Any indirect evidence of fauna were recorded including, feathers, fur, tracks, dens, nests, scratches, chew marks and owl wash.

Reptiles

Reptile surveys were undertaken over three days between the hours of 10:00am and 5:30pm. Survey techniques included rock-rolling, tree bark removal, displacement of fallen timber and opportunistic sightings.

Amphibians

Opportunistic observations of amphibians were made over the entire survey period. These observations complemented the call playback surveys and pitfall trapping previously completed by CES (2004).

4B.6.3 Flora of the Project Site

4B.6.3.1 Overview of Field Survey Results

While the Project Site has been subject to grazing or cultivation of varying intensity, native vegetation was identified across much of the Project Site through all previous surveys and the most recent survey of ELA (2010b). A total of 188 flora species have been recorded on the Project Site. This includes 116 native species, 72 exotic species with five of these considered noxious under the *Noxious Weeds Act 1993* (NW Act) (refer to Section 4B.6.3.5).

No threatened flora species were recorded within the Project Site during the current or previous surveys.

The greatest species diversity was identified within the woodland areas of the Project Site which support a large number of mature and hollow-bearing trees, although there was little evidence of recruitment of canopy species. Woody debris and fallen logs were also common throughout these woodland areas.

4B.6.3.2 Vegetation Communities of the Project Site

Vegetation across the Project Site has been classified by various authors over time, with each using a different method of classification. To assist in the development of a biodiversity offset strategy for the LOM Project, ELA (2010b) classified vegetation on the Project Site in accordance with 'Biometric Vegetation Types'. The vegetation communities within the Project Site, and a summary of their composition, are as follows.

White Box Grassy Woodland

The majority of tree covered vegetation at the Project Site is grassy woodland dominated by White Box (*Eucalyptus albens*). Tumbledown Gum (*Eucalyptus dealbata*) is co-dominant on the more exposed and erodible soils of the Narrawolga soil landscape, however, these areas are not considered to be sufficiently distinct to warrant classification as a separate vegetation type.

A total of 187 flora species have been recorded within this community on the Project Site between 2004 and 2010, including 115 native and 72 exotic species.

The most abundant grass species of the understorey are *Aristidaramosa* (Purple Wiregrass), *Aristidaleptopoda* (White Speargrass), *Chlorisventricosa* (Tall Chloris), *Austrostipaaristiglumis* (Plains Grass), *A. scabra* (Speargrass), A. *verticillat*a (Slender Bamboo Grass), *Bothriochloamacra* (Red-leg Grass) and *Dichanthiumsericeum* (Queensland Bluegrass).

This vegetation community is considered to meet the classification as an endangered ecological community (EEC) under the NSW TSC Act under the name of "White Box Yellow Box Blakely's Red Gum Woodland". It is also deemed to meet the classification as a Critically Endangered Ecological Community (CEEC) under the Commonwealth EPBC Act under the name of "White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland". The occurrence of the "White Box Grassy Woodland" is presented on **Figure 4B.22**.

Bluegrass – Spear Grass – Redleg Grass Derived Grasslands (White Box Grassy Woodland and Derived Native Grassland)

The most common and widespread vegetation community across the Project Site is derived grassland dominated by native perennial grasses. The dominant grass species are Red-leg Grass, Queensland Bluegrass, White Speargrass, Plains Grass, *Chloristruncata* (Windmill Grass) and *Austrodanthonia bipartita* (Wallaby Grass).

These derived native grassland patches are described as a distinct community, however, this community would previously have formed part of a grassy woodland with White Box forming the dominant overstorey. For the purposes of the impact assessment, therefore, this community has been included as part of the White Box Grassy Woodland threatened ecological community. For this purpose, they are further delineated into two condition classes.

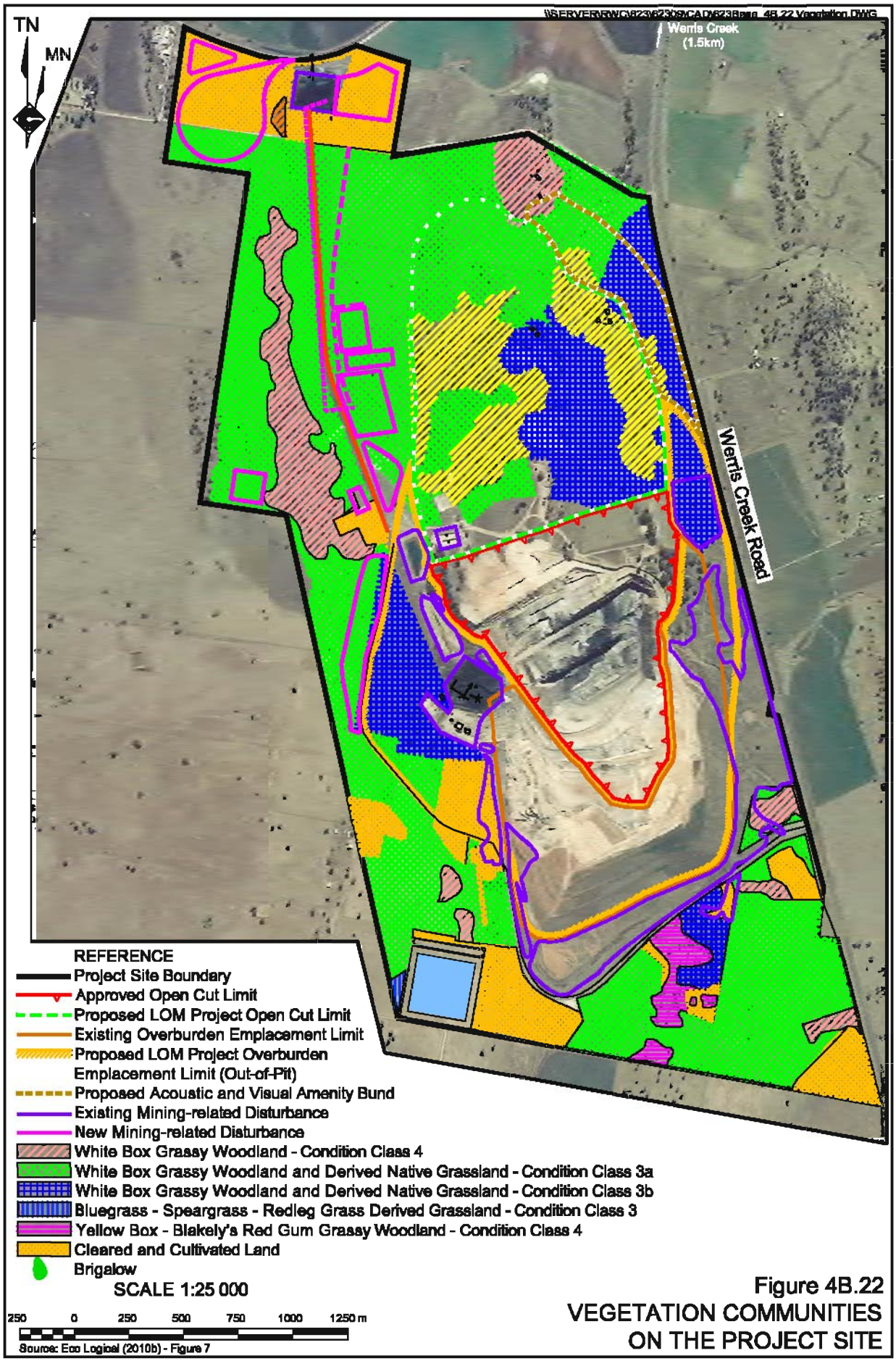


Figure 4B.22
VEGETATION COMMUNITIES ON THE PROJECT SITE

- Condition Class 3a (high diversity): no native canopy cover, >11 native perennial understorey species (not including grasses) and at least 1 important species. This condition class equates to the EPBC Act and TSC Act definition of White Box Grassy Woodland and Derived Native Grassland.
- Condition Class 3b (low diversity): no native canopy cover, native grassy understorey with low diversity of herbs or other perennial understorey species. This condition class equates *only* to the TSC Act definition of the White Box Grassy Woodland and Derived Native Grassland.

The occurrence of this community on the Project Site, identified as White Box Grassy Woodland and Derived Native Grassland Class 3a or Class 3b, is presented on **Figure 4B.22**.

Brigalow – Belah Woodland

This community is described as an open forest or woodland up to 25m high with an upper stratum dominated by Brigalow (*Acacia harpophylla*), often with Belah (*Casuarina cristata*) on less gilgaied clays.

This community, which has been mapped on the Project Site previously (GCNRC 2004, 2005 & 2009), occurs as a single remnant of approximately 50 mature Brigalow trees to the west of the current approved open cut area (see **Figure 4B.22**). The community supports only Brigalow in the upper stratum, and only one small shrub was recorded in the understorey, *Maireana microphylla* (Bluebush). The majority of Brigalow trees present were mature, though regrowth was noted.

The groundcover is relatively sparse, with the species present more common to the adjacent Grassy White Box Woodland than to the Brigalow – Belah woodland. ELA (2010b) reports that with the exception of Brigalow, all species found within the remnant patch of woodland were also recorded in the adjacent Box-Gum woodlands and grasslands.

The Brigalow – Belah woodland is listed as 'Endangered' under the TSC Act as 'Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains bioregions', as well as under the EPBC Act as 'Brigalow (*Acacia harpophylla* dominant and co-dominant)'.

Cropped and Cultivated Paddocks (Cleared Land)

To the north of Escott Road, an area of the Project Site surrounding the product coal storage area and rail load-out facility has previously been cleared for cultivation and cropping and as such no longer represents a native vegetation community. An area of paddocks to the east of the approved open cut area appears to have also been subject to regular cultivation/cropping (see **Figure 4B.22**).

These areas have been modified from the natural state to the extent that native species are now uncommon and most of the cultivated areas were either cleared at the time of survey or dominated by planted introduced species such as Lucerne (*Medicago sativa*).

4B.6.3.3 Flora of Conservation Significance

The database searches conducted by ELA (2010b) identified four threatened ecological communities and nine threatened flora species have been previously recorded within 10km of the Project Site. As noted in Section 4B.6.3.2, two threatened ecological communities are known to occur within the Project Site, namely:

- White Box Yellow Box Blakely's Red Gum Woodland EEC (also identified as the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the EPBC Act); and
- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains bioregions EEC (also identified as the Brigalow (*Acacia harpophylla* dominant and co-dominant) EEC under the EPBC Act).

Based on an assessment of presence or absence of suitable habitat, features of the Project Site, results of current and previous field survey and professional experience, ELA (2010b) concluded that none of the remaining threatened ecological communities or flora known to occur within 10km of the Project Site are likely to occur on the Project Site and as such have not been considered further.

4B.6.3.4 Groundwater Dependent Ecosystems

ELA (2010b) has confirmed that the vegetation occurring within the riparian zones of Quipolly and Werris Creeks is likely to be partially dependent on water flowing within these creeks. Given there is some base flow contribution to these creeks from the alluvial aquifers which surround them, it is concluded that the vegetation occurring within the riparian zones of Quipolly and Werris Creeks are GDEs and could be adversely affected should the LOM Project result in a reduction in the base flow of groundwater from the alluvium to the creek. RCA (2010) who conducted the groundwater assessment for the LOM Project determined that there would not be a significant reduction in base flow to Quipolly or Werris Creeks that would affect GDEs within these creek systems.

4B.6.3.5 Noxious Weeds

Five species listed as Noxious Weeds for Liverpool Plains Local Government Area (LGA) have been recorded within the Project Site.

- Spiny Burr Grass (*Cenchrus incertus*) (W4[8])
- St John's Wort (*Hypericum perforatum*) (W4)
- Prickly Pear (*Opuntia stricta*) (W4)
- Bathurst Burr (*Xanthium pungens*) (W4)
- Bathurst Burr (*Xanthium spinosum*) (W4)

All five species fall under W4 Weed category in accordance with the *Noxious Weeds Act 1993* classification. All five species would require continuous monitoring of infestations and control of any plants that appear with appropriate herbicides.

[8] The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed.

4B.6.3.6 Koala Habitat

State Environmental Planning Policy No. 44 - Koala Habitat Protection (SEPP 44), which applies in the LGAs of Parry and Quirindi (now part of the Liverpool Plains LGA), aims to identify potential Koala habitat in the form of native vegetation where the trees of the types listed in Schedule 2 of SEPP 44 constitute at least 15% of the trees in the area. White Box is the dominant tree species within the areas to be disturbed by the proposed modification, representing >15% of all trees present. White Box is identified as a Koala feed tree species and therefore, the Grassy White Box Woodland community of the Project Site represents "potential Koala habitat".

4B.6.4 Fauna

4B.6.4.1 Fauna Habitat

Based on the vegetation types present within the Project Site, ELA (2010b) considers the habitat for species such as ground-dwelling mammals and some arboreal mammals is limited. **Table 4B.35**presents the various habitat features of the Project Site, areas where these features occur and the fauna assemblage that could utilise these habitat features.

Table 4B.35
Fauna Habitat Features of the Project Site

Habitat feature	Habitat type	Species
Hollow-bearing trees / stags	• Woodland vegetation • Grassland vegetation	Arboreal mammals, microbats, hollow-dependent birds, reptiles
Dead Tree Stags	• Woodland vegetation • Rehabilitated areas of the Project Site	Birds, particularly birds of prey
Rocky outcrops	• Woodland vegetation • Cleared areas, e.g. former quarries • Homesteads at the northern end of the Project Site	Reptiles
Dams	• Grassland vegetation	Amphibians, birds, reptiles, microbats
Autumn / winter-flowering eucalypts	• Woodland vegetation	Foraging resources for birds, bats and mammals
Flowering myrtaceous trees and shrubs	• Woodland vegetation	Foraging resources for birds, bats and mammals
Coarse woody debris	• Woodland vegetation • Rehabilitated areas of the Project Site	Small mammals and reptiles
Leaf litter	• Woodland vegetation	Amphibians, reptiles, ground-dwelling mammals
Defoliating bark	• Woodland vegetation	Microbats, reptiles
SEPP 44 Koala feed trees	• White Box	Koala
Anthropogenic structures	• Across the Project Site	Vantage points and shelter for birds, bats, mammals and reptiles
Pasture	• Grassland vegetation	Foraging resources for birds, bats, reptiles, ground-dwelling mammals
Source: Modified after ELA (2010b) – Table 11		

4B.6.4.2 Project Site Fauna

The results of the 2010 field survey and previous field surveys were compiled by ELA (2010) with **Table 4B.36** summarising the number of species recorded during these surveys.

Table 4B.36
Fauna Species of the Project Site

Fauna Group	Number of Species	Native	Exotic	Threatened species
Amphibians	8	8	0	
Birds	61	59	2	Little Eagle Brown Treecreeper Hooded Robin Little Lorikeet
Ground Dwelling Mammals	12	5	7	
Bats	13	13	0	Eastern False Pipistrelle Eastern Bent-wing Bat Yellow-bellied Sheathtail-bat Greater Broad-nosed Bat
Reptiles	25	25	0	
Source: Modified after ELA (2010b) – *Appendix D*				

ELA (2010b) provides a complete list of the fauna species recorded on the Project Site between 2004 and 2010.

4B.6.4.3 Fauna of Conservation Significance

The database searches conducted by ELA (2010b) identified 23 threatened fauna and 11 migratory species have previously been recorded within 10km of the Project Site. Based on an assessment of presence or absence of suitable habitat, features of the Project Site, results of current and previous field survey and professional experience, ELA (2010b) assessed the likelihood of occurrence of each of the 34 species. **Table 4B.37**provides a summary of the assessment completed by ELA (2010b) recording the likelihood of occurrence of the 34 fauna species previously identified within 10km of the Project Site.

ELA (2010b) concludes that seven threatened species are 'known' to occur on the Project Site, while a further nine threatened species and three migratory species have the 'potential' to occur on the Project Site.

4B.6.5 Impact Avoidance, Minimisation and Mitigation Management

4B.6.5.1 Introduction

In accordance with Step 4 of *Draft Guidelines for Threatened Species Assessment* (DEC and DPI, 2005), the Proponent has designed the LOM Project to avoid or minimise impacts, where possible. Where impact avoidance is not feasible, mitigation measures are proposed to reduce the residual impact on biodiversity. A biodiversity offset strategy has been proposed to ensure there is no net loss of biodiversity values in the long term as a consequence of the residual impact of the LOM Project.

Table 4B.37
Likelihood of Occurrence of Threatened and Migratory Species

Scientific Name	Common Name	Conservation Status		Likelihood of Occurrence
		TSC Act	EPBC Act	
AMPHIBIA				
Litoria booroolongensis	Booroolong Frog	E	E	No – no suitable habitat
AVES				
Anthocha eraphrygia	Regent Honeyeater	E	E and M	Potential – not recorded during field survey
Ardea alba	Great Egret, White Egret	-	M	Potential – not recorded during site survey
Ardea ibis	Cattle Egret	-	M	Potential – not recorded during site survey
Climacterispicumnus victoriae	Brown Treecreeper (Eastern sub-species)	V	-	Known – recorded on the Project Site
Gallinago hardwickii	Latham's snipe	-	M	No – no suitable habitat
Haliaeetus leucogaster	White-bellied Sea Eagle	-	M	No – no suitable habitat
Hirundapus caudacutus	White-throated Needletail	-	M	Unlikely
Lathamus discolor	Swift Parrot	E	E and M	Potential – not recorded during field survey
Merops ornatus	Rainbow bee-eater	-	M	Unlikely
Melanodrya scucullata ssp. *cucullata*	Hooded Robin	V	-	Known – recorded on the Project Site
Myiagra cyanoleuca	Satin Flycatcher	-	M	No – no suitable habitat
Pyrrholaemus sagittatus	Speckled Warbler	V	-	Potential – not found during survey
Neophema pulchella	Turquoise Parrot	V	-	Potential – not found during survey
Rostratula australis	Australian Painted Snipe	E	M	No – no suitable habitat
Stagonopleura guttata	Diamond Firetail	V	-	Potential – not found during survey
Rostratula benghalensis	Painted Snipe	E	M	As above
MAMMALIA				
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Potential – not detected during survey
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Known – recorded on the Project Site
Miniopterus schreibersiioceanensis	Eastern Bent-wing Bat	V	-	Known – recorded on the Project Site
Nyctophilus timoriensis	Eastern Long-eared Bat	V	V	Potential – not detected during survey
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Potential – not detected during survey
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Known – recorded on the Project Site
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Known – recorded on the Project Site
REPTILIA				
Anomalopus mackayi	Five-clawed Worm-skink	E	V	No
Aprasia parapulchella	Pink-tailed Worm Lizard	V	V	Potential – not found during survey
Delma torquata	Collared Delma	-	V	No
Elseya belli	Bell's Turtle	V	V	No – no suitable habitat
Hoplocephalus bitorquatus	Pale-headed Snake	V	-	No – no suitable habitat
Underwoodis aurussphyrurus	Border Thick-tailed Gecko	V	V	Potential – not found during site survey
OSTEICHTYES (Bony Fish)				
Maccullochella peeliipeelii	Murray Cod	-	V	No – no suitable habitat
V = Vulnerable E = Endangered M = Migratory				
Source: Modified after ELA (2010b) – *Appendix C*				

4B.6.5.2 Impact Avoidance and Minimisation

The direct impact of the LOM Project cannot feasibly be avoided, as in order to recover the coal, vegetation needs to be removed. However, the Proponent has committed to a number of measures aimed at minimising the impacts on local biodiversity.

- The majority of overburden is to be placed within the completed section of the open cut, limiting the additional area of land required for the creation of out-of-pit overburden emplacements.
- The placement of the ancillary infrastructure for the LOM Project has been located preferentially in areas of lower conservation value, i.e. cleared land and exotic pasture.
- Where not possible to utilise areas of cleared and cultivated lands, the infrastructure would be placed over grassland of lower condition class in preference to higher condition class or woodland.
- Where possible, existing infrastructure would be retained and used in preference to disturbing new areas.
- Areas currently utilised for, or approved for the stockpiling of soil and cleared vegetation resources would continue to be used in preference to other undisturbed locations. Furthermore, once the overburden emplacement reaches its maximum height, the upper surface of the structure would be used for the stockpiling of soil and cleared vegetation (for future spreading over the created final landform).

It is notable that a northern extension of the overburden emplacement has been proposed which would follow the eastern and northern perimeter of the open cut. Whilst this is not consistent with the impact avoidance principle, the placement of overburden in this fashion has been necessitated by the need to provide visual and acoustic screening of the mining operations to the town of Werris Creek to the north.

4B.6.5.3 Impact Mitigation Measures

Vegetation clearing needs to be undertaken for mining to occur, however, the Proponent currently (and would continue to) mitigate the impacts of disturbance by adopting risk minimising practices for pre-clearing activities onsite. The following pre-clearing practices would be continued by the Proponent.

- Vegetation clearing would be undertaken during a single campaign each year (except when there are extenuating circumstances). The area to be cleared would be surveyed and clearly pegged (to ensure clearing is restricted to this area) and would allow the vegetation clearing to be completed during seasons that minimise the risk of impacting on hibernating microbats or breeding woodland birds.
- A Pre-start Clearing Inspection of the proposed disturbance area would be completed by an ecologist to identify the presence of fauna (including threatened species such as the Koala and microbats).
- Pre-start Clearing Inspections would also identify biological resources within the disturbance area including habitat resources (hollows, stag trees and coarse woody debris) and the availability of endemic seed.

The following clearing practices would continue to be implemented.

- Environmental and noxious weeds would be identified and controlled within the disturbance area prior to clearing.
- Seed collection would be undertaken.
- Habitat trees would be identified and inspected prior to felling.
- If no fauna is observed, a bulldozer would rip the root zone around the base of the tree and slowly push the tree to allow it to fall under its own weight, thereby minimising damage during felling.
- A trained wildlife handler would be present to inspect the tree and to attend to any animals which may be injured or require assistance.
- The toppled trees would be left on the ground overnight to allow any other unidentified animals to relocate.
- The felled trees would be re-inspected the following morning prior to being relocated to the rehabilitation areas for habitat augmentation.

The following landscape management practices would also assist in the mitigation of impacts on biodiversity.

- The final landform would be progressively rehabilitated through the sowing and planting of native woodland and grassland vegetation.
- Approximately 3.7ha of the final landform would be designated as Brigalow woodland to replace the 0.35ha of this vegetation type to be removed.
- All but 37ha of the remaining final landform (508ha) would be rehabilitated to create native woodland vegetation, thereby improving the linkage between remnant areas of native woodland vegetation (including EECs) to the east and west.
- Habitat augmentation through the placement of previously cleared timber (on the ground as well as upright ‘stags’) would provide important habitat value for arboreal and ground hollow-dependant fauna and perching sites. The placement of upright and on-ground dead timber provides a habitat resource for wildlife that is not currently available (or would be available) in the grassland areas and would take many decades to reproduce in these revegetation areas.
- When practicable, soil would be immediately transferred from stripping site to active rehabilitation areas to minimise handling and maximise the potential regeneration from in situ seed resources.
- Weed management, particularly focused on noxious weeds, would be undertaken.
- Feral animal management would be undertaken, as required.
- Areas of the final landform and Project Site generally designated for native vegetation conservation would be fenced when practical to do so to avoid unauthorised or accidental disturbance.

- A seed collection strategy and program to harvest endemic seed from local vegetation to either directly sow or propagate for tube stock planting in either biodiversity offset or rehabilitation areas would be continued.
- Detailed monitoring and inspection programs that annually review progress against set criteria based on vegetation community benchmark data would be completed.

4B.6.5.4 Biodiversity Offset Strategy

As identified in Section 2.14.9, the Proponent has developed the LOM Project Biodiversity Offset Strategy (BOS), to build upon and complement the existing biodiversity offset strategy for the Werris Creek Coal Mine, address the requirements of DECCW and DSEWPaC and to ensure that biodiversity values are maintained or improved.

The total LOM Project BOS area is 838.9ha of which the overall conserved extant vegetation is 779.6ha (including 567.4ha of Grassy White Box Woodland and Derived Native Grassland and 211.9ha of other native vegetation). Considered in totality (including the existing Werris Creek Coal Mine BOS of 362.1ha and proposed 454.0ha of rehabilitation works to be undertaken on the final landform post mining), the total restoration package of ecological communities, principally Grassy White Box Woodland, would approximate 1 655ha. *Section 8* of ELA (2010b) provides a detailed description of the proposed LOM Project BOS, the methodology used to quantify appropriate offset requirements and the various vegetation and habitat features incorporated into each of the separate components on the Project Site and the three surrounding properties ("Eurunderee", Railway View" and "Marengo"). **Figure 4B.23** illustrates the location, vegetation types and complementary nature of the LOM Project BOS with the current Werris Creek Coal Mine BOS and regional and sub-regional biodiversity corridors.

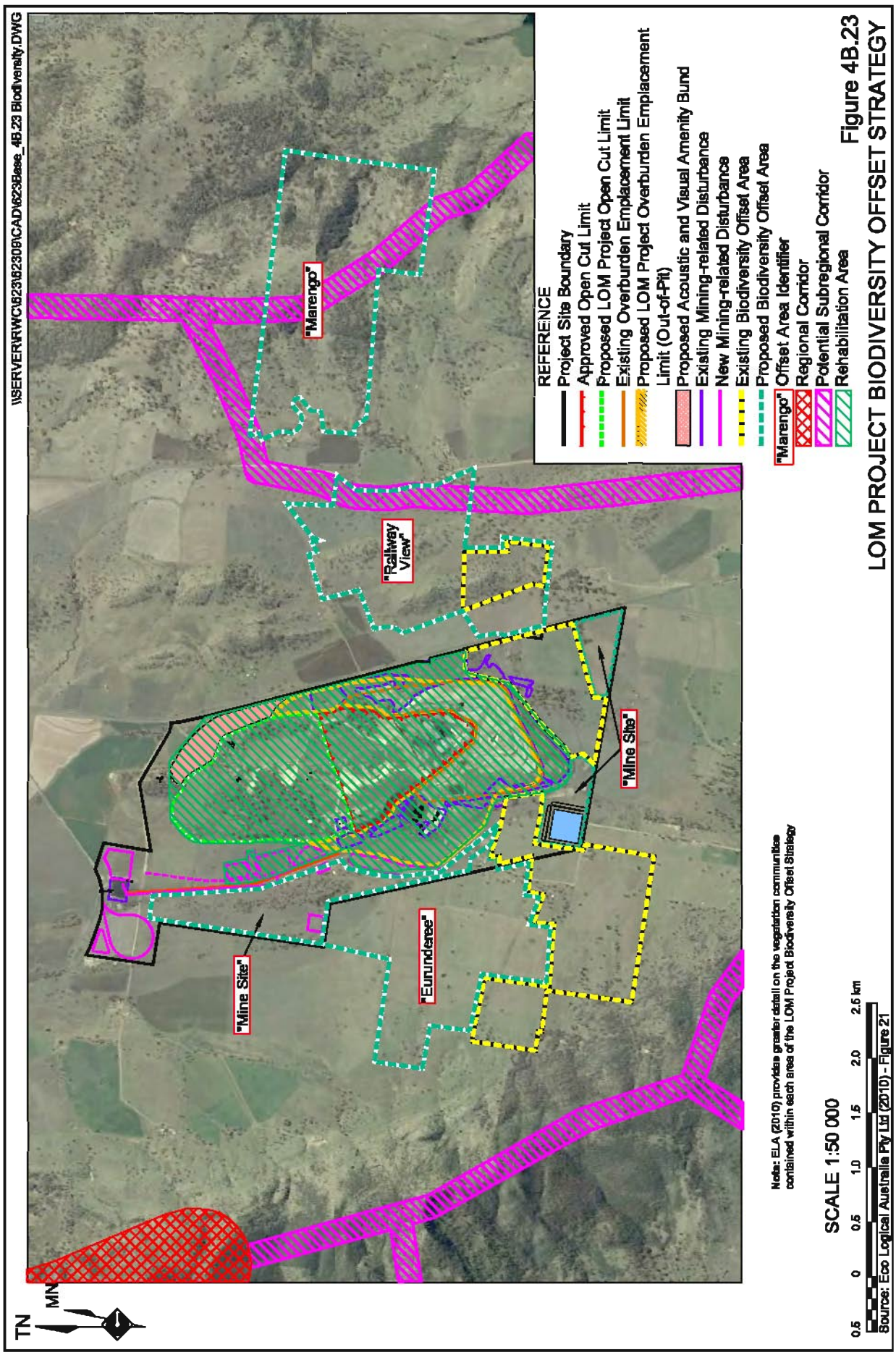
The following considers the adequacy of the proposed LOM Project BOS against the 13 guiding principles of DECC (2008d) and the eight guiding principles of DEWHA (2007) (identified in Section 2.14.9.2).

