

Figure 41: Vegetation Communities

Fauna Impacts

The fauna surveys identified some 147 fauna species on the project site, including 137 native species and 10 exotic species. Of the identified species, there were 100 birds, 25 mammals, 17 reptiles and 5 amphibians.

A total of 39 threatened fauna species were either positively recorded on site (11 species) or identified as potentially occurring on site due to favourable habitat (28 species), as outlined in the following table.

Table 15: Threatened Fauna Present or Potentially Present on Site

Common Name (Latin name)	TSC Act	EPBC Act	Status
Birds			
Little Lorikeet (<i>Glossopsitta pusilla</i>)	Vulnerable	N/A	Present
Brown Treecreeper (<i>Climacteris picumnus</i>)	Vulnerable	N/A	Present
Speckled Warbler (<i>Pyrrholaemus saggitatus</i>)	Vulnerable	N/A	Present
Grey-crowned Babbler (<i>Pomatostomus temporalis</i>)	Vulnerable	N/A	Present
Diamond Firetail (<i>Stagonopleura guttata</i>)	Vulnerable	N/A	Present
Spotted Harrier (<i>Circus assimilis</i>)	Vulnerable	N/A	Present
Little Eagle (<i>Hieraaetus morphnoides</i>)	Vulnerable	N/A	Present
Barking Owl (<i>Ninox connivens</i>)	Vulnerable	N/A	Present
White-bellied Sea Eagle (<i>Haliaeetus leucogaster</i>)	N/A	Migratory	Present
Black-chinned Honeyeater (<i>Melithreptus gularis</i>)	Vulnerable	N/A	Potential to occur
Painted Honeyeater (<i>Grantiella picta</i>)	Vulnerable	N/A	Potential to occur
Regent Honeyeater (<i>Anthochaera phrygia</i>)	Critically Endangered	Endangered, Migratory	Potential to occur
Swift Parrot (<i>Lathamus discolor</i>)	Endangered	Endangered	Potential to occur
Hooded Robin (<i>Melanodryas cucullata</i>)	Vulnerable	N/A	Potential to occur
Varied Sittella (<i>Daphoenositta chrysoptera</i>)	Vulnerable	N/A	Potential to occur
Turquoise Parrot (<i>Neophema pulchella</i>)	Vulnerable	N/A	Potential to occur
Superb Parrot (<i>Polytelis swainsonii</i>)	Vulnerable	Vulnerable	Potential to occur
Bush Stone-curlew (<i>Burhinus grallarius</i>)	Endangered	Endangered	Potential to occur
Square-tailed Kite (<i>Lophoictinia isura</i>)	Vulnerable	N/A	Potential to occur
Black-breasted Buzzard (<i>Hamirostra melanostemon</i>)	Vulnerable	N/A	Potential to occur
Masked Owl (<i>Tyto novaehollandiae</i>)	Vulnerable	N/A	Potential to occur
White-throated Needletail (<i>Hirundapus caudacutus</i>)	N/A	Migratory	Potential to occur
Fork-tailed Swift (<i>Apus pacificus</i>)	N/A	Migratory	Potential to occur
Rainbow Bee-eater (<i>Merops ornatus</i>)	N/A	Migratory	Potential to occur
Cattle Egret (<i>Ardea ibis</i>)	N/A	Migratory	Potential to occur
Great Egret (<i>Ardea alba</i>)	N/A	Migratory	Potential to occur
Mammals			
Koala (<i>Phascolarctos cinereus</i>)	Vulnerable	Vulnerable	Present
Yellow-bellied Sheath-tail Bat (<i>Saccolaimus flaviventris</i>)	Vulnerable	N/A	Present
Spotted-tailed Quoll (<i>Dasyurus maculatus</i>)	Vulnerable	Endangered	Potential to occur
Eastern Freetail-bat (<i>Mormopterus norfolkensis</i>)	Vulnerable	N/A	Potential to occur
Little Pied Bat (<i>Chalinolobus picatus</i>)	Vulnerable	N/A	Potential to occur
Eastern Cave Bat (<i>Vespadelus troughtoni</i>)	Vulnerable	N/A	Potential to occur
Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>)	Vulnerable	Vulnerable	Potential to occur
South-eastern Long-eared Bat (<i>Nyctophilus corbeni</i>)	Vulnerable	Vulnerable	Potential to occur
Squirrel Glider (<i>Petaurus norfolcensis</i>)	Vulnerable	N/A	Potential to occur
Reptiles			
Border Thick-tailed Gecko (<i>Underwoodisaurus sphyrurus</i>)	Vulnerable	Vulnerable	Potential to occur
Five-clawed Worm-skink (<i>Anomalopus mackayi</i>)	Endangered	Vulnerable	Potential to occur
Pink-tailed Legless Lizard (<i>Aprasia parapulchella</i>)	Vulnerable	Vulnerable	Potential to occur
Pale-headed Snake (<i>Hoplocephalus bitorquatus</i>)	Vulnerable	N/A	Potential to occur

The EIS includes tests of ecological significance for each of these species, which concluded that the project is unlikely to result in any significant impact on the respective species, subject to implementation of the proposed avoidance, mitigation and offsetting measures.

Whilst raising some initial concerns about the impacts on threatened fauna habitat, both OEH and DOE accept this conclusion, and are now satisfied that the project is unlikely to significantly affect the identified threatened species. Issues associated with the Koala are addressed under a separate heading below.

Groundwater Dependent Ecosystems

As outlined in Section 6.1, there are no significant groundwater dependent ecosystems in the locality that would be adversely affected by the project, and a specific stygofauna assessment did not identify any groundwater dependent subterranean fauna on or near the site.

Following the provision of some additional information during the assessment process, both OEH and NOW are satisfied that the project is unlikely to have any significant impacts on groundwater dependent ecosystems.

Koala

The ecological assessment found that Koalas are utilising the majority of the wooded habitats within the project site. Using the Spot Assessment Technique (SAT) survey methodology, which uses non-invasive plot surveys to assess Koala distribution, the assessment predicted that there is a population of about 262 Koalas within the project disturbance area, at a density of about 0.3 individuals per hectare of woodland. The on-site population represents approximately 2% of the estimated Koala population in the Gunnedah LGA.

Approximately 847 hectares of core Koala habitat would be progressively cleared over the 30 year project life, and the resident Koala population of 262 individuals would be progressively displaced over this time.

In addition to the general biodiversity avoidance and mitigation measures outlined above, the draft Koala Plan of Management (KPoM) includes a number of mitigation measures specifically designed to mitigate and manage impacts on Koalas. Some of the key measures include:

- providing for the long term conservation of 8,166 hectares of preferred Koala habitat in the biodiversity offset areas and mine rehabilitation area, including 3,722 hectares of existing habitat and 4,444 hectares of revegetation/rehabilitation;
- maintaining and enhancing 8 key Koala habitat corridors connecting Koala habitat areas within the project area to facilitate Koala movement and migration between these areas (see Figure 42);
- installing signage and fencing on roads in key Koala habitat and movement areas, and enforcing speed limits;
- constructing an underpass beneath the rail spur corridor (see Figure 42) to facilitate Koala movement/migration east-west between Mt Watermark and Offset Area 6, and monitoring the efficacy of the underpass by automated cameras;
- employing an environmental officer with specific responsibility to implement the KPoM;
- installing Koala-proof fencing around all mining, emplacement and high risk infrastructure areas;
- excluding dogs from the site and biodiversity offset areas;
- installing water points if required during drought periods;
- maintaining a Koala incident response protocol and Koala incident register;
- translocating Koalas within the project disturbance area, in accordance with a detailed Koala Translocation Management Plan (KTMP); and
- contributing to Koala research and recovery projects, nominated as a \$180,000 contribution over 3 years to the Australian Research Council (ARC) Linkage Project, which is being developed by the University of Sydney and OEH to research Koala population change in relation to spatial and climate change scenarios.

Translocation of threatened fauna in NSW requires a licence from OEH under the *National Parks and Wildlife Act 1974*, and is generally considered a measure of last resort, where animals are at extreme and immediate risk. Translocation is required to be undertaken in accordance with the *NPWS Policy and Procedure Statement No. 9 – Policy for the Translocation of Threatened Fauna in NSW*.



Figure 42: Koala Corridors

The draft KPoM includes detail on the key elements of the proposed KTMP for the project. These elements can be briefly summarised as:

- **Prior to translocation:**
 - *Preparation of release sites:*
 - identification of potential release sites, which may include the Offset Area 6, Breeza State Forest and the Mt Erin and Currajong offset area (see below for detail on the offset areas);
 - SAT surveys of release sites, to ensure the sites have sufficiently low resident Koala populations to accommodate translocated Koalas;
 - habitat and soil surveys of release sites, to ensure the sites have suitable Koala habitat attributes;
 - predator control;
 - supply of access to water if required;
 - *Survey and assessment of disturbance site:*
 - to fully detail the resident Koala population prior to the (progressive) clearing;
 - *Translocation timing:*
 - to be undertaken outside of mating and key rearing periods, and poor weather;
- **During translocation:**
 - *Selection of individuals for translocation:*
 - Koala health assessment, including Chlamydia DNA assessment;
 - older and/or sick animals may be taken into care rather than being immediately translocated;
 - *Capture protocol:*
 - using only personnel with considerable regional Koala capture experience;
 - *Handling protocol:*
 - including minimising handling time and monitoring stress levels;
 - *Data collection protocol:*
 - including measurement and checking of key Koala statistics;
 - *Health assessment:*
 - including blood sampling, disease examination and health checklist;

- *Marking and identification protocol:*
 - including micro-chipping and ear tagging/tattooing of all Koalas, and fitting of radio-transmitters, GPS loggers and satellite trackers to a subset of animals;
- *Transport protocol:*
- *Holding protocol:*
 - including holding animals in an intermediate holding area for a few weeks to acclimatise the Koala and ensure that it does not immediately attempt to return to the capture site; and
- **Post-release monitoring:**
 - *Visual surveys on release:*
 - 1 day, 7 days and 14 days after release, then at regular intervals for at least 4 months;
 - *Health assessment:*
 - after 12 months, GPS/radio collars to be removed and a 12 month post-release health check undertaken;
 - *Annual SAT survey:*
 - non-invasive SAT surveys 1 year post-release and annually thereafter; and
 - *Documentation and publishing of monitoring data.*

Whilst not objecting to the draft KPoM and translocation plan, OEH raised concerns that the SAT survey techniques used to assess the Koala population on the site does not provide a detailed picture of the demographics and health of the resident Koala population on the site, and therefore the potential impacts on the population were not able to be determined. OEH also noted that translocation was a 'drastic measure and exceptional care will be required' to ensure its success. It also recommended some technical or detailed measures associated with the implementation of the KPoM (eg. the width of the Koala corridors).

To address the unknowns and risks associated with the population dynamics and health of the resident Koala population on the site, OEH recommends that Shenhua be required to collect specific details of the Koala population including population composition, breeding success and population health to provide baseline information on the status of the population prior to commencement of management activities.

The Department agrees, and has recommended conditions requiring Shenhua to monitor the structure and health of the resident population both prior to the commencement of mining, and on an ongoing basis, as part of a comprehensive final KPoM prepared in consultation with OEH and Gunnedah Council.

With regard to translocation, OEH recommends that any translocation be undertaken in accordance with the NPWS translocation policy outlined above, and that it should be undertaken as a trial measure in the first instance, with alternative procedures (eg. assisted or natural migration) available if translocation is found not to be successful.

Shenhua's Koala expert (Dr Steve Phillips) noted that where previous Koala translocations have failed, it is generally because not enough research has been carried out at the release sites, in particular ensuring that the release site has:

- similar mature feed trees as the capture site;
- similar soil types; and
- does not have a dense resident population of Koalas.

Dr Phillips also noted that methods to hold animals at the release site for several days (as proposed in the draft KPoM) has proven to be extremely successful in minimising post-translocation movements and associated impacts (eg. vehicle strike, predation). This method has resulted in a 100% survival rate of translocated Koala moved as a result of the Oxley Highway construction project in northern NSW.

The Department acknowledges that translocation is a 'last resort' mitigation measure, but accepts that it is more than likely to be required, and is indeed warranted, for this project. Relying on other methods, such as natural or encouraged migration, is likely to have potentially higher risks associated with predation or vehicle strike.

Previous translocation studies indicate that, with detailed baseline data and the implementation of comprehensive and well structured translocation methods, Koala translocation can be successful in not only conserving the resident Koala population, but potentially extending Koalas into un-utilised or under-utilised habitat areas, this assisting in the recovery of the species. In this regard, a 2009 national study into native fauna translocation²¹ found that, of 18 Koala translocations with reported outcomes, 17 were successful.

The Department also acknowledges that the biodiversity offset strategy and rehabilitation strategy for the project will ultimately provide for the long term conservation of over 8,000 hectares of preferred Koala habitat, which is almost 10 times the area of Koala habitat in the project disturbance area. The project would also provide for nearly 4,500 hectares of new Koala habitat (ie. through revegetation/rehabilitation), which is some 5 times the area of Koala habitat removed by the project.

To ensure that the translocation plan has the highest likelihood of success, and to conserve the Koala in general, the Department has recommended conditions requiring Shenhua to:

- establish and/or maintain the proposed 8,166 hectares of Koala habitat in the on-site and off-site biodiversity offset areas and rehabilitation area;
- conserve these areas in perpetuity;
- prepare and implement a detailed final KPOM, with the plan to be prepared by recognised Koala experts in consultation with OEH and Council, and include amongst other things;
 - detailed baseline data on the resident Koala population and Koala habitat on site and in the biodiversity offset areas and release areas;
 - identification of threats to Koalas and habitat;
 - measures to mitigate and manage the identified impacts, including a detailed KTMP;
 - a program to monitor Koala health and habitat;
 - implement the commitment to indirect Koala mitigation, such as the \$180,000 contribution to the ARC Linkage Project; and
 - identify potential risks to the successful implementation of the plan, and include contingency measures to address these risks.

Project Biodiversity Offset Strategy

Shenhua has developed a biodiversity offset strategy and rehabilitation strategy for the project to compensate for the 789 hectares of EEC and 148 hectares of other native woodland communities, and the impact on threatened fauna species.

The offset strategy includes on-site and off-site offset areas, and indirect offsets in the form of contributions towards ecological research projects. The biodiversity offset strategy and rehabilitation strategy are summarised in Tables 16 and 17 below, and shown on Figures 43-45.

