



**Planning &
Environment**

**STATE SIGNIFICANT
DEVELOPMENT ASSESSMENT
Watermark Coal Project
(SSD-4975)**



Secretary's
Environmental Assessment Report
Section 89E of the
Environmental Planning and Assessment Act 1979
May 2014

Cover Photos: Liverpool Plains and coal core samples.

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EXECUTIVE SUMMARY

Shenhua Watermark Coal Pty Limited (Shenhua) is proposing to develop the Watermark Coal Project, a new open cut coal mine located 3 kilometres west of the village of Breeza and 25 kilometres south-east of Gunnedah on the Liverpool Plains.

In October 2008, the Minister for Mineral Resources granted Shenhua an exploration licence (EL 7223) over the Mt Watermark area of the Liverpool Plains. The Watermark EL area is immediately to the north of BHP Billiton's Caroonna exploration licence area (EL 6505), which was granted by the Minister for Mineral Resources in April 2006.

The granting of the Watermark and Caroonna ELs has generated very strong community concern, particularly about the potential land use conflicts between mining and farming on the Liverpool Plains and the potential impacts on groundwater resources. The rich 'black soils' and high quality water resources of the Plains make the area one of NSW's most fertile and productive agricultural regions.

In September 2011, the Minister for Resources and Energy announced tough new conditions on the renewal of the Watermark EL. These included a prohibition from open cut mining or longwall mining on or under the areas of the alluvial flood plain and the black soils of the Liverpool Plains. Similar conditions have been placed on BHP's Caroonna EL.

Shenhua has since developed the Watermark Coal project in accordance with these conditions, and in February 2013, lodged its Environmental Impact Statement (EIS) for the project¹.

The project involves extracting coal via open cut methods from 3 separate pits in the area surrounding Mt Watermark, on higher ground above the Liverpool Plains and the black soils. This area has historically supported grazing and cropping land uses.

Coal would be extracted at up to 10 million tonnes of coal a year over 30 years, recovering a coal reserve of about 268 million tonnes of run-of-mine coal. Extracted coal would be processed (washed) on site before being loaded onto trains and railed to the Port of Newcastle for export. Approximately 159 million tonnes of product coal would be produced, including 133 million tonnes of metallurgical coal and 26 million tonnes of thermal coal.

The project involves the construction of a range of necessary infrastructure to support the new mine, including a coal handling and preparation plant (CHPP), administration and workshop facilities, rail spur and rail loop, railway overpass and deviation of the Kamilaroi Highway, mine access road, water management infrastructure and power and communications infrastructure.

The project has a capital investment value of \$850 million, and would generate about 600 jobs during the 18 month construction period and 600 jobs during operations.

In total, the project would disturb some 4,084 hectares of land. Of this, about 789 hectares comprises listed endangered ecological communities (EECs), and 96 hectares within the mining areas comprises Biophysical Strategic Agricultural Land (BSAL) as identified under the *New England North West Strategic Regional Land Use Plan* (SRLUP).

The project is classified as a State Significant Development (SSD) under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), and consequently requires approval from the Minister for Planning. However, under the Minister's delegations, the development application must be determined by the Planning and Assessment Commission (PAC) due to the number of objections received. Prior to this determination, the Minister has directed that the PAC undertake a detailed review of the merits of the project, with the review to include public hearings.

The NSW Department of Planning and Environment (the Department) exhibited the EIS of the project for 2 months from 28 February 2013 until 26 April 2013, and received some 133 submissions: including 12 from government authorities, 14 from special interest groups and 107 from the general public. The Department also received correspondence from the Commonwealth Department of the

¹ BHP Billiton is yet to lodge its Environmental Impact Statement for the Caroonna project.

Environment (DOE)², as part of its parallel assessment of the project under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, and also received advice from the newly established NSW Mining and Petroleum Gateway Panel.

None of the government authorities object to the project, although most raised concerns and/or made comments and recommendations. The vast majority of the special interest group and general public submissions objected to or raised concerns about the project.

The key issues raised in the submissions and/or identified in the Department's assessment of the project include:

- *water resources* – particularly impacts to the significant groundwater aquifer resource of the Upper Namoi catchment;
- *noise and dust* – including health and amenity impacts and impacts on agricultural land uses in the area;
- *biodiversity* – particularly impacts on the Box Gum Woodland endangered ecological community (EEC) and the Koala;
- *Aboriginal heritage*;
- *visual amenity*; and
- *socio-economics* – particularly potential impacts on surrounding agricultural resources on the site and in the surrounding area.

Shenhua has prepared detailed responses to the issues raised in submissions, in consultation with relevant authorities, and has made some amendments to the project to further avoid and/or mitigate the identified impacts, including:

- using an 'optimised' mining fleet to reduce noise and dust emissions; and
- amending the biodiversity offset strategy to avoid higher value agricultural land and increase ecological benefits.

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. As part of this assessment, the Department has commissioned independent experts to review the project's potential groundwater and surface water impacts. The assessment also benefits from the comprehensive Namoi Catchment Water Study, commissioned by the NSW Government in 2010 to investigate the potential cumulative impacts of mining and coal seam gas projects in the region.