- **DECCW Principle 1: Impacts must be *avoided first* by using prevention and mitigation measures.**

  Offsets are then used to address remaining impacts. This may include modifying the proposal to avoid an area of biodiversity value or putting in place measures to prevent offsite impacts.

The design of the LOM Project has attempted to avoid impacts where possible by preferentially using the completed open cut void for the placement of overburden and interburden, using previously disturbed or approved areas for temporary disturbance features such as soil and vegetation stockpiles and placing these stockpiles on the upper lift of the overburden emplacement once this area becomes available. Impacts on local biodiversity would be further minimised by using areas of lower class vegetation for the mine infrastructure. Section 4B.6.5.2 provides more detail on the proposed impact avoidance and minimisation measures.

Section 4B.6.5.3 describes the various safeguards and controls to be implemented by the Proponent to mitigate impacts on biodiversity.


\\SERVERVRWC\623\623009\CAD\623Base_4B.23 Biodiversity.DWG
REFERENCE
Project Site Boundary
Approved Open Cut Limit
Proposed LOM Project Open Cut Limit
Existing Overburden Emplacement Limit
Proposed LOM Project Overburden Emplacement Limit (Out-of-Pit)
Proposed Acoustic and Visual Amenity Bund
Existing Mining-related Disturbance
New Mining-related Disturbance
Existing Biodiversity Offset Area
Proposed Biodiversity Offset Area
"Marengo" Offset Area Identifier
Regional Corridor
Potential Subregional Corridor
Rehabilitation Area
"Marengo"
"Railway View"
"Mine Site"
"Mine Site"
"Eurunderee"
TN
MN
SCALE 1:50 000
0.5 0 0.5 1.0 1.5 2.0 2.5 km
Source: Eco Logical Australia Pty Ltd (2010) - Figure 21
Note: ELA (2010) provides greater detail on the vegetation communities contained within each area of the LOM Project Biodiversity Offset Strategy
Figure 4B.23
LOM PROJECT BIODIVERSITY OFFSET STRATEGY

The proposed mitigation and impact avoidance proposed by the Proponent notwithstanding, the LOM Project would still result in the disturbance to approximately 194ha of native woodland and derived native grassland vegetation. By providing an offset ratio of approximately 3:1 for direct 'like for like' vegetation (of the EEC), and approximately 4:1 when all conserved vegetation is considered (see **Table 2.14** and Section 2.14.9.3), the proposed LOM Project BOS addresses these residual impacts by providing for the long-term conservation of similar vegetation and habitat to that disturbed. This would ensure habitat for the identified threatened species is maintained locally, increasing the viability of local populations of these species as well as regionally significant communities.

- **DECCW Principle 2: All regulatory requirements must be met.**
  Offsets cannot be used to satisfy approvals or assessments under other legislation, e.g. assessment requirements for Aboriginal heritage sites, pollution or other environmental impacts (unless specifically provided for by legislation or additional approvals).

The LOM Project BOS has been designed to meet the 'improve or maintain' requirement identified by both DoP and DECCW in the DGRs issued for LOM Project. Notably, the implementation of the LOM Project BOS would ensure that the impacts on threatened flora and fauna do not exceed the key thresholds identified by Step 5 of the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI, 2005).

The Proponent would meet all regulatory requirements related to the construction, operation and rehabilitation of the LOM Project nominated by the project approval, should this be granted.

- **DECCW Principle 3: Offsets must never reward ongoing poor performance.**
  Offset schemes should not encourage landholders to deliberately degrade or mismanage offset areas in order to increase the value from the offset.

The Proponent has not deliberately degraded or mismanaged any land under its control. *Appendix K* of ELA (2010b) provides a summary of environmental performance of the Proponent at the Werris Creek Coal Mine.

- **DECCW Principle 4: Offsets will complement other government programs.**
  A range of tools is required to achieve the NSW Government's conservation objectives, including the establishment and management of new national parks, nature reserves, state conservation areas and regional parks and incentives for private landholders.

The LOM Project BOS has been designed to secure a conservation corridor between two sub-regional corridors of over 1 655ha. This land would be managed privately, however, would complement other government conservation programs and areas.

The LOM Project BOS (and associated rehabilitation) would also assist in the achievement of catchment targets for native plants and animals noted in the Namoi Catchment Action Plan (NCMA, 2007) as follows.

- MTB1 – From 2006, maintain or improve the extent, distribution and condition of the existing native vegetation of the catchment.

  *The LOM Project BOS and proposed rehabilitation would create a wildlife corridor in the order of 1 655ha between two existing sub-regional biodiversity corridors (see **Figure 4B.23**).*

- MTB2 – From 2006, support the recovery of priority fauna populations, and Threatened Species, Populations and Communities.

  The conserved corridor would provide for the creation and conservation of important habitat features for threatened species, populations and communities.

- MTB3 – From 2006, reduce the economic and environmental impacts of targeted invasive plants and animals.

  The creation of a large corridor, linking existing biodiversity corridors, would reduce edge effects on remnant native vegetation which would assist in the control of invasive species.

It is also notable that while not designed as a Biobanking project, ELA (2010b) used the Biobanking Methodology (DECC, 2008a) to complete an indicative calculation of offset requirements. This calculation was used to guide and inform the development of suitable offset ratios, which also considered the social and economic benefits provided by the LOM Project. As discussed in ELA (2010), the proposed LOM Project BOS compares favorably with the offset requirements generated using the Biobanking Methodology.

- **DECCW Principle 5: Offsets must be underpinned by sound ecological principles.**

  They must:
  - *include the consideration of structure, function and compositional elements of biodiversity, including threatened species;*
  - *enhance biodiversity at a range of scales;*
  - *consider the conservation status of ecological communities; and*
  - *ensure the long-term viability and functionality of biodiversity.*

  Biodiversity management actions, such as enhancement of existing habitat and securing and managing land of conservation value for biodiversity, can be suitable offsets. Reconstruction of ecological communities involves high risks and uncertainties for biodiversity outcomes and is generally less preferable than other management strategies, such as enhancing existing habitat.

  DSEWPaC* Equivalent *(Principle 4): Environmental offsets should be developed as a package of actions - which may include both direct and indirect offsets

Significant flora and fauna survey has been completed on the Project Site (where the impacts will occur) and over the lands to be included in the LOM Project BOS. This survey has been completed in accordance with the survey requirements specified by DEC (2004) and as such the assessment of impacted and available vegetation is based on sound ecological study.

The LOM Project BOS meets the above objectives through the creation of a 1 655ha corridor which includes:

- 'like for like' ecological communities;
- removal of grazing from derived native grasslands to allow for natural resilience to regenerate over cleared landscapes;
- creation of a connection between two sub-regional biodiversity corridors that is currently absent in the landscape; and
- provides the eco-tonal elements associated with ridge-top vegetation types within the conservation corridor that are currently unsecured in the locality.

As noted specifically by this principle, the efficacy of reconstructing ecological communities is uncertain. Therefore, as the proposed LOM Project BOS primarily involves securing and managing land for biodiversity, and focuses on reconstruction of ecological communities as a supplementary activity. On this basis, it is considered that the LOM Project BOS would contribute significantly to ensuring the long term viability and functionality of biodiversity in the locality.

Furthermore, consideration of the Biobanking Methodology (DECC, 2008a) identifies that the proposed offset areas generally conform to the requirements generated using this method (ELA, 2010b).

- **DECCW Principle 6: Offsets should aim to result in a net improvement in biodiversity over time.**

  Enhancement of biodiversity in offset areas should be equal to or greater than the loss in biodiversity from the impact site.

  Setting aside areas for biodiversity conservation without additional management or increased security is generally not sufficient to offset against the loss of biodiversity. Factors to consider include protection of existing biodiversity (removal of threats), time-lag effects, and the uncertainties and risks associated with actions such as revegetation.

  Offsets may include enhancing habitat, reconstructing habitat in strategic areas to link areas of conservation value, or increasing buffer zones around areas of conservation value and removal of threats by conservation agreements or reservation.

  DSEWPaC Equivalent (Principle 3): Environmental offsets should deliver a real conservation outcome.

The areas to be included in the LOM Project BOS provide a 4:1 offset ratio of offset:cleared vegetation, which would be managed to provide an increase in biodiversity values, i.e. through restoration of canopy, shrubs and groundcovers components, to provide a net improvement over time. The LOM Project BOS would be managed through the development of a Landscape Management Plan that would provide the objectives, schedules, protocols, and management activities to ensure that the proposed rehabilitation of mine-related disturbance to native woodland is completed and the land maintained as a conservation area.

- **DECCW Principle 7: Offsets must be enduring – they must offset the impact of the development for the period that the impact occurs.**

  As impacts on biodiversity are likely to be permanent, the offset should also be permanent and secured by a conservation agreement or reservation and management for biodiversity. Where land is donated to a public authority or a private conservation organisation and managed as a biodiversity offset, it should be accompanied by resources for its management. Offsetting should only proceed if an appropriate legal mechanism or instrument is used to secure the required actions.

  DSEWPaC Equivalent (Principle 7): Environmental offsets should be delivered in a timely manner and be long lasting.

By conserving existing native vegetation in good condition, and improving vegetation in poor or moderate condition, the proposed LOM Project BOS would provide the immediate offsetting of disturbance, which would be maintained for the life of the LOM Project and beyond.

The Proponent would secure the LOM Project BOS through an enduring covenant or restriction on the use of the land under Section 88B of the *Conveyancing Act 1919*, Part 4, Division 12 of the *National Parks and Wildlife Act 1974* or similar arrangement, to the satisfaction of the DoP. The purpose of such an arrangement would be to restrict the use of the offset area for the purposes of native vegetation conservation in perpetuity. In light of this commitment to ensure the ongoing maintenance and restriction of the use of the offset area, and the eventual rehabilitation of selected areas of the Project Site to native vegetation, the proposed offset measures would result in the offsets continuing longer than the period of impact associated with the LOM Project.

- **DECCW Principle 8: Offsets should be agreed prior to the impact occurring.**

The offset measures, and a timeframe for putting the appropriate legal arrangements and management strategies in place, would be agreed with the relevant government agencies prior to LOM Project-related disturbance occurring. Preliminary consultation has been undertaken with State and Commonwealth government agencies.

All of the land that forms the LOM Project BOS is already owned by the Proponent, and as such the BOS can be implemented upon project approval.

- **DECCW Principle 9: Offsets must be quantifiable – the impacts and benefits must be reliably estimated.**

  Offsets should be based on quantitative assessment of the loss in biodiversity from the clearing or other development and the gain in biodiversity from the offset. The methodology must be based on the best available science, be reliable and used for calculating both the loss from the development and the gain from the offset. The methodology should include:
  - *the area of impact;*
  - *the types of ecological communities and habitat/species affected;*
  - *connectivity with other areas of habitat/corridors;*
  - *the condition of habitat;*
  - *the conservation status and/or scarcity/rarity of ecological communities;*
  - *management actions; and*
  - *level of security afforded to the offset site.*

  The best available information/data should be used when assessing impacts of biodiversity loss and gains from offsets. Offsets would be of greater value where:
  - *they protect land with high conservation significance;*
  - *management actions have greater benefits for biodiversity;*
  - *the offset areas are not isolated or fragmented; and*
  - *the management for biodiversity is in perpetuity, e.g. secured through a conservation agreement.*

  Management actions must be deliverable and enforceable.

The LOM Project BOS was developed with reference to the Biobanking Methodology (DECC, 2008a), which provides a transparent, consistent and scientifically-based set of rules to assess biodiversity values and calculate sufficient offsets to impacts so as to 'improve or maintain' environmental outcomes. **Table 4B.38** provides a summary of the biobanking calculations completed by ELA (2010) in accordance with DECC (2008a).

Table 4B.38
Ecosystem Credits and Offset Requirements using the Biobanking Methodology

Vegetation Type Name	Condition Class	Cleared Area (ha)	Credits Required	Credits Required (/ha)	Credits Generated (/ha)	Offset Required (ha)
Grassy White Box Woodland	4	58.5	3,826	65	11.06	345.9
White Box Grassy Woodland and Derived Native Grassland [1]	3a	74.6	2,238	30	13.31	168.1
White Box Grassy Woodland and Derived Native Grassland [2]	3b	60.7	1,821	30	13.31	136.8
Brigalow - Belah Woodlands	4	0.35	16.8	48	10	1.68
Final Offset Requirements (TSC Act only)		**194.2**	**7,902**			**652.5**
Final Offset Requirements (EPBC Act only)		**133.2**	**6,080**			**515.7**

Note 1: Meets the classification under both the EPBC Act and TSC Act
Note 2: Meets the classification for the TSC Act only

Source: Modified after ELA (2010b) – Table 12

Noting that reference to biobanking credits has only been included to provide some quantifiable reference against which the LOM Project BOS can be considered, i.e. no formal biobanking assessment has been completed, and considering the important habitat values provided by the non-EEC vegetation of the LOM Project, the proposed areas of conservation provided for by the LOM Project BOS (838.9ha of which 567.4ha represents Grassy White Box Woodland), the attainment of the "improve or maintain" outcome is considered to have been achieved.

The LOM Project BOS was also developed in consultation with DECCW and DSEWPaC. It provides for both 'like for like' vegetation and the eco-tonal influence of vegetation types that would not be impacted upon but provide the necessary integration from valley to ridgeline.

- **DECCW Principle 10: Offsets must be targeted – they must offset the impacts on a "like for like or better" basis.**

  They must offset impacts on the basis of like-for-like or better conservation outcome. Offsets should be targeted according to biodiversity priorities in the area, based on the conservation status of the ecological community, the presence of threatened species or their habitat, connectivity and the potential to enhance condition by management actions and the removal of threats. Only ecological communities that are equal or greater in conservation status to the type of ecological community lost can be used for offsets. One type of environmental benefit cannot be traded for another: for example, biodiversity offsets may also result in improvements in water quality or salinity but these benefits do not reduce the biodiversity offset requirements.

  DSEWPaC Equivalent (Principle 1): Environmental offsets should be targeted to the matter protected by the EPBC Act that is being impacted.

  DSEWPaC Equivalent (Principle 5): 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'.

The LOM Project BOS proposes the inclusion of 567.4ha of 'like for like' vegetation in varying condition states, along with the additional benefits of securing eco-tonal influence of shrubby woodland and rainforest vegetation types to compliment the grassy woodlands vegetation types.

Notably, ELA (2010b) confirms the presence of at least two threatened bird species (Hooded Robin and Diamond Firetail) within the shrubby woodland vegetation on the "Marengo" property. This illustrates the value of these additional, non-grassy woodland vegetation, vegetation types within the LOM Project BOS.

- **DECCW Principle 11: Offsets must be located appropriately.**

  Wherever possible, offsets should be located in areas that have the same or similar ecological characteristics as the area affected by the development.

  DSEWPaC Equivalent (Principle 6): Environmental offsets should be located within the same general area as the development activity.

The proposed LOM Project BOS includes 838.9ha of vegetation into conservation covenant in the immediate vicinity of the impact area. This is complemented by an additional area of rehabilitation in excess of 454ha of native woodlands post mining plus 362.5ha of an existing BOS creating a corridor of approximately 1 655ha between two sub-regional biodiversity corridors. The vegetation contained within the sub-regional corridors and LOM Project BOS is equivalent to, or complements that to be disturbed.

- **DECCW Principle 12: Offsets must be supplementary.**

  They must be beyond existing requirements and not already funded under another scheme. Areas that have received incentive funds cannot be used for offsets. Existing protected areas on private land cannot be used for offsets unless additional security or management actions are implemented. Areas already managed by the government, such as national parks, flora reserves and public open space cannot be used as offsets.

  DSEWPaC Equivalent (Principle 2): 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.

The LOM Project BOS would be located on land owned by the Proponent in the immediate vicinity of the impacted area which are currently managed as grazing and cropping lands. There is no conservation security provided to any of the vegetation present within the land to be included within the LOM Project BOS and therefore it would be supplementary to existing conservation management.

- **DECCW Principle 13: Offsets and their actions must be enforceable through development consent conditions, licence conditions, conservation agreements or a contract.**

  Offsets must be audited to ensure that the actions have been carried out, and monitored to determine that the actions are leading to positive biodiversity outcomes.

  DSEWPaC Equivalent (Principle 8): Environmental offsets should be enforceable, monitored and audited.

The Proponent has proposed to include approximately 838.9ha of vegetation identified in the conservation corridor into covenant. As noted in Section 2.14.9.3, the Proponent proposed to monitor the progress of this corridor for a period post mining of 20 years (or a lesser period, if deemed acceptable by the Director-General). The Proponent envisages that the implementation of the LOM Project BOS would be included as a condition of any project approval granted. In addition, it is anticipated that the conditions to any project approval would include a requirement for the Proponent to undertake an independent compliance audit of the LOM Project BOS against the conditions of the project approval.

4B.6.6 Assessment of Residual Impacts on Biodiversity

4B.6.6.1 Introduction

The following sub-sections consider the residual impacts of the LOM Project on local biodiversity values.

- Section 4B.6.6.2 reviews the direct impact of the LOM Project on vegetation and fauna habitat on the Project Site.
- Section 4B.6.6.3 reviews the likely impact of the LOM Project on the threatened communities and species that are known to occur, or which could potentially occur on the Project Site.
- Section 4B.6.6.4 considers the potential impact of the LOM Project on GDEs.
- Section 4B.6.6.5 considers the indirect impacts of the LOM Project such as edge effects and noise impacts.
- Section 4B.6.6.6 reviews the cumulative impact of the LOM Project on local biodiversity.

4B.6.6.2 Direct Impacts (Clearing of Vegetation)

The LOM Project would result in the removal of approximately 194ha of native vegetation, comprising approximately 59ha of Class 4 Grassy White Box and Brigalow woodland vegetation and 135ha of Class 3 Grassy White Box Woodland and Derived Native Grassland (Class 3a and 3b). Of the Derived Native Grassland vegetation within the Project Site, 74ha is listed as threatened under both the TSC Act and EPBC Act 1999 with a further 61ha listed under the TSC Act only.

The following assesses the significance of the proposed clearing. It is assessed that the direct impact of this vegetation clearing is acceptable as the area of impact has been minimised (see Section 4B.6.5.2), with mitigation measures proposed to further reduce the overall impact (see Section 4B.6.5.3).

- The proposed clearing would result in a temporary reduction in the extent of the identified native vegetation communities locally.

  The area of impact has been minimised (see Section 4B.6.5.2) with established mitigation measures to be implemented (see Section 4B.6.5.3) likely to reduce the impact of the clearing further.

  It is also noted that the reduction in native vegetation would only be temporary as the proposed rehabilitation would ultimately increase the area of native vegetation on the Project Site and improve the condition of those undisturbed sections of the Project not designated as agricultural land in the final landform (all but 31ha).

  Furthermore, the establishment of the LOM Project BOS would create a habitat corridor of approximately 1 655ha linking recognised habitat corridors to the east and west.

- The proposed clearing would result in a temporary reduction in fauna habitat.

  As noted above, the area of impact has been minimised, with the proposed mitigation measures and LOM Project BOS likely to improve fauna habitat in the longer term.

- The proposed clearing could potentially result in the incidental mortality of threatened bats during clearing.

  The established pre-clearing procedures that would continue to be implemented would significantly reduce the risk of this outcome.

- The proposed clearing would result in a temporary fragmentation of remnant woodland and grassland vegetation.

  The proposed rehabilitation of the final landform and establishment of the LOM Project BOS would create a habitat corridor of approximately 1 655ha linking recognised habitat corridors to the east and west.

- The proposed clearing could result in temporary reduction in the ecological function of this vegetation type in the immediate area.

  It is considered that the long-term benefits provided by the proposed rehabilitation and LOM Project BOS would offset the short-term impacts associated with the vegetation clearing. Assuming the Brigalow woodland can be successfully established in the final landform, the possible reduction in ecological function would not result in any community or species being threatened with extinction locally (see Section 4B.6.6.3).

4B.6.6.3 Impacts of Flora and Fauna of Conservation Significance

ELA (2010b) completed an assessment of the potential impact of the LOM Project on each of the threatened species and ecological communities known to occur on the Project Site.

The assessment of ELA (2010b) considered both the impact assessment guidelines relevant to threatened species and communities listed under the NSW TSC Act, and the threatened species, communities and migratory species listed under the Commonwealth EPBC Act.

The following summarises the impact assessments of ELA (2010b) under the two legislative processes.

TSC Act – Impact Assessments for Threatened Species and Communities

Only species or communities "known" to occur on the Project Site were considered by ELA (2010b) as the survey effort between 2004 and 2010, which was more comprehensive than recommended by the *Threatened Biodiversity Survey and Assessment Guidelines* (DEC 2004), was considered sufficient to identify if "potential" or "likely" species actually occurred. The species and communities assessed by ELA (2010b) included:

- Brown Treecreeper (vulnerable species);
- Hooded Robin (vulnerable species);
- Little Eagle (vulnerable species);
- Little Lorikeet (vulnerable species);

- Eastern Bent-wing Bat (vulnerable species);
- Eastern False Pipistrelle (vulnerable species);
- Greater Broad-nosed Bat (vulnerable species);
- Yellow Sheath-tailed Bat (vulnerable species);
- White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Native Grasslands (endangered ecological community); and
- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions (endangered ecological community).

No threatened flora listed under the TSC Act have been recorded within the Project Site and therefore, no impact assessment was completed by ELA (2010b).

The assessment of the threatened species known to occur on the Project Site, which was completed in compliance with the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI, 2005), concluded that while the LOM Project would result in the removal of approximately 194ha of Grassy White Box Woodland and Derived Native Grasslands, which could provide habitat for these species, the impact was not considered significant when the following mitigating factors were taken into account.

- The total area of Grassy White Box Woodland and Derived Native Grasslands to be removed represents a <0.01% of the approximately 25 000ha of this vegetation type found locally, i.e. there is significant foraging, nesting and roosting habitat available (within 10km of the LOM Project Site).
- The implementation of the LOM Project BOS would provide conservation security for approximately 838.9ha of native vegetation, including 567.4ha of Grassy White Box Woodland and Derived Native Grasslands. This represents approximately 87% of the calculated biobanking requirement (see **Table 4B.38**). When considered along with the other key habitat features provided by the additional lands of the LOM Project BOS, and the creation of a continuous east-west corridor between two established sub-regional corridors (see **Figure 4B.23**), this is assessed as an extremely valuable offset.
- The LOM Project BOS would be complemented by an additional 454ha of native woodland to be generated over the final landform as part of mine rehabilitation.
- The combined area of vegetation held within the LOM Project BOS and mine rehabilitation would create a habitat corridor of approximately 1 655ha between two sub-regional biodiversity corridors. This would enhance the value of these corridors for the conservation and distribution of native species.
- The proposed disturbance would not isolate or fragment any currently connected areas of habitat for use by these highly mobile species.
- In the case of the Eastern Bent-wing Bat, no maternity caves would be disturbed.
- The incremental nature of the clearing coupled with the rehabilitation of the final landform would provide an intermediary habitat resource for fauna movement and dispersal of floral genetic resources.

The ELA (2010b) assessment of the impact on the White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Native Grasslands concluded that while approximately 194ha of this community type (in varying condition) would be removed, this impact was not considered significant when the following mitigating factors were taken into account.

- The total area of this vegetation community to be removed represents a <0.01% of the approximately 25 000ha of this vegetation type found within 10km of the LOM Project Site.
- The implementation of the LOM Project BOS would provide conservation security for 567.4ha of this vegetation community.
- The combined area of vegetation held within the LOM Project BOS and mine rehabilitation would create a habitat corridor of approximately 1 655ha between two sub-regional biodiversity corridors. This would enhance the security of this vegetation type by providing greater opportunity for the spread of floral genetic resources.
- The incremental nature of the clearing coupled with the rehabilitation of the final landform would provide an intermediary habitat resource for the dispersal of floral genetic resources.

The ELA (2010b) assessment of the impact on the Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions concluded that the complete displacement of an old growth remnant of this EEC would constitute a significant impact. ELA (2010b) did note, however, that the proposed rehabilitation would significantly reduce the impact which, when considered in conjunction with the proposed creation of a 1 655ha corridor of native vegetation between two sub-regional biodiversity corridors which, is assessed as a positive outcome. This is considered to meet the "like for like or better" criteria of DECC (2008d) (Principle 12).

On the basis of the conclusions drawn by ELA (2010b), and with reference to Step 5 (Key Thresholds) of the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI, 2005), the residual impacts on threatened species is justified as:

- the proposed rehabilitation and LOM Project BOS would provide for an improvement in biodiversity values;
- the LOM Project would not result in a reduction to the long-term viability of any of the affected species or ecological communities (in fact the creation of the wildlife corridor would improve the long-term viability of the identified threatened species and communities);
- the LOM Project would not accelerate the extinction of any of the affected species or communities (in fact the proposed rehabilitation and LOM Project BOS would increase available habitat and habitat connectivity which would assist in the conservation of these species and communities in the region); and
- the LOM Project would not adversely affect critical habitat.

EPBC Act Matters of National Environmental Significance Impact Assessment

ELA (2010b) also assessed the impact of the LOM Project on the following EPBC Act listed endangered and critically endangered species and communities, either known to occur on the Project Site, having the potential to occur on the Project Site or identified by supplementary DGRs issued by the DoP to the Proponent, in accordance with the Significant Impact Guidelines for Matters of National Environmental Significance. The following provides the conclusions of ELA (2010b) with respect to the four species and two communities assessed.

- Swift Parrot (endangered species) and Regent Honeyeater (endangered species).

  The LOM Project proposes to remove approximately 58.5 ha of woodland habitat for these two woodland bird species. However, as this vegetation represents <0.01% of this vegetation type within 10km of the LOM Project Site, it is not considered likely that these species would decline as a result of the LOM Project.

- Finger Panic Grass (endangered species).

  It is considered highly unlikely that this species occurs on the Project Site (due to the conspicuous nature of the species and the comprehensive survey effort conducted between 2004 and 2010) and therefore highly unlikely that the LOM Project would have any impact.

- *Prasophyllum sp. Wybong* (A leek orchid) (critically endangered species).

  It is considered highly unlikely that this species occurs on the Project Site (due to the fact that it is not known from the local area and is likely to have been observed if present during the comprehensive survey effort conducted between 2004 and 2010). It is therefore highly unlikely that the LOM Project would have any impact.