Table 16: Summary of the Biodiversity Offset Strategy

Area	Offset Name	Size (ha)
On-site Offsets	Mt Watermark Offset Area	296
	Offset Area 6	2,003
	Mooki River Offset Area	44
	Rehabilitation Area Offset	2,384
Off-site Offsets	Barraba Offset Area	2,878
	Mt Erin and Glendowda-Currajong Offset Area	3,581
Indirect Offsets	Koala Research Project	n/a
	Box Gum Woodland Restoration Research Project	n/a
	Landcare Namoi Biodiversity Habitat Restoration Project/s	n/a
Total Area		11,186

²¹ *The Characteristics and Success of Vertebrate Translocations within Australia*, by Dr Jeff Short, Australian Animal Welfare Strategy (2009)
NSW Government
Planning & Environment

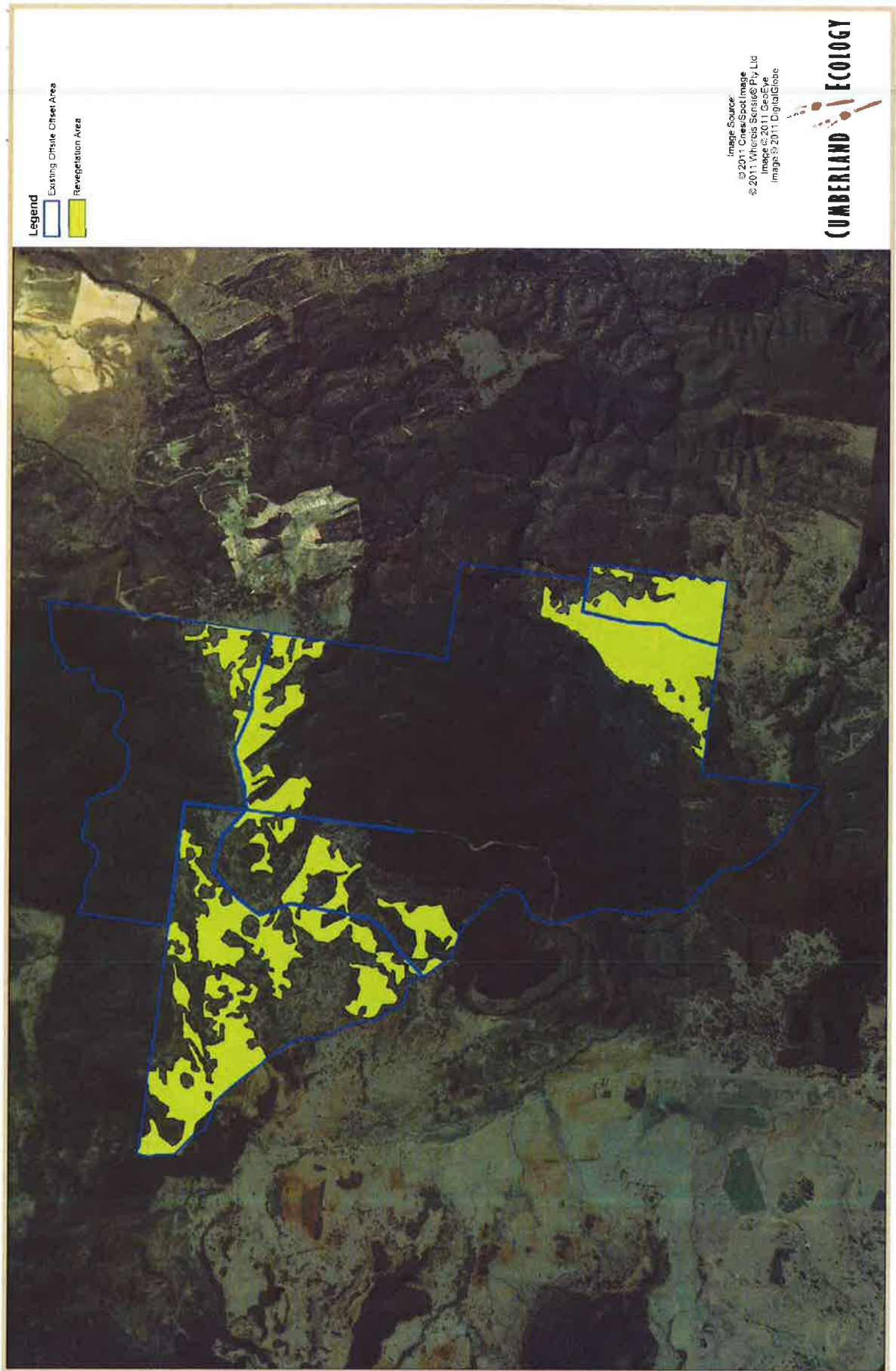


Figure 44: Off-site Biodiversity Offset Areas – Barraba Offset Area

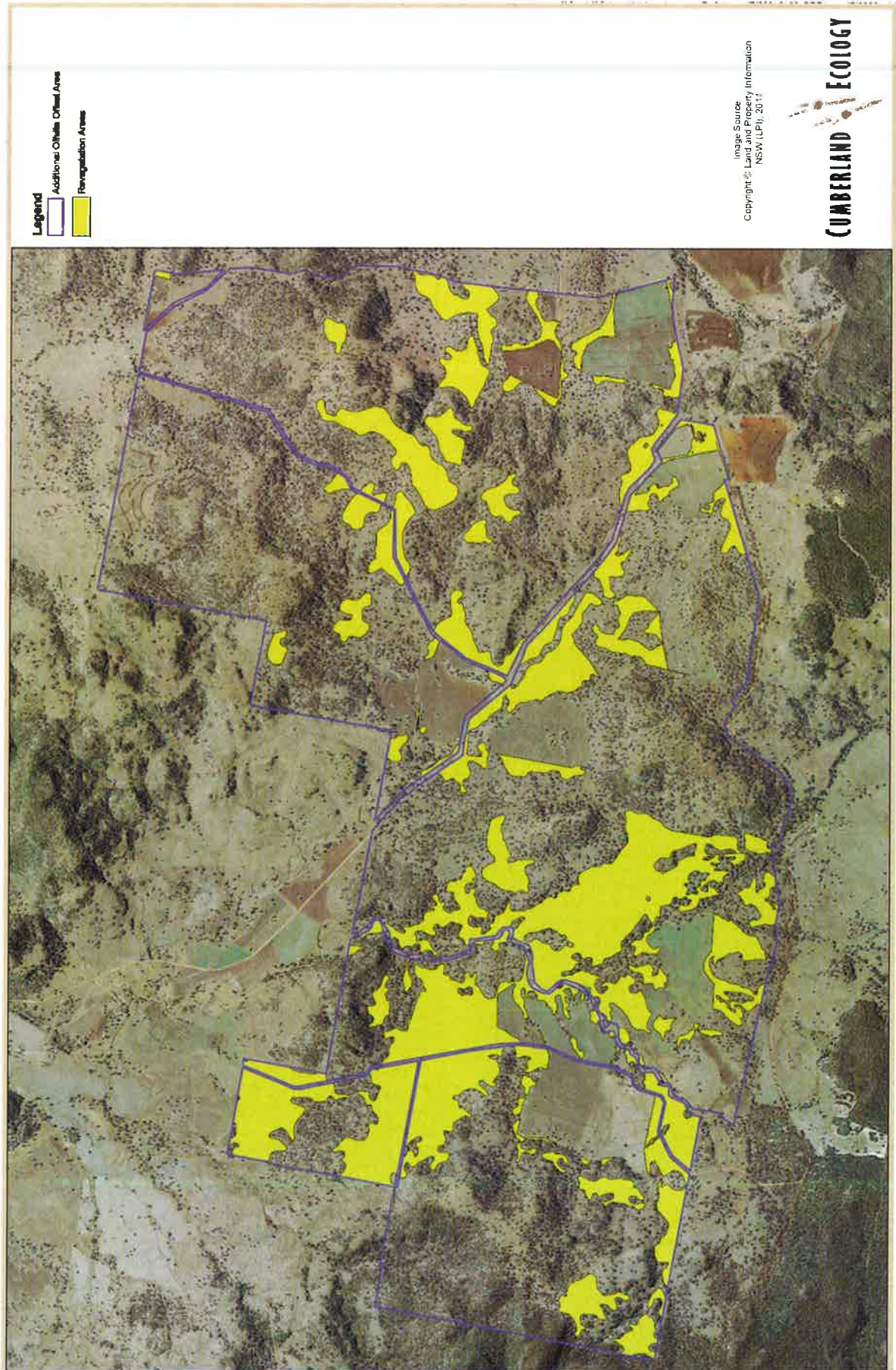


Figure 45: Off-site Biodiversity Offset Areas – Mt Erin and Glendowda Offset Area

Table 17: Vegetation Community Offsets

Vegetation Community	Disturbance Area	Biodiversity Offset Strategy Areas (ha)			Rehab. Strategy Area (ha)	Total	Offset Ratios	
		Existing Veg	Reveg	Sub-total			Exc. Rehab	Inc. Rehab
Box Gum Woodland EEC	738 ¹	3,323	2,514	5,837	1,975	7,812	8:1	11:1
Inland Grey Box Grassy Woodland EEC	30	-	70	70	46	116	2:1	4:1
Weeping Myall EEC	3	3	5	8	-	8	3:1	3:1
Fuzzy Box Woodland EEC	18	-	-	-	36	36	-	2:1
Sub-total EEC	789	3,326	2,589	5,915	2,057	7,972	7:1	10:1
Other native woodland	148	2,745	97	2,842	327	3,169	19:1	21:1
Other ²	3,147	45	-	45	-	45	-	-
Total	4,084	6,116	2,686	8,802	2,384	11,186	-	-

1 Includes 73 hectares of DNG

2 Includes low diversity native grassland, pasture/cropland and cleared areas

The biodiversity offset strategy was amended following the exhibition of the EIS, to address concerns raised in submissions. In this regard, Offset Area 6 has been reduced in size considerably (from the original 7,457 hectares) to exclude the 696 hectares of biophysical strategic agricultural land (BSAL) within the offset area, and to remove additional areas of land not owned by Shenhua. These areas were originally included in the offset because the land is within the noise and/or dust affectation zone for the project, and because the land has large areas of existing and/or potential Koala habitat potential (as discussed above). However, following agricultural land sterilisation concerns from OAS&FS and others, these areas were subsequently excluded from Offset Area 6.

To compensate for the reduction in area of Offset Area 6, and to address concerns raised by OEH and DOE about the adequacy of the original biodiversity offset strategy, Shenhua has bolstered the strategy through the purchase and inclusion of the 3,581 hectare Mt Erin and Glendowda/Currajong Offset Area, also referred to as the Additional Off-site Offset Area.

These properties, about 50 kilometres west of the project site near Tambar Springs, comprise a total area of 4,095 hectares, however 514 hectares is proposed to be retained in agricultural land use as described in Section 6.8.

Shenhua has undertaken assessments of the adequacy of the revised biodiversity offset strategy, in consultation with OEH, DOE and the Department. This has included a number of meetings between the stakeholders, a site visit by the agencies to the on-site and off-site (Tambar Springs) offset areas, and assessment of the adequacy of the direct offsets using 3 key assessment methods, namely:

- OEH's *NSW Offset Principles for Major Projects* (2013), and the BioBanking assessment tool;
- DOE's *Environmental Offsets Policy* (2012), and the Offsets Assessment Guide tool; and
- offset ratio analysis.

The assessment tool analyses have been reviewed independently by both OEH and DOE.

Based on OEH's BioBanking assessment tool, the project would require some 54,652 ecosystem credits to suitably offset the project's biodiversity impacts. The credits required for individual vegetation communities, along with the credits generated by the revised biodiversity offset strategy, are summarised in the following table.

Table 18: Summary of BioBanking Analysis

Vegetation Community	BioBanking Ecosystem Credits		
	Required	Generated	Difference
Box Gum Woodland EEC (inc. DNG)	43,722	85,904	+42,182
Other EECs	3,104	1,894	-1,210
Other native woodland	7,826	36,281	+28,455
Total	54,652	124,079	+69,427

OEH has verified the BioBanking assessment calculations, and is now satisfied that the quantity and quality of the offset package is adequate. This is despite the minor ecosystem credit deficit for some individual EECs, residual differences of opinion with Shenhua's ecologist regarding the mapping and classification of some vegetation types, and residual concerns regarding the ability to re-create EECs

in the mine rehabilitation area (the Department notes that these risks are considered in the calculations of ecosystem credits generated).

OEH does recommend that the offsets are secured for conservation purposes in perpetuity in accordance with an appropriate instrument, which could include (subject to government agreement):

- BioBanking Agreement;
- dedication to the public reserve system;
- Conservation Agreement;
- Trust Agreement; or
- Planning Agreement.

The Department agrees, and has recommended conditions requiring Shenhua to arrange for the long term security of the offsets.

Using DOE's Offsets Assessment Guide tool, Shenhua has also assessed the adequacy of the biodiversity offset strategy with respect to the applicable Matters of National Environmental Significance (MNES) under the EPBC Act. These MNES, and the assessed adequacy of the direct offsets provided by the revised biodiversity offset strategy, are outlined in the following table. It is noted that under the EPBC Act Environmental Offsets Policy, the minimum requirement for direct offsets is 90%.

Table 19: Summary of EPBC Act Offsets Assessment Guide Analysis

MNES	Offsets Assessment Guide Results	
	Including Mine Rehabilitation	Excluding Mine Rehabilitation
Box Gum Woodland EEC	143%	108%
Grey Box Grassy Woodland EEC	173%	105%
Koala	435%	327%
Regent Honeyeater	418%	316%
Swift Parrot	343%	241%
Corben's Long-eared Bat	436%	311%

DOE is satisfied that the revised offset strategy provides adequate direct offsets for Commonwealth-listed threatened species, but considers that the offsets for the Grey Box Grassy Woodland EEC still falls (marginally) short of its direct offset requirements. DOE noted that the proposed Grey Box offset does not contain any existing remnants, and that there is some uncertainty about revegetation of ecological communities on improved pasture areas. It also reiterated that mine rehabilitation does not qualify as offsets under its offsets policy.

Shenhua has since consulted further with DOE and provided it with additional information (see Appendix G), noting that the proposed revegetation areas are not 'improved pasture', that its own calculations have been conservative in the consideration of revegetation, and that there are a number of studies and examples of Box Gum Woodland revegetation (including examples in the locality) that point to the ability to successfully revegetate Box Gum Woodland species. It also noted that whilst the mine rehabilitation does not formally qualify as an offset under the Commonwealth policy, it does nonetheless complement the offset strategy.

DOE's final response recommends that, in order to meet the EPBC Act Environmental Offsets Policy, Shenhua should be required to identify and secure an existing remnant(s) of Grey Box EEC, and that the NSW BioBanking scheme (as refined to meet the Commonwealth policy requirements) would be an appropriate mechanism for meeting this offset requirement. DOE recommends that this additional offset be identified prior to substantial commencement of the project.

Based on the offsets assessment tool findings, and the more traditional offset ratio analysis (see Table 17), the Department is satisfied that the biodiversity offset strategy provides an adequate conservation package to ensure that the project is able to be undertaken in a manner that would enhance, or at least maintain, the biodiversity values of the locality over the medium to long term.

Whilst recognising that the direct offsets for some EECs do not meet, or just meet, the benchmarks established under some offset calculators, the Department is satisfied that any shortcomings are

minor and are more than compensated for by some of the strategic benefits and strong points of the biodiversity offset strategy, in particular that the strategy provides:

- more than double the required ecosystem credits in total using the BioBanking calculator;
- very good offset ratios for Box Gum Woodland EEC, which is the main EEC affected by the project, a key EEC in the Liverpool Plains and a core habitat for threatened species including the Koala;
- a good mix of protection of existing vegetation plus revegetation/regeneration of new woodland areas;
- large areas of Koala habitat (ie. some 5,800 hectares excluding the rehabilitation area, or 8,166 hectares including the rehabilitation area) to compensate for the 847 hectares of Koala habitat removed by the project; and
- long term conservation of some 11,186 hectares of vegetation, to compensate for the 937 hectares of native woodland removed by the project.

Nonetheless, the Department accepts DOE's conclusions regarding the Grey Box EEC and has recommended conditions requiring Shenhua to enhance the offset strategy for this community.

With regard to the indirect offsets identified in Table 16 above, the Department notes that the EIS and subsequent documentation provides little detail on the composition or scope of these offsets, other than that the offsets would include:

- research to improve restoration and management of Box Gum Woodland or other woodland that would be impacted by the project;
- research to better manage populations of key threatened species in the Namoi catchment, especially the Koala; and
- Landcare projects or similar that are aimed at restoring flora and fauna habitats within the Namoi catchment.

Notwithstanding the paucity of detail about these indirect offsets, the Department is satisfied that they are not essential for establishing an adequate biodiversity offset package for the project, and as such is satisfied that the detail of these offsets can be determined at a future date. To ensure this occurs, the Department has recommended conditions requiring Shenhua to implement the indirect offsets, and to fully detail the offsets as part of the comprehensive Biodiversity Management Plan for the project.

Conclusion

The Department is satisfied that Shenhua has designed the project to avoid, mitigate, manage and/or at least compensate for the biodiversity impacts of the project such that the project would enhance or maintain the biodiversity values of the locality over the medium to long term.

The Department recognises that the project would disturb habitat for a number of threatened species, including a resident population of some 262 Koalas. However, with careful management the Department, OEH and DOE are satisfied that the impacts to Koalas and other threatened species can be effectively managed.

To ensure this occurs, the Department has recommended conditions requiring Shenhua to:

- implement the biodiversity offset strategy and rehabilitation strategy, which would provide for the establishment of some 11,186 hectares of vegetation to compensate for the 937 hectares of woodland removed by the project;
- enhance the biodiversity offset strategy with additional Grey Box EEC offsets prior to the commencement of mining operations;
- ensure that the biodiversity offset strategy and rehabilitation strategy are focused on the re-establishment of EECs and habitat for other threatened species;
- establish at least 8,166 hectares of Koala habitat to compensate for the 847 hectares removed by the project;
- secure the offsets in perpetuity; and
- prepare and implement a comprehensive Biodiversity Management Plan and Koala Plan of Management, in consultation with relevant authorities.

6.5 Heritage

The EIS includes an Aboriginal Archaeological Assessment and Historic Heritage Assessment, both undertaken by AECOM Australia, as well as an Aboriginal Cultural Heritage Values Assessment, undertaken by Connect for Effect. The Aboriginal archaeological assessment is supported by a number of specialist technical assessments, including:

- a geomorphological assessment of selected sites to identify the potential for sub-surface sites, undertaken by A/Professor Fanning of Macquarie University;
- an arborist assessment of potential Aboriginal scarred trees, undertaken by Australian Tree Consultants; and
- a geotechnical assessment to assess the relocation potential of grinding groove sites, undertaken by Strata Control Technology.

The assessments were undertaken in consultation with a range of stakeholders including local Aboriginal groups and historical societies. Almost 150 registered Aboriginal parties (RAPs) have been involved in consultation and/or field surveys for the project.

Some submissions, including from NTS Corporation, raised concerns about the process, including that the EIS did not contain enough information on the consultation process and that there was no identifiable mechanism to ensure that traditional owners were involved in all cultural heritage identification and assessment processes. The Department and OEH have reviewed the consultation process and are satisfied that the assessment and consultation has been undertaken in accordance with applicable guidelines, including the OEH's *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (2010).

Aboriginal Heritage Impacts

The project site is located within Kamilaroi Country, the traditional homelands of the Gomeroi People. The site is within the administrative area of the Walhallow Local Aboriginal Land Council (WCALC).

The archaeological assessments undertaken for the project identified a total of 55 Aboriginal sites within the project boundary, 29 of which are within the project disturbance area and would be directly impacted by the project. The identified sites are shown on Figure 46, and a summary of the sites and their proposed management is provided in Table 20.

Table 20: Aboriginal Sites and Archaeological Significance Summary (Proposed Management in Brackets)

Site Type	Within Project Disturbance Area			Outside Project Disturbance Area			Total
	High Significance	Moderate Significance	Low Significance	High Significance	Moderate Significance	Low Significance	
Isolated Find	-	1 (SC)	12 (SC)	-	1 (C)	9 (C)	23
Artefact Scatter	1 (SC+E)	4 (SC) 1 (SC+E)	8 (SC)	2 (C)	2 (C)	3 (C)	21
Axe-grinding groove	1 (R)	1 (R)	-	-	1 (C)	-	3
Scarred tree	-	-	-	4 (C)	1 (C)	3 (C)	8
Total	2	7	20	6	5	15	55

Legend:

SC – Surface Collection

SC + E – Surface Collection and Excavation

R – Relocation

C – Conservation

The two largest artefact scatters identified (ie. WM-AS9-11 and WM-AS1-11) are located outside the project disturbance area, and contain 358 and 105 artefacts respectively. WM-AS9-11 in particular is said to be the largest and most complex site currently known within the regional study area. Its artefacts are spread over an area of almost 10 hectares, adjacent to Watermark Gully.

The artefact scatter of high archaeological significance that would be directly impacted is identified as WM-AS5-11, and contains 60 identified artefacts over an area of about 0.3 hectares. It is located on the western edge of the Eastern Mining Area (see Figure 46).

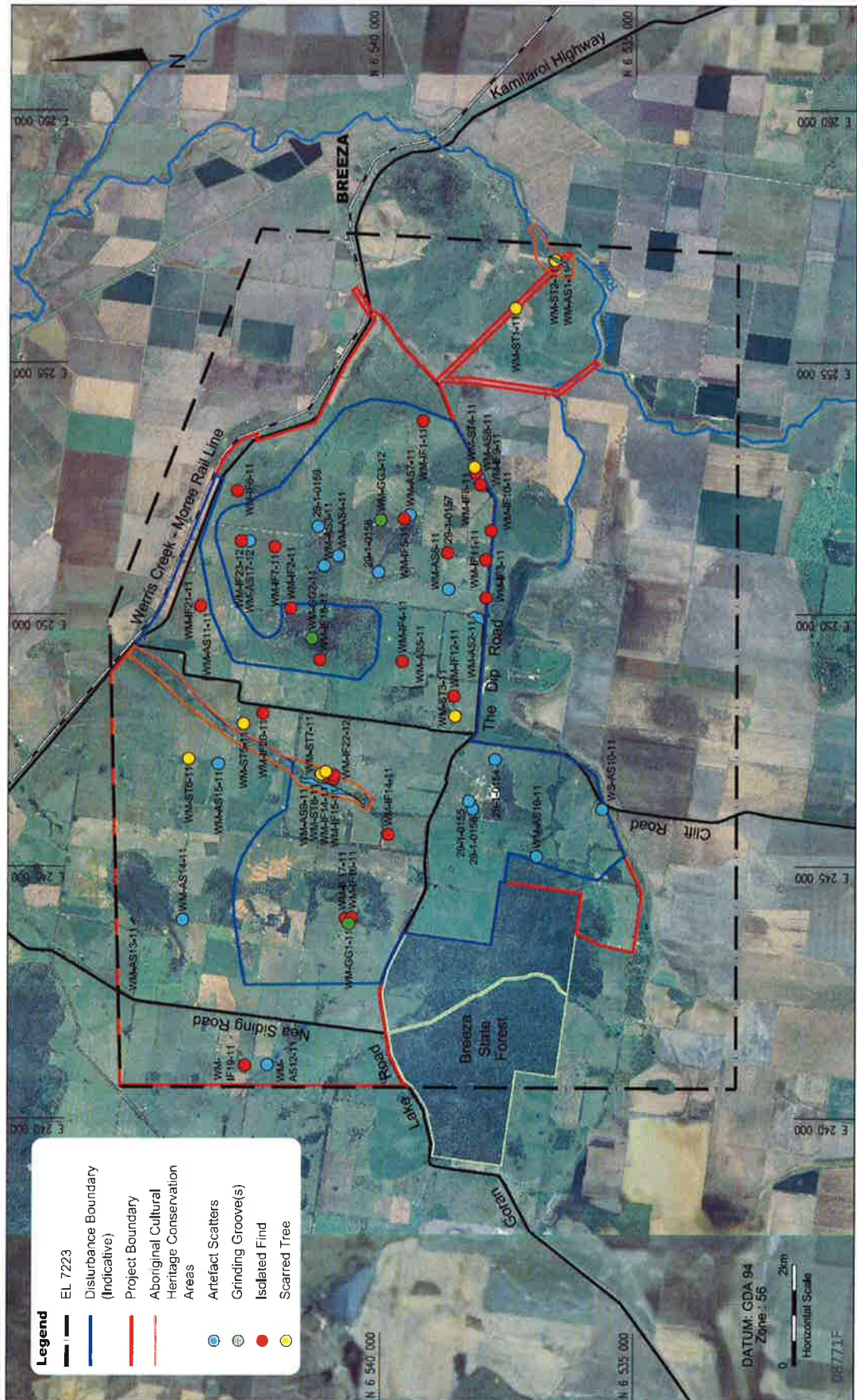


Figure 46: Aboriginal Heritage Sites

The other site of high archaeological significance that would be directly impacted by the project is an axe grinding groove (WM-GG1-11), located in the middle of the Western Mining Area. The site comprises a large grinding site covering about 0.5 hectares, and contains up to around 75 grooves.

In terms of cultural significance, the RAP's generally assert that all land within the project site is of high archaeological significance, with the highest significance areas being the:

- Watermark Gully area;
- grinding groove complexes;
- scarred trees; and
- camping areas along the Mooki River.

Shenhua has designed the project to avoid impact on the Watermark Gully area (which contains the significant WM-AS9-11 site) and has specifically designed the Eastern Mining Area to avoid 4 sites of high, medium and low significance near the south-eastern edge of the pit (including WM-ST4-11). Mining would be restricted to not encroach within 20 metres of these sites.

The EIS includes a number of other measures to further mitigate impacts on the Aboriginal heritage values of the site, including:

- establishment of two 'Aboriginal cultural heritage conservation areas', with one along Watermark Gully (165.7 ha) and one on the Mooki River (40.7 ha). These areas contain Aboriginal sites of high archaeological and cultural heritage significance;
- in-situ conservation of the sites outside the project disturbance area, including fencing and signage;
- salvage of isolated finds and artefact scatters within the disturbance area, with additional excavation around artefact scatters of moderate to high significance;
- relocation of the 2 axe grinding grooves sites within the project disturbance area²²;
- undertaking a third party review of the arborist assessment about scarred trees²³;
- involving Aboriginal groups in the salvage, excavation, relocation and conservation works; and
- facilitation of continued access to identified Aboriginal sites, and to landscape features around Mt Watermark, via a 'walk on country' program.

Shenhua also proposes to implement measures to mitigate potential indirect blasting-related impacts on the axe grinding grooves that would be conserved (ie. WM-GG2-11), as discussed in Section 6.2. These and other measures would be managed in accordance with an Aboriginal Cultural Heritage Management Plan for the project, developed in consultation with Aboriginal stakeholders.

The Department also acknowledges that, whilst the EIS does not include detailed archaeological assessment of the proposed biodiversity offset areas (particularly the off-site offset areas), the offset areas would conserve a range of Aboriginal sites and cultural heritage values.

The Department and OEH are satisfied that Shenhua has explored and identified reasonable and feasible measures to minimise the project's impacts on Aboriginal heritage values as far as practicable, and that the project's residual impacts are unlikely to have a significant impact on the Aboriginal heritage values of the region. To ensure that this occurs, the Department has recommended conditions consistent with OEH's recommendations, including requiring Shenhua to prepare and implement a comprehensive Heritage Management Plan covering both Aboriginal and historic heritage. For Aboriginal heritage, the plan would require:

- ongoing consultation with the local Aboriginal community and OEH;
- a detailed plan for the implementation and long term protection of the Aboriginal cultural heritage conservation areas, and the Aboriginal values of the biodiversity offset areas; and
- a description of measures to be implemented for:
 - ongoing research to interpret the known and unknown distribution of Aboriginal sites across the EL and surrounding area;

²² The geotechnical investigation carried out by SCT indicates that the grooves (ie. WM-GG1-11, of high significance; and WM-GG3-12, of moderate significance) are able to be relocated – with smaller slabs hosting grinding grooves able to be manually excavated and relocated easily, and large slabs needing to be reduced in size prior to relocation.

²³ Several RAPs had objected to the arborist assessment's finding that 6 additional scarred trees in the project boundary were not of Aboriginal origin. Shenhua has provided additional assessment indicating that the trees do not comply with several characteristics of Aboriginal scarred trees (which OEH accepts), but has nonetheless committed to additional third party review.

- management of sites not impacted by the project;
- third party review and management of potential scarred trees in consultation with the Aboriginal community;
- access arrangements for Aboriginal stakeholders;
- managing the discovery of human remains or previously unidentified Aboriginal artefacts;
- adequate training and induction of personnel; and
- strategy for storage and management of salvaged items.

Historic Heritage

The Breeza area has been farmed continuously since the 1830's, with some local families history, such as the Clifts, stretching right back to these earliest days of European settlement in the area.

In addition to farming the project site has had some history of coal mining, with a small operation established by the Wilga Coal and Coke Company in 1914, about 1 kilometre south of the Wilga's homestead and to east of the proposed Eastern Mining Area (see Figure 47). The operation lasted only 2 years, being forced to close due to poor coal quality, lost contracts and the onset of World War I. Small coal workings were also established by the Clift family at about the same time, with these workings located about 500 metres south-east of the Wilga workings.

Today, there are no heritage items within the project site that are listed on any heritage inventory, however the historic assessment identified 14 items within the project site that have been assessed as having at least some local historical significance, and a further 4 sites of interest/importance to local families. None of the items are assessed as being of State historical significance. Ten of the items are located within the project disturbance area and would be directly impacted by the project.

The sites are shown on Figure 47, and outlined in the following table.

Table 21: Historic Heritage Items

Item	Type	Impact
Farm Complex 1 – Shar	Former homestead site and farm structures	Direct impact
Farm Complex 2 – Demeter	Homestead and farm structures	Direct impact
Williams Family Markers*	Family commemorative plaque	Direct impact
Farm Complex 3 – The Wilgas	Homestead site and farm structures, plus disused coal mine	Indirect impact
Clift Coal Mine*	Depression and adjacent rock pile	No impact
Farm Complex 4 – Keington*	Homestead site and farm structures	No impact
Farm Complex 5 – Browns Corner*	Farm structures	No impact
Farm Complex 6 – Cloveneden	Homestead site and farm structures	Direct impact
Farm Complex 7 – Inverness	Homestead site and farm structures	Indirect impact
Farm Complex 8 – Watermark	Homestead site and farm structures	Direct impact
Farm Complex 9 – Linavaroi Hut	Hut and farm structures	Direct impact
Farm Complex 10 – Barwo	Homestead site and farm structures	Direct impact
Farm Complex 11 – Molonga	Homestead site and farm structures	Direct impact
Farm Complex 12 – Tilbrook	Homestead site and farm structures	Indirect impact
Farm Complex 13 – Wattle Vale	Homestead site and farm structures	Indirect impact
Farm Complex 14 – Flakenhoe	Former homestead site and farm structures	Direct impact
Farm Complex 15 – Lilyfield	Homestead site and farm structures	Direct impact
Former Watermark Public School	Site of former school building (removed from site c.1918)	No impact

* Assessed as being of interest/importance to local families

Shenhua proposes to implement the following measures to avoid, minimise and/or mitigate the impacts on the heritage values of these sites and the broader area:

- avoiding disturbance of key landmarks to mitigate visual impacts, including Mt Watermark;
- undertaking archival recording, archaeological test excavation and, where warranted by testing, archaeological salvage of the 10 sites within the project disturbance area; and
- managing blasting activities to meet applicable criteria at sites outside the project disturbance area, and undertaking dilapidation surveys at the sites.

These and other measures would be managed in accordance with a Heritage Management Plan, which would also include conservation management plans for Farm Complex 3 – The Wilgas and Farm Complex 7 – Inverness.

The Heritage Branch of OEH did not raise any particular concerns about the project-related impacts or the proposed mitigation measures, but recommended that the Watermark Public School site be protected with fencing during construction. It also recommended conditions reinforcing the above mitigation measures.

The Department agrees, and has recommended conditions in accordance with the Heritage Branch's recommendations. The Department's recommended conditions require Shenhua to prepare and implement a comprehensive Heritage Management Plan for the project in consultation with the Heritage Branch and local historical organisations, including requirements for:

- measures to protect the heritage values of the Watermark Public School site;
- conservation management plans for Farm Complex 3 – The Wilgas and Farm Complex 7 – Inverness;
- photographic and archival recording of all heritage items directly or indirectly impacted by the project;
- archaeological test excavation and salvage of the 10 sites within the project disturbance area;
- protection of other heritage items outside the disturbance area; and
- blast monitoring and management.

With the implementation of these measures, the Department is satisfied that the project is unlikely to have any significant impact on the historical heritage values of the locality.

6.6 Visual Amenity

Visual Context

As outlined in Section 1.2, and depicted in Figure 2, Mt Watermark arises as one of many 'islands' out of the flat Liverpool Plains. In this visual context, it is difficult to hide the development of a large open cut coal mine around the summit of this local landmark. From a visual perspective, this is one of the drawbacks of restricting mining to the ridge country above the plains.

The consequential visual impacts of mining the ridge country are mitigated to a degree by the generally sparsely populated nature of surrounding area, and the large distances between land users. However, there are a number of visual receivers in the area that have the potential to be impacted by the visual impacts of the project. These receiver locations include:

- rural properties on all sides of the project site (especially those within 7.5 kilometres);
- residential properties in Breeza to the east (approximately 5 kilometres away), Curlewis to the north (approximately 12 kilometres away), and Caroon and Spring Ridge to the south (approximately 12 kilometres away);
- the Kamilaroi Highway to the north and east (approximately 1.5 kilometres at the closest point), and other local roads on all sides of the site; and
- other sensitive locations, including Porcupine Lookout in South Gunnedah, approximately 20 kilometres to the north of the project site.