- White Box-Yellow Box-Blakely's Red Gum and Derived Native Grasslands (critically endangered ecological community).

  The LOM Project would result in disturbance to approximately 133.1ha of this community (although approximately 44% is found as derived native grasslands only) and as such has been deemed a controlled action by DSEWPaC. ELA (2010b) concludes that while the clearing of this Critically Endangered Ecological Community is likely to be significant, the implementation of the LOM Project BOS and proposed rehabilitation of the Project Site (to provide a conservation corridor of approximately 1 655ha) would mitigate this impact such that it provides a 'net gain' outcome for the community in the local area.

- Brigalow (*Acacia harpophylla* dominant and co-dominant) (endangered ecological community).

  The 0.35ha area of this vegetation community remnant that would be impacted is in a modified condition and has a low diversity of species common to this vegetation type. In order to mitigate the impact on this community, it is proposed that this remnant is supplanted locally (3.7ha) as part of mine rehabilitation and revegetation. ELA (2010b) concludes that the complete displacement of an old growth remnant of this EEC constitutes a significant impact. However, it is assessed that the proposed rehabilitation would significantly reduce the impact which when considered in conjunction with the proposed creation of a 1 655ha corridor of native vegetation between two sub-regional biodiversity corridors which is assessed as a positive outcome.

4B.6.6.4 Impacts on Groundwater Dependent Ecosystems

As the proposed drawdown attributable to the LOM Project would not result in any measurable reduction in base flows to Werris or Quipolly Creeks, there would be no impact on any groundwater dependent vegetation located within the riparian zones of these creeks.

4B.6.6.5 Indirect Impacts

Edge Effects

Potential edge effects that may occur as a result of the LOM Project include weed invasion and fragmentation of existing woodland remnants. These impacts would be considered minimal due to current weed management practices undertaken by the Proponent.

Any temporary edge effects would be offset by the creation of a large conservation corridor (1 655ha) through the implementation of the LOM Project BOS.

Noise

It is possible that the noise associated with mining operations could indirectly impact upon fauna species by limiting communication between individuals and the general ambience of the natural environment (ELA, 2010a). This may cause the migration of some highly mobile species from the Project Site to alternative habitat in the local area during the period of mining operations.

The field survey of ELA (2010b) recorded 82 fauna species using the Project Site, including four threatened bird species and four threatened bat species. Given the diversity of species still found at the Project Site alongside current mining operations, this potential indirect impact is considered unlikely to have a significant impact on local biodiversity.

4B.6.6.6 Cumulative Impacts

The approved Werris Creek Coal Mine includes the clearing of 43ha of native woodland. The loss of a further 194ha of native woodland and derived native grassland as a result of the LOM Project would add to the cumulative loss of vegetation from the local area. However, this reduction in this community type still represents less than 0.01% of the approximately 25 000ha of box gum woodland mapped within 10km of the LOM Project Site (ELA, 2010a). Furthermore, any reduction in this community type would be adequately offset by the proposed mine rehabilitation and LOM Project BOS.

4B.7 ABORIGINAL HERITAGE

A Cultural Heritage Assessment (incorporating an assessment of Aboriginal heritage) was completed for the LOM Project by Landskape Natural and Cultural Heritage Management. The full assessment is presented in Volume 2, Part 6 of the Specialist Consultant Studies Compendium (Landskape, 2010). Information from the assessment has been summarised in the following sub-sections.

4B.7.1 Introduction

Based on the risk analysis undertaken by R.W. Corkery & Co Pty Limited for the LOM Project (see Section 3.3 and **Table 3.6**), the specific Aboriginal heritage-related impacts that may result as a consequence of the Project (without the implementation of the safeguards, controls and mitigation measures presented in this section) and therefore require assessment include the following.

- Destruction of a minor Aboriginal site or artefact (moderate risk).
- Destruction of a significant Aboriginal site or artefact (moderate risk).
- Loss of archaeological knowledge (moderate risk).

In addition, the DGRs identify "*heritage (both **Aboriginal** and non-Aboriginal)*" as a key issue for assessment. DECCW identified "*impact assessment and protection of Aboriginal heritage, including blasting and vibration from operations and potential instability as a result of open pit operations and layout*" as key information requirements in its response to request by the Department of Planning for assistance in generating the DGRs. Further, the DECCW requested that the assessment of cultural heritage be undertaken in accordance with the relevant guidelines produced by the DECCW for the preparation of Aboriginal heritage assessments. These include:

- Aboriginal Cultural Heritage: Standards and Guidelines (NPWS, 1997).
- Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010).

The following sub-sections present the objectives of the assessment, methodology employed, a review of results from the heritage surveys undertaken, the proposed management of Aboriginal cultural heritage and an assessment of the significance of any impacts.

4B.7.2 Assessment Methodology

The Aboriginal heritage assessment was undertaken in the following stages.

- Stage 1 – Background Research and Literature Review.

  An understanding of the archaeological context of the Project Site was obtained through a review of historic records of the local area, previous archaeological studies and the Aboriginal Heritage Information Management System (AHIMS) register of Aboriginal sites. This information is further discussed in Section 4B.7.3.

- Stage 2 – Consultation and Community Involvement.

  Local Aboriginal community stakeholders were initially identified in accordance with the *Interim Community Consultation Requirements* (ICCRs) (DEC, 2004). Stakeholder identification and registration was then completed in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (ACHCRs) (DECCW, 2010). Consultation with each of the registered Aboriginal parties was then undertaken in accordance with the ACHCRs. Section 4B.7.4 provides further detail on the consultation undertaken.

- Stage 3 – Development of a Predictive Model for Site Location.

  Based on the background research and experience of Landskape, the archaeological sensitivity of landforms within the Project Site were determined to predict the likely type and frequency of the Aboriginal sites that may be identified. This allows for the development of a more targeted field survey methodology. Section 4B.7.5 provides further detail on the predictive model for site location and distribution.

- Stage 4 – Field Survey

  Field surveys were undertaken on 9 and 10 June 2010. Section 4B.7.6 presents further detail on the site inspection methodology, coverage and results.

- Stage 5 – Development of Management Strategies for Aboriginal Cultural Heritage.

- The proposed cultural heritage management strategies to be implemented for the LOM Project are described (see Section 4B.7.7).

- Stage 6 – Assessment of Impacts

  Considering the adoption of the proposed management strategies, the residual impact of the project on Aboriginal cultural heritage was assessed. This took into account not only the direct impact of the LOM Project, but also potential cumulative impacts on the regional archaeological record. Section 4B.7.8 provides further details in relation to the assessment of impacts.

4B.7.3 Background Research and Literature Review

A search was made of the Aboriginal Heritage Information Management System (AHIMS) Site Register maintained by the Culture and Heritage Division, DECCW, for all sites within a 5km radius centred on the Project Site. The search resulted in a listing of only 3 sites. These include stone artefact scatters at The Gap and Escott, respectively some 3km northwest and 1.5km west of the Project Site. A third site (AHIMS site number 29-2-0005) was identified by a previous Aboriginal heritage survey of the Project Site (ASR, 2004) (see **Figure 4B.24**).

Identified by ASR (2004) as "Narrawolga Axe-Grinding Grooves", it comprised at least 25 grooves on several sandstone slabs over an area of approximately 90m x 35m. Although mapped as occurring several hundred meters from this location on the AHIMS database, the description of the site and lack of suitable resources in the location recorded on the AHIMS database for axe grinding grooves convinced ASR (2004) that AHIMS site number 29-2-0005 and Narrawolga Axe-Grinding Grooves are the same site.

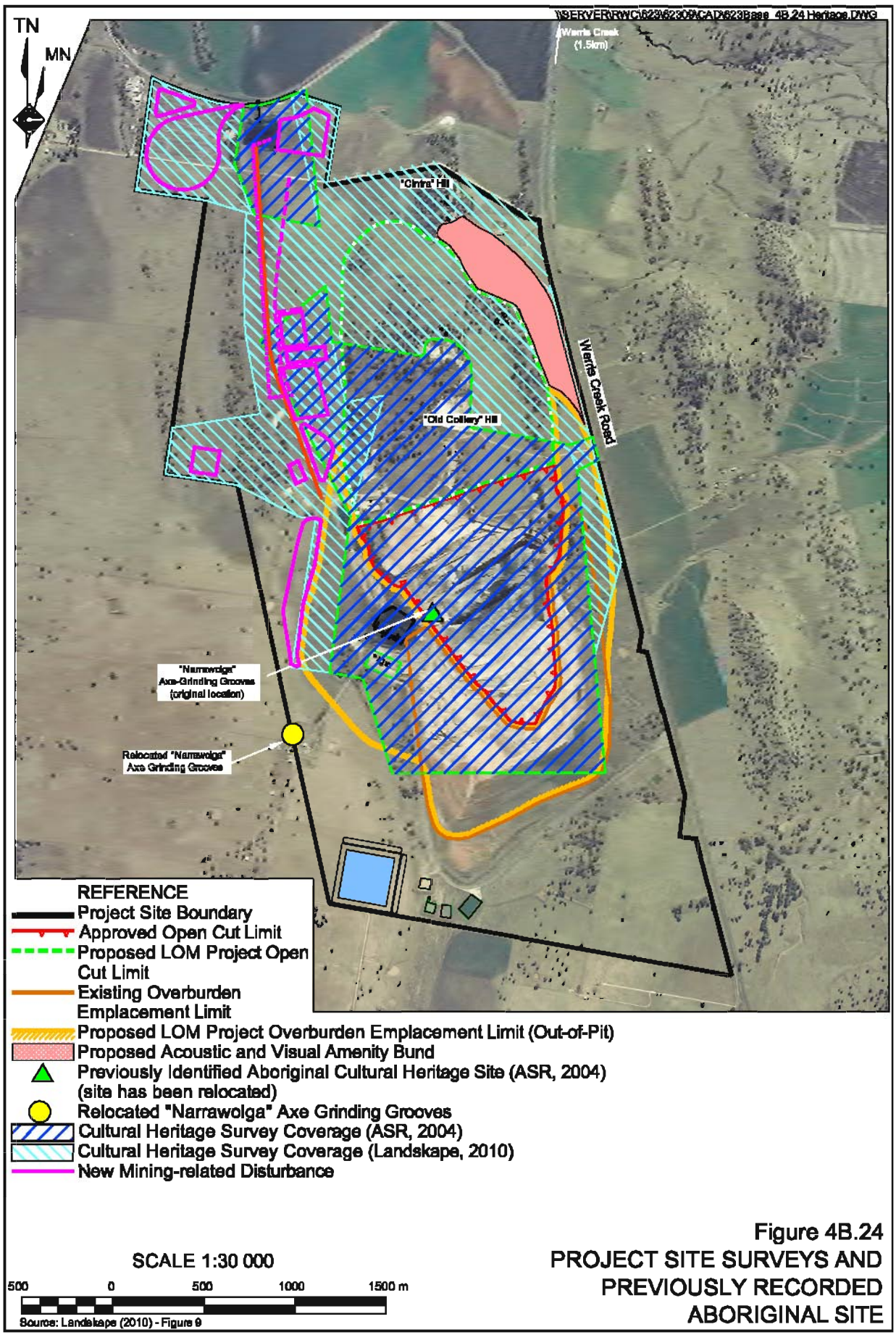


Figure 4B.24
PROJECT SITE SURVEYS AND PREVIOUSLY RECORDED ABORIGINAL SITE

Although originally proposed to be retained in situ, an Aboriginal Heritage Impact Permit (AHIP) under Section 90 of the *National Parks and Wildlife Act* 1974 was eventually applied for and issued to Werris Creek Coal Pty Limited to remove the Narrawolga Axe-Grinding Grooves (AHIMS site number 29-2-0005). The Narrawolga Axe-Grinding Grooves are presently stored on an adjacent property and are to be re-instated to a position as close as is possible to their original location following restoration and rehabilitation of the final landform.

4B.7.4 Consultation and Community Involvement

4B.7.4.1 Overview

Local Aboriginal community stakeholders were initially identified in accordance with the *Interim Community Consultation Requirements* (ICCR's) (DEC, 2004). Stakeholder identification and registration was then completed in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (ACHCR's) (DECCW, 2010).

In accordance with DECCW (2010), consultation was conducted:

- before the field assessment to identify Aboriginal community stakeholders, assess preliminary community views and organise a field survey team;
- during the field survey with the Aboriginal team members; and
- after the field survey to discuss the findings and recommendations for Aboriginal cultural heritage management.

4B.7.4.2 Identification of Aboriginal Community Groups and Individuals

Relevant stakeholders from the Aboriginal community were identified using a process consistent with the *Interim Community Consultation Requirements for Applicants* (DEC, 2004) and also considering the *Draft Aboriginal Cultural Heritage Community Consultation Requirements for Proponents* (DECC, 2009) and *Aboriginal Cultural Heritage Community Consultation Requirements for Proponents* (DECCW, 2010), as follows.

- Written letters of notification were sent to the Nungaroo LALC, Registrar of the NSW *Aboriginal Land Rights Act* 1983, NTS Corp Limited, DECCW, National Native Title Tribunal, Namoi Catchment Management Authority and Liverpool Plains Shire Council (11 March 2010) requesting advice about local Aboriginal stakeholders.
- Public advertisements were placed in local/regional newsprint media including the *Namoi Valley Independent* and *Northern Daily Leader* (15 March 2010) inviting interested persons/parties to register an interest in the LOM Project.
- Those previously involved in assessments of cultural heritage significance for the Werris Creek Coal Mine were contacted and considered.

In total, nine responses were received to this initial 'stakeholder identification' stage of consultation identifying five separate registered Aboriginal parties.

- Corie Taylor (individual).
- Lisa Shipley (individual).
- Tamworth Local Aboriginal Land Council (LALC).
- Gomeroi Tribal Nation Secretariat.
- Nungaroo LALC.

The location of the Werris Creek Coal Mine, the nature of the works associated with the LOM Project and a proposed survey methodology was presented to each of the registered Aboriginal parties and input as to acceptability of the proposed survey methodology sought.

4B.7.4.3 Aboriginal Involvement Prior to the Field Assessment

Prior to the field assessment, telephone discussions were held with each of the registered Aboriginal parties to explain the location of the Werris Creek Coal Mine, the nature of the works associated with the LOM Project and a proposed survey methodology. Each was then presented with written copies of a proposed methodology for the cultural and archaeological assessment. Opinions of the registered Aboriginal stakeholders about the LOM Project and its potential impacts on cultural heritage were sought and any concerns or queries were addressed.

The registered Aboriginal stakeholders were then presented with a detailed overview of the LOM Project to assist the registered Aboriginal parties in identifying relevant information about the cultural significance of Aboriginal cultural heritage items and/or places and the potential for impacts from the project.

4B.7.4.4 Aboriginal Involvement during the Field Assessment

On the recommendation of the registered Aboriginal stakeholders, the following four representatives from the registered Aboriginal stakeholders participated in the field survey conducted from 9 to 10 June 2010:

- Gordon Nean (Heritage Officer, Nungaroo LALC);
- Neville Sampson (Heritage Officer, Tamworth LALC);
- Victor Porter (Representative, Gomeroi Tribal Nation Secretariat); and,
- Heather Porter (Representative, Gomeroi Tribal Nation Secretariat).

Discussions were held with the representatives of the Aboriginal stakeholders to ascertain their views about the LOM Project and its potential impact on Aboriginal cultural heritage items, places and values.

4B.7.4.5 Aboriginal Involvement Following the Field Assessment

Draft copies of the cultural heritage assessment report were provided for comment to the registered Aboriginal parties for review and comment. In total, three responses to the draft cultural heritage assessment were received with all agreeing with the information included and recommended management strategies.

4B.7.5 Predictive Model

Predictive modelling aims to establish a theoretical model for site location and distribution within a given area. Based on the regional archaeological record, the high level of disturbance on the Project Site and the general setting of the Project Site, Landskape (2010) proposed the following predictive model of Aboriginal cultural heritage site locations on the Project Site.

- **Trees scarred or carved by Aboriginal people** may occur wherever mature Eucalypt and Cypress Pine trees grow. However, given the extent of vegetation clearance the probability of encountering culturally modified trees is not particularly high.

- **Stone artefact scatters** and **isolated finds** of stone artefacts are possible over the entire Project Site, but their density is likely to be low due to the absence of creeks and wetlands on or immediately surrounding the Project Site.
- **Burial sites** are unlikely, given that the region's acidic soils are not suited to preserving bone and other organic material.
- **Freshwater shell middens** will not occur because they are rarely found more than 100m from permanent water sources.
- **Earthen features** including **mounds**, **ovens** and **hearths, stone arrangements** and **ceremonial rings** are unlikely to be encountered because previous land disturbance such as earthworks associated with past and recent quarrying and mining activities, grading roads and fence lines, and ploughed cultivation during agricultural cropping is likely to have destroyed earthen and stone features (had these site types originally occurred within the Project Site).
- Some sites dependent upon the presence of rock formations such as **rock shelters** and **rock art sites** are also improbable because the sedimentary bedrock in the low hills and ridges of the Project Site does not contain caves or overhangs. The Project Site is not suited to **quarrying**, although Aboriginal people may have collected pebbles and cobbles from colluvial and alluvial deposits for stone artefact knapping.
- **Axe-grinding grooves** may occur on sandstone surfaces, and as such outcrops in the Project Site were targeted for particular attention during the survey.

4B.7.6 Field Survey

4B.7.6.1 Survey Methodology

Fieldwork was undertaken on 9 and10 June 2010 by Dr Matt Cupper (of Landskape) with the assistance of the Aboriginal community representatives listed in Section 4B.7.4.4.

The field survey area included the LOM Project disturbance footprint (see **Figure 4B.24**) which was inspected on foot with the ground surface examined for any archaeological traces such as stone artefacts, axe-grinding grooves, hearths, hearthstones, shells, bones and mounds. All mature trees in the areas of proposed disturbance were inspected for scarring or carving by Aboriginal people.

Landskape (2010) reports that approximately 18% of the survey area was inspected on foot with particular attention paid to areas with high ground surface visibility such as along stock and vehicle tracks and in scalds, gullies and other eroded areas. Further detail on the survey methodology, conditions and coverage is provided by Landskape (2010).

4B.7.6.2 Survey Results

No Aboriginal sites were identified during the field survey.

4B.7.7 Management Strategies for Aboriginal Cultural Heritage

The following management strategies would be implemented by the Proponent to ensure appropriate management of Aboriginal cultural heritage on the Project Site.

- The Archaeology and Cultural Heritage Management Plan would be updated to reflect the approval of the LOM Project. The updated Archaeology and Cultural Heritage Management Plan would remain active for the life of the Werris Creek Coal Mine and define the tasks, scope and conduct of all cultural heritage management activities.
- The Narrawolga Axe Grinding Grooves would be re-instated to a position as close as possible to their original location following rehabilitation of the Project Site in consultation with local Aboriginal community representatives.
- Staff and contractors would undergo cultural heritage inductions alerting them to their legislative obligations under the *National Parks and Wildlife Act 1974* (NPW Act). These inductions form part of the wider induction requirement for the Werris Creek Coal Mine, with all inducted persons recorded in a register, including the signature of each inductee as to their agreement with all matters prescribed within the induction, including cultural heritage management requirements.
- In the event the Project Site disturbance footprint changes, the Proponent would ensure that appropriate consultation and field survey is undertaken to confirm no sites or object of Aboriginal heritage significance are impacted.
- In the event any previously unidentified 'objects' or other Aboriginal sites (such as burials) are uncovered, work in that area of activity would be suspended and the DECCW Western Regional Archaeologist (Dubbo Office) and local Aboriginal community contacted to discuss how to proceed.

4B.7.8 Significance Assessment

The LOM Project would not have any direct impact on any sites or objects of Aboriginal heritage significance. The Proponent has demonstrated a commitment to consultation with the local Aboriginal community and assuming the implementation of the proposed management strategies, it is unlikely that the LOM Project would result in any future adverse impacts on Aboriginal cultural heritage.

4B.8 NON-ABORIGINAL HERITAGE

A Cultural Heritage Assessment (incorporating an assessment of non-Aboriginal heritage) was completed for the LOM Project by Landskape Natural and Cultural Heritage Management. The full assessment is presented in Volume 2, Part 6 of the Specialist Consultant Studies Compendium (Landskape, 2010). Information from the assessment has been summarised in the following sub-sections.

4B.8.1 Introduction

Based on the risk assessment undertaken for the Project (see Section 3.3 and **Table 3.6**), the specific non-Aboriginal heritage-related impacts that may result as a consequence of the LOM Project (without the implementation of the safeguards, controls and mitigation measures presented in this section) and therefore require assessment include the following.

- Destruction of a site or object which holds minor historic or local heritage significance (low risk).
- Destruction of a site or object which holds major historic or wider heritage significance (moderate risk).

In addition, the Director-General's requirements (DGRs) identify "*heritage (both Aboriginal and **non-Aboriginal**)*" as a key issue for assessment.

The following sub-sections present the objectives of the assessment, methodology employed, a review of results from the heritage surveys undertaken, the proposed management of non-Aboriginal cultural heritage and an assessment of the significance of any impacts.

4B.8.2 Assessment Methodology

The non-Aboriginal heritage assessment was undertaken in the following stages.

- Stage 1 – Background Research and Literature Review.

  An understanding of the historical context of the Project Site was obtained through a review of historic records of the local area, previous archaeological studies, a review of various heritage databases managed by local, NSW and Commonwealth agencies and interviews with current and previous residents of Werris Creek with some connection to activities on the Project Site. This information is further discussed in Section 4B.8.3.
- Stage 2 – Field Survey

  Field surveys were undertaken on 9 and 10 June 2010 coincident with the field surveys for Aboriginal heritage (see Section 4B.8.4).
- Stage 3 – Assessment of Significance
- Items of potential historic significance identified during the field survey were assessed for historic significance using the NSW Heritage Branch's assessment criteria detailed in *Assessing Heritage Significance* (NSW Heritage Office, 2001) (see Section 4B.8.5)
- Stage 4 – Development of Management Strategies for the Identified non-Aboriginal Sites.

  Based on the relative significance of the identified non-Aboriginal sites, management strategies have been recommended. Section 4B.8.6 presents further detail on the management strategies to be implemented for the identified Aboriginal sites.
- Stage 5 – Assessment of Impacts

  Considering the adoption of the proposed management strategies, the residual impact of the LOM Project on non-Aboriginal cultural heritage was assessed. Section 4B.8.7 provides further details in relation to the assessment of impacts.

4B.8.3 Background Research and Literature Review

4B.8.3.1 Historical Cultural Heritage Sites of the Local Area

The NSW State Heritage Inventory contains items listed by the Heritage Council under the Heritage Act. The Parry Local Environmental Plan (LEP) also lists historical heritage sites within the Parry Shire, precursor to the current Liverpool Plains Shire, the local government area in which the Project Site is located (Parry Shire, 1987).

The historical heritage site closest to the Project Site previously registered on the NSW Heritage database is Werris Creek Railway Station and Yard (State Heritage Register Database Number 5012287). This structure is located on the Great Northern Railway in Single Street, Werris Creek, approximately 3km north of the Project Site (NSW Heritage Branch, 2010). The Werris Creek Railway Precinct is also listed on the Parry LEP (LEP Database Number 4806177).

4B.8.3.2 Previous Archaeological Studies

Landskape (2010) reports that few historical archaeological investigations of the Werris Creek area have been completed. Of those that have been completed (Halliday, 2005 & ASR, 2004), the remnant coal mining infrastructure of the former Werris Creek Colliery was identified as being of some local historic significance. Halliday (2005) recommended that the boiler chimneystack of the former Werris Creek Colliery be added to the Liverpool Shire Heritage Inventory as it represented a site of high local significance[9].

4B.8.3.3 Historic Significance of the Former Werris Creek Colliery

In order to develop the historic context of the Project Site, particularly with reference to the operation of the former Werris Creek Colliery, Landskape (2010) conducted a number of interviews. In summary, the review of available literature and interviews provides the following record of operations at the Werris Creek Colliery.

- Exploration drilling commenced in 1924.
- Mining commenced in 1925.
- By 1928, the colliery employed 13 men with coal delivered to the Werris Creek railway to the north.
- Mining continued through the 1920s, 1930s and 1940s at a rate of approximately 20 000tpa supplying the local railways and Tamworth Electrical Power Station.
- Mining operations were partly mechanised in 1949 when electric-driven scraper loaders were introduced underground to load skips.
- As steam powered locomotives were gradually replaced, the production of coal reduced until 1963 when production ceased.

As noted by Halliday (2005) and ASR (2004), some surface remains of the former Werris Creek Colliery remain on the properties within the Project Site.

[9] The chimney stack was demolished in 2010, with the approval of Liverpool Plains Shire Council, due to structural instability and the safety hazard posed. It was comprehensively photographed prior to demolition with photographs to be included in a document entitled "History of Coal Mining at Werris Creek" (or similar) currently being prepared for the Werris Creek Coal Mine CCC.

4B.8.4 Field Survey

4B.8.4.1 Survey Methodology

Survey was undertaken by the LOM Project archaeologist concurrently with the survey for Aboriginal heritage, i.e. a combination of pedestrian and vehicle transects (see Section 4B.7.6.1).

4B.8.4.2 Survey Results

Landskape (2010) confirms the presence of remnant features of the former Werris Creek Colliery on the Project Site, namely:

- the underground workings;
- above-ground ruins;
- the deputy mine manager's residence; and
- a coal loading ramp.

The locations of the remnant features of the former Werris Creek Colliery are presented on **Figure 4B.25**, with all located within the proposed disturbance footprint of the LOM Project. Landskape (2010) provides a detailed description of each of these historic features.

4B.8.5 Assessment of Significance

The assessment of historic heritage significance has been undertaken using the NSW Heritage Branch's assessment criteria detailed in *Assessing Heritage Significance* (NSW Heritage Office, 2001). The following provides a summary of the Landskape (2010) evaluation of the remnant features of the former Werris Creek Colliery against the NSW Heritage Office (2001) criteria.

- Criterion (a) – an item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area).

  The remnant features of the former Werris Creek Colliery are considered significant in the local history of Werris Creek, being associated with development of the coal mining industry, rail transport and broader society, but are not of State or national importance and meet this criterion at the moderate level.

- Criterion (b) – an item has a strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local area).

  The remnant features of the former Werris Creek Colliery have low to moderate local significance according to this criterion. Original owners and former employees of the former Werris Creek Colliery and occupants of the former Deputy Mine Manager's residence still reside in the Werris Creek area or wider North West Slopes region or are known in local histories and to members of the local and regional community.

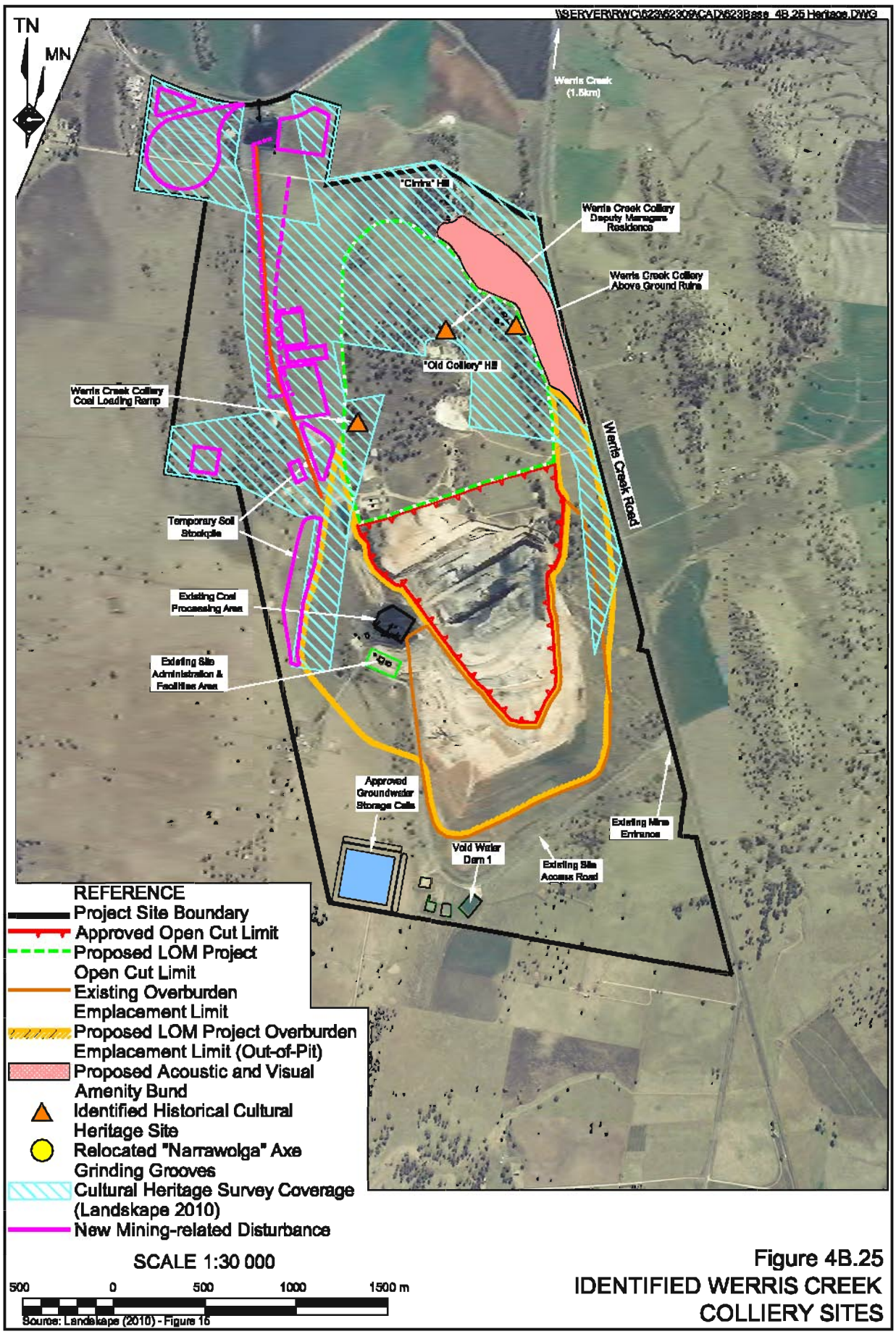


Figure 4B.25
IDENTIFIED WERRIS CREEK COLLIERY SITES

- Criterion (c) – an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area).

  The aesthetic qualities of the former underground workings, above ground ruins and coal loading ramp are low. The former Deputy Mine Manager's residence has a moderate local aesthetic rating.

- Criterion (d) – an item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons.

  Historical features associated with the former Werris Creek Colliery have moderate local social significance to some residents of Werris Creek and the wider community who formerly worked or lived at the site, or have family members and acquaintances who formerly worked or lived at the site.

- Criterion (e) – an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area).

  The Deputy Mine Manager's residence has moderate technical and research significance as the remains of domestic activities from the middle of the twentieth century may be preserved at the site (although given the residence was inhabited until 2008, this is unlikely). The potential for other features of the former Werris Creek Colliery to provide information about the history of the coal mining in the local area or NSW is limited, due to their generally poor state of preservation.

- Criterion (f) – an item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area).

- Criterion (g) – an item is important in demonstrating the principal characteristics of a class of NSW's:

  i. cultural or natural places; or
  ii. cultural or natural environments (or a class of the local area's: cultural or natural places; or cultural or natural environments).

  Mining sites from the middle of the twentieth century are not particularly abundant in the Werris Creek area or North West Slopes regions. However, the former Werris Creek Colliery is a very poorly preserved example of such site type. Dwellings from the 1920s similar to the Deputy Mine Manager's residence are common in Werris Creek and the wider region.

Table 4B.39 provides a summary of the four remnant features of the former Werris Creek Colliery and their assessment against the NSW Heritage Office (2001) criteria.

Table 4B.39
Assessment of Heritage Significance of the Remnant Features of the Former Werris Creek Colliery

Feature	Significance Criteria						
	(a)	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**
Underground Workings	Local (Moderate)	Local (Moderate)	None	Local (Moderate)	Local (Low)	Local (Moderate)	Local (Moderate)
Above-ground Ruins	Local (Moderate)	Local (Moderate)	None	Local (Moderate)	Local (Low)	Local (Moderate)	Local (Moderate)
Deputy Mine Manager's Residence	Local (Moderate)	Local (Moderate)	Local (Moderate)	Local (Moderate)	Local (Moderate)	Local (Low)	Local (Low)
Coal Loading Ramp	Local (Low)	Local (Low)	Local (Low)	Local (Low)	Local (Low)	Local (Moderate)	Local (Moderate)

Source: Modified after Landskape (2010) – Table 6

Landskape (2010) concludes that the remnant features of the former Werris Creek Colliery are not of high historical significance, even at a local level.

4B.8.6 Management Strategies for the Historic Sites

No specific management strategies have been proposed for the remnant features of the former Werris Creek Colliery as these do not represent sites of high heritage significance (even at a local level) which would require preservation or salvage. The Proponent recognises, however, that with the development of the LOM Project, the last remaining physical evidence of the former Werris Creek Colliery would be removed. In acknowledgement of this, the Proponent is prepared to undertake the following.

- Concrete marked with the hand and shoe prints of the former Deputy Mine Manager's daughter's at the residence would be salvaged and provided to Ms Dora Koops (one of the daughters) for posterity.
- The photo record held by the Proponent and its consultants would be made available to the Werris Creek Historical Society (or other similar community group) as a record of the remnant features at the time of removal.
- A copy of the Cultural Heritage Assessment (Landskape, 2010) would be provided to the Werris Creek Historical Society (or other similar community group) as a record of the remnant features of the Werris Creek Colliery at the time of removal.

4B.8.7 Assessment of Impacts

The impact associated with the removal of the remnant features of the former Werris Creek Colliery is considered to be minor, as the historic sites do not meet the NSW Heritage Office (2001) criteria for high significance sites (even at a local level) (Landskape, 2010).

No specific strategies are required to manage the removal of these remaining features, however, the Proponent would act to preserve a photo record (and other specific features as requested) of the former Werris Creek Colliery to ensure the history of the site is recorded for posterity.

4B.9 SOILS, LAND CAPABILITY AND AGRICULTURAL SUITABILITY

The soils, land capability and agricultural suitability assessment for the LOM Project was undertaken by GSS Environmental (GSSE, 2010b). The full assessment is presented in Volume 2, Part 7 of the Specialist Consultant Studies Compendium. Relevant information from the assessment is summarised in the following subsections.

4B.9.1 Introduction

Based on the risk analysis undertaken by R.W. Corkery & Co Pty Limited for the LOM Project (Section 3.3, **Table 3.6**) the potential impacts on soils, land capability and agricultural suitability requiring assessment and their **unmitigated** risk rating are as follows.

- Erosion of stripped, stockpiled and replaced soils (high risk).
- Insufficient soil qualities/quantities for rehabilitation (high risk).
- Reduced productivity of the final landform (high risk).
- Contaminated soil and land due to hydrocarbon/ chemical spills (moderate risk).

The Director-General's Requirements issued by the DoP identified "*Soils and Land Capability*" as one of the key issues that requires assessment for the LOM Project. The assessment of impacts on soils and land capability is required to address the following.

- Provide a description of the existing soil and land capability environment for the LOM Project using sufficient baseline data.
- Provide an assessment of the potential impacts of the LOM Project, including any cumulative impacts taking into consideration any relevant guidelines, policies, plans and statutory provisions.
- Provide a description of the measures that would be implemented to avoid, minimise and if necessary, offset the potential impacts of the LOM Project, including detailed contingency plans for managing any significant risks to the environment.

The following is a summary of the soils, land capability and agricultural suitability assessment. It describes the soils within the Project Site that would be disturbed, identifies the soil and land management issues associated with the LOM Project and the proposed soil-related controls, safeguards and mitigation measures. An assessment of the suitability of the proposed final rehabilitated landform is also presented.

4B.9.2 Soil Occurrences

4B.9.2.1 Regional Setting

The following four soil landscape units underpin the Project Site as delineated by the 'Soils of the Tamworth 1:100 000 Sheet Report'.

Narrawolga Soil Landscape

- Three soil profile types are present within this soil landscape, namely:
  - shallow tenosols (Lithosols) on the crests;
  - shallow tenosols (Earthy Sands) of the midslopes; and
  - brownsodosols (Solodic Soils) of the lower slopes.

Escott Soil Landscape

One major soil profile type occurs within this soil landscape, namely a Brown Sodosol (Soloth).

Siphon Soil Landscape

Five major soil profile types are present within this soil landscape, namely:

- red and brown chromosols (Red-brown Earths) and Red Ferrosols (Euchrozems) of the upper footslopes;
- black vertosols (Black Earths) of the mid footslopes; and
- grey vertosols (Grey Clays) of the lower footslopes.

The elevated land within the Project Site comprises the Narrawolga soil landscape. The area to the southwest, west and northwest of the ridge country comprises the Escott soil landscape and the area to the east and southeast of the Project Site comprises the Siphon soil landscape.

4B.9.2.2 Project Site Soils

The following soil units (**Figure 4B.26**) were identified by GSSE (2010b) within areas of the Project Site that are currently undisturbed by open cut mining activities.

- Brown Chromosol (73ha).
- Stoney Brown Chromosol (144ha).
- Dark Brown Vertosol (205ha).

4B.9.2.3 Soil Physical and Chemical Attributes

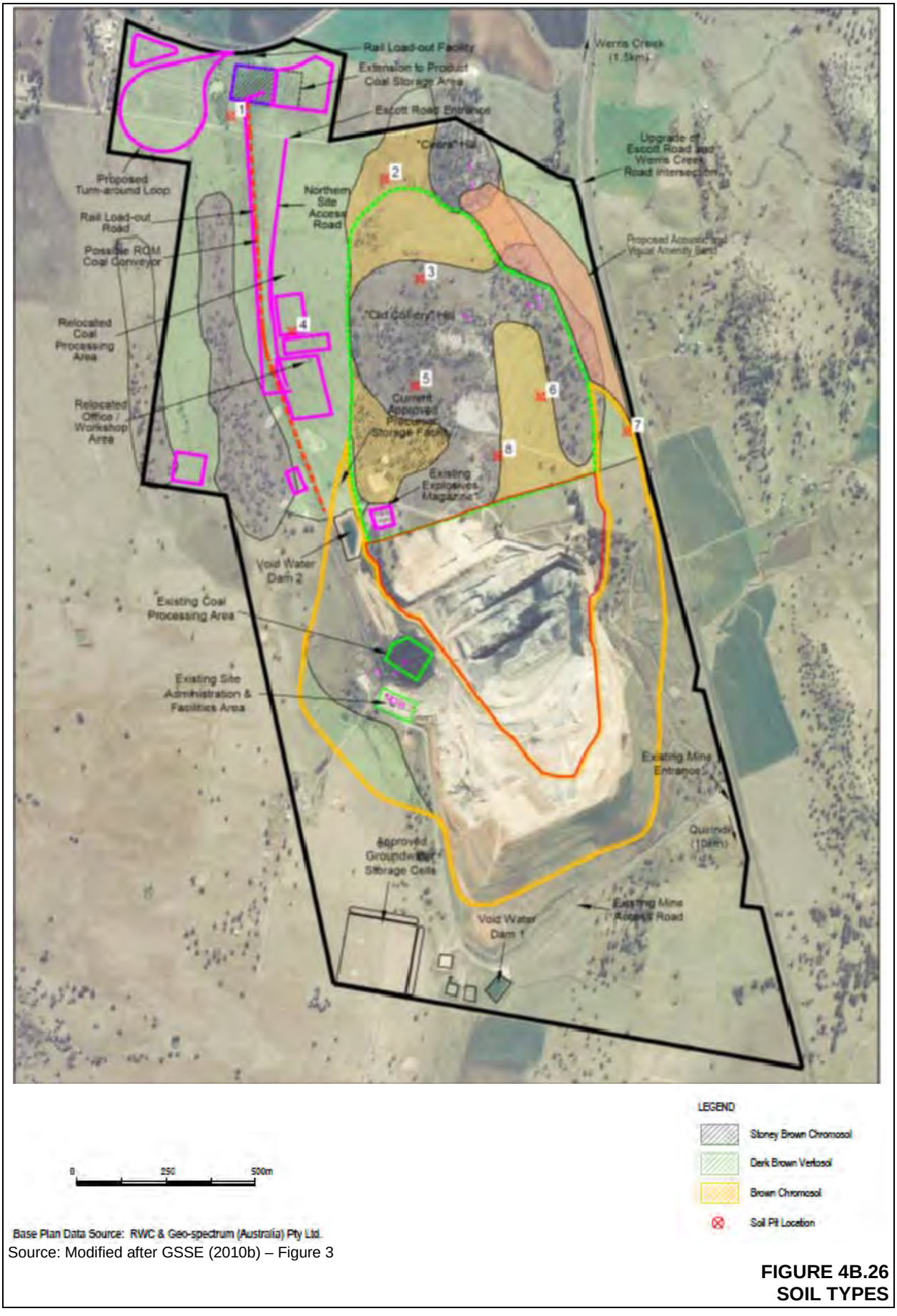
Tables 4B.40 to **4B.42** summarise each of the soils' physical and chemical attributes identified within the Project Site in accordance with the *Australian Soil Classification System* and laboratory testing.

Soils were described based on the following.

- The number of horizons in the profile.
- The colour of various horizons with special emphasis on the surface horizons.
- Texture and structure.
- Relative arrangement and chemical composition.
- Thickness of the horizons.
- Geological origin of the soil material.

The following laboratory testing for both physical and chemical attributes of the soils was conducted by the Scone Soil Conservation Service Laboratory.

- Colour.
- Particle Size Analysis.
- Emerson Aggregate Test.
- pH.
- Electrical Conductivity.
- Cation Exchange Capacity (CEC) and Exchangeable Cations.



Base Plan Data Source: RWC & Geo-spectrum (Australia) Pty Ltd.
Source: Modified after GSSE (2010b) – Figure 3

FIGURE 4B.26
SOIL TYPES

Table 4B.40
Physical Attributes of the Brown Chromosol

Layer	Depth (m)	Description
1	to 0.3	Brown (10YR 3/2), moderate consistence loam to sandy loam. A moderate pedality soil (blocky 10-20mm) with slightly acidic to neutral pH (6.6-7.0), slight dispersion (EAT 3(1)), non-saline (0.02dS/m), roots common to many and nil to <10% stones (<10mm).Approximate sample depths 0.05–0.1m and 0.15-0.2m. Clear and even boundary to Layer 2.
2	0.3 to 0.5	Light brown (7.5YR6/3) to light brownish grey (10YR5/2), weak consistence loam to loamy sand. An apedal single grained to weak pedality soil (blocky <10mm) with neutral to slightly alkaline pH (7.1-7.5), slight dispersion (EAT 3(2)), non-saline (<0.01dS/m), roots few and <10% stones (<10mm). Approximate sample depth 0.4-0.45m. Sharp even boundary to Layer 3.
3	0.5 to 1.2	Yellowish brown (10YR 4/4) to strong brown (7.5YR4/6) with 40% red mottles, strong consistence clay. A massive structured soil with slight to moderately alkaline pH (7.4-8.3), slight dispersion (EAT 3(1)), non-saline (0.03dS/m), no roots and nil stones. Approximate sample depth 0.8m.
Source: Modified after GSSE (2010b) – Table 5		

Table 4B.41
Physical Attributes of the Stoney Brown Chromosol

Layer	Depth (m)	Description
1	to 0.1	Brown (10YR 3/3), weak consistence loamy sand. A weak to moderate pedality soil (blocky 5-10mm) with slightly alkaline pH (7.5), slight dispersion (EAT 3(1)), non-saline (0.06dS/m), roots common and 20-50% stones (10–50mm).Approximate sample depth 0.05–0.1m. Gradual and even boundary to Layer 2.
2	0.1 to 0.2	Light brown (7.5YR4/4), weak consistence loamy sand. A weak pedality soil (blocky <5mm) with alkaline pH (8.8), slight dispersion (EAT 3(1)), non-saline (0.06dS/m), roots few and 30-40% stones (10–50mm). Approximate sample depth 0.1-0.2m. Clear even boundary to Layer 3.
3	0.2 to 1.2	Yellowish brown with 20% orange mottles, strong consistence clay. A massive structured soil with alkaline pH, slight dispersion, non-saline, no roots and 80% stones (10-100mm). Sample not lab tested due to stone content.
Source: Modified after GSSE (2010b) – Table 6		

Table 4B.42
Physical Attributes of the Dark Brown Vertosol

Layer	Depth (m)	Description
1	0.3	Brown (7.5YR 3/2) to dark brown (7.5YR2.5/2), moderate consistence silty clay loam to clay. A strong pedality soil (sub angular blocky 10-50mm) with neutral to slightly alkaline pH (6.6 – 7.9), slight dispersion (EAT 3(1)), non-saline (0.01-0.04dS/m), roots many and stones nil to 5% (<10mm). Approximate sample depth 0.1–0.2m. Gradual and even boundary to Layer 2.
2	0.3 to 0.6	Brown (7.5YR3/3) with 10% orange mottles to very dark greyish brown (10YR2/2), strong consistence clay. An apedal massive soil with alkaline pH (8.1 to 9.0), non-dispersive (EAT 4 to 5), non-saline (0.08 to 0.15dS/m), nil roots and nil stones. Approximate sample depth 0.4-0.5m. Gradual even boundary to Layer 3.
3	0.6 to 1.2	Yellowish brown (10YR4/4) with 10% orange mottles to dark greyish brown (10YR3/3), strong consistence clay. A massive structured soil with alkaline pH (8.4 to 9.2), nil to slight dispersion (5 to 3(1)), non-saline (0.16-0.18), nil roots and nil stones. Approximate sample depth 0.8-0.9m.
Source: Modified after GSSE (2010b) – Table 7		

4B.9.2.4 Soil Stripping Suitability

GSSE (2010b) recommends the following for the stripping of soil within the Project Site.

- The top 0.3m of the Brown Chromosol soil would be suitable for stripping and re-use as topdressing in rehabilitation. The subsoil, however, should not be used in rehabilitation due to the limiting factor of high clay content.
- The Stoney Brown Chromosol soil is unsuitable for re-use as topdressing in rehabilitation due to its high stone content.
- The top 0.3m of the Dark Brown Vertosol soil would be suitable for stripping and re-use as topdressing in rehabilitation. However, the key limiting factor for the lower layers of the soil profile is the high clay content, massive structure and strong alkalinity, whilst in the eastern section of the Project Site, the limiting factor is weathered basalt rock from 0.35m below surface.

4B.9.2.5 Erosion Potential and Erosion Hazard

The results of the Emerson Aggregate Test for all topsoil samples were Class 3(1) which is considered slightly dispersive. The subsoils were generally considered non dispersive to slightly dispersive. GSSE (2010b) determined that all soils identified within the Project Site would only require the standard sediment and erosion controls, if disturbed. These controls would include the following.

- Ensuring the final slope gradient of the rehabilitated landform does not exceed 17% or 10° (except if associated with the final void).
- The construction of contour furrows, contour banks or graded banks at intervals down slopes to control surface flow.
- Contour ripping across grades.
- The use of engineered waterways using erosion blankets, ground-cover vegetation and/or rip rap to safely dispose of runoff downslope where required.
- The construction of sediment control dams to capture sediment laden runoff prior to discharge from the Project Site.

4B.9.2.6 Soil Management

The LOM Project would require the disturbance of soils from the currently undisturbed areas of the Project Site. A consequence of this disturbance would be an increase in the erosion potential. However, appropriate measures would be implemented to protect stockpiled soil and exposed areas within the Project Site. Long term soil stockpiles in particular would be stabilised with a permanent pasture cover to prevent erosion.

Soils from the currently undisturbed areas of the Project Site, as well as stockpiled soil from the existing Werris Creek Coal Mine operations, would be used for progressive rehabilitation purposes. Soils would be stripped to the depths recommended by GSSE (2010b) (see also **Table 4B.43**) from areas within the Project Site that have not been previously disturbed by open cut mining. The soils would either be directly placed over the re-profiled landform or stockpiled to provide future soil resources for the final rehabilitated surface of the Project Site.

The soil management procedures described in *Section 5.2* of GSSE (2010b) would continue to be adopted for the stripping, stockpiling and spreading of soil for the LOM Project.

4B.9.2.7 Soil Available for Rehabilitation

GSSE (2010b) determined that based on the existing soil stockpiled, and the soil to be stripped to the depths recommended in **Table 4B.43**, there would be approximately 855 000m^{3}of subsoil and 682 000m^{3}of topsoil available for rehabilitation purposes for the LOM Project. Based on the calculations conducted by GSSE (2010b) to rehabilitate the Project Site to a standard above what is required in the final landform (refer to **Figure 2.18** in Section 2) there would be a surplus of both topsoil and subsoil available for rehabilitation purposes.

Table 4B.43
Recommended Soil Stripping Depths

Layer (Thickness)	Material	Soil Stripping Procedures
Brown Chromosol		
1 (30cm)	Moderate consistence loam to sandy loam	Strip to a depth of 30cm.
2 (20cm)	Weak consistence loam to loamy sand	Do not strip.
3 (70cm)	Strong consistence clay	Do not strip.
Stoney Brown Chromosol		
1 (10cm)	Weak consistence loamy sand	Do not strip.
2 (10cm)	Weak consistence loamy sand	Do not strip.
3 (100cm)	Strong consistence clay	Do not strip.
Dark Brown Vertosol (Black Soil)		
1 (30cm)	Moderate consistence silty clay loam to clay	Strip to a depth of 30cm.
2 (30cm)	Strong consistence clay	Do not strip.
3 (60cm)	strong consistence clay	Do not strip.
Source: Modified after GSSE (2010b)		

4B.9.2.8 Assessment of Impacts

If the recommended soil stripping, windrowing, handling and storage procedures, described in the assessment by GSSE (2010b) are adhered to, there would be in a minimal impact soil resources associated with the LOM Project.

4B.9.3 Land Capability and Agricultural Land Suitability

4B.9.3.1 Existing (Pre-Mining) Land Capability

Land capability was assessed against S*ystems Used to Classify Rural Lands in New South Wales* (Emery 1986 and Cunningham *et al*., 1988). A description of the land capability classes described in Emery 1986 and Cunningham *et al*., 1988 is provided in GSSE (2010b).

The majority of the pre-mining (prior to the commencement of mining in 2005) land capability within the Project Site was Class III land (567.7 ha). The Class III land, which is suitable for regular cultivation, occurs on the lower slopes and flats of the Project Site. Class V land (242.2ha) occurs mainly on the steeper slopes overlying the coal measures. Some Class VI land (97.7ha) also occurs on the ridge tops. It is noted that as open cut mining has commenced, some land within the Project Site is currently classified as a land capability Class M.

4B.9.3.2 Post-Mining Land Capability

Post-mining land capability would include Class VI on the (<10 degrees) slopes of the overburden emplacements (<10º). The top of the overburden emplacement area and the flat section between the overburden emplacement and the void would be relatively flat and a layer of subsoil would be placed as an intermediate layer between the overburden and the topsoil, which should bring the land capability of the area to Class IV. The steep slopes of the partially backfilled final void are considered Class VII and should only be used for woodland ecological community. The base of the void would be Class VII.

Although the post-mining land capability is predicted to have capabilities between Class III and Class VII, it is noted that the revegetation plan for the Project Site only requires some Class III land (37ha) with the rest of the Project Site being established with woodland vegetation. Areas established with the woodland vegetation would have a range of land capability classes from Class III to Class VII. Given the post-mining land capability classes predicted, there would be no impact on agricultural enterprises in the immediate area. The land would be capable of maintaining current levels agricultural production provided the methodology for reinstating soil material is followed.

4B.9.3.3 Existing Agricultural Land Suitability

The agricultural suitability of the Project Site was assessed is in accordance with the *Agricultural Suitability Maps – Uses and Limitations* (NSW Agricultural & Fisheries, 1988). Each agricultural suitability class as described by NSW Agricultural & Fisheries, 1988 is summarised in GSSE (2010b).

The majority of the pre-mining agricultural suitability (prior to the commencement of mining in 2005) within the Project Site was considered Class 2 land (highly productive land suited to both row and field crops), and was located on the lower slopes and flats of the Project Site. Class 4 land occurs mainly located on the steeper slopes overlying the coal measures. Some Class 3 land also occurs present on the mid-slopes. It is noted that as open cut mining is already conducted at the Werris Creek Coal Mine, some land within the Project Site currently has no agricultural suitability classification. The area of land proposed to be disturbed for the LOM Project is dominated by Class 4 land and Class 2 land, with a relatively small area of Class 3 land.

4B.9.3.4 Post Mining Agricultural Suitability

Agricultural suitability Class 4 would be re-established on the slopes of the overburden emplacements with slopes of <10º. The top of the main overburden emplacement would be rehabilitated to Class 3 land. The steep slopes and base of the final void are considered Class 5 and should only be used for woodland/bushland timbered country.

Although the post-mining agricultural suitability is predicted to have capabilities between Class 2 and Class 5, it is noted that the revegetation plan for the Project Site only requires 37ha of Class 2 land, with the rest of the Project Site being established with native woodland vegetation for ecosystem establishment (which does not require a specific agricultural suitability class). Therefore areas to be established with native vegetation would be from Classes 2 to 5 leaving the rest of Class 2 land to be used for agricultural purposes.

4B.9.3.5 Assessment of Impacts

The revegetation plan for the LOM Project has less Class III land than what was originally in place, with the area actually designated for agriculture restricted to 37ha.

The reason for this reduced area is due to the occurrence of the Grassy White Box Woodland and Derived Native Grassland over the Project Site, a Threatened Ecological Community (TEC). ELA (2010b) report that much of the Project Site which is currently considered Class III land, actually forms part of the TEC (see **Figure 4B.22**). Given the critically endangered classification given to this TEC (under the EPBC Act), it has been considered a preferable environmental outcome to maximise the area of native vegetation in the final landform (with the required land capability for the re-instatement of native vegetation lower than if the land was to be rehabilitated for subsequent agricultural use). The Proponent has proposed to reinstate agricultural activities over 37ha of land in the northern part of the Project Site, where these lands do not classify as the Grassy White Box Woodland and Derived Native Grassland TEC and are located adjacent to ongoing agricultural activities, i.e. on the "Cintra" property.

Given the post-mining land capability and agricultural suitability classes predicted by GSSE (2010b), it has been determined that there would be limited impact on agricultural enterprises in the immediate area of the Project Site and there are adequate soil resources to meet post mining land capability and agricultural suitability objectives. The land would be capable of maintaining current levels of agricultural production provided the methodology for reinstating soil material is followed.