The project also has the potential to create light spill at night, which would have potential impacts on these receivers, as well as the Siding Springs Observatory near Coonabarabran, about 120 kilometres west of the project site.

The EIS includes a specialist visual impact assessment, prepared by JVP Visual Planning and Design, to assess the residual visual and lighting impacts of the project on these receivers.

Avoidance and Mitigation Measures

The visual assessment is based on a number of mitigation measures that Shenhua would implement to avoid or mitigate the visual and lighting impacts of the project. One of the key measures is the avoidance of disturbance to Mt Watermark itself, which would retain this local landmark. This avoidance measure is consistent with other large mining projects where mining around a local high point was proposed – for example the Mt Arthur and Mangoola (formerly Anvil Hill) coal projects in the Hunter Valley.

Other measures that would be adopted include:

- prompt construction and rehabilitation of overburden emplacement areas;
- locating the mine infrastructure area (MIA) between existing topographical features to screen it from external receiver locations;
- ensuring all lighting does not shine above the horizontal and orientating lights away from sensitive receivers, in accordance with applicable Australian Standards;
- shaping and landscaping overburden emplacements and rehabilitation areas to provide 'micro-relief' and mimic natural landforms and vegetation communities as far as possible (and avoid 'bread basket' like landforms); and
- painting infrastructure in 'forest tones' to blend in with the surrounding environment as far as practicable.

Shenhua has also committed to undertaking offsite mitigation measures, including:

- providing landscape treatments for privately-owned primary residences predicted to receive high visual impact from the project (for properties generally within 7.5 kilometres from mining operations); and
- providing screening vegetation along impacted sections of the Kamilaroi Highway and local roads (ie. Clift Road, The Dip Road and Nea Siding Road).

Residual Visual Impact

The view sections used in the visual assessment are shown on Figure 48.

With regard to broad acre rural residences, the assessment indicates that residences on all sides with views to the project site within 7.5 kilometres of the site would experience high visual impacts at some stage during the project, with impacts grading to moderate for residences up to 12.5 kilometres from the disturbance areas. Beyond this distance, any visual impacts would be low.

With regard to the villages, the assessment indicates that Curlewis, Caroonia and Spring Ridge would not be subject to any significant impacts as a result of screening vegetation and distance which restricts views to the project site. Breeza on the other hand would be subject to high visual impacts, associated mainly with construction of the overburden emplacements for the Eastern, and to a lesser extent Southern, mining areas (see Figure 49).

Commuters on the Kamilaroi Highway would experience high visual impacts on the section of the Highway that is within 2.5 kilometres of the project site, with impacts grading to moderate for distances up to 7.5 kilometres from the site. The impacts would be similar for local roads, especially The Dip Road, Clift Road and Nea Siding Road.

Visual impacts from Porcupine Lookout are predicted to be low, given the significant distance from the project site (ie. 20 kilometres).

The assessed impact levels on these receivers assume open visibility to project areas, which is often not the case due to view orientation or local intervening topography or vegetation.

The assessed high and moderate impacts would be reduced to moderate and low respectively following completion and rehabilitation of overburden emplacements, and would ultimately reduce to very low as rehabilitation vegetation matures.

The Department recognises that the project would result in some permanent changes to the visual landscape and that there would be impacts on surrounding residences, around Breeza Village and some roads. However, the Department also acknowledges Shenhua's commitment to minimise these broad scale impacts, particularly through avoiding disturbance of Mt Watermark, backfilling the Eastern and Southern mining area voids (thus reducing out of pit emplacement volumes), and promptly rehabilitating the emplacements.

To minimise the residual visual impacts of the project on receivers as far as practicable, the Department has also recommended conditions requiring Shenhua to:

- implement additional visual mitigation measures to reduce the visibility of the mine operations on privately owned receivers that have significant direct views of the mining operations, at the request of the landowner;

- notify relevant land owners of their entitlement to additional site-specific visual assessment and landscaping treatments;
- undertake screening along affected roadsides as soon as possible; and
- implement all reasonable and feasible measures to reduce visual impacts.

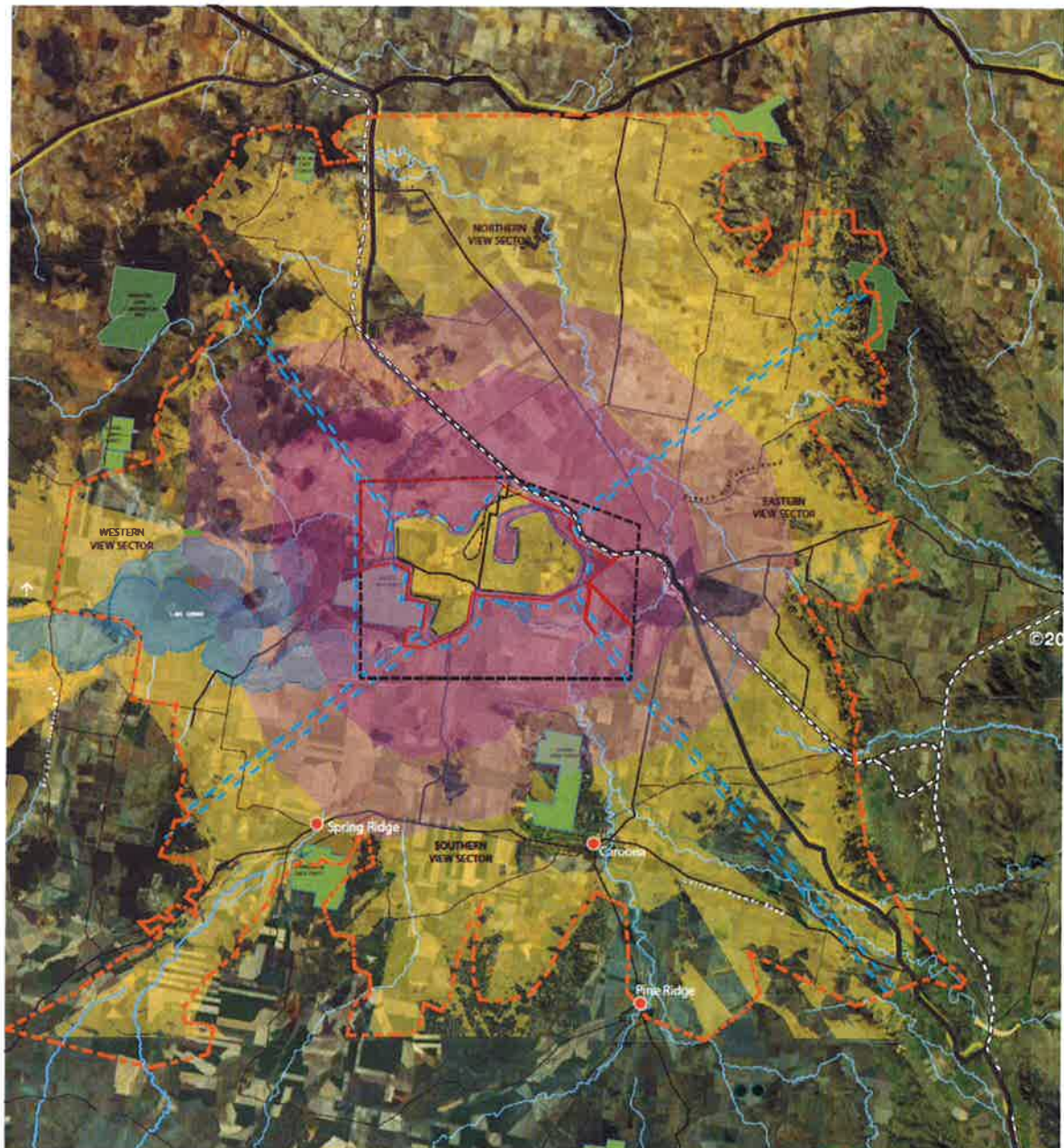


Figure 48: View Sectors

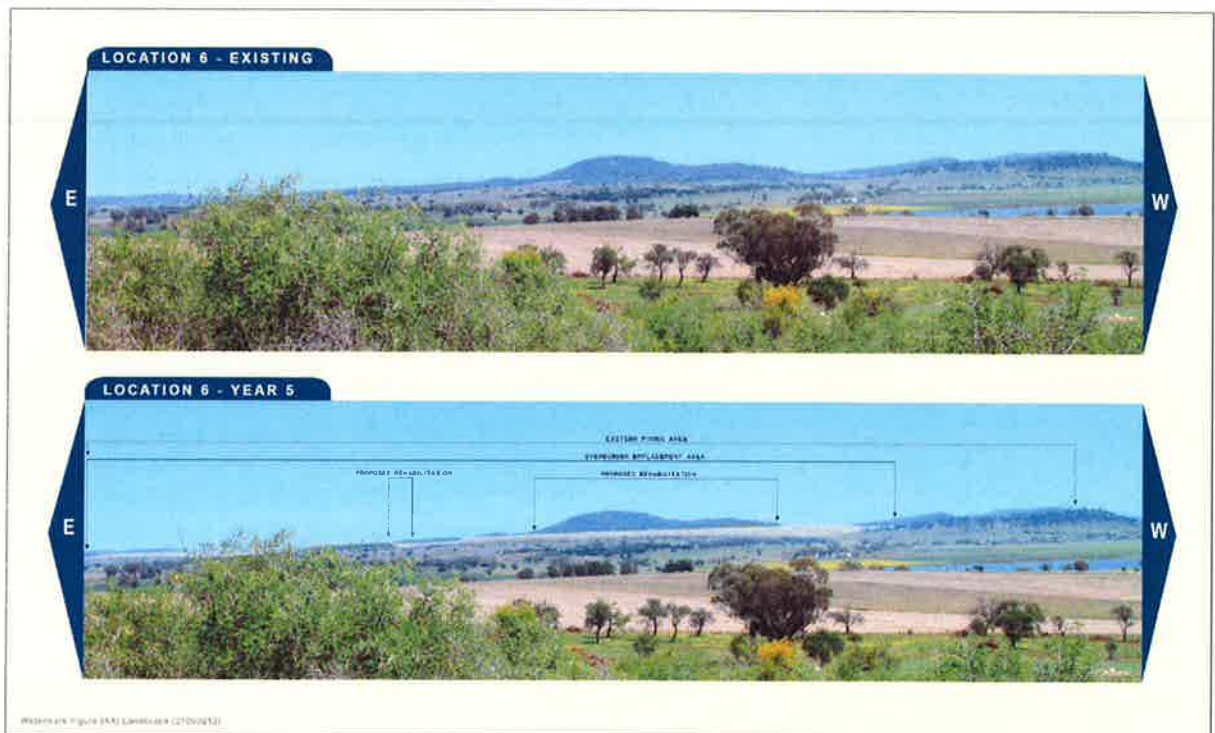


Figure 49: Photomontages showing existing and Year 5 (worst case) view from Breeza

Residual Lighting Impacts and Impacts on Siding Springs Observatory

The locations with potentially higher night lighting impacts are very likely to correlate with the areas of potential high day-time visual impacts, as discussed above. Lighting impacts are commonly managed through compliance with relevant Australian Standards and ongoing management of operational light sources. The Department has recommended conditions to ensure that these standard mitigation measures are implemented, including ensuring that fixed outdoor lighting sources do not shine above the horizontal.

In addition, the generation of dust from mining operations can exacerbate the impacts of lighting. The Department has recommended conditions that would require Shenhua to apply best practice management practice and reasonable and feasible mitigation measures to minimise dust generation.

As outlined above, the mining operations are located approximately 120 kilometres from the Siding Springs Observatory. The Australian Astronomical Observatory (AAO) noted the importance of minimising light spill for the observatory, however it does not object to the project and recommends that Shenhua be required to consult with AAO in preparation and implementation of a program to minimise lighting (and dust) impacts on the observatory. This would include monitoring of light and dust levels and adoption of best practice technology to reduce emissions. The Department has recommended conditions in this regard, including a requirement to minimise lighting impacts on Siding Springs Observatory, and monitor lighting levels in consultation with AAO.

AAO also noted that some of its equipment (including telescopes with a replacement cost of over \$100 million) is very sensitive to vibration and seismic disturbance, although it conceded that blasting vibration associated with the project is likely to be within vibration tolerances.

6.7 Traffic and Transport

Introduction

The project site enjoys direct frontage to the Kamilaroi Highway, which would be used for all road access to and from the site via a purpose built Mine Access Road.

The site also enjoys direct frontage to the Werris Creek – Moree Rail Line, which runs parallel to the highway in the vicinity of the site, and which would be used to transport all coal from the site via a dedicated rail spur and loop.

In the vicinity of the site, the Kamilaroi Highway is an undivided two lane rural road under the care and control of the RMS. It currently carries about 1,500 vehicles/day.

Other local roads within and adjacent to the project site provide access to rural properties in the locality, and have very low traffic volumes. They include:

- The Dip Road – approximately 30 vehicles per day;
- Court Lane – approximately 35 vehicles per day;
- Nea Siding Road – approximately 50 vehicles per day; and
- Clift Road, Cull Road, Goran Lake Road, Whitby Road, Rowarth Road, Duddy Road and several unnamed roads.

A number of other local and regional roads would provide access to the site from local centres, including Tamworth. These roads are discussed in the following sections.

Project Transport Upgrades

To facilitate the project, the sealed Mine Access Road would be joined to the highway at a new channelised T-intersection²⁴ with indented turn-off lanes for southbound and northbound traffic. A 170 metre section of the highway in the vicinity of the Mine Access Road would be raised and realigned to facilitate the proposed rail spur and its underpass of the highway (see Figure 50).

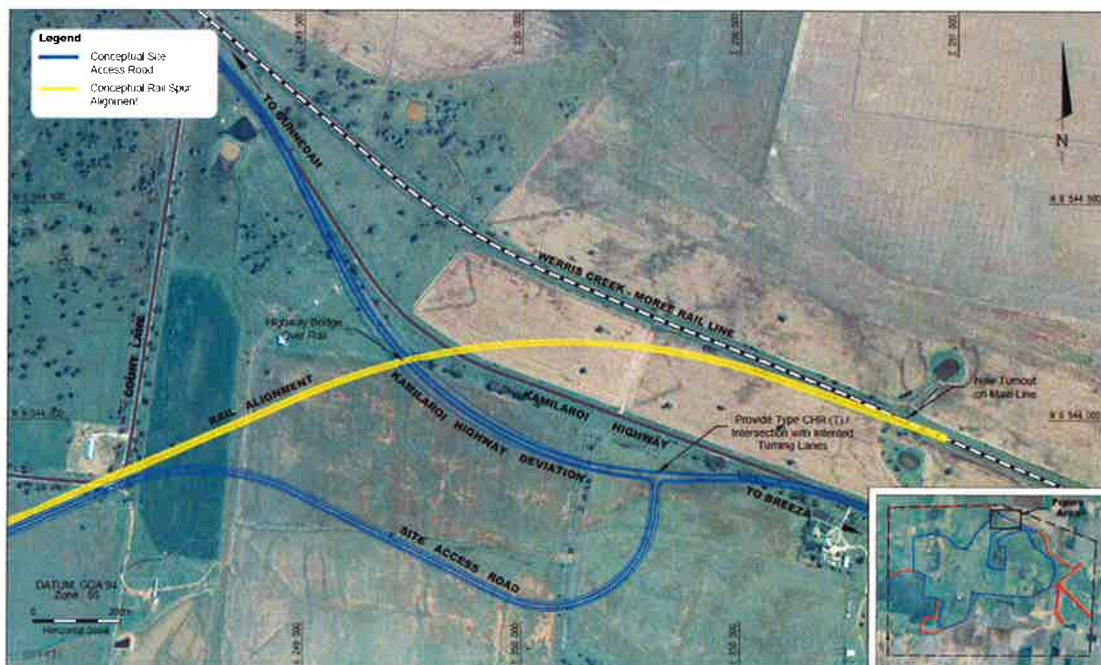


Figure 50: Conceptual Road and Rail Alignments

The Mine Access Road and highway deviation would be constructed prior to any significant construction works on the site. Prior to the completion of the Mine Access Road, Court Lane would be used to access the site. To mitigate safety risks during this use, Shenhua would install additional signage at the intersection including electronic signage.

A number of local roads within the project area would be closed facilitate the project, including permanent closure of:

- Court Lane;
- Rowarth Road;
- Whitby Road;
- The Dip Road (west); and
- a number of unnamed roads.