4B.10 VISIBILITY

4B.10.1 Introduction

Based on the risk analysis undertaken by R.W. Corkery & Co Pty Limited for the LOM Project (Section 3.3 and **Table 3.6**) the potential impacts relating to visual amenity requiring assessment and their **unmitigated** risk rating are as follows.

- Decreased visual amenity during the life of the mine (extreme risk).
- Altered visual outlook following mine closure (high risk).
- Nuisance/amenity impacts from mine lighting (high risk).
- Sleep deprivation from mine lighting (high risk).

Visual impacts associated with the LOM Project was raised in the DGRs as an issue that is required to be addressed as part of this *Environment Assessment*. Specifically, there is a requirement to include a detailed description of the measures that would be implemented to minimise the visual impact of the LOM Project. The Liverpool Plains Shire Council also raised the issue of visual amenity in their submission of requirements for the *Environmental Assessment*. Specifically, Council required that residents in the town of Werris Creek be provided proof and be assured that they would not be adversely impacted or their local amenity reduced by environmental impacts associated with the LOM Project. Council also saw that the early bunding of the northern and eastern extremities of the proposed open cut extension, along with early plantings of fast growing vegetation would be seen as advantageous to the LOM Project. Replacement of road haulage of coal from the Coal Processing Area to the Product Coal Storage Area with a conveyor was also identified by Council as being a positive outcome.

The following assessment focuses on the potential visual impacts relating to the LOM Project, particularly lighting and the visibility of open cut mining operations to the local community and to motorists travelling along Werris Creek Road. Potential lighting impacts from the LOM Project on the Siding Spring Observatory near Coonabarabran have also been taken into account.

4B.10.2 Existing Visual Amenity

4B.10.2.1 North and West of the Existing Open Cut Mine

The current operations of the Werris Creek Coal Mine are situated to the south of a small ridge which rises to an elevation of 445m AHD (referred to as "Old Colliery" Hill). This ridge provides natural topographic shielding of the current operations to the properties to the north and the township of Werris Creek. The only visible aspect of the Werris Creek Coal Mine from some of these vantage points is the Coal Product Storage Area and Rail Load-out Facility.

The only residential vantage point to the west of the Project Site is from the "Escott" residence, which is now owned by the Proponent. "Old Colliery" Hill also obscures the current mining area from this vantage point, although the Coal Product Storage Area, Rail Load-out Facility and Rail Load-out Road are all visible.

Plates 4B.1 to **4B.4** present the visual amenity from several vantage points to the north of the Project Site looking southward (towards the existing Werris Creek Coal Mine)[10]. The plates illustrate that the existing Werris Creek Coal Mine operations have minimal impact on visual amenity from the town of Werris Creek, with the outlook remaining one of agricultural land and remnant patches of native vegetation.

4B.10.2.2 South and East of the Existing Open Cut Mine

From vantage points to the south of the existing Werris Creek Coal Mine, the approved operations have altered the local visual amenity. The most obvious feature of the current operations is the overburden emplacement. Anecdotal evidence provided by residents of Werris Creek suggest that the rehabilitation completed on the outer batters of the overburden emplacement has markedly reduced the visual impact of the structure, with the grassed slopes blending visually (especially when viewed from a distance) with the grassed area in the foreground and background. This view of the overburden emplacement is also highly visible to traffic on the Werris Creek Road.

The current operations of the Werris Creek Coal Mine have altered the visual amenity from vantage points to the south and east of the Project Site (although those properties to the east of the Project Site, which have direct views of the overburden emplacement, are owned by the Proponent). The visual outlook of agricultural land and remnant patches of native vegetation has been replaced by the overburden emplacement which is gradually becoming less noticeable as the slopes are revegetated.

4B.10.3 Visual Controls

The following visual controls would be implemented as part of the LOM Project to reduce potential adverse impacts upon local visual amenity.

- Once mining operations reach the base of "Old Colliery" Hill (approximately Year 7 of the LOM Project) an Acoustic and Visual Amenity Bund (as described in Section 2.5.5.5) would be constructed at the northern extent of mining operations. The Acoustic and Visual Amenity Bund would reach an elevation of approximately 425m AHD.
- A screen of native trees and shrubs would be planted to the north of the footprint of the Acoustic and Visual Amenity Bund, prior to it being constructed.

[10] The view provided from "Tonsley Park" is of the Rail Load-out Facility as a tree screen along the southern boundary of the property provides a visual barrier towards the mine itself.

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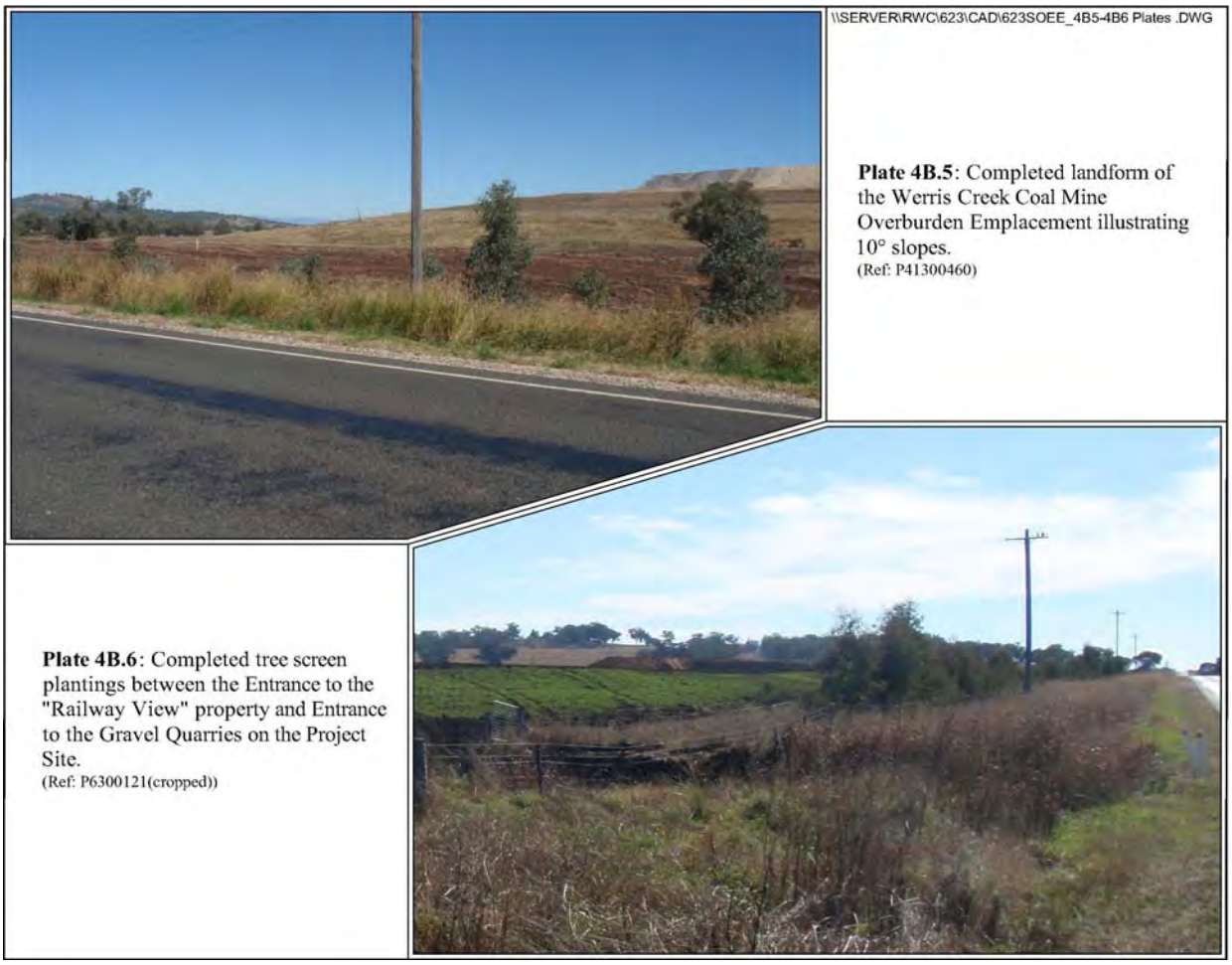
Plate 4B.1 : View towards the Project Site from 43 Kurrara Street (Corner of Kurrara Street and Punyarra Street) (Ref: E623E - 075)

Plate 4B.2 : View towards the Project Site from elevated property located adjacent to dirt track off Punyarra Street. (Ref: E623F-026)

Plate 4B.3 : View towards the Project Site from 26 Kurrara Street. (Ref: E623F-019)

Plate 4B.4 : View towards the Rail Load-out Facility from "Tonsley Park" (Ref: E623E-069)

- Trees would be planted around the perimeter of the extended Product Coal Storage Area.
- The viability of replacing the transportation of coal from the Coal Processing Area to the Product Coal Storage Area from trucks to a conveyor system (as described in Section 2.7.6) would be investigated and implemented, if it is determined to be viable.
- All mining-related infrastructure, e.g. the relocated Coal Processing Area and Site Administration and Facilities Area, would be located in such a way that the local topography (of "Cintra" Hill) provides a visual barrier to the town of Werris Creek and the residential receivers located to the south of the town. The positioning of infrastructure to the southwest of "Cintra" Hill notwithstanding, it is inevitable that some mining equipment would be visible from vantage points surrounding the Project Site from time to time.
- The overburden emplacement and Acoustic and Visual Amenity Bund would be constructed along the eastern perimeter of the limit of open cut mining to create a visual barrier to the east of the Project Site including the Werris Creek Road. The overburden emplacement area would reach a final elevation of approximately 445m AHD which is equivalent to the existing highest point on the Project Site, "Old Colliery" Hill, which is to be removed.
- It is recognised that the overburden emplacement and Acoustic and Visual Amenity Bund could impact negatively on the visual aspect of road users. In order to mitigate this potential negative impact, the Proponent has committed to the following controls.
  - The slope of the created landform would not exceed 10º. This is similar to the slopes of the existing "Old Colliery" Hill (of up to 7º). **Plate 4B.5** provides an illustration of a completed 10º slope at the southern end of the overburden emplacement.
  - A tree screen would be planted between the road reserve and the toe of the overburden emplacement and Acoustic and Visual Amenity Bund. These plantings have already been commenced between the existing Mine Site Entrance and the entrance to the Council gravel quarries along the boundary of Werris Creek Road (see **Plate 4B.6**). Plantings would be commenced on receipt of approval to allow for at least five years grow before the overburden emplacement reaches its closest point to the road.
  - The closest distance between the toe of the overburden emplacement or Acoustic and Visual Amenity Bund and the road shoulder would be at least 35m (for a length of approximately 1 200m). The Proponent has confirmed that neither the overburden emplacement nor the Acoustic and Visual Amenity Bund would encroach any closer than shown on this cross-section.
  - The distance where the overburden emplacement is at its closest point to Werris Creek Road would be limited to approximately 400m. To the north and south, the overburden emplacement and Acoustic and Visual Amenity Bund would be constructed progressively further from the road.



- Areas of disturbance would continue to be progressively rehabilitated once they are no longer required for mining purposes.
- Where the use of floodlights is required in the open cut, on the overburden emplacements or within the coal handling and processing area, lights would be directed downwards and towards the west, wherever possible. Special attention would be paid to lighting of internal haul roads into the open cut and onto the overburden emplacement to ensure that lights are not shined directly towards Werris Creek Road.
- The second rail load-out bin (approved in MOD 5) would be constructed with a similar green shade as the existing bin which is barely perceptible from vantage points surrounding the Coal Product Storage Area and Rail Load-out Facility.
- Maintaining the LOM Project Site and associated areas of disturbance in a clean and tidy condition at all times.

The locations of these visual controls in relation to the town of Werris Creek and the Werris Creek Road and cross sections from various vantage points surrounding the Project Site are shown in **Figures 4B.27** and **4B.28**. Photo montages of the visual landscape associated with the LOM Project from a vantage point within the town of Werris Creek, as well as to the east of the Project Site are shown in **Figures 4B.29** and **4B.30**.

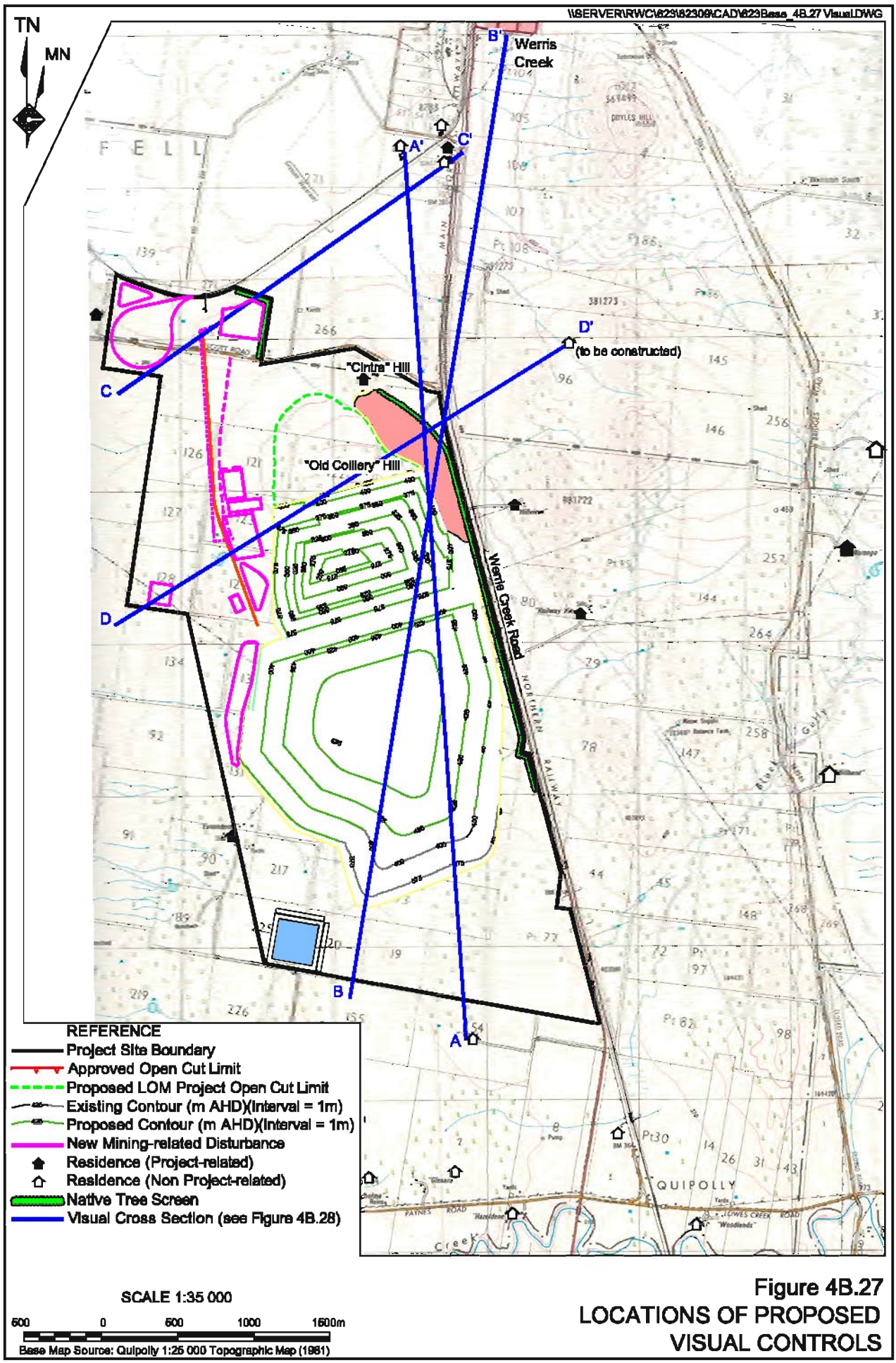


Figure 4B.27
LOCATIONS OF PROPOSED VISUAL CONTROLS

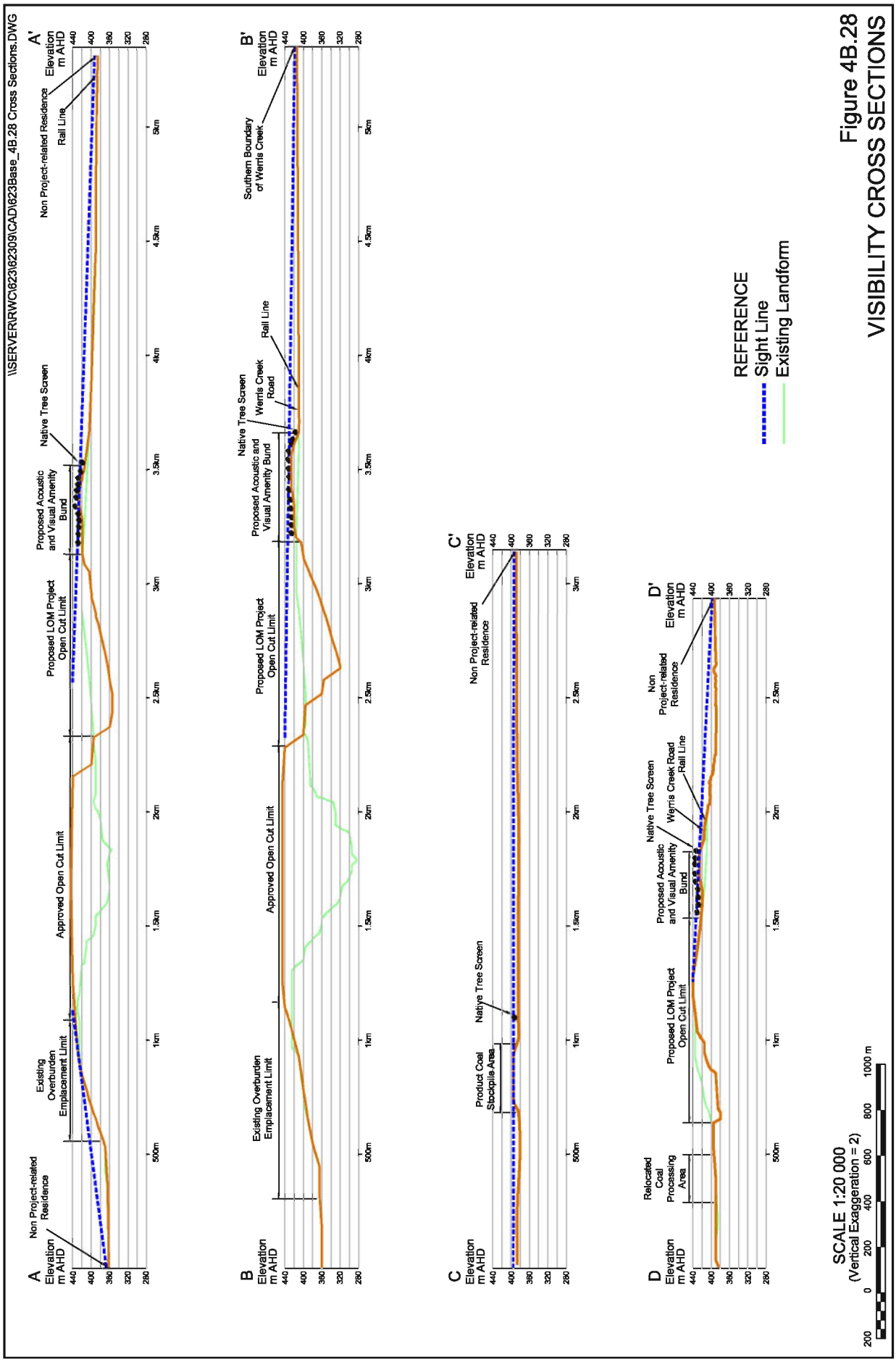

\\SERVER\RWC\623\62309\CAD\623Base_4B.28 Cross Sections.DWG
A
A'
B
B'
C
C'
D
D'
Elevation m AHD
Non Project-related Residence
Existing Overburden Emplacement Limit
Approved Open Cut Limit
Proposed LOM Project Open Cut Limit
Proposed Acoustic and Visual Amenity Bund
Native Tree Screen
Rail Line
Werris Creek Road
Southern Boundary of Werris Creek
Product Coal Stockpile Area
Relocated Coal Processing Area
REFERENCE
Sight Line
Existing Landform
VISIBILITY CROSS SECTIONS
SCALE 1:20 000
(Vertical Exaggeration = 2)

Figure 4B.28

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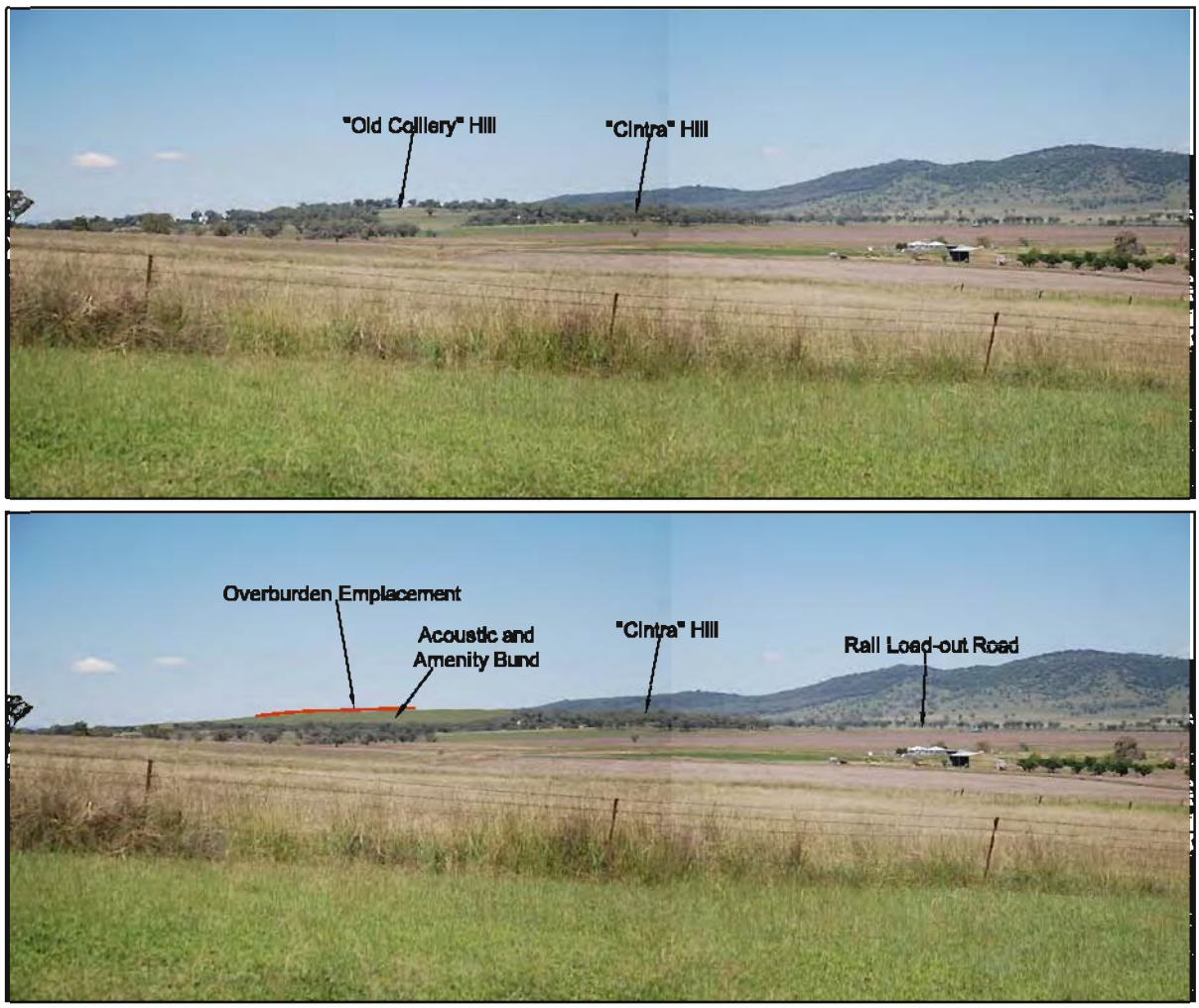

Note: Visibility of the Overburden Emplacement would be significantly reduced following establishment of tree and shrub vegetation on the Acoustic and Visual Amenity Bund

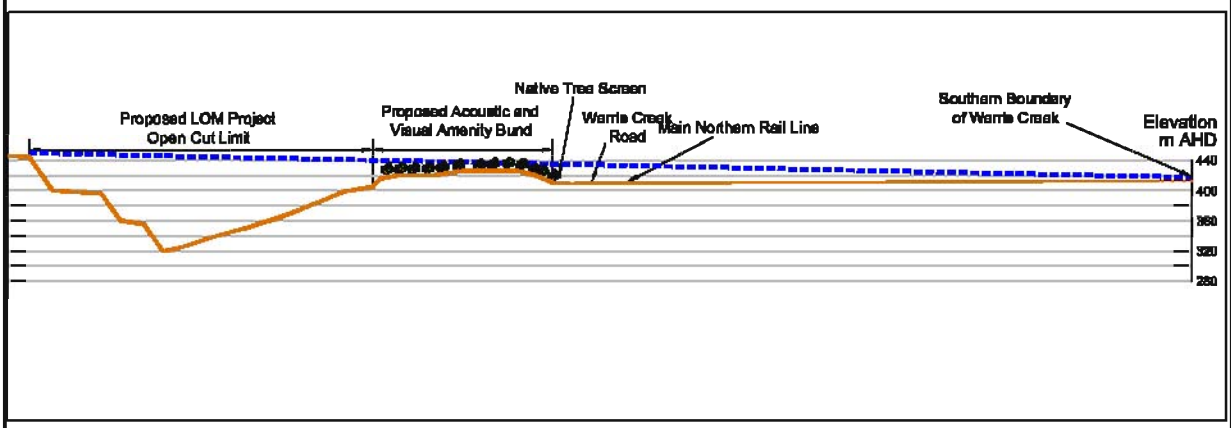

Figure 4B.29
PHOTOMONTAGE OF THE LOM PROJECT FROM A VANTAGE POINT WITHIN WERRIS CREEK (Corner of Kurrara and Punyarra Streets)

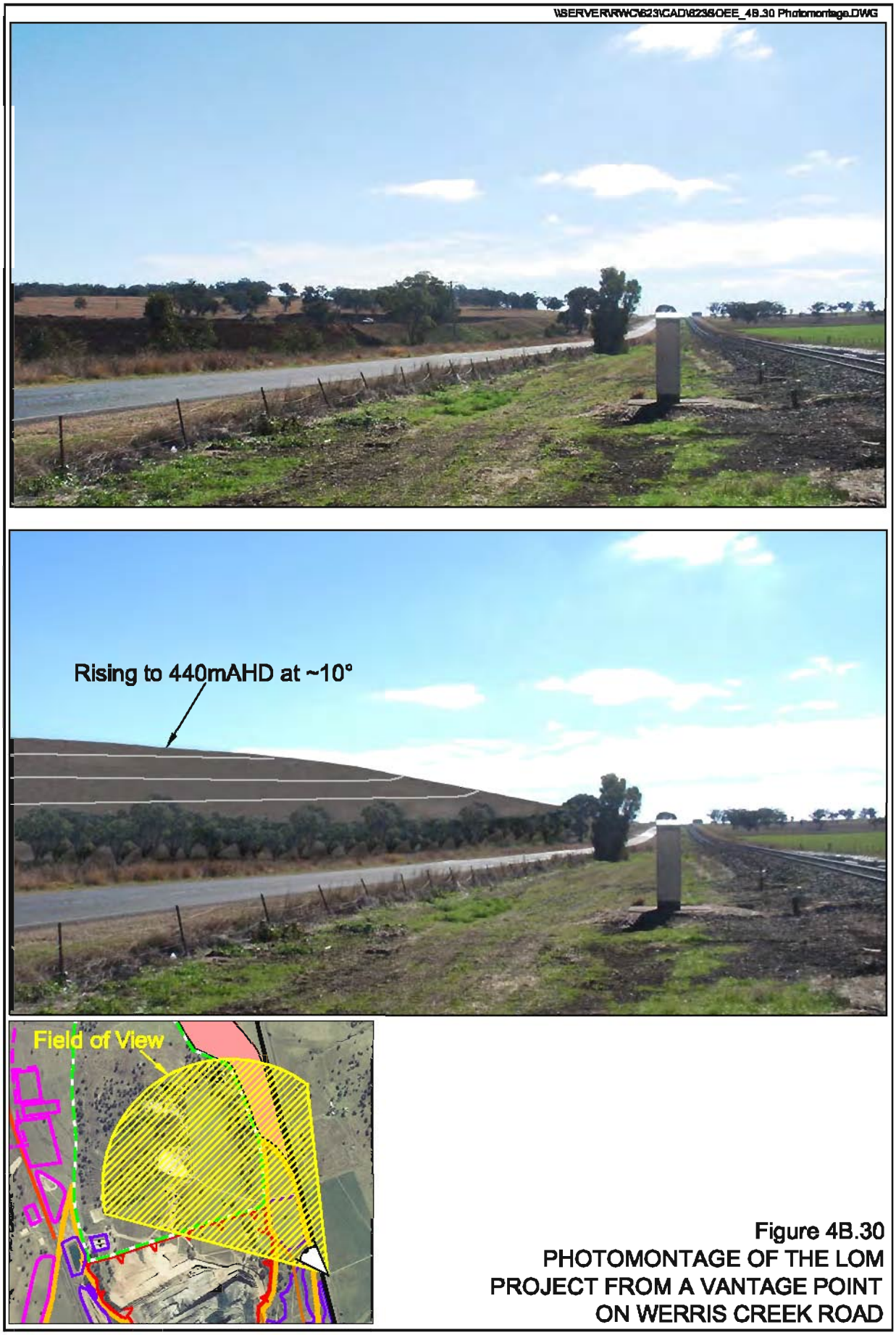

Figure 4B.30
PHOTOMONTAGE OF THE LOM PROJECT FROM A VANTAGE POINT ON WERRIS CREEK ROAD

4B.10.4 Assessment of Impacts

Based on the cross sections shown in **Figure 4B.28** and the photo montages illustrated in **Figures 4B.29** and **4B.30**, visibility of the LOM Project on the surrounding community would be as follows.

- Residents to the north and northeast of the Project Site (including those in the town of Werris Creek), looking south would not have a view of the open cut void. There may be times when mining equipment may be seen intermittently when working on top of the overburden emplacement, or to the southwest of "Cintra" Hill, however, as the vegetation on the Acoustic and Visual Amenity Bund is established, the visibility of these activities would become more obscured. The general view would be of the revegetated Acoustic and Visual Amenity Bund, the tree screen to the north of this bund and a small section of the overburden emplacement (while trees are established on the Acoustic and Visual Amenity Bund). As the bund would be 'keyed in' to "Cintra" Hill, the Acoustic and Visual Amenity Bund would only be seen as integrated into the existing landscape rather than a separate and imposing landform.
- The outlook for residents from the south looking north would not change. The rehabilitated southern end of the existing overburden emplacement would continue to shield open cut mining operations from these residences.
- The native tree screen to be planted on the perimeter of the extended Product Coal Storage Area would partially screen the stockpile and activities associated with the Rail Load-Out Facility to residents to the northeast of this area once the trees are established.
- The toe of Visual and Acoustic Amenity Bund would, like the overburden emplacement, the Visual and Acoustic Amenity Bund, provide screening of open cut operations from Werris Creek Road. Offset in excess of 35m from Werris Creek Road, constructed behind a tree screen planted between five and seven years previous and constructed with an outer slope of 10° to ensure that is integrated into the existing landscape, the visual impact of the bund itself is considered acceptable. Furthermore, the eventual height of the Visual and Acoustic Amenity Bund would not exceed 20m above surface and would be no higher than 10m above surface where it is aligned along Werris Creek Road.

As illustrated by **Plates 4B.1** to **4B.4**, the Project Site lies within a rural landscape where areas of land are disturbed seasonally for agriculture-related purposes. This landscape has been impacted by the current operations of the Werris Creek Coal Mine, especially from vantage points to the south and east of the Project Site. The Proponent has demonstrated a commitment to minimising these visual impacts through both design, e.g. construction of the overburden emplacement and Acoustic and Visual Amenity Bund, positioning of mining-related infrastructure, e.g. the relocated Coal Processing Area and Site Administration and Facilities Area, in such a way that the local topography provides a visual barrier to vantage points to the north of the Project Site, and operational controls, e.g. tree screen planting, progressive rehabilitation, light reduction and waste management.

Therefore, while the proposed LOM Project may be noticeable from some new vantage points surrounding the Project Site, it is considered that with appropriately placed visual controls, such as those described in Section 4B.10.3, the impact could be managed such that the impact is adequately minimised and mitigated.

The existing operations of the Werris Creek Coal Mine have no influence on the function of the Siding Spring Observatory at Coonabarabran and it is not considered likely that the LOM Project would result in any change to lighting arrangements which may alter this current lack of impact.

4B.11 TRANSPORTATION ASPECTS

The traffic and transport assessment for the Project was undertaken by Constructive Solutions (Constructive Solutions, 2010). The full assessment is presented in Volume 2, Part 8 of the Specialist Consultant Studies Compendium. Relevant information from the assessment is summarised in the following subsections.

4B.11.1 Introduction

Based on the risk analysis undertaken by R.W. Corkery & Co Pty Limited for the LOM Project (see Section 3.3 and **Table 3.6**), the specific traffic-related impacts that may result as a consequence of the LOM Project (without the implementation of the safeguards, controls and mitigation measures presented in this section) and therefore require assessment include the following.

- Potential vehicle accidents (moderate risk).
- Altered conditions at rail crossings resulting in:
  - Delays to local road traffic (low risk) i.e. and / or
  - Possible delays to emergency service response (moderate risk).

The DGRs identify "*Traffic and transport – including a detailed assessment of potential impacts on the safety and performance of the rail and road networks*" as a key issue for assessment. Liverpool Plains Shire Council identified "*road network impacts*" as a key issue requiring assessment, with specific reference to impacts that would "*increase Council's road maintenance obligations and potentially interfere with the smooth movement of traffic generally in the locality*".

Liverpool Plains Shire Council also identified *"rail network impact"* as a key issue requiring assessment, within specific reference made to "*Dust generated from loaded coal carriages especially as they move through urbanised areas*", "*Increasing noise from trains passing through urban areas*" and "*Prolonged obstruction of the road network by trains at level crossings*". Issues related to rail noise and dust are addressed in Sections 4B.3.6.4 and 4B.5.5.3 respectively. This section is restricted to an assessment of impacts on the road and rail network performance and safety.

The following sub-sections describe and assess the existing traffic and transport environment, identify traffic and transport management issues, proposed controls, safeguards and mitigation measures associated with the LOM Project.

4B.11.2 Existing Transport Network and Traffic Levels

4B.11.2.1 Introduction

A description of the existing road network is based on an inspection of the roads that form part of the road haulage route from the Werris Creek Coal Mine completed by Constructive Solutions in July 2010. The following sub-sections provide an overview of existing roads standards and their respective condition, however, a more detailed description is provided as *Appendix A* of Constructive Solutions (2010) (*Part 8* of the *Specialist Consultant Studies Compendium*).

Road traffic count data for local roads and Werris Creek Road was obtained from Liverpool Plains Shire Council (LPSC) and consists of data collected between November 2009 and July 2010. Road traffic count data for state roads was obtained by reference to data collected by the Roads and Traffic Authority (RTA) in 2004 (the latest in the RTA's AADT collection series for the Northern Region of NSW).

4B.11.2.2 Principal Roads of the Werris Creek Coal Mine Road Haulage Route

The roads that would be affected by traffic generated by the LOM Project are as follows.

- Escott Road (Shire Road [SR] No. 143).
- Werris Creek Road (Main Road [MR] No. 130).
- Taylors Lane (Shire Road [SR] No. 53).
- Kamilaroi Highway (State Highway [SH] No.29).

Figure 4B.31 identifies each of these roads, all of which form part of the main road network of the Liverpool Plains Local Government Area. Escott Road and Taylors Lane are local roads, i.e. any unclassified public road for which Council is the road authority and which are not either state or regional roads. Councils exercise roads authority powers and have financial asset management responsibility and determine road works priorities for local roads.

Werris Creek Road is a regional road, i.e. a public road of secondary importance within the State-wide context. Regional roads comprise both classified roads that are not State roads and some important but not classified council roads. Councils also exercise roads authority powers, have financial asset management responsibility and determine road works priorities for regional roads.

The Kamilaroi Highway is a State road, i.e. public road of primary importance within the State-wide context. The NSW RTA exercise roads authority powers, however, the section of the Kamilaroi Highway within the Liverpool Plains Local Government Area is maintained on behalf of the RTA by Liverpool Plains Shire Council through a maintenance contract arrangement.

The following provides a description of the existing standards, conditions and traffic levels of the roads of the Werris Creek Coal Mine road haulage route.

Escott Road

Escott Road (SR 143) is a local road which services the existing properties along its length ("Escott", "Cintra" and the Zeolite Australia Processing Plant). The road consists of a 6m wide gravel pavement between table drains (see **Plate 4B.7**). The road accommodates two-way traffic in one travelling lane, with enough width between table drains to allow passing. The existing alignment is considered fair to poor.

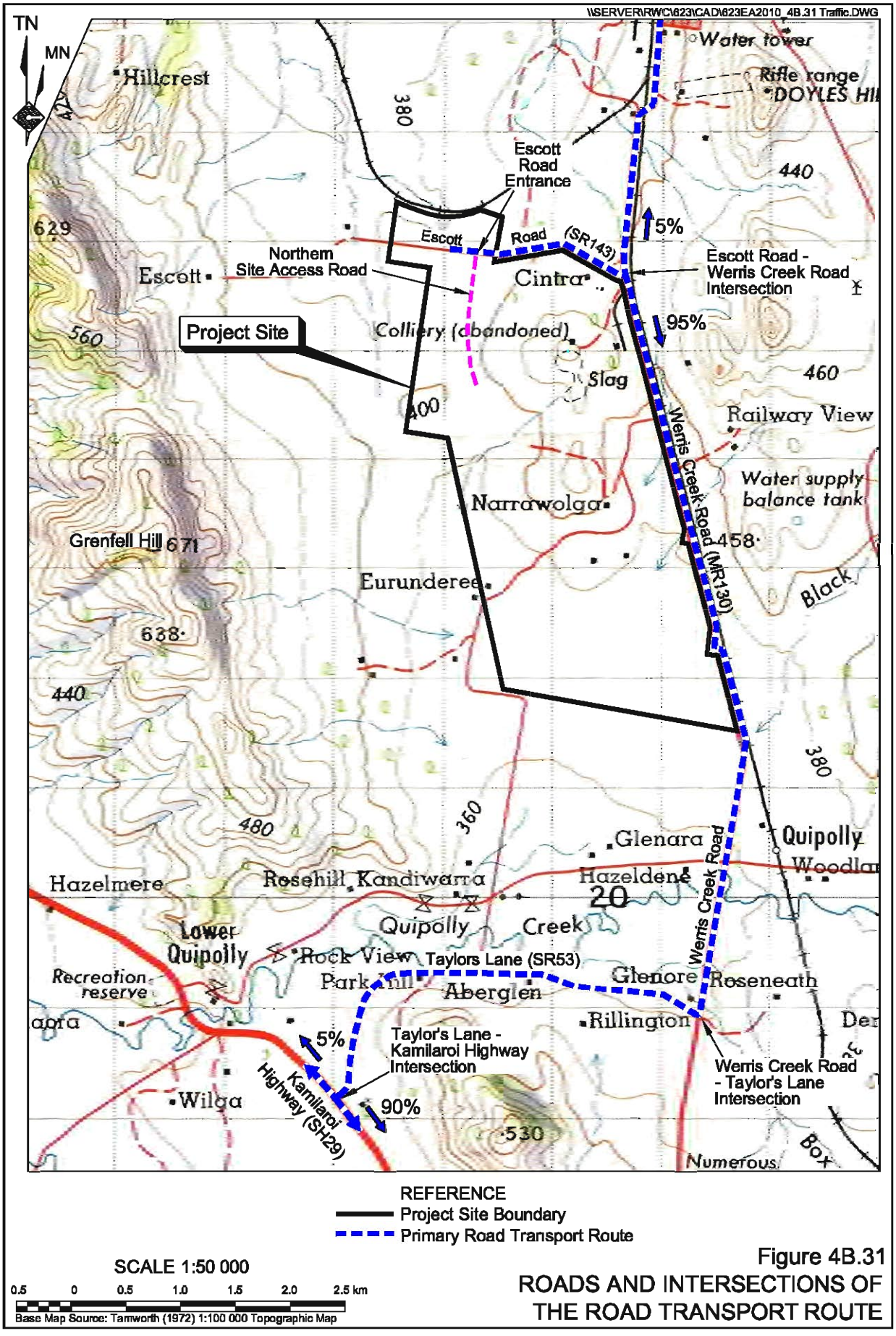

Figure 4B.31
ROADS AND INTERSECTIONS OF THE ROAD TRANSPORT ROUTE

The existing traffic on Escott Road is presumed to be less than 100 AADT, most of which is generated by the operations of the Werris Creek Coal Mine.

Werris Creek Road

Werris Creek Road (MR 130) is a regional road that provides a strategic link between the centres of Quirindi (to the south) and Tamworth (to the north) with Werris Creek. Werris Creek Road consists of two lanes from 3.2m to 3.5m wide with sealed shoulder of width varying from 0m to 1.0m (see **Plate 4B.8**). The alignment is generally good, however, there are several sections where pavement failure is evident.

The existing annual average daily traffic (AADT) on Werris Creek Road, based on the most recent count conducted in July 2010, is 2 316.

Taylors Lane

Taylors Lane (SR 53) is a local road which services the existing properties at various intervals along its length. It also serves as a designated alternative route for heavy vehicles to bypass Quirindi. Taylors Lane consists of a 7m seal on 9m formation with approximately 300mm of local gravel pavement (see **Plate 4B.9**). Originally constructed in the 1997-1998 financial year in two sections, the join being the Wadwells Lane intersection, the western section of this road was resealed in 2008. The road is centreline marked, which has significantly faded on the eastern section of the road that has not yet been resealed. Pavement condition is generally good although Constructive Solutions (2010) noted two small areas of pavement failure (each approximately $0.5m^2$). The alignment is considered by Constructive Solutions (2010) to be fair to good, although the seal width is considered to be narrow.

Recent rural residential subdivision has occurred along the southern side of Taylors Lane, with sight distance from at least one of the newly constructed accesses only 200m (to the east).

The existing AADT on Taylors Lane, based on the most recent count obtained by Council in 2009, is 273.

Kamilaroi Highway

The Kamilaroi Highway (SH 29) provides a strategic link between the Great Dividing Range and outback New South Wales. It commences at the New England Highway (at Willow Tree) and continues through Quirindi, Gunnedah and Narrabri before terminating at the Castlereagh Highway near Walgett. The formation consists of two lanes between 3.2m and 3.5m wide with sealed shoulders varying in width from 0m to 1.0m (see **Plate 4B.10**). The alignment is considered by Constructive Solutions (2010) to be good.

The existing AADT on the Kamilaroi Highway based on the most recent count obtained in 2004 is 1 833. Since 1992, the volume of traffic on the Kamilaroi Highway has remained stable, with an annualised increase of only 0.2%. As such, the 2004 AADT has been used as the base traffic level against which increases attributable to the Project will be compared.

4B.11.2.3 Intersections of the Werris Creek Coal Mine Road Haulage Route

Escott Road Entrance

This would be a new intersection providing access from Escott Road to the Coal Processing Area (via the Northern Site Access Road). As noted in Section 2.7.1, the Proponent proposes to construct a basic right hand (BAR) and basic left hand (BAL) type intersection. On construction, the existing Mine Entrance (off Werris Creek Road) and Mine Access Road would be closed.

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Plate 4B.7: Escott Road - Typical Alignment and Condition
(Source: Constructive Solutions, 2010 - Plate 1)

Plate 4B.8: Werris Creek Road - Typical Alignment and Condition.
(Source: Constructive Solutions, 2010 - Plate 2)

Plate 4B.9: Taylors Lane - Typical Alignment and Condition.
(Source: Constructive Solutions, 2010 - Plate 3)

Plate 4B.10: Kamilaroi Highway - Typical Alignment and Condition.
(Source: Constructive Solutions, 2010 - Plate 6)

Escott Road - Werris Creek Road Intersection

This intersection is currently not used for the road haulage of coal.

The eastern end of Escott Road terminates at a T intersection at Werris Creek Road which provides a basic rural treatment without tapers. Sight distance to the north is not restricted, however, sight distance to the south is limited to approximately 300m. There is a grid approximately 30m from the intersection on Escott Road and a driveway access to the south of the intersection on Werris Creek Road. This would be closed prior to the construction of the intersection.

Constructive Solutions (2010) consider the general geometry of the intersection to be reasonable for the existing traffic volumes of the respective roads. However, the location of the driveway, intersection treatment and available sight distance from the driveway are such that improvements would be required for use by coal carrying trucks. Section 4B.11.4.1 provides the proposed intersection upgrade works that would be undertaken by the Proponent (based on a review of the recommendations of Constructive Solutions, 2010).

Taylors Lane and Werris Creek Road

This intersection is currently incorporated into the Werris Creek Coal Mine road haulage route.

The eastern end of Taylors Lane terminates at a T intersection at Werris Creek Road. The current intersection treatment is a modified rural treatment with tapers on all turning manoeuvres on and off Werris Creek Road to assist turning articulated vehicles. There is a short deceleration lane for vehicles turning left into Taylors Lane and a short passing lane for vehicles turning right into Taylors Lane. Access to a property located approximately half way along the passing lane and almost directly opposite the Taylors Lane intersection is considered undesirable. Constructive Solutions (2010) report that the sight distance is good approaching from Werris Creek along the Werris Creek Road, and reasonable approaching from Quirindi.

Constructive Solutions (2010) assessed the design of the intersection to be below the required standard for B-Double configurations. Section 4B.11.4.1 provides the proposed intersection upgrade works required from this intersection to achieve the required Austroads Standard (based on a review of the recommendations of Constructive Solutions, 2010).

Taylors Lane and Kamilaroi Highway

This intersection is currently incorporated into the Werris Creek Coal Mine road haulage route.

The existing intersection between Taylors Lane and the Kamilaroi Highway is a modified rural treatment with tapers on all turning maneuvers on and off the Kamilaroi Highway (to assist turning articulated vehicles). There is limited sight distance for vehicles approaching the intersection along Taylors Lane, with no advance warning of the intersection. There is a Give Way Sign at the intersection and barrier board located opposite the intersection (although this barrier board is not centred). The sight distance is good approaching from Quirindi along the Kamilaroi Highway, and is good approaching from Gunnedah along the Kamilaroi Highway. Similarly, sight distance is good for vehicles exiting Taylors Lane in either direction.

Constructive Solutions (2010) consider the intersection could be improved and Section 4B.11.4.1 provides a review of the intersection upgrade works that could be undertaken (based on a review of the recommendations of Constructive Solutions, 2010).

Lennox and Loder Streets (Kamilaroi Highway) Quirindi

This intersection is currently incorporated into the Werris Creek Coal Mine road haulage route.

The existing intersection between (Lennox Street and Loder Street (the local street names for the Kamilaroi Highway in Quirindi) is an urban T-intersection with passive controls. Lennox Street consists of two approach lanes, and acceleration lanes for vehicles entering and exiting Loder Street. Loder Street carries two-way traffic with a single lane in each direction. Constructive Solutions (2010) identified that there is sufficient manoeuvring capacity for the swept path of a B-Double vehicle to negotiate the intersection safely. There is also adequate sight distance in all directions for all maneuvers.

4B.11.2.4 Rail Crossings

Four rail crossings within the Liverpool Plains local government area have been identified that may be affected, to a varying degree, by the rail movements generated by the LOM Project (and rail movements generally).

- South Street, Werris Creek (see **Plate 4B.11**). Constructive Solutions (2010) considers this to be the most affected crossing by any increase in rail movements. It consists of passive controls and is located on a 50km/hr road. The road alignment approaching the crossing is straight with a rail maintenance facility access road running parallel to the rail line. The access road for the rail maintenance facility is located close to the rail line and offers insufficient maneuvering room for articulated vehicles. There is a stop sign for eastbound traffic, however, there is no stop sign for westbound traffic.
- Werris Creek Road, Werris Creek (South) (see **Plate 4B.12**). This is a dog leg style single rail crossing with approaches being approximately parallel to the rail line. The crossing consists of active controls. The intersection of South Street is located approximately 30m to the west of the crossing.
- Nowland Street Crossing, Quirindi (see **Plate 4B.13**). This crossing consists of active controls over two tracks. The Allnutt Street approach contains a ninety degree bend approximately 20m before the crossing that allows traffic to cross perpendicular to the tracks. The Nowland Street approach consists of a straight alignment with good visibility.
- Henry Street Crossing, Quirindi (see **Plate 4B.14**). This crossing consists of active controls over two tracks. Both approaches to the crossing consist of a straight horizontal alignment enabling traffic to cross perpendicular to the tracks.
- There is a roundabout located approximately 40m from the crossing for the intersection of Henry and George Streets. The location of this crossing coupled with the location of the roundabout combine to provide an undesirable traffic scenario whereby eastbound traffic queuing at the crossing could bank up and block the traffic on George Street.

4B.11.2.5 Traffic Volumes

Road Traffic

Table 4B.44 provides a summary of the existing traffic levels on the roads of the coal haulage route. As noted in Section 4B.11.2.1, traffic data for Werris Creek Road and Taylors Lane was obtained from traffic counts conducted by Liverpool Plains Shire Council in late 2009 and July2010. Traffic data for the Kamilaroi Highway was projected from RTA traffic counts completed in 1995, 1998, 2001 and 2004.

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Plate 4B.11 : Level Crossing at South Street Werris Creek
(Source: Google Maps)

Plate 4B.12 : South Street Crossing Looking Along West Street.
(Source: Constructive Solutions, 2010 - Plate 19)

Plate 4B.13 : South Street Crossing Looking Along the Maintenance Facility Access.
(Source: Constructive Solutions, 2010 - Plate 20)

Plate 4B.14 : Level Crossing at Werris Creek Road South Werris Creek.
(source: Google Maps)

Table 4B.44
Existing AADT for Roads of the Coal Haulage Route

Road		Total AADT	Commercial Vehicles (CV) (%)	Current Coal Haulage (vpd)	% of AADT	% of CV
Escott Road		100				
Werris Creek Road	North of Werris Creek	2 316	10%	1	0.04%	0.43%
	North of Escott Road	1 852	10%	8	0.05%	0.54%
	South of Escott Road	1 852	10%	8	0.43%	4.32%
Taylors Lane		273	20%	8	2.93%	14.81%
Kamilaroi Highway	North of Taylors Lane	1 145	10%	1	0.09%	0.87%
	South of Taylors Lane	1 853	10%	8	0.43%	4.32%
	South of Quirindi	2 614	10%	8	0.31%	3.06%
Source: Modified after Constructive Solutions (2010) – Tables 4 & 5						

Table 4B.44 provides a summary of current AADT numbers along with the current contribution of coal haulage trucks to both total AADT and total commercial vehicles, i.e. larger trucks.

As illustrated by **Table 4B.44**, current coal haulage by road from the Werris Creek Coal Mine contributes only a minor proportion of total traffic and commercial (heavy vehicle) traffic on these roads.

Rail

Existing rail paths for the Main Northern Rail Line to the south of Werris Creek were provided by Australian Rail Track Corporation (ARTC) (see **Table 4B.45**). These rail paths are current as of August 2010.

Table 4B.45
Current Daily Rail Paths on the Main Northern Rail Line

Train Type	No. of Paths (Return)
Coal	10
Passenger	1
Freight	12
Source: Modified after Constructive Solutions (2010) – Table 2	

The Proponent currently contributes an average of 1 train per day (approximately 5% of total rail movements), although the currently approved production limit of the Werris Creek Coal Mine would require an average of 9 train loads per week, and more than one train per day could occur depending on ARTC scheduling of rail movements.

4B.11.3 Changes to Existing Roads and Traffic Levels

4B.11.3.1 Changes to Local Road Traffic Levels

Construction Traffic Volumes

Construction of the Escott Road Entrance, Northern Site Access Road and the relocation of coal processing and administration areas, along with the upgrade of Escott Road would occur prior to the increase in road haulage of coal from the Project Site. Traffic generated by these construction activities would vary in number over time, however, it is expected that a construction workforce of between 5 and 20 full-time equivalent persons would be employed generating up to 60 vehicle movements per day for the initial 2 years of the LOM Project.

Workforce Traffic Volumes

The Proponent currently employs 58 full-time equivalent personnel, with a further 15 full-time persons involved in coal processing operations and despatch activities at the Rail Load-out Facility. 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. This would result in a relatively minor increase the expected workforce vehicle movements from approximately 170 trips per day to 190 trips per day.

Coal Haulage

The proposed increase in road haulage would double the number vehicle movements to each of the three destinations. The Proponent advises that the proportional distribution of these vehicle movements would remain consistent with current road haulage. **Table 4B.46** provides a summary of current AADT numbers, as well as the proposed change resultant from the increased road haulage.

Table 4B.46
Existing and Proposed Traffic Levels for Roads of the Coal Haulage Route

Road		Total AADT	Commercial Vehicles (CV) (%)	Current Coal Haulage			Proposed Coal Haulage		
				Total (vpd)	% of AADT	% of CV	Total (vpd)	% of AADT	% of CV
Escott Road		100		0			17		
Werris Creek Road	North of Werris Creek	2 316	10%	1	0.04%	0.43%	1	0.04%	0.43%
	North of Escott Road	1 852	10%	8	0.05%	0.54%	1	0.05%	0.54%
	South of Escott Road	1 852	10%	8	0.43%	4.32%	16	0.86%	8.28%
Taylors Lane		273	20%	8	2.93%	14.81%	16	5.69%	25.81%
Kamilaroi Highway	North of Taylors Lane	1 145	10%	1	0.09%	0.87%	1	0.09%	0.87%
	South of Taylors Lane	1 853	10%	8	0.43%	4.32%	15	0.81%	7.8%
	South of Quirindi	2 614	10%	8	0.31%	3.06%	15	0.57%	5.59%

AADT = Annual Average Daily Traffic CV = Commercial Vehicle vpd = vehicle per day
Source: Modified after Constructive Solutions (2010) – Tables 4 & 5

- Based on the proposed coal haulage distribution presented in **Table 4B.46**, the proportional use of the local road network by trucks originating from the Project Site would be as follows.
- 90.25% are destined for Newcastle (travelling south from the Project Site on Werris Creek Road, west on Taylors Lane and then south on the Kamilaroi Highway).
- 4.75% are destined for Gunnedah (travelling south from the Project Site on Werris Creek Road, west on Taylors Lane and then north on the Kamilaroi Highway).
- 5% are destined for Tamworth (travelling north from the Project Site on Werris Creek Road).