The closure of The Dip Road (west) in Year 15 of the project would necessitate an alternative route, which would be provided via the upgrade of Cull Road, Werner Road and Clift Road (see Figure 51).

²⁴ Intersection design would be subject to final design in consultation with RMS and Council.
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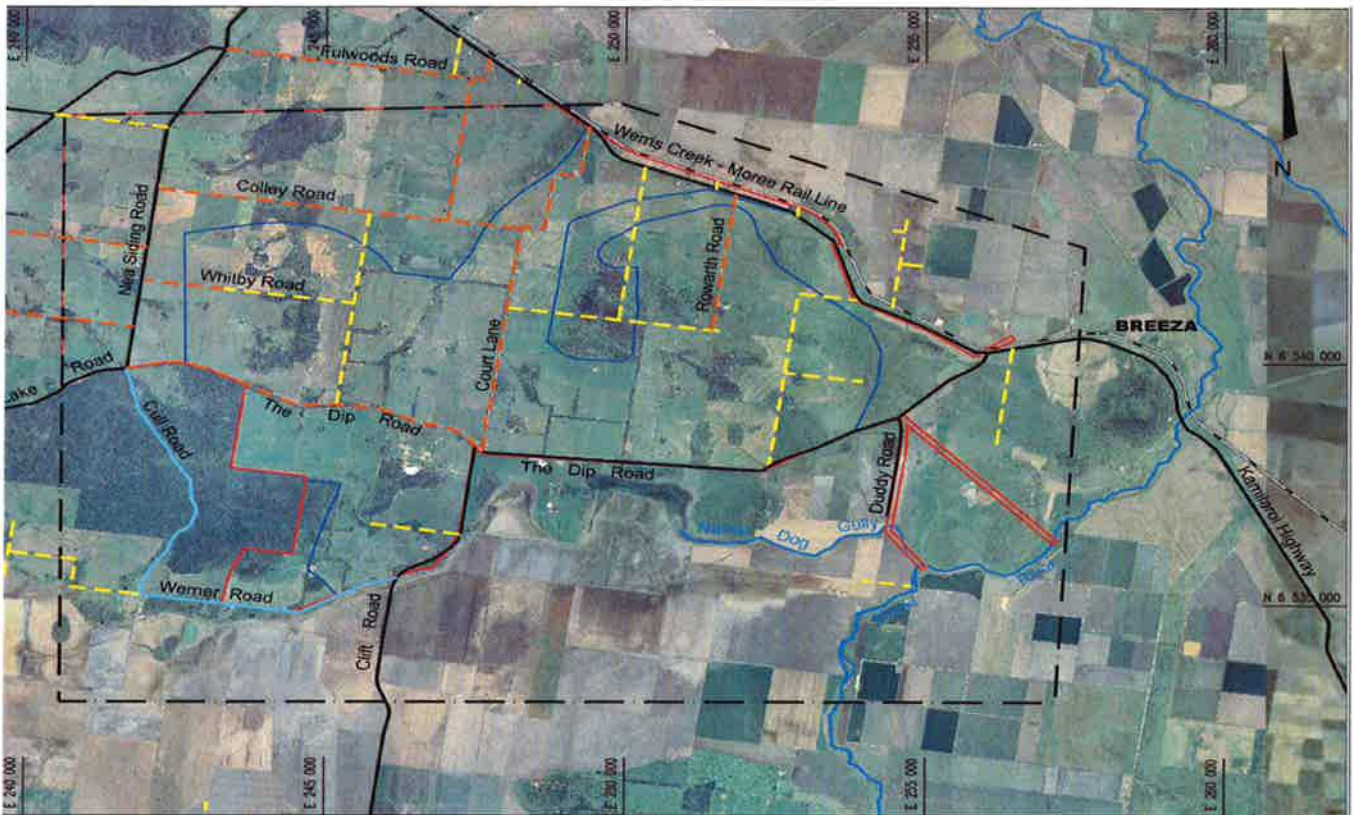


Figure 51: Proposed Road Closures and Upgrades

To assess the impacts of the project and road closures on the local and regional road and rail network, the EIS includes a specialist traffic and transport assessment undertaken by DC Traffic Engineering.

Following issues raised by both Gunnedah and Liverpool Plains Shire Councils, the Department engaged an independent traffic consultant, Sinclair Knight Merz (SKM), to undertake an independent review of the impacts of the project on road-related infrastructure. The independent traffic review is attached as Appendix E.

Road Traffic Impacts

The traffic assessment assumes that 60% of the construction and operational workforce would travel to the site via the Kamilaroi Highway from the north (ie. from Gunnedah, Curlewis and Tamworth via Gunnedah), and 40% from the south (ie. from Quirindi, Werris Creek, and Tamworth via Currabubula and Breeza).

Based on the peak construction workforce of 240 workers (with 30% transported to the site via a bus from a central pick-up point at Werris Creek) and a peak operational workforce of 600 full time equivalents (with 25% of the total workforce on each shift), the modelling undertaken for the assessment indicates that all roads and intersections in the locality would be able to adequately accommodate the additional traffic generated by the project, with Levels of Service (LoS) operating at between A to C, indicating good to satisfactory performance (including the temporary use of Court Lane).

Traffic safety was also assessed as satisfactory, subject to implementation of additional signage especially during Court Lane's temporary use. The assessment indicates that these roads have ample spare capacity to accommodate project-related traffic.

In the wider region, the key area of concern is traffic to and from Tamworth via Currabubula, and to a lesser extent to and from Werris Creek. In this regard, traffic from Tamworth is likely to travel to the site via Werris Creek Road and Bulunbulun Road (also known as Breeza-Currabubula Road), and from Werris Creek via Werris Creek Gap Road (see Figure 52).

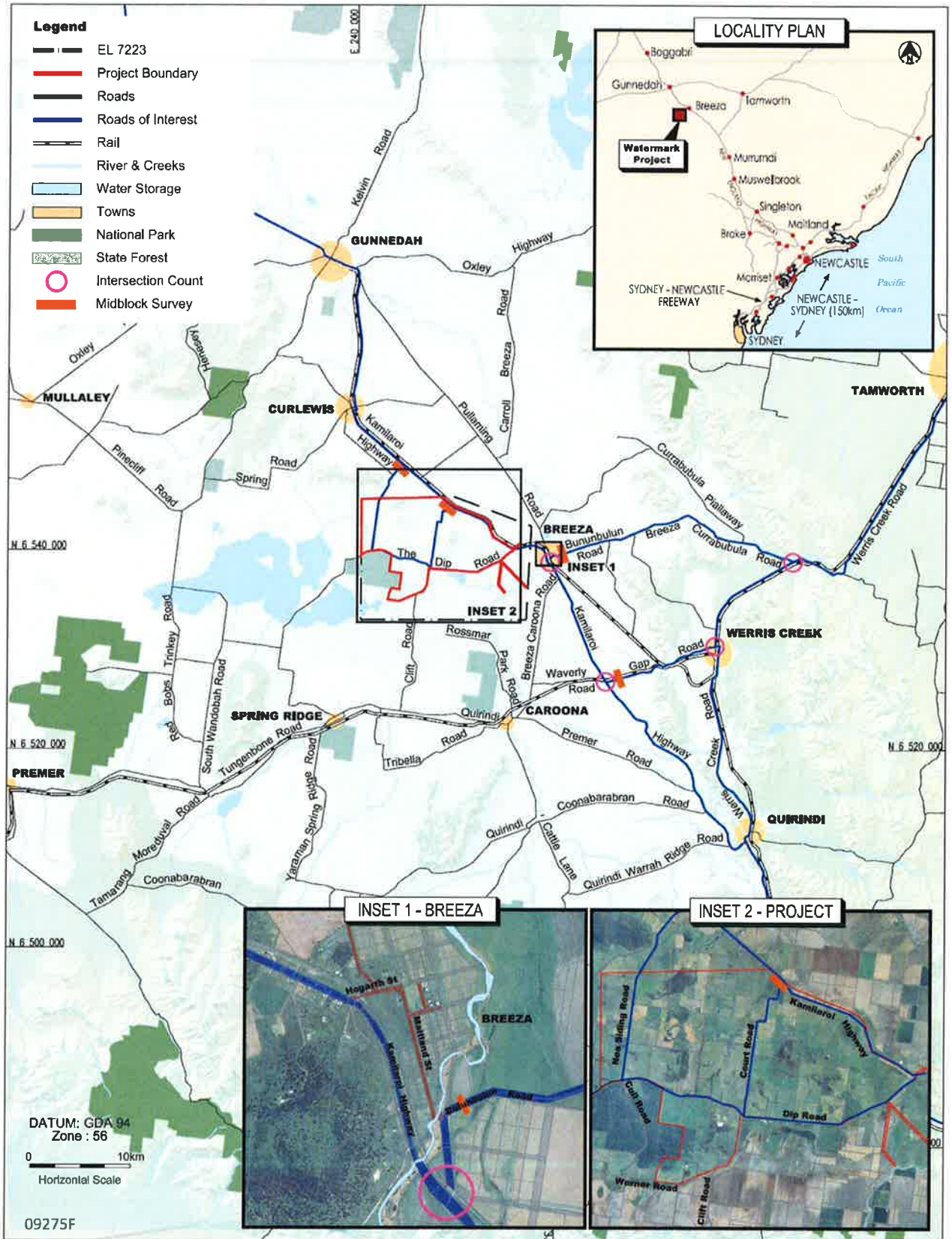


Figure 52: Regional Road Network

In terms of safety the traffic assessment notes that the pavement width of both Bulunbulun Road and the Werris Creek Gap Road could be improved given their unsealed shoulders. Somewhat ambiguously, the EIS recommends that the respective roads authorities (RMS, Gunnedah and Liverpool Plains Councils) continue to carry out necessary pavement condition surveys and identify maintenance or upgrade needs along these two routes from time to time.

The respective roads authorities – ie. RMS, Gunnedah Council and Liverpool Plains Council – were all initially critical of the traffic assessment in varying degrees. The Councils in particular noted that the assessment was based on outdated traffic counts which may consequently underestimate the impacts of the project. Both Gunnedah and Liverpool Plains Councils recommended that a number of road upgrades be undertaken in addition to those identified above. These are summarised in Table 22 below.

Table 22: Recommended Road Upgrades

Road	Recommended Upgrade	Recommended By	Reason
Nea Siding Road	Widen seal to provide 9m formation with 7m seal	GSC	To ensure that road safety and serviceability is not compromised by additional traffic resulting from closure of Court Lane
Cull Road, Werner Road	Upgrade to 9m formation	GSC	Currently in poor condition and not suitable for the alternate route proposed
Bulunbulun Road (Breeza-Currabubula Road)	Western GSC end (largely unsealed) – Reconstruct and bitumen seal from the low level bridge at Mooki River to existing seal at the boundary of Liverpool Plains LGA, with 9m formation with 7m seal	GSC	Will be used by project-related traffic to and from Tamworth. The TIA is considered by GSC likely to underestimate use of this road, potentially triggering an LoS of D on this route.
	Eastern LPSC end (sealed) – Upgrade to 10m formation and 10m pavement (inc. 1m shoulder), including culverts, causeway and intersection upgrades	LPSC	As above
Breeza local roads and infrastructure	Consider the need to upgrade: <ul style="list-style-type: none"> • Bulunbulun Rd/ Maitland St int.; • Bulunbulun Rd/ Kamilaroi Hwy int.; • Low-level bridge at Mooki River (Maitland St); • Maitland St; • Maitland St/ Hogarth St int.; • Hogarth Street; • Railway crossing (Hogarth St); • Hogarth St/ Kamilaroi Hwy int. 	GSC	Not considered in the EIS
Werris Creek Gap Road	Widen and seal to 10m formation (9m pavement and 1m shoulder, including culverts, and potential bridge replacement of culverts), and upgrade the intersection with the Kamilaroi Hwy	LPSC	Road network currently in poor condition
Werris Creek Road (MR 130)	Upgrade intersections with Bulunbulun Road (including upgrade to Anstey Ck bridge) and Werris Creek Gap Rd	LPSC	Road network currently in poor condition
Waverly Road	Upgrade intersection with Kamilaroi Hwy	LPSC	Not stated

Both Councils also requested that Shenhua be required to contribute to the ongoing maintenance of the local road network, and GSC also recommended that Shenhua be required to contribute to any other roads subsequently identified as requiring upgrade as a result of project-related traffic.

GSC also requested that Shenhua be required to prepare a future road network layout for accessing the site area post mine closure.

In the RTS, Shenhua's traffic consultant continued to argue that these upgrades were not warranted as a result of the project-related traffic. To address this divergence of opinion, the Department engaged SKM to review the traffic impact assessment and the need for upgrading these local and regional roads. The independent review included review of the traffic modelling, site inspection and consultation with the Council's and Shenhua, including a workshop between the various stakeholders.

The independent review concluded that none of the identified upgrades are warranted as a result of the project-related traffic, with the exception of the intersection of Bulunbulun Road and Werris Creek Road, which SKM believes should be upgraded as a result of the project (to include a channelised right-turn with a short turn bay).

With regard to safety, SKM considers that the predicted volume of traffic generated by the project would have minimal impact on the level of risk associated with existing hazards on these roads and intersections, and considers that the safety performance of these roads and intersections would be maintained with the addition of project-related traffic.

The Councils accept the conclusions of the independent review, subject to Shenhua being required to contribute to the ongoing maintenance of Bulunbulun Road, with the contribution based on Shenhua's proportionate use of the road. The Department agrees, and has recommended conditions in this regard.

GSC has also recommended that Shenhua be required to upgrade (seal) the unsealed section of Bulunbulun Road if traffic volumes on the road exceed the EIS predictions and ongoing maintenance costs exceed the breakeven value for maintaining the gravel road. In this regard, the predicted traffic volume on Bulunbulun Road with the project at full development is 276 vehicles a day (comprising 108 baseline vehicles and 168 project-related vehicles).

SKM noted that the breakeven value for gravel roads varies markedly from region to region, with the literature citing breakeven values being exceeded at anywhere from 200 vehicles a day to 500 vehicles a day. SKM recommended that regular dilapidation surveys and traffic counts are conducted on the road, and that if the condition of the road is found to be deteriorating as a result of the project-related traffic (despite maintenance), then Shenhua should be required to undertake restoration (or upgrade) at its expense. The Department agrees, and has recommended conditions in this regard.

With regard to the local roads within Breeza Village (including Hogarth Street and Maitland Street, and associated intersections), GSC and the Department are now satisfied that the road upgrades are not required, subject to Shenhua not using the roads for project-related traffic. The Department has recommended conditions restricting project-related traffic from using Breeza Village roads, and conditions requiring Shenhua to prepare a strategy in consultation with GSC detailing measures for preventing project-related traffic from using Breeza's urban area roads.

The Department has also recommended conditions requiring Shenhua to:

- prepare and implement a construction traffic management plan and a road closure management strategy; and
- construct the Cull Road / Werner Road / Clift Road alternative route to the satisfaction of GSC.

Kamilaroi Highway Overpass

Neither the RMS or the Councils object to the proposed Kamilaroi Highway deviation and overpass. However, the RMS requested additional design-related information (including minimum height and width clearances for the overpass, and security arrangements for the works), and both RMS and GSC raised concerns about the changes to flood dynamics in Watermark Gully affecting the safety and efficiency of the highway, with GSC noting that post mining flows in Watermark Gully would increase by about 19%. GSC noted that the existing Watermark Gully causeway on the highway is only 200

metres north of the proposed deviation, and that it would make sense that upgrade of the causeway occurs simultaneously with the road deviation works.

As outlined in Section 6.1, Shenhua has since committed to ensuring that flows in Watermark Gully are maintained to a standard where they are no greater than pre-development flows, for all flood events up to and including the 100 year ARI event. Consequently, the project would not result in any increased flooding on the Kamilaroi Highway, and there is no need or justification for Shenhua to be required to upgrade the causeway.

With regard to RMS's concerns about the lack of detail on the deviation and overpass, the Department is satisfied that the conceptual level information provided to date is adequate for the purposes of the project application, and that Shenhua will still be required to obtain separate approvals for the works under the *Roads Act 1993* and *Rail Safety (Adoption of National Law) Act 2012*. As outlined by RMS, it would also be required to enter into a Works Authorisation Deed (WAD) for the road works and a Surface Interface Agreement (SIA) for the rail over-bridge structure.