As noted in Sections 2.9.2 and 2.9.3, up to 95 000t of coal would be transported to the Newcastle Pacific Carbon facility. This would slightly alter the proportion of traffic using Werris Creek Road north of Escott Road and/or Kamilaroi Highway north of Taylor's Lane.

By comparing the traffic data for the current and proposed scenarios, it is evident that the most affected roads would be:

- Escott Road: on which there is minimal existing traffic; and
- Taylors Lane: on which the contribution of Werris Creek Coal Mine haulage to AADT would increase from 2.93% to 5.69% and the contribution to commercial vehicle traffic from 14.81% to 25.81%.

Impacts on Werris Creek Road and the Kamilaroi Highway would be relatively minor with contribution to AADT remaining less than 1% and contribution to commercial vehicle traffic remaining less than 9%.

4B.11.3.2 Changes to Local Rail Traffic Levels

An increase in coal production to 2.5Mtpa would require the average number of trains generated by the Werris Creek Coal Mine to increase from an average of 9 per week to 11 per week. However, as is the case for the current operations, the maximum number of trains loaded and despatched from the Rail Load-out Facility would (in all but exceptional circumstances) would remain limited to three per day. As with current operations, the scheduling of rail movements is provided to the Proponent by the rail line operators, ARTC.

4B.11.4 Operational Safeguards and Ongoing Maintenance

4B.11.4.1 Road and Intersection Upgrade Requirements

Escott Road and the Escott Road – Werris Creek Road Intersection

As noted in Section 2.7.3 the Proponent would provide for the upgrade of Escott Road and the Escott Road – Werris Creek Road intersection. Constructive Solutions (2010) provides a detailed description (including preliminary road engineering designs) of the proposed upgrades which would include the following.

- Widening of the road pavement to a 10m formation.
- Providing a 9m seal (2 x 3.5m lanes and 1m shoulder) over the 10m formation.
- Improve the alignment of the road (which would require the road reserve to be realigned).
- Improve stormwater drainage along the road (to meet the requirements of Volume 2C of the DECCW guideline "*Soils and Construction: Managing Urban Stormwater*" (DECCW, 2010)).
- Construct the Escott Road Entrance 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).
- Construct the Escott Road – Werris Creek Road intersection to provide for:
  - a deceleration lane in the form of a channelised right turn lane (CHR) for vehicles approaching from Werris Creek (in accordance with Figure 2.7 of Austroads, 2005) to accommodate light vehicles and the small number of returning unladen haulage vehicles;

  - an auxiliary left turn lane (AUL) on the northbound lane of Werris Creek Road (in accordance with Figure 2.5 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 the preliminary intersection treatment for this intersection. The final intersection design and construction would be undertaken in accordance with a permit issued under Section 138 of the *Roads Act 1993*, and following further consultation with Liverpool Plains Shire Council and the RTA.
- Two level crossings would be constructed across the turn-around rail loop. It is anticipated that rail speeds at the level crossings will be low, however the crossings would be designed and constructed in accordance with *AS 1742.7 Manual of uniform traffic control devices Part 7: Railway crossings*. An emergency side track would be constructed around the rail loop to allow emergency access should the road be blocked by a train.

The Proponent would provide all funding for all the noted road works. As such, an ongoing contribution to Liverpool Plains Shire Council (in the form of section 94 contributions) is not considered applicable for this part of the local road network.

Werris Creek Road

Constructive Solutions (2010) report that Werris Creek Road in its current form is suitable for the proposed increase in haulage. No further works are deemed necessary or proposed.

Werris Creek Road – Taylors Lane Intersection

Constructive Solutions (2010) report that the Auxiliary Right Turn (AUR) and the Auxiliary Left Turn (AUL) treatment of the Werris Creek Road – Taylors Lane Intersection assists in achieving the dimensional capacity to improve B-Double maneuvers onto and off Werris Creek Road. However, the current storage zone for right turning traffic and lane tapers for the passing lane do not meet current Austroads Standards (Austroads, 2005). **Figure 4B.32** and **Table 4B.47** illustrate the required intersection requirements and shortfall.

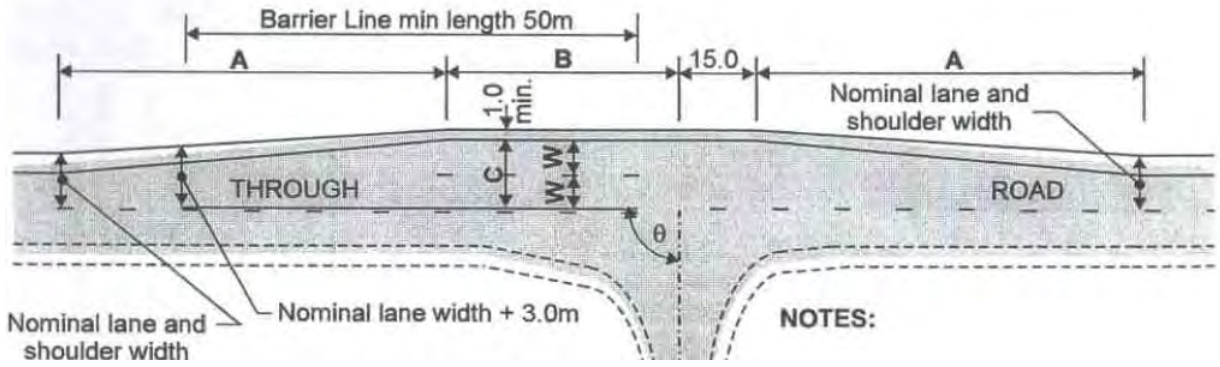

FIGURE 4B.32
AUSTROADS STANDARD REQUIREMENTS FOR THE WERRIS CREEK ROAD – TAYLORS LANE INTERSECTION

Table 4B.47
Current and Required Table of Dimensions for the Werris Creek Road – Taylors Lane Intersection

Dimension[1]	Existing	Required Standard
A	50	70
B	20	35
C	6.4	6.4
W	3.2	3.2
Note 1: see **Figure 4B.31**		

Notably, the right-turn bay currently provides for the storage of the configuration of trucks used for coal haulage with the ability to achieve greater storage capacity partially constrained by a large multi-cell box culvert on the northern side of the intersection (Constructive Solutions, 2010). It is also notable that coal carrying trucks from the Werris Creek Coal Mine currently, and would continue to represent only a small proportion of total and commercial vehicles using this intersection (which was constructed for the purpose of providing a by-pass for heavy vehicles around Quirindi). There is no record of traffic incidents at this intersection and given the proposed increase in heavy vehicle usage of the intersection would be relatively small, upgrade to this intersection should remain the responsibility of Liverpool Plains Shire Council. Should the Council propose to upgrade the intersection, an equitable contribution to this work could be provided by the Proponent.

Taylors Lane

The pavement of Taylors Lane is in generally good condition, however, the increased haulage associated with the LOM Project would accelerate the rate of pavement failure (Constructive Solutions, 2010). To mitigate this accelerated pavement deterioration, the Proponent would:

- Provide ongoing funding for maintenance to Taylors Lane on a per tonne basis (in the form of section 94 contributions).

Various methods for calculating an appropriate s94 contribution rate were considered by Constructive Solutions (2010) with a rate of between $0.31 and $0.39 per tonne of coal arrived upon. Notably this is less than the current s94 Contributions Plan between the Proponent and Council and it is assessed that this s94 Contributions Plan should be renegotiated on this basis. Further, discussion on the development of the s94 Contributions Plan is provided by Section 4B.11.4.4.

Taylors Lane – Kamilaroi Highway Intersection

Constructive Solutions (2010) recommend that this intersection be upgraded to meet the appropriate Austroads Standard. However, given the use of this intersection by LOM Project generated traffic would remain a relatively small proportion of total and commercial vehicle traffic (6% and 26% respectively), and the fact that the intersection falls below the Austroads Standard regardless of Werris Creek Coal Mine traffic, it is assessed that the intersection upgrade remains the responsibility of the road authority. It is considered reasonable that the Proponent provide some contribution to intersection upgrade based on the proportional use of which could be provided as capital contributions on part of an ongoing Contributions Plan.

Kamilaroi Highway Quirindi (Lennox and Loder Streets)

The intersection of Lennox and Loder Streets is considered adequate to accommodate the existing traffic. No further road upgrades are therefore proposed for this intersection.

4B.11.4.2 Rail Crossing Management

The total number of rail paths despatched from the Project Site each day, i.e. three, would not increase. Average maximum weekly rail movements would increase from 9 train loads to 11 train loads.

The Proponent is committed to continuing a dialogue with Liverpool Plains Shire Council and ARTC over the possibility of future upgrades to rail crossings. However, given the minimal increase in rail movements generated by the LOM Project, the Proponent does not propose to undertake any modifications to any of the rail crossings identified in Section 4B.11.2.4.

4B.11.4.3 Operational Safeguards

The truck configurations that would be used for the road haulage of the coal would be the same as those currently used, namely: Truck and Stag; Truck and Superdog; and 25m B-Double configurations. All three configurations are used extensively in the local area with an increasing emphasis being placed upon phasing out the use of standard articulated vehicles in favour of the more freight efficient combination vehicles.

The primary impacts associated with using combination vehicles are considered to be the dimensional capacity of the existing road infrastructure and traffic interaction. Section 4B.11.4.1 provides the details of the road and intersection upgrades to be completed to enable the proposed increase in road haulage of coal.

Safeguards and operational controls which would be incorporated into the design and operation of road haulage for the LOM Project include the following.

- All recommended road and intersection upgrades would be designed to accommodate B-Double use (see Section 4B.11.4.1).
- Intersection upgrades would be completed to a standard providing appropriate dimensional capacity and signage.
- Drivers would be instructed to obey all speed restrictions, other road rules and always operate in an appropriate and courteous manner to other road users.

4B.11.4.4 Contributions to Future Road Upgrades and Ongoing Maintenance (Section 94 Contributions)

Section 94 of the EP&A Act, enables Councils to levy contributions from developers for the provision of public amenities and services which are required as a consequence of development. The level of contribution can be calculated in several ways including:

1. 'bring forward' method: which considers the reduction in the theoretical remaining life of the road;
2. consideration of the cost associated with increasing the thickness of the pavement to accommodate the additional equivalent standard axle pairs attributable to the LOM Project; and

life cycle costs method: considers the maintenance costs for the road over the life of the LOM Project and calculates what the pro-rata share resulting from haulage would be.

Constructive Solutions (2010) calculated the contribution per tonne of coal hauled by each method and calculated a contribution of between $0.31 per tonne (for Methods 2 and 3) and $0.59 per tonne (for Method 1).

Constructive Solutions (2010) considers the life cycle cost analysis (Method 3) to be the most indicative of the actual cost and therefore representative of the impact on the road network resulting from the development.

The Proponent would provide Council with Section 94 contributions at a rate of $0.31 per tonne. Assuming haulage of 95 000t per annum along Taylors Lane, the total contribution made over the life of the LOM Project would be $581,595.

4B.11.5 Assessment of Impacts

4B.11.5.1 Road Conditions

Constructive Solutions (2010) report that with the exception of small areas of pavement deterioration (<0.5m^2) on Taylors Lane, and some sections of Werris Creek Road, road conditions are good. The Proponent has committed to contributing to the ongoing maintenance of Taylors Lane through the continuation of a Section 94 Contributions Plan with Liverpool Plains Shire Council. Constructive Solutions (2010) have recommended that a contribution of $0.31 per tonne (based on life cycle costs method) would be sufficient to account for the accelerated pavement deterioration attributable to the LOM Project. The Proponent anticipates that these contributions would be allocated to remediation and preventative maintenance on those sections of the transport route most susceptible to heavy vehicle damage.

The Proponent would upgrade Escott Road and maintain this road for the life of the LOM Project.

Given Werris Creek Road and the Kamilaroi Highway generally have sealed pavements between 6.4m and 7.0m wide and satisfy *RTA Road Design Guidelines* regarding pavement width for the anticipated traffic volumes with the LOM Project, the potential for LOM Project-related traffic to contribute significantly or noticeably to pavement deterioration is considered very small.

4B.11.5.2 Intersection Performance and Suitability

The proposed Escott Road Entrance would be designed and constructed to RTA standards for BAL and BAR treatments for the left turn in and right turn out the Project Site. The intersection would be able to accommodate all configuration of vehicle that would enter or exit the Project Site.

The proposed Escott Road – Werris Creek Road intersection would be upgraded as nominated in Section 4B.11.4.1 which would provide suitable dimensional capacity, sight distance and storage space for all configurations of vehicles that would use this intersection to access the Project Site.

While the current treatment of the Werris Creek Road – Taylors Lane intersection does not strictly meet the Austroads (2005) standard for an AUR / AUL intersection (see **Figure 4B.32** and **Table 4B.47**), limitations caused by a large multi-cell box culvert and good operation of this intersection to date are such that it is assessed as suitable for the proposed increase in coal haulage in its current form.

While Constructive Solutions (2010) note that improvements could be made to the Taylors Lane – Kamilaroi Highway intersection, they also report that this intersection in its current form is suitable for the proposed traffic that would be generated by the LOM Project.

4B.11.5.3 Road Closures

Rail Transport

There are a maximum of 23 rail paths possible per day on the Main Northern Rail Line to the south of Werris Creek. The LOM Project would not result in any significant increase in this number. This notwithstanding, the potential impact of a rail movements on local roads is considered further.

The most significantly impacted rail crossing would be on South Street, Werris Creek where, due to the speed limit of 15km/hr for trains on the Werris Creek Rail Siding, a train will take approximately 7 minutes to pass. The delays experienced by traffic at other level crossings are expected to be around the 3 to 4 minute duration at the maximum based upon a travel speed of 25 to 40km/hr.

Based on roads with 2 000 AADT, the number of vehicles that may be delayed from one train movement on average would be approximately 5 to 6. Considerable variations either side of this would occur based on the time of day and other traffic influences. Given the increase in (one way) rail movements is proposed to be an additional 4 per week on average, approximately 30 vehicles in each direction may be delayed.

Due to the proximity of the Henry Street – George Street Roundabout in Quirindi to the rail crossing, it is currently possible that eastbound traffic on Henry Street queuing at the crossing could potentially back up and block traffic on the roundabout. Importantly, however, this is an existing issue that would not be exacerbated by the LOM Project. As discussed in Section 4B.11.4.2, the Proponent is prepared to maintain a dialogue with the relevant stakeholders in relation to issues such as these.

It is acknowledged that it is possible that access for emergency vehicles across the affected rail crossings may be delayed as a consequence of the crossing trains. However, this potential occurrence is a current feature of the local setting which the LOM Project would not impact upon. It is important to note that over 90% of all traffic on the Main Northern Rail Line south of Werris Creek would be generated by sources other than the Werris Creek Coal Mine. Any solution to the issues of traffic delays and restricted emergency vehicle access should include the operators responsible for the remaining 90% of rail traffic, local Council's and the NSW State government.

Given that the LOM Project would not significantly increase the number of rail paths, or the duration of level crossing delays, it is considered that the impact associated with road closures due to rail transport of coal from the Project Site (which is a feature of the road network now) is acceptable.

Blasting

Blasting within 350m of Werris Creek Road would require the closure of the road to traffic. Given the Proponent would undertake most blasts around 1:15pm, when traffic is likely to be light, the number of vehicles likely to be stopped (for a period generally not exceeding 15 minutes) should not exceed 5 or 6 (although variation would occur based on other traffic influences). With the exception of immediately following the initiation of the blast sequence and immediately following whilst the road is inspected, passage of emergency vehicles could be accommodated whilst the road is closed (as the blast sentries and traffic controllers would be able to contact the shot-firer).

Given the management measures to be implemented by the Proponent to limit road closures to blasts within 350m of Werris Creek Road, the initiation of blasts outside peak traffic times, and the safety procedures documented in Section 4B.4.4.5, the impact of road closures associated with blasting would be minimised.

4B.11.5.4 Traffic Levels

Road Traffic

The increase in local traffic levels attributable to the LOM Project would be minimal (see **Table 4B.46**). On Werris Creek Road and the Kamilaroi , the contribution to AADT would remain less than 1% and the contribution to commercial vehicle traffic less than 9%. The most significant increases would be on Escott Road, where the Proponent would provide for the necessary road and intersection upgrades, and Taylors Lane, which is a designated heavy vehicle by-pass route with a contribution to road maintenance to be provided by the Proponent.

The proposed increases in traffic would therefore be minimal and suitably mitigated by the proposed road works, contributions plan and operational safeguards proposed.

Rail Traffic

The maximum number of daily rail movements generated by the Werris Creek Coal Mine would not increase. Trains from the Werris Creek Coal Mine would continue to represent less than 10% of total rail paths on the Main Northern Rail Line.

It is worthy of note that every rail movement of approximately 5 400t is equivalent to 170 truckloads of coal. Therefore, the minor increase in rail traffic is far preferable to an increase in road traffic that would be associated with the same quantity of coal.

4B.11.5.5 Road and Rail Safety

The increased number of truck movements could increase the risk of traffic accident slightly (as would any increase in traffic). However, the upgrade to the Escott Road – Werris Creek Road intersection and proposed operational controls should counter any increase in risk.

The slight increase in the total number of trains may increase the likelihood of accidents at level crossings. Although the increased risk is only minor, it is recommended that the level crossings affected be reviewed for compliance with AS 1742.7.

4B.12 WASTE MANAGEMENT

4B.12.1 Introduction

Based on the risk analysis undertaken by R.W. Corkery & Co Pty Limited for the LOM Project (see Section 3.3 and **Table 3.6**), the specific waste management impacts that may result as a consequence of the LOM Project (without the implementation of the safeguards, controls and mitigation measures presented in this section) and therefore require assessment include the following.

- Contamination of downstream surface waters (moderate risk).
- Contamination of groundwater (low risk).
- Contamination of downstream lands (low risk).
- Reduced visual amenity (moderate risk)

The Director-General's requirements (DGRs) issued by the DoP identify "*waste – including accurate estimates of the quantity and nature of the potential waste streams of the project and a description of the measures that would be implemented to minimise, handle and dispose of waste on site*" as a key issue for assessment in the *Environmental Assessment*.

The following sub-sections consider the waste streams that would be generated by the LOM Project, the measures proposed to prevent or mitigate any impacts and an assessment of impact. In effect, this section draws together information regarding the management of waste contained elsewhere in the *Environmental Assessment*.

4B.12.2 Identification of Waste Streams

4B.12.2.1 Introduction

The following waste streams, predicted nature and quantity, would be generated by the LOM Project.

4B.12.2.2 Overburden / Interburden

Over the life of the LOM Project, the Proponent estimates approximately 143Mbcm (178Mlcm) of overburden and interburden material, additional to that removed as part of the approved mining operations, would be removed. As noted in Section 2.5.5.2, the material is not considered to be saline or acid forming and as such there are no specific requirements for the management of this material.

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.

4B.12.2.3 Water

Approximately 200ML of groundwater remains within the former Werris Creek Colliery underground workings to be extracted. This water is considered brackish with an electrical conductivity of up to 3 000µS/cm.

4B.12.2.4 Hydrocarbon Waste

Generated during the maintenance and refuelling of mine equipment, this waste would include waste oils and lubricants, oily water, oil filters and oily rags. Estimates of the volume of this type of waste generated each year are between 80kL and 130kL all of which is recycled

4B.12.2.5 General Domestic-Type Wastes

The volume of general waste generated each year would approximate 800m^3.

4B.12.2.6 Sewage

The septic systems on site are inspected and maintained fortnightly. The 10kL capacity of the tanks requires servicing and disposal every 2 years.

4B.12.3 Waste Management Objectives

The LOM Project currently has the following objectives for waste management. These objectives would also be utilised for the LOM Project to ensure the effective management of waste.

- Waste production is minimised.
- Waste types and quantities on site are identified.

- Potential re-use or recycling opportunities are identified and appropriate handling and collection procedures are in place.
- Disposal of wastes conforms to applicable guidelines or licences.
- Areas where fuels, oils or other potential contaminants are stored are appropriately bunded.
- Sewage disposal does not degrade the waste water utilization area.

4B.12.4 Safeguards and Controls

4B.12.4.1 General

The following provides the general safeguards and controls that would be implemented to manage waste across the Project and achieve the waste management objectives outlined in Section 4B.12.3. Waste management practices for specific waste streams are summarised in Sections 4B.12.4.1 to 4B.12.4.6. These practices would form the basis for the waste management section in the LOM Project's Environmental Management Strategy.

- A programme to encourage waste minimisation would be implemented.
- A register of the types and quantities of wastes produced on the Project Site would be maintained.
- Storage areas would be designed and maintained to contain spillages.
- Recyclable and non-recyclable waste would be segregated and retained in designated storage areas prior to removal from the Project Site.
- The Project Site would be kept in a clean and tidy condition.
- Waste would be regularly removed from the Project Site by a licensed contractor such that vermin infiltration, odour, etc. do not become issues.
- Waste management and minimisation would be reported in the AEMR.

The following sub-sections describe the specific management measures that would be implemented for the waste streams identified in Section 4B.12.2.

4B.12.4.2 Overburden / Interburden

Periodically, samples of the overburden / interburden should be sampled and analysed for salinity and acid generating potential. In the event that either potential is identified, specific management strategies would be developed to ensure land and water resources on the Project Site and downstream are not adversely affected.

As nominated in Section 2.5.5.4, the majority of the overburden and interburden (80%) would be placed within or over the open cut void.

4B.12.4.3 Saline Water

Water pumped from the underground workings would be stored in one of the groundwater storage cells located at the southwestern corner of the Project Site. These storage cells would be lined, either with clay or an artificial liner, such that permeability does not exceed 1×10^{-9}m/s. These dams would be segregated from surface flows with sufficient freeboard maintained to ensure that they do not over top. The water accumulated in these dams would be used preferentially for the watering of the internal road and hardstand network.

4B.12.4.4 Hydrocarbon Contaminated Water

The majority of hydrocarbon contaminated water would be generated within the workshop and mobile equipment laydown areas with runoff directed sumps equipped with oil/water separators.

In the event of a major hydrocarbon spill, which leads to the contamination of water on the Project Site, a 3-phase remedial action plan would be adopted.

- **Phase 1 –** Recover as much as possible at the source by pumping free hydrocarbon from the surface and excavating hydrocarbon-contaminated materials. Contaminated materials would be stockpiled on site under cover and on an impermeable surface, e.g. a high-density polyethylene sheet. This material would later be bio-remediated on site and/or transported to an approved waste depot.
- **Phase 2 – Source Control:** Begin hydraulic control of the source to prevent spreading of contamination. Subject to the relative position of the open cut excavation and the source of contamination, this could involve digging one or more holes close to the centre of the spill area, and pumping from those holes to create a cone of depression with a hydraulic gradient towards the holes. Such actions would prevent movement of contamination away from the area of the spill.
- **Phase 3 – Recovery:** If necessary, install boreholes to remove and treat contaminated groundwater.

4B.12.4.5 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 Project Site. 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.

4B.12.4.6 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.

4B.12.4.7 Sewage

The Proponent would maintain adequate toilet and hand-washing facilities within the Site Administration and Facilities Area for the site workforce and visitors. These facilities would incorporate a septic sewage treatment system approved by Liverpool Plains Shire Council. This facility would be serviced by a licensed waste collection and disposal contractor as required.

Waste water from the Project Site ablutions facilities would be drained via a rubble drain to the waste water utilisation area licensed by EPL 12290. The waste water utilisation area would be managed so that any surface runoff from the waste water utilisation area would be collected within the site water management system.

4B.12.5 Assessment of Impact

With the proposed safeguards and controls, it is considered that the impacts of waste generated associated with the Project would be acceptable and that the proposed LOM Project would not significantly contribute to increasing the local waste stream.

4B.13 HAZARDS

4B.13.1 Introduction

The DGRs identify "*hazards – including bushfires*" as a key issue for assessment. The following sub-sections identify the various hazards of the LOM Project and provide a summary of each hazard, proposed management and residual impacts associated with each.

4B.13.2 Potential Hazards

Following a review of current and proposed operations at the Werris Creek Coal Mine, the following hazards (that could potentially impact on the general public) were identified.

- Bushfire.
- Traffic Incident.
- Spontaneous Combustion.
- Storage and Use of Potentially Hazardous Materials, e.g. explosives.
- Land Contamination.

The following sub-sections consider each of these hazards, outlining the risk posed by each to the general public or surrounding environment,

4B.13.3 Bushfire Hazard

4B.13.3.1 Introduction

Based on the risk assessment undertaken for the Project (see Section 3.3 and **Table 3.6**), specific **unmitigated** bushfire related impacts that may result as a consequence of the LOM Project include the following.

- Destruction of equipment or assets (moderate risk).

- Injury or fatality to employees or surrounding residents (high risk).
- Injury or death of livestock (high risk).
- Adverse impact on native biota (high risk).

This section identifies the dominant vegetation type(s) within the Project Site and surrounding landholdings in order to determine the potential bushfire hazard associated with the Project. In identifying the bushfire hazard, the document "*Planning for Bushfire Protection*" produced by NSW Rural Fire Service in consultation with the then Planning NSW (now Department of Planning) in 2001 (RFS, 2001). RFS (2001) forms the basis of the identification of bushfire hazard. It is noted that information required for this assessment was drawn from the Biodiversity Impact Assessment (ELA, 2010).

4B.13.3.2 Existing Environment – Assessment of Bushfire Hazard

Vegetation

As identified in Section 4B.6.3.2, the Project Site is predominantly covered by Grassy White Box Woodland and Derived Native Grasslands of varying condition (from woodland to derived native grassland with no overstorey). RFS (2001) classifies vegetation into three broad groups to provide some indication of flammability and therefore bushfire hazard, namely:

- Group 1 - forest;
- Group 2 - woodlands and heath; and
- Group 3 - rainforests, shrubland, open woodlands, mallee, and grassland.

Within each group, RFS (2001) assigns classes to describe the various vegetation types within these broader groups. The Project Site vegetation is considered to vary between the following RFS (2001) classifications.

- Group 2, Class 6. Categorised as woodland with trees of 10m to 30m high, foliage cover of 10% to 30% and understorey of low trees, tall shrubs and/or grasses. A maximum fuel load of 25t/ha is assigned to this vegetation type by RFS (2001).
- Group 3, Class 22. Categorised as native dominated pasture. A maximum fuel load of 6t/ha is assigned to this vegetation type by RFS (2001).

The vegetation of the landholdings surrounding the Project Site is dominated by the similar vegetation community types to those found on the Project Site.

Slope Classification

Slopes within the Project Site are typically between 1^{o} and 10^{o} (see Section 4A.1.3).

Hazard Assessment

The bushfire hazard assessment takes into account not only the vegetation and associated bushfire hazard within the Project Site, but the vegetation immediately surrounding the Project Site and the local area generally. **Table 4B.48** presents the parameters for the assessment, which were then compared to RFS (2001) to determine bushfire hazard (referred to as bushfire attack category in RFS (2001)).

Table 4B.48
Bushfire Hazard Assessment

Assessment	Vegetation Classification	Slope	Distance to Activities	Category of Bushfire Attack
Group 2	Woodland and Open Forest	5^o to 10^o	<20m	High
Group 3	Grassland	15^o to 5^o	<20m	Low
Source: Based on Appendix 3.3 of RFS (2001)				

A high category of bushfire attack describes a site or asset where:

> *"attack by burning debris is significant with radiant heat levels and flame threatening some building elements (screened glass)."*

Specific construction requirements (Level 2 construction in accordance with Section 3 of Australian Standard (AS) 3959 – 1999) should be considered.

A low category of bushfire attack describes a site or asset where:

> *"minimal attack from radiant heat and flame due to the distance of the site from the vegetation, although some attack by burning debris is possible. There is insufficient threat to warrant specific construction requirements."*

Based on the above bushfire attack categories, the Project Site could be affected by bushfire and precautionary measures should be developed for implementation in the event of a significant bushfire event locally.

4B.13.3.3 Safeguards and Controls

Management of a Local Bushfire Event

Acknowledging the 'High' bushfire attack category associated with the woodland / open forest vegetation within and surrounding the Project Site, the construction of buildings within the Project Site should consider the Level 2 requirements of AS 3959 – 1999. Notably, the entire length of the Northern Site Access Road would traverse grassland / pasture vegetation which has a low bushfire attack categorisation. As such, an immediate method of egress from the Project Site would be available to Project personnel in the event of bushfire attack on the Project Site.

In the event of a local bushfire threatening the Project Site, mine management would follow all instructions provided by the NSW Rural Fire Service (RFS) or police. Access to all Project Site water storages would be provided to the RFS and any reasonable assistance offered to RFS or police personnel.

Management of Project Site Operations

The Project Site operations that may increase the risk of bushfire, and the controls proposed to limit the risk posed by these are presented in **Table 4B.49**.

Table 4B.49
Bushfire Hazard – Activities and Controls

Activity	Possible Ignition Source	Safeguards and/or Controls
Refuelling	• Spilt fuel ignited by spark	• Refuelling undertaken within designated fuel bays or within cleared area of the Project Site. • Vehicles to be turned off during refuelling. • No smoking policy to be enforced in designated areas of the Project Site. • Fire extinguishers maintained within site vehicles and refuelling areas.
General Activities	• Cigarette • Rubbish, e.g. glass, metal.	• No smoking policy to be enforced in designated areas of the Project Site. • Focus on housekeeping to be maintained by mine management. • Water cart available to assist in extinguishing any fire ignited. • Site vehicles to carry a fire extinguisher.

It is recognised that even after the safeguards identified in **Table 4B.49** are adopted, the threat of bushfire would remain. As such, an appropriate bushfire management strategy would be developed in consultation with the local Rural Fire Service to ensure that the appropriate management and response procedures are implemented to reduce the risk of bushfire hazard and subsequently the potential safety risk to employees and the local community.

- The Proponent has considered the relevant guidelines and would also adopt the following controls and safeguards.
- All equipment on site would be equipped with adequate and fully operational fire suppression equipment in accordance with AS 1841 and AS 1851.
- All employees would be trained in the proper use of fire fighting equipment held on site.
- Water would be especially set aside for fire fighting on site and a water cart made available for fire fighting purposes.
- Mine site fire fighting equipment would be made available to the local Rural Fire Service if required in the event of a bushfire in the land surrounding the Project Site.
- Firebreaks would be developed and maintained at the edge of the Project Site.

4B.13.3.4 Assessment of Impacts

The LOM Project Site operations would increase the number and type of ignition sources in the local area. The proposed controls and safeguards, in conjunction with general clearing activities associated with the LOM Project would, however, ensure that a lowered bushfire hazard was maintained within the Project Site.

4B.13.4 Traffic Incident

4B.13.4.1 Potential Incident(s)

Mine traffic (road registered semi-trailers and light vehicles) would cross Escott Road, a public road, which could potentially result in an accident involving a mine vehicle and a vehicle driven by a member of the public.

The turn-around rail loop would traverse Escott Road and as such there is the potential for an accident involving a train and vehicle driven by a member of the public.

4B.13.4.2 Safeguards and Hazard Reduction Strategies

While the risk associated with an incident between a mine vehicle (truck or rail wagon) and a vehicle driven by a member of the public is considered low based on the limited volume of public traffic that uses Escott Road, the following hazard reduction measures or strategies would be implemented.

- Give way signs are erected on the Rail Load-out Road where this crosses Escott Road.
- The Escott Road Entrance to the Project Site would be located to the east of the Rail Load-out Road with light vehicle traffic to the Project Site offices not required to cross the Rail Load-out Road.
- All truck drivers would be advised of the potential use of Escott Road by the general public.
- The train on the rail loop would be travelling very slowly given it would be being loaded.
- Level crossings would be installed at the two points where Escott Road crosses the turn-around rail loop with appropriate warning signs.
- An emergency access road would be constructed around the perimeter of the turn-around rail loop.

4B.13.4.3 Assessment of Impacts

Given the low risk associated with this particular hazard and the proposed hazard reduction measures and strategies, it is unlikely that a traffic incident involving a mine vehicle and vehicle of the public would occur.

4B.13.5 Spontaneous Combustion

4B.13.5.1 Potential Incident(s)

Based on the risk assessment undertaken for the Project (see Section 3.3 and **Table 3.6**), specific **unmitigated** spontaneous combustion related incidents that may result as a consequence of the Project include the following.

- Uncontrolled fire event (high risk).
- Odour and subsequent emission of sulphur dioxide (moderate risk).

4B.13.5.2 Safeguards and Hazard Reduction Strategies

It is noted in Section 2.2.6 that the Self Heating Temperature calculations identify the coal from the Werris Creek Coal Mine in the medium to high spontaneous combustion potential range. Hazard reduction strategies currently implemented at the Werris Creek Coal Mine are as follows.

- The length of time coal is held in stockpiles is minimised.
- The coal stockpiles are watered as required to reduce heat.
- The coal stockpiles are monitored for signs of spontaneous combustion.
- Incidents of spontaneous combustion are immediately reported.
- Extinguishment by excavation, spreading and saturation with water would be undertaken in the event of a spontaneous combustion event.

The above hazard reduction strategies have been successful to date at the Werris Creek Coal Mine and there have only been relative minor incidences of spontaneous combustion outbreaks at the mine which were brought under control with bulldozers and water carts readily available.

4B.13.5.3 Assessment of Impacts

The proposed hazard reduction measures and strategies have proven to adequately manage the incidents resultant from this hazard. The potential impact associated with spontaneous combustion is therefore low.

4B.13.6 Storage and Use of Potentially Hazardous Materials

Appendices 3 and **4** provide a risk screening for the use and storage of potentially hazardous materials on the Project Site and a Preliminary Hazards Analysis for the storage of ammonium nitrate (an explosives pre-cursor) on the Project Site.

The risk screening and PHA determined that none of the dangerous goods to be used on the Project Site are deemed hazardous.

4B.13.7 Land Contamination

4B.13.7.1 Potential Incident(s)

Based on the risk assessment undertaken for the Project (see Section 3.3 and **Table 3.6**), specific **unmitigated** land contamination related incidents that may result as a consequence of the LOM Project include the following.

- Surface water and land contamination (low to moderate risk).
- Reduced availability of soils (low to moderate risk).

The only potential source of land contamination on the Project Site would be diesel fuel and other hydrocarbon products.

4B.13.7.2 Safeguards and Hazard Reduction Strategies

The following hazard reduction practices would be adopted to ensure water flowing from areas on the Project Site with the potential to generate hydrocarbon-contaminated water, e.g. washdown areas, workshops, hydrocarbon storage and refuelling areas, is not contaminated by hydrocarbons.

- All water from wash-down areas and workshops would be directed to oil/water separators and containment systems.
- All storage tanks would either be self-bunded tanks or bunded with an impermeable surface and a capacity to contain a minimum 110% of the largest storage tank capacity.
- All hydrocarbon products would be securely stored.
- With the exception of less mobile mining equipment, e.g. excavators which would be refuelled within the open cut area, designated areas would be allocated for refuelling and minor maintenance work. The use of these areas would be enforced by mine management.

In the event of a major hydrocarbon spill, a 3-phase remedial action plan would be adopted as described in Section 4B.12.4.4.

4B.13.7.3 Assessment of Impacts

The proposed hazard reduction measures and strategies would ensure that the risk of land contamination is very low. The potential impact associated with land contamination is therefore low.

4B.14 SOCIO-ECONOMIC SETTING

4B.14.1 Introduction

Based on the risk analysis undertaken for the Project (see Section 3.3 and **Table 3.6**), the potential socio-economic impacts requiring assessment and their unmitigated risk rating are as follows.

- Changed economic activity and related social impacts (no risk rating).
- Change in the socio-economic structure of the local community (moderate to high risk).

The DGRs particularly request that the assessment of socio-economic impacts includes an assessment of the costs and benefits of the LOM Project as a whole, the demand on local infrastructure and services and whether it would result in a net benefit for the NSW community.

4B.14.2 Existing Socio-economic Setting

4B.14.2.1 Australian Bureau of Statistics Data

Information presented in the following subsections has been obtained from census data produced by the Australian Bureau of Statistics from the 2006 Census. The LOM Project Site is located to the south of the town of Werris Creek within the Liverpool Plains Local Government Area (LGA) which also encompasses the town of Quirindi to the south.

Population and Population Growth

Table 4B.50 presents a summary of the 2006 population statistics for the Liverpool Plains LGA, Werris Creek, Quirindi and for NSW as a whole.

Table 4B.50
2006 Census Population Statistics

		LGA		Werris Creek		Quirindi		NSW	
	Age Groups	**Persons**	**%**	**Persons**	**%**	**Persons**	**%**	**Persons**	**%**
	0-4 years	493	6	82	5	165	6	420 431	7
Children	5-14 years	1 023	14	182	12	322	12	878 483	13
Studying or	15-24 years	737	10	149	10	286	11	871 717	13
Working	25-54 years	2 795	37	499	34	862	33	2 753 219	42
Approaching	55-64 years	1 105	15	254	17	365	14	719 551	11
Retirement or Retired	65 years and over	1 387	18	323	22	607	24	905 778	14
	Total Persons	**7 541**	**100**	**1 489**	**100**	**2 608**	100	**6 549 178**	**100**

Source: Australian Bureau of Statistics – 2006 Census

The Census data indicates that within the Liverpool Plains LGA, Werris Creek and Quirindi, the proportion of persons aged 65 years and over (18% to 24%) was higher than for NSW as a whole (14%) and generally slightly lower for persons aged between 15 and 24 years (10% to 11% compared to 13% for NSW) and persons aged between 25 and 54 years (33% to 37% compared to 42% in NSW).

It is notable that the population of Werris Creek increased only marginally between the 2001 and 2006 Census'. The age group distribution also became more skewed towards the older cohort (55+) increasing from 478 to 577, the 25-54 cohort declining from 532 to 499 and the 15-24 age group remaining approximately the same (148 vs 149). The same trend is observed when comparing the 2001 and 2006 census statistics of the Quirindi to the south.

Employment, Occupation and Industries

Table 4B.51 presents the employment statistics from the 2006 Census. This data indicates that the unemployment rate in the Liverpool Plains LGA and Quirindi on the date of the census was similar to the unemployment rate NSW as a whole. The unemployment rate in Werris Creek, however, was slightly higher than NSW as a whole (10.1% compared to 5.9%) (although this is a reduction of the unemployment rate noted following the 2006 Census of 11.5%). Labour force participation is also lower in the Liverpool Plains LGA, Werris Creek and Quirindi ranging from 38.5% to 53.3% compared to 58.9% for NSW as a whole.

Table 4B.51
2006 Census Employment Statistics

	LGA		Werris Creek		Quirindi		NSW	
	Persons	**%**	**Persons**	**%**	**Persons**	**%**	**Persons**	**%**
Employed								
Full-time	1 877	58.4	236	49.8	567	55.4	1 879 628	60.8
Part-time	906	28.2	152	32.1	307	30.0	842 713	27.2
Employed, away from work	106	3.3	21	4.4	35	3.4	103 525	3.3
Hours of work not stated	135	4.1	16	3.4	52	5.1	83 578	2.8
Total	3024	94.0	425	89.7	961	93.9	2 909 444	94.1
Unemployed, looking for work								
Full-time work	137	4.3	34	7.2	47	4.6	115 565	3.7
Part-time work	53	1.6	14	2.9	15	1.5	67 994	2.2
Total	190	5.9	48	10.1	62	6.1	183 159	5.9
Labour Force Participation								
Total labour force	3 214		473		1 023		3 092 603	
Total Persons	6024		1 227		2 121		5 250 261	
Labour force participation	53.3%		38.5%		48.2%		58.9%	
Source: Australian Bureau of Statistics – 2006 Census								

Table 4B.52 presents a summary of the 2006 Census statistics relating to industry of employment. This data indicates that, within the Liverpool Plains LGA, "Agriculture, forestry and fishing" (28%), is the leading industry of employment. "Transport, postal and warehousing" is the leading industry of employment in Werris Creek, while "Retail trade is the leading industry in Quirindi.

State-wide, "Retail trade" and "Healthcare and social assistance" were the principal industries (employing 11% and 10% of the workforce respectively) followed by "Manufacturing" (9%).

These trends reflect that the "Agriculture, forestry and fishing" industry dominates the Liverpool Plains LGA and that mining is only a small industry within the area accounting for only 1% to 2% of the employed population, however, this is in line with employment in the mining industry across NSW. It is noted that "Transport, postal and warehousing" is the leading industry in Werris Creek, which would be largely associated with the rail infrastructure in Werris Creek, which supports the local mining industry by transporting product to the coast.

Income

Table 4B.53 presents income statistics provided in the 2006 Census. That data indicates that median individual, family and household incomes in the Liverpool Plains LGA, Werris Creek and Quirindi were substantially lower than NSW as a whole (between 24% and 46% lower).

This difference is likely to be attributed to the fact that there are proportionally fewer people working, i.e. higher unemployment, in the Liverpool Plains LGA (especially Werris Creek) than in NSW as a whole. Also, typically, wages and salaries available for workers in rural areas are lower than other areas within the State.

Table 4B.52
Industry Employment Statistics

	LGA		Werris Creek		Quirindi		NSW	
	No*	**%**	**Persons**	**%**	**Persons**	**%**	**Persons**	**%**
Agriculture, forestry & fishing	840	28	23	5	58	6	78 661	3
Mining	40	1	10	2	13	1	20 318	1
Manufacturing	162	5	29	7	59	6	277 986	9
Electricity, gas, water & waste services	53	2	11	3	33	3	29 184	1
Construction	154	5	22	5	63	6	212 729	7
Wholesale trade	89	3	6	1	37	4	136 761	5
Retail trade	256	8	47	11	124	13	323 929	11
Accommodation & food services	125	4	21	5	67	7	190 454	6
Transport, postal & warehousing	228	8	76	18	58	6	145 518	6
Information media & telecommunications	21	1	0	0	15	1	68 976	2
Financial & insurance services	28	1	0	0	13	1	144 867	5
Rental, hiring & real estate services	26	1	0	0	9	1	50 588	2
Professional, scientific & technical services	87	3	7	2	36	4	213 247	7
Administrative & support services	53	2	16	4	11	1	90 431	3
Public administration & safety	153	5	29	7	75	8	174 915	6
Education & training	217	7	27	7	94	10	219 679	8
Health care & social assistance	271	9	50	12	107	11	304 335	10
Arts & recreation services	20	1	6	1	10	1	39 574	1
Other services	104	3	24	6	51	5	110 094	4
Inadequately described/Not stated	94	3	17	4	23	2	77 194	3
Total	**3 021**		**421**		**956**		**2 909 440**	
*No of Persons								
Source: Australian Bureau of Statistics - 2006 Census								

Table 4B.53
Income Statistics 2006

	LGA	Werris Creek	Quirindi	NSW
Median individual income ($/weekly)	351	279	349	461
Median family income ($/weekly)	857	674	793	1 181
Median household income ($/weekly)	666	559	644	1 036
Source: Australian Bureau of Statistics - 2006 Census				

Housing

Table 4B.54 presents a summary of the housing cost statistics for the Liverpool Plains LGA, Werris Creek, Quirindi and NSW as a whole. The data indicates that the median monthly loan repayment is generally between $759 and $932 less than the NSW median. Similarly, median rental costs are between $89 and $110 less than the NSW median.

The average household size was marginally lower for the Liverpool Plains LGA Werris Creek and Quirindi than for NSW as a whole although the average number of people per bedroom was the same.

Table 4B.54
Cost of Housing and Household Size Statistics - 2006

	LGA	Werris Creek	Quirindi	NSW
Median housing loan repayment ($/monthly)	758	585	758	1 517
Median rent ($/weekly)	100	110	121	210
Average number of persons per bedroom	1.1	1.1	1.1	1.1
Average household size	2.4	2.2	2.3	2.6
Source: Australian Bureau of Statistics - 2006 Census				

4B.14.2.2 Community Values

General Overview

Werris Creek is a relatively healthy community which, while definitely displaying evidence of a decline in recent times (vacant shops, minimal population growth), supports and maintains services and amenities common to similarly sized towns across western NSW including a hospital, one primary school, a pre-school, library, several churches, two hotels, a small shopping area including several cafes, a bowling club and tennis courts, swimming pool, netball/basketball courts and a local sports ground.

Townspeople of Werris Creek and members of the small community surrounding the Project Site appear to share the values common to many small towns/rural communities. The relative peace and quiet offered by the rural setting is highly valued, especially by those landholders surrounding the Project Site. A number of local residents have also indicated the attractiveness of the local area is highly valued.

A number of residents of Werris Creek have previously expressed concern, however, over reduced industry and employment opportunities within the local area and the movement of younger people to larger centres such as Tamworth.

Community Survey 2009

The Liverpool Plains Shire Council commissioned Micromex Research in 2009 to conduct a community survey. The outcomes of the survey that may be related to the LOM Project are summarised below.

- Residents had strong concerns about the conditions of roads both inside and outside of towns within the Liverpool Plains LGA.
- Mining was listed as the fourth highest priority issue for the next 10 years, with environment being ranked as the fifth highest priority.
- In relation to mining as the fourth highest priority, it is noted that mining in general was an issue of concern, however, some residents were also concerned about the balance between farming and mining including what effect coal mining in particular may have on water supplies.
- Issues relating to water management and water conservation in relation to environment as the fifth highest priority of concern were seen as the most important.
- Lifestyle and peace and quiet were what residents within the Liverpool Plains LGA valued most about living in the area.

4B.14.2.3 Infrastructure and Services

With the exception of road infrastructure, which the 2009 Community Survey identified as being a major concern to the residents of the Liverpool Plains LGA, there is no evidence to suggest that other infrastructure and services are unduly stressed. The fact that the populations of both Werris Creek and Quirindi have not increased significantly in recent years indicates that supply of infrastructure such as housing, and services such as water electricity and sewerage, would remain adequate.

The Proponent currently contributes, via a s94 Contributions Plan, to the maintenance of local roads affected by road transportation of coal from the Project Site. The current contribution of $0.85/t exceeds that calculated by Constructive Solutions (2010) ($0.31/t or $0.59/t) (see Section 4B.11.4.4) indicating that the Proponent currently contributes more adequately to the maintenance of the road infrastructure used by coal carrying trucks.

4B.14.3 Community Liaison, Management and Mitigation

4B.14.3.1 General Community Liaison and Management Strategy

In addition to the mitigation measures and management procedures relating to amenity aspects such as noise, air quality, visibility and transportation described throughout the preceding sections, the Proponent would implement the following community liaison and management strategies to ensure that Project-related benefits for the community surrounding the LOM Project Site are maximised and adverse impacts are minimised.

- The Proponent would continue to consult with neighbouring land owners and other stakeholders potentially affected by the LOM Project operations. Key staff members of the Proponent live locally and have also encouraged other members of the community to contact the mine directly if issues of concern arise. Evidence was provided at the Community Open Day (see Section 3.2.2.2) that issues raised by local community members were addressed promptly.
- The Proponent would continue to prepare and distribute a Community Newsletter providing updates as to the progress of key features of the mine. The Community Newsletter would also encourage that issues of concern be raised with the mine directly such that these might be addressed. The newsletter also provides opportunity for the views of the Community Consultative Community (CCC) to be presented.
- Community Consultative Committee meetings would continue to be held providing further opportunity for community related issues to be raised and discussed.
- A complaints management system would continue to be implemented whereby the complainant is contacted as soon as practicable following the registering of the complaint. The actions taken and results of these actions would be provided to the complainant with a summary recorded in the next AEMR for the mine.
- It would remain an objective of the Proponent to provide preference, where practicable, to suppliers of equipment, services or consumables located within the local area.

4B.14.3.2 Community Enhancement

- Recognising the importance of the ongoing support of the local community to the Werris Creek Coal Mine and LOM Project, the Proponent would maintain ongoing financial and in-kind support for local schools, community events and progress associations. Applications for assistance or funding from local organisations would be encouraged and assessed on a case by case basis. Examples of contributions provided to the local community since the commencement of mining include the following.
- Werris Creek Rail Museum: $20,500 (two separate contributions).
- Youth Centre: $15,000.
- Werris Creek Pre-School: $4,500 (two separate contributions).
- Werris Creek Catholic School: $3,000.
- Werris Creek Public School: $6,500 (two separate contributions).
- Quirindi Public School: $1,334.
- Rural Fire Brigade: $500 annually.
- Werris Creek Library: $3,000.
- Werris Creek CWA: $1,000.
- Werris Creek Boy Scouts: $500.
- Werris Creek Community Shed: $1,000.
- Werris Creek Swimming Club: $1,000.
- Quirindi Show: $4,000 (two separate contributions).
- Werris Creek Primary School: $500.
- Werris Creek Signal Singers: $1,000.
- Spring Ridge Bushfire Brigade : $500.
- Werris Creek Community Gym/Hospital: $1,000.

In addition, the Proponent has also agreed to the establishment of a Community Enhancement Fund (CEF) to be administered by Liverpool Plains Shire Council with funds to be provided to community projects within the Liverpool Plains LGA. A commitment to provide $300 000 in six instalments of $50 000 over six years has been made by the Proponent. The only stipulations made by the Proponent being that payment would only occur should the LOM Project be approved and that two thirds of the CEF is to be provided for community projects within the township of Werris Creek.

Finally, and in acknowledgement of the importance of quality road construction materials to Council, the Proponent has agreed to allow Council to access the O'Donnell's Quarry (now on land owned by Werris Creek Coal) until such time as the mine progresses through the quarry.

4B.14.4 Assessment of Impacts

4B.14.4.1 Economic Impacts

The LOM Project would continue to result in a range of economic benefits to the local and wider community including the following.

- Continued direct employment (full-time equivalent) for approximately 90 people on site with an additional 10 casual positions.
- Direct employment (full-time equivalent) in the short term (one to two years) of between 5 and 20 persons associated with the relocation of the Coal Processing Area and Site Administration and Facilities Area, as well as the construction of the rail turn-around loop and the upgrade of Escott Road and its intersection.
- Through the continued and increased provision of local employment, the LOM Project would inject over $10M in wages into the local economies. While the residential locations of mine employees would fluctuate over time, statistics held by the Proponent suggest that up to 10% of staff would reside in Werris Creek, up to 30% in Quirindi, with the remainder split between larger centres such as Tamworth and Gunnedah, and smaller townships and villages or the surrounding area.
- Total expenditure per annum, including the previously noted $10M in wages, would approximate $109 million in capital and operating costs. This would include approximately $9 million in royalties and levies paid to the NSW government.

With the provision of employment and payment of wages, flow-on benefits to the economies within which these employees reside, through purchase of goods and services locally would be maintained.

Interestingly, despite the introduction of the mine to the local area, the population of the two closest towns, Werris Creek and Quirindi, has not increased significantly. In fact, the population cohort likely to be employed at the mine has decreased in both locations. It is reasonable to conclude, therefore, that without the operation of the Werris Creek Coal Mine the population of these towns may well have decreased and the economic position of each (and the LGA as a whole) worse off.

Through the CEF, additional money would be injected into community projects within Werris Creek and the wider Liverpool Plains LGA. Importantly, these funds may replace those which otherwise would have been provided by Council or another organisation, freeing up these funds for other projects within the LGA.

The LOM Project would provide certainty of employment and economic stimulus to the towns and communities of Liverpool Plains Shire Council for the proposed 20 year life of the LOM Project. The economic benefits would be shared between the direct mine employees, businesses from which mine employees (and the Proponent more generally) purchase goods and services, the recipients of CEF funding, the Council to whom rates and levies are paid, and the NSW and Commonwealth governments to whom royalties, levies and taxes are paid. As noted above, should the LOM Project not proceed, it is likely that growth within Werris Creek and Quirindi would be reduced (or decrease) which would negatively impact on local businesses and the overall economic position of the Council.

4B.14.4.2 Social Impact

Since commencement of mining operations at the Werris Creek Coal Mine in 2005, the Proponent has been an active member in the community including through donations to local schools, community events and progress associations.

- Ongoing support for training and education of employees.
- Continued positive support and involvement in the local community.
- Continued financial contributions to the Local, State and National economies.

Some of the community contributions made since the commencement of mining at the Werris Creek Coal Mine are listed in Section 4B.14.3.2 and illustrate the social as well as economic contribution made by the Proponent. Community contribution would continue in the form of the Werris Creek Coal Mine CEF, which would provide funds to be used by Council to support community projects in Werris Creek and the Liverpool Plains LGA.

Of particular importance is the stipulation that at least 2/3 of the CEF funds are spent on community projects within Werris Creek. The provision of funds for community projects and its administration by Liverpool Plains Shire Council will address community perceptions that Werris Creek does not receive a fair share in funding.

It is acknowledged that the LOM Project would also have some negative socio-economic impacts, including the following.

- Some surrounding residents may become more aware of site activities as the LOM Project progresses north towards the town of Werris Creek. However, the Proponent would take all reasonable and feasible measures to minimise those impacts (as noted in previous sections of Section 4B) and would continue to proactively monitor and implement further measures, as necessary.
- The loss of some higher class agricultural land from agricultural production. A large proportion of this would be returned on the cessation of mining. The loss of agricultural production from what is generally grazing and cropping land would be readily offset by the value of the coal produced.
- An increase in heavy vehicles on the local road network which may cause some damage to road pavement conditions. The Proponent recognises this and would continue the maintenance agreement with Liverpool Plains Shire Council for the maintenance of local roads, thus benefiting local residents who use those roads. The Werris Creek – Escott Road intersection would also be upgraded to reduce road damage at this intersection as well as increase safety.

It is also acknowledged that there is also concern that access to groundwater resources for agricultural purposes may be impacted by the LOM Project. Although the groundwater assessment has determined that there would be negligible impact to the availability of groundwater resources, groundwater levels will continue to be monitored over the life of the LOM Project to ensure no significant mine related impacts on groundwater resources.

4B.14.4.3 Infrastructure and Services

The LOM Project would not require a significant increase in the number people residing in the towns of Werris Creek and Quirindi (or using the services of these towns), and so there is no evidence to suggest that the LOM Project would result in a critical shortage of accommodation or stress local service provision.

The Proponent would continue to contribute, through a Section 94 Contributions Plan, to the maintenance of roads used by coal carrying trucks and so should not cause any significant deterioration of this infrastructure.

The Proponent would continue to liaise with Council and should any issues related to the adequate supply of infrastructure or services arise which is attributable to the LOM Project, the Proponent would contribute appropriately to assisting in alleviating any shortages.

4B.14.4.4 Conclusion

Based on the assessment of impacts, it has been determined that any negative socio-economic impacts, both actual and perceived, would be more than adequately countered by the positive effect the LOM Project would have on employment and contribution to the local and wider community. The Proponent intends to continue to be actively involved in the local community, including the continued support of local services and facilities as part of this involvement.

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