The Department has recommended conditions requiring Shenhua to complete these roadworks to the satisfaction of RMS, and to commission the Mine Access Road and deviation prior to the commencement of the main construction works on site.

Rail Traffic and Level Crossings

The project would generate an average of 8 train movements a day (in + out). The rail traffic assessment notes that the Hunter Valley Coal Chain (see Section 3.1) is currently serviced by a fleet of 43 trains, with current daily train movements on the corridor approximately:

- 14 movements (up + down) between Gunnedah and Werris Creek;
- 18 movements (up + down) between Werris Creek and Scone; and
- 24 movements (up + down) between Scone and Newcastle.

The rail traffic assessment estimates that the project, together with recently approved and/or proposed projects in the region (including the Boggabri Coal Project, Maules Creek Coal Project, Narrabri Stage 2 Project, Tarrawonga Coal Project, Vickery Coal Project and Vickery South Project²⁵) are likely to generate a total of 47 additional train movements (up + down) a day, equating to one additional laden train and one additional un-laden train per hour on the network between Narrabri and Muswellbrook.

The Department notes that the estimates for all of these projects are based on the respective projects all operating at maximum production, which would almost certainly not occur in practice. Nevertheless, the estimate highlights the considerable expected growth in rail traffic in the coming years as production from these projects materialises.

The traffic assessment acknowledges the constraints in the wider rail network to accommodate the forecast growth in coal transport, noting that the deficiencies have been identified and are being addressed through the ARTC's Hunter Valley Corridor Capacity Strategy. Focusing on the more applicable section of the network up-line of Muswellbrook (ie. between Narrabri and Muswellbrook), the rail traffic assessment identifies the key deficiencies as the single line, and steep grades at the Liverpool Ranges at Ardglan (which requires use of additional 'banker' locomotives to assist coal trains). ARTC strategies to address these constraints include the Liverpool Ranges Duplication Project and the Watermark Passing Loop Project (not related to the Watermark Coal Project).

Given these wider ARTC-led capacity enhancing projects, the traffic assessment does not propose any measures to mitigate project-related impacts on the rail network capacity, other than consulting closely with the ARTC. However, the assessment does include specific consideration of project-related impacts on the some 28 railway level crossings of public roads between the project site and Muswellbrook²⁶.

The assessment indicates that most of the level crossings have adequate controls in place and have acceptably low risk, however 4 crossings (1 at Blandford, 2 at Wingen and 1 near Aberdeen) are

²⁵ The Caroon Coal Project was not included as it is still in the exploration stage, and details of train movements are not known. Cumulative rail impacts associated with the Caroon project would need to be considered as part of the assessment of that project.

²⁶ The assessment considers, and the Department accepts, that the project would have a minor impact downstream of Muswellbrook.

subject to short stacking risks, whereby traffic queued at nearby intersections may queue back over the railway line.

Whilst identifying these risks, the assessment notes that the crossings are covered by the national 'ALCAM' scheme which assesses and prioritises funding for railway level crossing upgrades, based on risk. Consequently, the EIS does not recommend any mitigation measures other than consulting with ARTC and Australian Transport Council (ATC) with regard to forecast train volumes and scheduling. However, the EIS does commit to the installation of signage at the Hogarth Street level crossing in Breeza to provide warning about short stacking, and to discouraging project-related road traffic from using Hogarth Street. As outlined above, the Department has recommended conditions restricting project-related traffic from using Breeza Village roads, including Hogarth Street.

The independent traffic review also looked at the level crossing on Bulunbulun Road, near the intersection with the Kamilaroi Highway, and concluded that the level crossing has ample available queuing space and that the project would not exacerbate risks at the crossing.

ARTC has confirmed to the Department that it has no comments or concerns regarding the project. However, Transport for NSW requested additional detail on mine-to-port movements and train path availability, and impacts on other industries such as agriculture, noting that the project movements should not impede rail and port accessibility during seasonal agriculture peaks. GSC and LPSC also raised concerns about cumulative train-related issues on level crossings and recommended that rail companies contribute to the development and implementation of sub-regional infrastructure strategies.

The Department acknowledges these issues and concerns, but also recognises that train movements and scheduling on the wider rail network is largely outside the control of Shenhua, or any other coal company in the Gunnedah Basin. ARTC is the responsible entity for managing the rail network, and it has not raised any issues in relation to rail network capacity as a result of the project. In the allocation of train paths, ARTC gives first and highest priority to passenger services. ARTC also reserves a portion of train paths for grain and other agricultural traffic on a seasonal basis to safeguard access to the network for the movement of agricultural produce. Only after passenger and grain services are catered for does ARTC allocate the remaining paths to general freight and coal trains.

Consequently, the Department is satisfied that the wider rail capacity constraints issues are being addressed at a broader level, and that the project itself would not produce any subjective cumulative impacts.

The Department recognises the identified issues regarding the 4 railway level crossings, but acknowledges that these are existing issues and that the project would not significantly exacerbate the existing risks. Environmental issues relating to train movements on the rail network – particularly noise and dust – have been addressed separately in Section 6.2.

6.8 Socio-Economics

The project would generate a large number of jobs and inject very significant capital investment into Gunnedah and the New England North West region. While these changes would lead to a range of benefits, the project would also put pressure on services and facilities and affect social dynamics, and has the potential to affect other land users, including the agricultural users of the area.

The EIS includes a number of specialist studies to assess the project's impact on these socio-economic matters, including:

- a Social Impact Assessment, undertaken by Hansen Bailey, which assesses the project's impacts on local and regional social infrastructure and services;
- an Economic Impact Assessment, undertaken by Gillespie Economics, which attempts to identify, assess and weigh up potential economic costs and benefits, including externalities; and
- an Agricultural Impact Statement, undertaken by Scott Barnett and Associates, which assesses the project's impacts on agriculture in the region.

Local Infrastructure and Services

The EIS notes that population in the region has been variable over the past 15 years or so, with:

- Gunnedah LGA's population declining by 10% in the early 2000's, then increasing by 6% in the late 2000's. It has a current population of approximately 12,000;

- Liverpool Plains LGA's population falling marginally over the past 15 years. It has a current population of approximately 7,500; and
- Tamworth Regional LGA's population increasing by around 10% over the past 15 years. It has a current population of approximately 56,500.

Unemployment levels are generally marginally higher than NSW averages (ie. about 6%), with current unemployment rates approximately:

- 6.7% in Gunnedah LGA;
- 6.6% in Liverpool Plains LGA; and
- 6.3% in Tamworth Regional LGA.

The Agriculture, Fishing and Forestry industry sector is the region's highest employer, accounting for the following proportion of the workforce in each LGA:

- 17% in the Gunnedah LGA;
- 24% in the Liverpool Plains LGA; and
- 7% in the Tamworth Regional LGA.

The Mining industry sector has generated significant employment growth in the region over the past 15 years (albeit from low base levels), with sector employment:

- tripling in the Gunnedah LGA, now accounting for 7% of the total workforce;
- doubling in the Liverpool Plains LGA, now accounting for 3% of the total workforce; and
- tripling in the Tamworth Regional LGA, now accounting for 0.8% of the total workforce.

The increase in employment in the mining sector is likely to have assisted in offsetting the decline in population in the Gunnedah and Liverpool Plains LGAs over this time.

The Watermark Coal Project would generate approximately 600 full time equivalent construction jobs over the 18-month construction period. The assessment predicts that most of these jobs would be non-local hires due to the specialist and temporary nature of the work, with the assessment based on 480 non-local hires and approximately 100 local hires or temporary relocation hires. Another 320 people are predicted to move into the area due to flow-on employment benefits related to the construction phase.

Shenhua notes that it would encourage workers to reside in the planned 1,500 unit MAC Village²⁷ at Werris Creek to alleviate pressure on local housing market during the temporary construction period.

The operational phase of the project is predicted to generate 200 full time equivalent positions in Year 1, gradually rising to a peak of 600 employees at Year 21. Whilst Shenhua has affirmed a strong preference for local hire for its operational workforce, the socio-economic assessment includes modelling of 3 scenarios to account for all potential eventualities, including:

1. 80% local, 20% non-local hires;
2. 50% local, 50% non-local hires; and
3. 20% local, 80% non-local hires.

Conservatively assuming that all non-locals settled in the area permanently, the project operational workforce would increase the population of the region by up to 1,200 people. Additional population as a result of flow-on employment is predicted to be about 1,460 people. This population growth equates to an increase of about 2.5% across the region²⁸, with most of this growth felt in Gunnedah, which would increase up to about 9%.

In this regard, most of the employees are expected to reside in the Gunnedah LGA (40%-50%), with 25% in the Liverpool Plains LGA, 25% in the Tamworth Regional LGA and minor amounts in other LGAs such as Narrabri and the Upper Hunter.

²⁷ The MAC Village was approved in November 2011, but the approval was overturned by the NSW Supreme Court in June 2013, which found that the facility was not permissible in the rural zone. LPSC has since rezoned the land to allow the workers accommodation facility, and a fresh DA for the facility was approved in February 2014.

²⁸ For the purposes of the assessment the region includes the Gunnedah, Liverpool Plains, Tamworth, Narrabri and Upper Hunter LGAs, which together have a population of about 102,500 people.

Based on the above scenarios, the social assessment found that:

- the project-related effects would be incremental, given the incremental employment growth;
- the subregion would likely be able to absorb a substantial proportion of the jobs created by project, given the relatively high unemployment (especially in youth and indigenous employment) and low participation rates (including low women's labour workforce participation rates);
- residential housing availability and affordability is a current issue (as it is for large areas of NSW and Australia), however there is ample land supply available in the Gunnedah, Liverpool Plains and Tamworth LGAs, and the predicted housing growth rates are consistent with historical growth rates in the region;
- health services would be strained with the cumulative development of mines in the region, with one of the most prominent impacts being the impacts of the construction workforce, especially families nearest the proposed MAC Werris Creek workers accommodation facility;
- education facilities (including pre-school, primary, secondary and tertiary schools) are likely to have sufficient capacity to accommodate the project, but would be strained with the cumulative development of mines in the region, especially for tertiary education;
- skilled labour is an issue for the region (hence the expected demand for non-local hires), particularly in the construction phase;
- emergency services (including Police, Fire and Rescue, Rural Fire Service, State Emergency Service, NSW Ambulance) are likely to have sufficient capacity to accommodate the project, but would be strained by cumulative development of mines in the region, and services around the MAC Werris Creek facility may also be strained;
- community recreation, sports and cultural facilities will face increased but not unreasonable demand;
- public transport facilities (including air, rail and bus services) would face some additional, but not unreasonable, demand; and
- the project would inevitably have some impact on the community identity, values, cohesion and lifestyle, given the large size of the project.

To mitigate adverse social impacts as far as practicable, Shenhua has developed a wide range of mitigation measures, which would be managed via a Social Impact Management Plan. A summary of these measures, which amount to some \$2 million in direct contributions, is presented in Figure 53 below.

It is noted that these measures are outside and on top of the direct contributions to local councils. With regard to these contributions, Shenhua has made offers to enter into voluntary planning agreements (VPAs) with each of Gunnedah, Liverpool Plains and Tamworth councils, with the vast majority of the contributions proposed for the Gunnedah LGA.

The offer to GSC totals approximately \$16 million towards local infrastructure and services, including:

- \$6.5 million towards a new community facility, and funding a steering committee to identify, plan and implement the facilities; and
- \$0.06 per tonne of product coal, amounting to some \$9.5 million over the life of the project.

The offers to the other Councils comprise:

- \$1.5 million to LPSC towards a new regional indoor sports centre in Quirindi; and
- \$0.35 million to Tamworth Regional Council towards a new recreation centre and Stage 2 of Marsupial Park.

Whilst initially requesting consideration be given to the imposition of additional contributions, both GSC and LPSC have now agreed to the contributions offers. Tamworth Regional Council did not make a submission on the project, and it is assumed that it does not object to the proposed contributions.

GSC also noted that the EIS contains numerous platitudes about encouraging 'local' employment over 'non-locals', but little in the way of hard detail and commitment in this regard. To address this, Council requested that Shenhua commit to an operational workforce of at least 50% locals and that it supports a detailed apprenticeship and training program and a housing development program.

Shenhua noted that its proposed social mitigation measures include a number of commitments in this regard (see Figure 53), such as: commitments to local apprenticeships, traineeships and graduate placement programs; a school-based trainee program; tertiary scholarship funding; seed funding (of \$250,000) towards the construction of a mining skills centre in Gunnedah; and an employee incentive scheme to encourage re-location to the local area. The Department is satisfied that these measures are appropriate and adequate to encourage local employment associated with the project.

Ref	Mitigation and Management Measures
General	
1	A Social Impact Management Plan will be prepared to the satisfaction of the Director-General to manage the potential social impacts of the Project.
Housing and Residential Land	
2	Monitor housing affordability and availability in the local area and report in the regulatory required Annual Review
3	Implement an Employee Incentive Scheme which will include policies on items such as encouraging progressive re-location to the local area by provision of financial assistance to relocate.
4	Facilitate the use of the Workforce Accommodation Facility (MAC Werris Creek) by 'non-local hires' of the construction workforce.
5	Encourage the short term use of the Workforce Accommodation Facility (MAC Werris Creek) by 'non-local hires' of the operational workforce while they settle in to their work and familiarise themselves with the local housing market.
6	Provide bus transport for the Project workforce during the construction phase between the Workforce Accommodation Facility (MAC Werris Creek) and the Project.
7	Shenhua will, through the Gunnedah Basin Coal Developers Group & Namo Mining Working Group, continue to work with local government and other mining companies to monitor workforce size, the workforce's previous and current residential location, local housing demand and supply, housing prices and affordability.
Labour Force	
8	Provide the following employment options for Gunnedah, Liverpool Plains and Tamworth LGA residents: <ul style="list-style-type: none"> • Apprenticeships; • Traineeships; and • Graduate placement programs The employment options will include: <ul style="list-style-type: none"> • Positions for suitable candidates from the Gunnedah, Liverpool Plains and Tamworth Regional LGAs based on merit; • Positions for suitable Indigenous candidates from the Gunnedah, Liverpool Plains and Tamworth Regional LGAs based on merit; and • Positions, including 'transitional employment opportunities', for young people from the Gunnedah, Liverpool Plains and Tamworth Regional LGAs.
9	Continuation of Shenhua's School-based Trainee Program. This program will support 8 students per year for the life of the Project. This includes Indigenous and non-Indigenous students.
10	Provide part time and / or flexible employment opportunities to encourage a higher rate of labour force participation.
11	Contribute funds and assistance to the value of \$5,000 per year for 20 years to relevant school programs currently offered throughout the region and to new programs. For public schools, this assistance will be delivered by coordination through the New England Regional Director of the Department of Education and Communities. For private schools, this assistance will be delivered in direct consultation with specific schools. For example, the following current programs could be assisted: <ul style="list-style-type: none"> • The Moolo Murris Program, currently at Quindind High School; • The Clontarf Foundation program currently operating at Odey High School, Tamworth; • The Quicksmart Program, currently at 30 schools within the New England Education Region; and • Other programs as appropriate and agreed to by the New England Regional Director of the Department of Education and Communities.
Tertiary Education	
12	Provide an annual scholarship fund of \$10,000 for 20 years for locally based students to study a mining related course at University.
13	Provide seed funding of \$250,000 towards the construction of the proposed Mining Skills Centre in Gunnedah. This will be in collaboration with other mining and resource companies in the Study Area.
Children's Services	
14	Provide an annual scholarship fund of \$5,000 for 10 years for locally based students to study a child care related course as well as sponsoring a traineeship program for child care workers.
Health Services	
15	Commitment to financial contributions of up to \$20,000 per year for 20 years to encourage retention of medical staff at the Gunnedah Rural Health Centre.
16	Provide information on mental health, counseling and family support programs to support the Project workforce and their families.
17	Provide information to new employees about available health services in the community.
18	Partner with health agencies in promoting healthy lifestyles and disease prevention to the Project workforce.
19	Provide health information on the impacts of mining to residents, including those living in mine owned houses, in the zone of mitigation or acquisition.
Emergency Services	
20	Provide investment of approximately \$50,000 per year for 20 years into capital equipment for services such as the bushfire brigade, ambulance and other valued community services in the Gunnedah and Liverpool Plains LGAs.
21	Implement a salary sacrifice program among all employees with proceeds going to the Westpac Rescue Helicopter.
22	Develop employee policies that enable emergency services personnel to be released from duties to attend emergency calls and to allow release of employees to perform crucial volunteer actions.
Recreation, Leisure and Sporting Facilities	
23	Promote the Gunnedah, Liverpool Plains and Tamworth Regional LGAs' recreational, cultural and social support facilities and community organisations to the incoming workforce and their families.
Community Identity and Values	
24	Assist new residents and families to integrate into the community by collaborating with GSC, LPSC, TRC and other mining and resource companies in the region to produce the following information, projects and policies: <ul style="list-style-type: none"> • Information for incoming residents, regarding their new community, region, facilities and services; • Welcoming events or programs for new residents; • Information for existing residents regarding information about the Project, it's likely workforce characteristics and their needs; • Holding 'family fun days' to help new families who have relocated here meet other families in the area and on the project; and • Enforcing, by company policy, employees to remove their high-visibility mining jackets if they intend to visit public places in the towns and villages of Gunnedah, Liverpool Plains and Tamworth Regional LGAs before and after work.
Health and Wellbeing	
25	Provide detailed information about managing sleep cycles and the impact on lifestyle and relationships to employees and their families.
26	Identify programs in the community and within local schools to involve working parents, especially fathers, in children's activities.
27	Implement zero tolerance drug and alcohol policies and testing regimes for the Project workforce.
28	Encourage and support organisations to identify and address gaps in mental health, family support and domestic violence services in Gunnedah and surrounding areas.
Social Order and Community Safety	
29	Participate in the Gunnedah Crime Prevention Committee and become a Partner in the Gunnedah Liquor Accord.

Figure 53: Proposed Social Mitigation and Management Measures

Regional Economic and Socio-Economic Impacts

The economic assessment, using input-output analysis, indicates that the project would provide very significant socio-economic direct and indirect benefits for the locality, region and State, including:

For the local economy:

- 908 direct and indirect jobs;
- \$902 million in annual business turnover;
- \$493 million in annual value added to the gross local product; and
- \$80 million in annual household income.

For the regional economy:

- 1,015 jobs;
- \$913 million in annual business turnover;
- \$507 million in annual value added to the gross regional product; and
- \$91 million in annual household income.

For the State economy:

- 3,260 jobs;
- \$1,554 million in annual business turnover;
- \$802 million in annual value added to the gross regional product; and
- \$276 million in annual household income.

As a comparison, the direct and indirect benefits to the regional economy associated with the continued use of the project site for agriculture²⁹ include:

- 41 jobs;
- \$5 million in annual business turnover;
- \$3 million in annual value added to the gross regional product; and
- \$1 million in annual household income.

Benefit Cost Analysis

Input-output analyses are recognised as being rather simplistic as they do not include consideration of externalities (ie. consequential benefits and costs) associated with an activity or project. The intention of the input-output analysis is merely to estimate the economic stimulus of a project. To assess the net economic benefits of the project, the economic assessment includes a Benefit Cost Analysis, which seeks to identify and weigh up all of the project's benefits and costs based on its full range of environmental, social and economic impacts and benefits.

The costs and benefits used in the assessment are illustrated in the following table.

Table 23: Benefits and Costs of the Project

	Potential Costs	Potential Benefits
Production	<ul style="list-style-type: none"> • Opportunity costs of capital • Opportunity cost of land • Capital costs of development including acquisition costs for impacted properties and offsets • Operating costs of mine including mitigation measures • Rehabilitation and decommissioning costs at end of the project life 	<ul style="list-style-type: none"> • Value of coal production • Residual value of capital and land at end of project life
Potential externalities	<ul style="list-style-type: none"> • Greenhouse gas impacts • Agricultural production • Noise impacts • Blasting impacts • Air quality impacts • Surface water impacts • Groundwater impacts • Ecology impacts 	<ul style="list-style-type: none"> • Any non-market benefits of employment

²⁹ Includes the agricultural production lost from the project site and on-site and off-site offset areas, as originally proposed in the EIS. As outlined below, Shenhua has since removed key agricultural land from the on-site offset area.

Potential Costs	Potential Benefits
<ul style="list-style-type: none"> • Road transport impacts • Aboriginal heritage impacts • Non-Aboriginal heritage impacts • Visual impacts 	

The assessment calculates that the project would have a net benefit to society of about \$3 billion, with a minimum of \$1.3 billion of these net benefits accruing to Australia. Taxes and royalties over the project life would amount to some \$745 million in company tax and \$565 million in royalties (present value).

The Department acknowledges that Benefit Cost Analyses are also commonly criticised, with reasonable people differing on the value that should be placed on various costs and benefits, particularly the externalities. Nonetheless, based on the BCA undertaken for the project (and similar BCAs undertaken for other coal mines in the region and elsewhere in NSW), the Department is satisfied that the project's benefits to society (especially to the State and region) would significantly outweigh its costs, including externalities. The Department also acknowledges that there is a demonstrable need for the project in terms of meeting society's basic energy needs, as discussed in Section 3.1.

Agricultural Impacts

As outlined in the input-output analysis above, the gross economic benefits of the project far outweigh the economic benefits associated with the continued use of the project lands (including the offset areas) for agriculture. However, the Department recognises the importance of the agricultural industry and prime agricultural land to society, and that any impacts should be avoided where possible and otherwise minimised to the greatest extent practicable.

To this end, Shenhua has designed the project to avoid impacts on the highly valued black soil plains, notwithstanding that a large portion of the EL and its potentially economic coal reserves lie under the plains³⁰. By restricting disturbance to the lower quality ridge country around Mt Watermark, the project is able to avoid considerable impacts to agricultural land with this key avoidance measure.

Other avoidance and mitigation measures that Shenhua has incorporated into the project include:

- minimising disturbance of biophysical strategic agricultural land (BSAL) land as far as practicable in the disturbance area and the biodiversity offset areas;
- maintaining the agricultural productivity of land that it acquires outside the disturbance and offset areas;
- re-establishing at least 1,000 hectares of Class III rural land capability land within the rehabilitation area; and
- implementing a range of other measures to avoid and/or mitigate the project's direct and indirect environmental impacts on surrounding land users.

Residual environmental impacts (eg. water, noise and dust impacts) on agricultural land users are addressed in other sections of this report.

With regard to residual impacts on agricultural resources themselves, the project would impact agricultural land resources and associated production through the project disturbance footprint, the on-site and off-site biodiversity offset areas and the use of water that could otherwise be used for agricultural production.

The project disturbance area (including a nominal 100 metre buffer) would affect about 5,630 hectares of land at various stages over the project life. This area comprises (in approximate descending order of potential production value):

- beef grazing;
- sheep grazing;
- wheat;
- barley;
- canola; and
- sorghum.

³⁰ Special condition 48 of the EL restricts Shenhua from mining on the black soil plains.
NSW Government
Planning & Environment

The on-site and off-site offset areas (as revised to avoid higher value agricultural land) comprise a further 8,800 hectares of land (excluding the rehabilitation area offset). Much of these areas are timbered, though do support some agricultural production, including beef and sheep grazing and some cropping of wheat, barley and canola.

The project disturbance area and offset areas (ie. about 14,400 hectares altogether) constitute approximately 0.02% of the available agricultural land in NSW.

The gross value of agricultural production from land resources impacted by the project (including the disturbance area, offset areas and water that could be otherwise used for agricultural production) is approximately \$4.5 million per annum, if superior management and/or capital investment was implemented. This represents about 1.3% of the total agricultural production across the Gunnedah and Liverpool Plains LGAs, 0.04% of NSW agricultural production, and 0.01% of Australia's agricultural production.

The Department accepts that the partial/temporary (or even full) loss of this production is negligible relative to total regional, State and national agricultural production. Measures to protect and rehabilitate higher value agricultural land are discussed in more detail below.

Biophysical Strategic Agricultural Land

In terms of BSAL³¹, the EIS assessed that the Ponderosa and Conadilly soil landscape units on site constitute BSAL. Within the project disturbance area (plus a nominal 100 metre buffer), there is approximately 236 hectares of these soil landscapes, including:

- 62 hectares of Conadilly soil landscape; and
- 174 hectares of Ponderosa soil landscape.

Of this area, 96.1 hectares of the Ponderosa soil landscape is located within the proposed mining areas and would be destroyed by the project. The remaining areas are outside the key disturbance areas, and would not be subject to wholesale removal of the soil profile. Much of the 96 hectares of BSAL is relatively fragmented, occurring mainly in a thin strip in the Eastern Mining Area (see Figure 54).

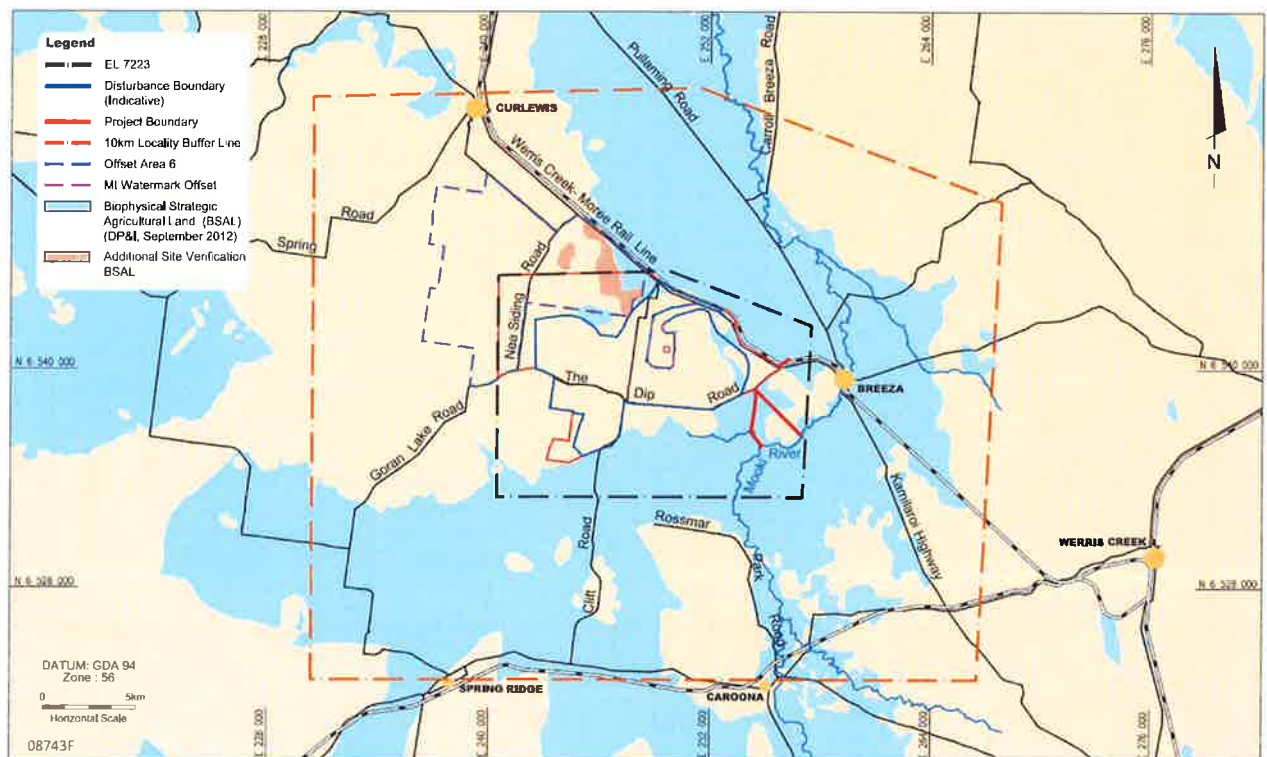


Figure 54: Mapped Biophysical Strategic Agricultural Land

³¹ Land with high quality soil and water resources capable of sustaining high levels of agricultural productivity.
NSW Government
Planning & Environment

The on-site offset area (ie. Offset Area 6) as originally proposed contained a further 696 hectares of BSAL (see Figure 54), which drew criticism in a number of submissions, including from the OAS&FS. To address this issue, Shenhua has revised its biodiversity offset strategy to remove the BSAL (and non-Shenhua-owned land) from Offset Area 6.

Notwithstanding these changes, the OAS&FS continued to raise two key residual issues regarding BSAL following the Response to Submissions, namely:

1. that there is the potential for more BSAL within the project disturbance area than the 96 hectares identified by Shenhua; and
2. that the Additional Off-site Offset Area contains (draft) mapped BSAL.

With regard to BSAL within the project disturbance area, the Gateway Panel and OAS&FS were critical that Shenhua had not verified the potential BSAL in accordance with the *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (the Interim Protocol)³². Consequently, the authorities questioned the assessment methodology and whether some additional soil landscape units (particularly the Booloocooroo soils) could also constitute BSAL. If these units were included, OAS&FS noted in its submission on the RTS that the project disturbance area could potentially contain up to about 960 hectares of BSAL. OAS&FS recommended that Shenhua undertake additional soil sampling (in accordance with the guidelines in the new Interim Protocol) to further investigate these issues.

To address this issue, Shenhua provided additional information on the site verification undertaken, and the Department, OAS&FS and Shenhua met and carried out a site inspection in March 2014. Following this site inspection and additional information, OAS&FS confirmed that it was satisfied that the Booloocooroo soil type on site is unlikely to be of moderately-high or high fertility, that it contains slopes and bumps that adversely affect its strategic value, and that it is consequently likely to be of lower land capability (ie. Class III or IV) and does not constitute BSAL.

OAS&FS subsequently confirmed that it accepts that there is 236 hectares of BSAL within the project disturbance area (plus the 100 metre buffer), and that it accepts the methods used to determine BSAL on site.

The Department also accepts that Shenhua used the available guidance material that was available at the time in undertaking its soil assessments, and does not believe that it is warranted to require Shenhua to undertake additional detailed soil sampling simply to satisfy the current extant guideline.

It is noted that the Gateway Panel also criticised the fact that Shenhua's BSAL verification had only been applied to the project disturbance area, and not to the wider project boundary. However, for the purposes of this assessment, the Department and OAS&FS are satisfied that the BSAL verification area is appropriate, as the project does not require a gateway certificate (see Section 4.7), and the disturbance area for the project is well defined (unlike a typical gateway certificate application which occurs early in the assessment process before the mine plan and disturbance area is established).

The Department is satisfied that Shenhua has designed the project to avoid impacts on BSAL to the greatest extent practicable, and that the BSAL located within the project disturbance area is generally fragmented and isolated, and not conducive to large scale, high value agricultural pursuits. In this regard, the project has been considerably restricted to avoid disturbance of the high value black soil plains within the EL, and the revised biodiversity offset strategy minimises the locking up of high value agricultural land.

The residual BSAL located within the mining area (ie. the 96 hectares) represents only 0.0064% of the mapped BSAL in the New England North West region (ie. 1.5 million hectares), and only 0.0034% of the mapped BSAL in NSW (ie. 2.8 million hectares). Even if it is assumed that all BSAL in the wider project disturbance area is lost (ie. 236 hectares), the area of BSAL affected is still negligible in relative terms, representing 0.02% of mapped BSAL in the New England North West, and 0.01% of mapped BSAL in NSW.

³² It is noted that the Interim Protocol was published in April 2013, after the submission and exhibition of the EIS for the project (ie. February 2013).

With regard to BSAL in the Additional Off-site Offset Area, as outlined in Section 6.4 this offset area comprises two properties about 50 kilometres west of the project boundary near Tambar Springs, with a total area of 4,095 hectares.

The original New England North West SRLUP did not identify or map any BSAL on these properties, however the State-wide BSAL mapping released in October 2013 (after Shenhua's purchase of the properties) indicated the potential presence of approximately 600 hectares of BSAL on these properties (see Figure 55).

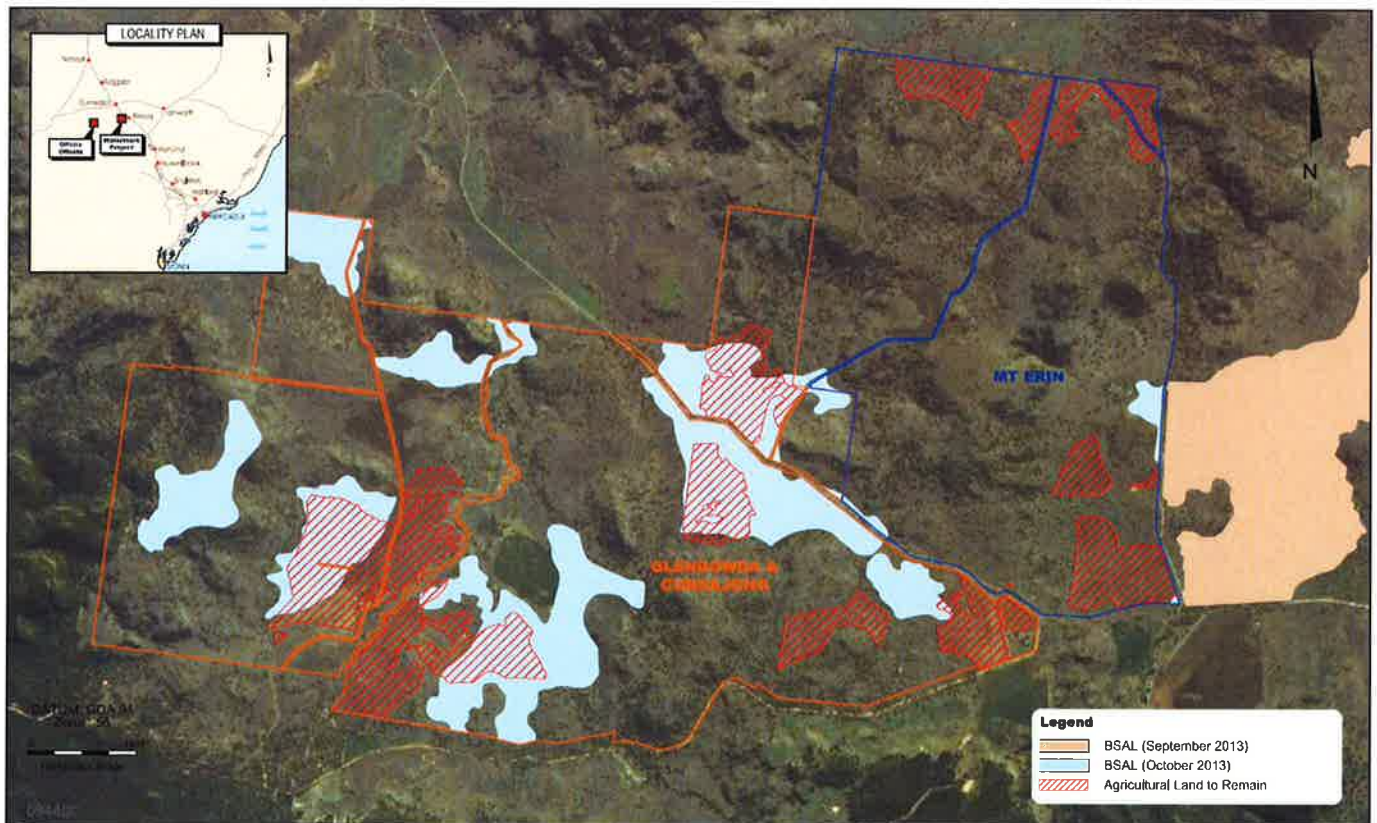


Figure 55: Additional Off-site Biodiversity Offset Area – BSAL

In its RTS, Shenhua noted that the mapped BSAL on the properties does not align with the current and historical cultivation areas on the land, and does not meet the BSAL criteria in the SRLUP as the land capability mapping of the properties indicates that the best land capability present is Class IV and V, whereas the SRLUP intimates a minimum of Class III land capability to be classified as BSAL.

The Gateway Panel criticised Shenhua's analysis, stating that the land capability mapping is broad and not a substitute for detailed site verification. The Department notes that under the provisions of the Mining SEPP, the gateway certificate process (and site verification process) does not extend to areas outside the mining area of a mining lease (such as an off-site biodiversity offset area).

Nonetheless, to mitigate the potential for land use conflict and to preserve higher-value agricultural land, Shenhua has removed any land currently or historically cropped (as evidenced by a lack of native vegetation) from the Additional Off-site Offset Area (comprising about 514 hectares), which would remain in agricultural production. As noted above, these cropping areas are similar, but not identical, to the draft mapped BSAL areas (see Figure 55).

The Department accepts that Shenhua's proposal to exclude current and historically cultivated land in the offset area is logical and appropriate, particularly given that the mapped BSAL is based on regional scale mapping only.

The Department also accepts the inclusion of some mapped BSAL in the Additional Off-site Biodiversity Offset Area, and is satisfied that biodiversity conservation is the highest and best use of this land, particularly given that many threatened species, including the endangered White Box

Woodland, are typically located on BSAL. Indeed, widespread historical clearing of good quality 'BSAL' for agriculture is one of the key reasons why these species/populations/communities are threatened.

The Department acknowledges that some stakeholders and sections of the community will be highly critical of the removal of any BSAL from agricultural production. However, the Department recognises that the stated purpose of the SRLUP's is to balance the protection of agricultural land and the sustainable management of natural resources with the strong economic growth of regional NSW. The Department is satisfied that such a balance has been achieved for this project.

The Department also acknowledges that Shenhua has committed to the re-establishment of 100 hectares of BSAL in the rehabilitation for the project, as outlined further below.

Broader Land Capability and Rehabilitation

In terms of broad land capability within the project disturbance area, Shenhua is proposing to rehabilitate the site such that there would be no net loss of higher value land capability (ie. Class I to III³³). The pre and post land capability is shown in Table 24, and the post mining land capability is shown on Figure 56.

Table 24: Pre and Post-Mining Land Capability

Land Class	Pre-mining		Post-mining	
	ha	%	ha	%
Class II	351.3	6.2	351.3	6.2
Class III	2,948.4	52.4	3,233.0	57.4
Class IV	80.5	1.4	22.7	0.4
Class V	1,751.0	31.1	1,649.5	29.3
Class VI	426.8	7.6	273.0	4.9
Class VII	55.4	1.0	9.7	0.2
Class VIII	0.0	0.0	86.8	1.5
Disturbed Land	16.6	0.3	4.0	0.1
Total	5,630.0	100	5,630.0	100

It is noted that the Class II and III capability land is largely outside the key disturbance areas (ie. the mining areas), as indicated on Figure 54.

Following rehabilitation, 1,000 ha of Class III land is proposed to be returned to agriculture, with the balance forming part of the biodiversity offset strategy through restoration of native woodland and grassland (see Section 6.4). Approximately 100 hectares is proposed to be reinstated as verifiable BSAL to compensate for the BSAL impacted by the project.

The specific area of reinstated BSAL is not identified, although Shenhua notes that it would be located 'on the most favourable topography and proximity to farm tracks and access roads', and would avoid potential groundwater seepage sites.

The OAS&FS and the Gateway Panel initially expressed doubts about the ability to rehabilitate to the proposed land capability, particularly because:

- less soil may be available for rehabilitation as the quantities are not accurately assessed;
- evidence provided of similar rehabilitation success is not on 'like-for-like' soils; and
- no evidence has been provided to support claims that BSAL can be successfully rehabilitated.

Some submitters also claimed that at least 1.5 metres of soil depth is required to achieve Class III land capability. However, Shenhua noted that its proposed soil depth of 0.3 metres topsoil above 0.5 metres subsoil was supported by the OEH's *Land and Soil Capability Assessment Scheme*, which suggests that soils of between 0.75 to 1.0 metres can be Class III land taking into consideration improved technology and farming practices. OAS&FS does not refute this.

The Department notes that OAS&FS's concerns about available soil volumes were based on conservative assumptions, whilst it also recognises that Shenhua's estimates are also based on a number of assumptions. In an ideal situation, full soil depth data would be available across the entire

³³ There is no Class I land in the project disturbance area, and Class II land is generally located outside the proposed mining areas.

site in all soil units, however the Department accepts that this would be a very expensive and time consuming exercise, with questionable added value for the purposes of development assessment. Following the March 2014 meeting, OAS&FS accepted that there is reasonable probability that the soil volumes required would be able to be sourced.

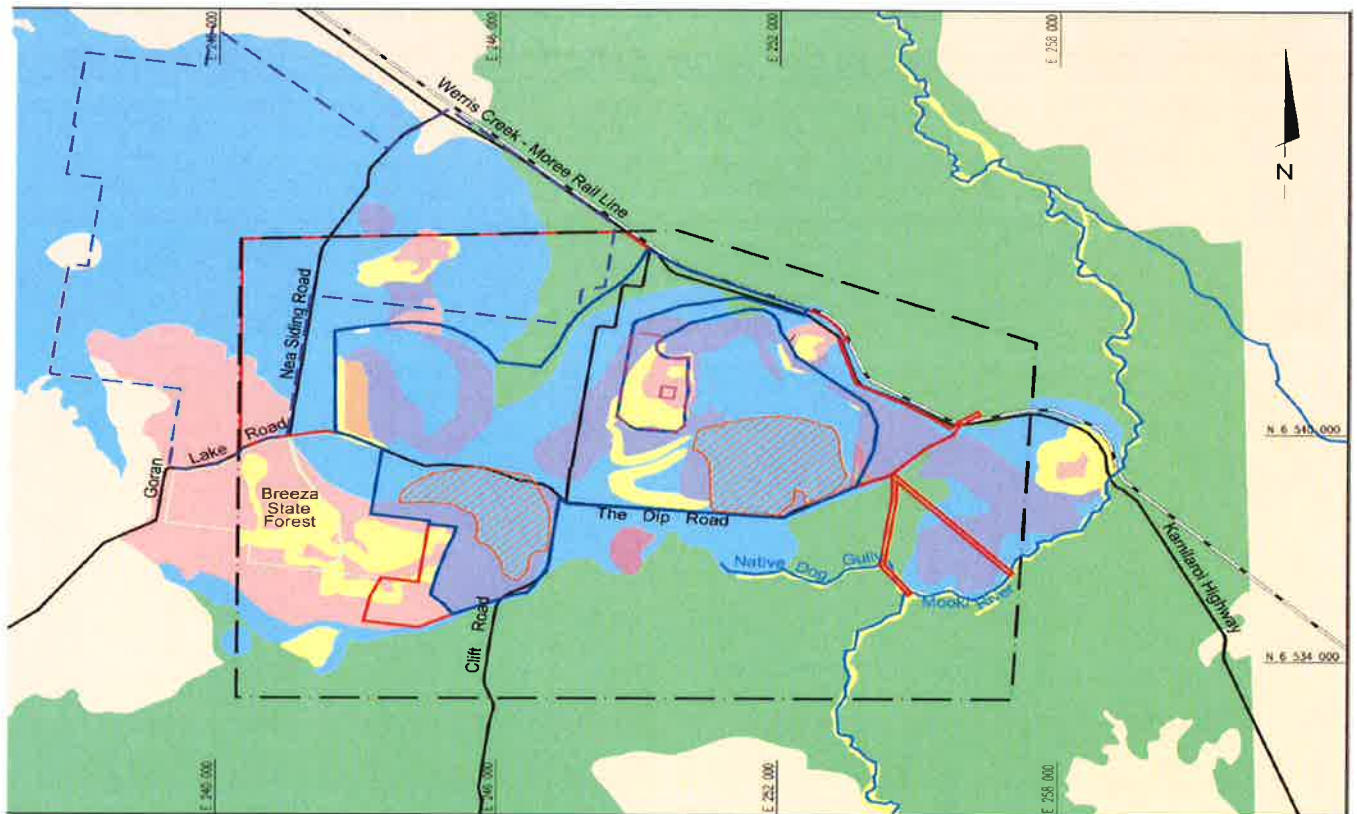


Figure 56: Post Mining Land Capability

Similarly, a lack of direct like-for-like evidence of rehabilitation success in similar soils is not considered to be a necessary or reasonable pre-requisite for determining whether rehabilitation would be successful.

For the purposes of its assessment, the Department is satisfied that Shenhua has made reasonable soil availability estimates. Whilst acknowledging the risks to establishing higher quality agricultural land, the Department believes that Shenhua should be able to achieve the proposed rehabilitation outcomes, subject to detailed rehabilitation planning and ongoing assessment, monitoring and management in close consultation with relevant authorities.

To ensure this occurs, the Department has recommended conditions that are generally consistent with OAS&FS's recommended conditions, including requiring Shenhua to:

- achieve a number of rehabilitation objectives, including reinstatement of at least 1,000 hectares of Class III land for agricultural purposes, and 100 hectares of BSAL (with total land capability similar to that identified in Table 24 above); and
- prepare and implement a comprehensive Rehabilitation Management Plan in consultation with DPI, including requirements on Shenhua to (amongst other things):
 - achieve detailed performance and completion criteria for agricultural land;
 - maintain and periodically review a detailed soil balance;
 - prepare and implement a comprehensive plan for reinstating Class I-III agricultural land and BSAL;
 - a protocol for periodic trials to demonstrate that the stated land capability is being achieved; and
 - a protocol for verification of the BSAL rehabilitation.

OAS&FS also recommended that all Class III rehabilitated land be returned to agriculture at the end of the project. The Department does not support this recommendation, as it conflicts with the desired

biodiversity outcomes for the rehabilitation area. In this regard, the additional Class III land in the rehabilitation area would be important for facilitating the revegetation of good quality Box Gum Woodland on the land (which relies on more fertile soils), which in turn would be important for Koala habitat.

In addition to the above recommended conditions, the Department has recommended conditions requiring Shenhua to use its best endeavours to maintain or enhance the agricultural productivity of all of its landholdings outside the project disturbance area and biodiversity offset areas (eg. land acquired within the acquisition zone and the agricultural land within the Additional Biodiversity Offset Area).

The Department also acknowledges Shenhua's commitment to the preparation of a Land Management Plan to facilitate the management of existing agricultural land under its ownership.

7. RECOMMENDED CONDITIONS

The Department has prepared recommended conditions of approval for the project (see Appendix A). These conditions are required to:

- prevent, minimise, and/or offset adverse impacts of the project;
- ensure standards and performance measures for acceptable environmental performance;
- ensure regular monitoring and reporting; and
- provide for the ongoing environmental management of the project.

The Department believes the conditions reflect current best practice for the regulation of coal mines in NSW.

8. CONCLUSION

The Department has assessed the development application, EIS, submissions on the project and Shenhua's responses to these submissions, in accordance with the objects of the EP&A Act and the principles of ecologically sustainable development.

Based on this assessment, the Department is satisfied that Shenhua has designed the project in a manner that achieves a reasonable balance between maximising the recovery of a recognised coal resource of State significance and minimising the potential impacts on surrounding land users and the environment as far as is practicable, particularly through:


- avoiding disturbance of the black soil plains;
- avoiding disturbance of the Upper Namoi alluvial aquifers;
- avoiding disturbance of Mt Watermark and Breeza State Forest;
- minimising final voids, with 2 of the 3 mining pits backfilled and the residual void located distant from the black soils and alluvial soils; and
- reducing impacts on biodiversity, Aboriginal sites and agricultural land, and reducing noise and dust impacts.

The Department has recommended a comprehensive and precautionary suite of conditions to ensure that the project complies with the relevant criteria and standards, and to ensure that the predicted residual impacts are effectively minimised, mitigated and/or at least compensated for. The Department believes that the conditions reflect current best practice for the regulation of mining projects in NSW.

The Department also recognises that the project would provide major economic and social benefits for the New England North West region, in particular Gunnedah and Liverpool Plains local government areas, including:


- a direct capital investment in the mine of \$850 million;
- direct employment for up to 600 workers, and generation of over 1,000 jobs in the region;
- generating almost \$1 billion in annual business turnover in the region;
- funding for local infrastructure and community service projects; and
- direct revenue for the State Government from coal resource royalties.

The Department has carefully weighed the impacts of the project against the significance of the resource and the socio-economic benefits. On balance, the Department believes that the project's benefits outweigh its residual costs, and that it is in the public interest and should be approved, subject to stringent conditions

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