Based on this assessment, the Department is satisfied that the project is unlikely to have any significant impact on the water resources of the Namoi catchment, and can be undertaken in a manner that is consistent with the water sharing principles established under the *Water Management Act 2000*. In this regard, groundwater assessment indicates that the project's 'water take' from the valuable Upper Namoi alluvial aquifer would peak at 103 megalitres a year, which is less than the usage from a single licensed agricultural bore in the region, which averages 142 megalitres a year. A key reason for this relatively minor impact is the restriction of mining to the higher ground away from the black soil plains.

The Department has recommended a broad range of conditions to ensure that water resources are appropriately managed, including requirements on Shenhua to: obtain water licences prior to mining; to provide compensatory water supplies to surrounding water users in the unlikely event that their water supplies are affected by the project; to not discharge any mine (saline) water from the site under any circumstances; to appropriately manage other run-off to minimise increases in salt loads in local creeks; to meet a number of water performance objectives; and to prepare and implement a comprehensive water management plan.

With regard to noise and dust, the assessment indicates that the project would result in significant residual impacts on 6 privately-owned residences (on 5 properties), with a further 6 privately-owned properties predicted to be significantly affected over more than 25% of the property area. A further 10 privately-owned residences are predicted to be marginally to moderately affected. Whilst this number

² Including advice from the Commonwealth's Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC).
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of affected properties is not insignificant, it is similar to contemporary mining projects in the Gunnedah and Hunter coalfields, particularly for greenfield projects (ie. new mines).

The Department has recommended conditions requiring Shenhua to acquire the significantly affected properties and to undertake additional noise and dust mitigation measures (eg. insulation, air conditioning) on all affected residences, at the request of the landowner. The recommended conditions also require Shenhua to maintain the agricultural productivity of any properties that it does acquire, and to prepare and implement detailed noise and air quality management plans, including provision for real-time monitoring and active (or adaptive) management of day-to-day operations to minimise emissions.

With regard to biodiversity, the Department and the NSW Office of Environment & Heritage (OEH) are satisfied that Shenhua's revised biodiversity offset strategy would adequately compensate for the impacts of the project on EEC's and threatened species of the locality, including the Koala. In this regard, the offset strategy would ultimately provide for the long term (in perpetuity) conservation of almost 11,200 hectares of land (including almost 8,000 hectares of EEC), to compensate for the 789 hectares of EEC and 148 hectares of other woodland that would be cleared for the project.

The Commonwealth Department of the Environment (DOE) is also satisfied that the offset strategy would adequately compensate for the impacts on Commonwealth-listed threatened species, subject to some additional offsets being provided for the 'Grey Box' EEC.

The Department has recommended conditions requiring Shenhua to: implement the biodiversity offset strategy; to supplement the strategy to meet DOE's Grey Box EEC offset requirements; to establish over 8,000 hectares of Koala habitat within the offset areas (to compensate for the 847 hectares of Koala habitat that would be affected by the project); to provide for the conservation of the offsets in perpetuity; and to prepare and implement comprehensive biodiversity and Koala management plans.

The project would affect 29 Aboriginal sites in the project disturbance area, including 2 sites of high archaeological significance (ie. an artefact scatter and an axe grinding groove site) which Shenhua proposes to salvage and/or relocate in consultation with local Aboriginal groups. A number of other Aboriginal sites have been identified outside the project disturbance area, including 6 sites of high significance. Shenhua proposes to protect these sites, and establish 2 cultural heritage conservation areas (totalling over 200 hectares) to conserve sites of high significance. The Department (including OEH) is satisfied with this approach, and the Department has recommended conditions requiring Shenhua to establish the conservation areas and to prepare and implement a detailed heritage management plan in consultation with the local Aboriginal groups.

The project would have some residual visual impacts on surrounding residents and commuters on the Kamilaroi Highway and other local roads. These impacts would be mitigated to some degree through the avoidance of disturbance of Mt Watermark, backfilling 2 of the 3 mining areas, and prompt rehabilitation of overburden emplacement areas. The Department has also recommended conditions requiring Shenhua to provide additional visual impact mitigation measures to landowners with direct views to the site, and to undertake landscaping along local roads.

With regard to socio-economic impacts, the Department's assessment indicates that the project is unlikely to have any significant impact on agricultural operations and agricultural productivity in the area surrounding the mine, or have any significant adverse impacts on community infrastructure and services in the wider area. Indeed, the project is predicted to generate very significant benefits to the regional economy, including over 1,000 jobs and almost \$1 billion in annual business turnover. This far exceeds the regional benefits associated with continued use of the site for agricultural land use (ie. about 40 jobs and \$5 million in annual business turnover).

The project would affect 96 hectares of BSAL, however the Department is satisfied that this area represents a negligible (and fragmented) portion of the 1.5 million hectares of mapped BSAL in the region, and acknowledges that Shenhua has committed to re-establishing 100 hectares of BSAL (or equivalent) in the rehabilitation for the project.

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 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.

1. INTRODUCTION

1.1 Background

Shenhua Watermark Coal Pty Limited (Shenhua) is proposing to develop the Watermark Coal Project, a new open cut coal mine located 3 kilometres west of the village of Breeza and 25 kilometres south-east of Gunnedah on the Liverpool Plains of NSW (see Figure 1).

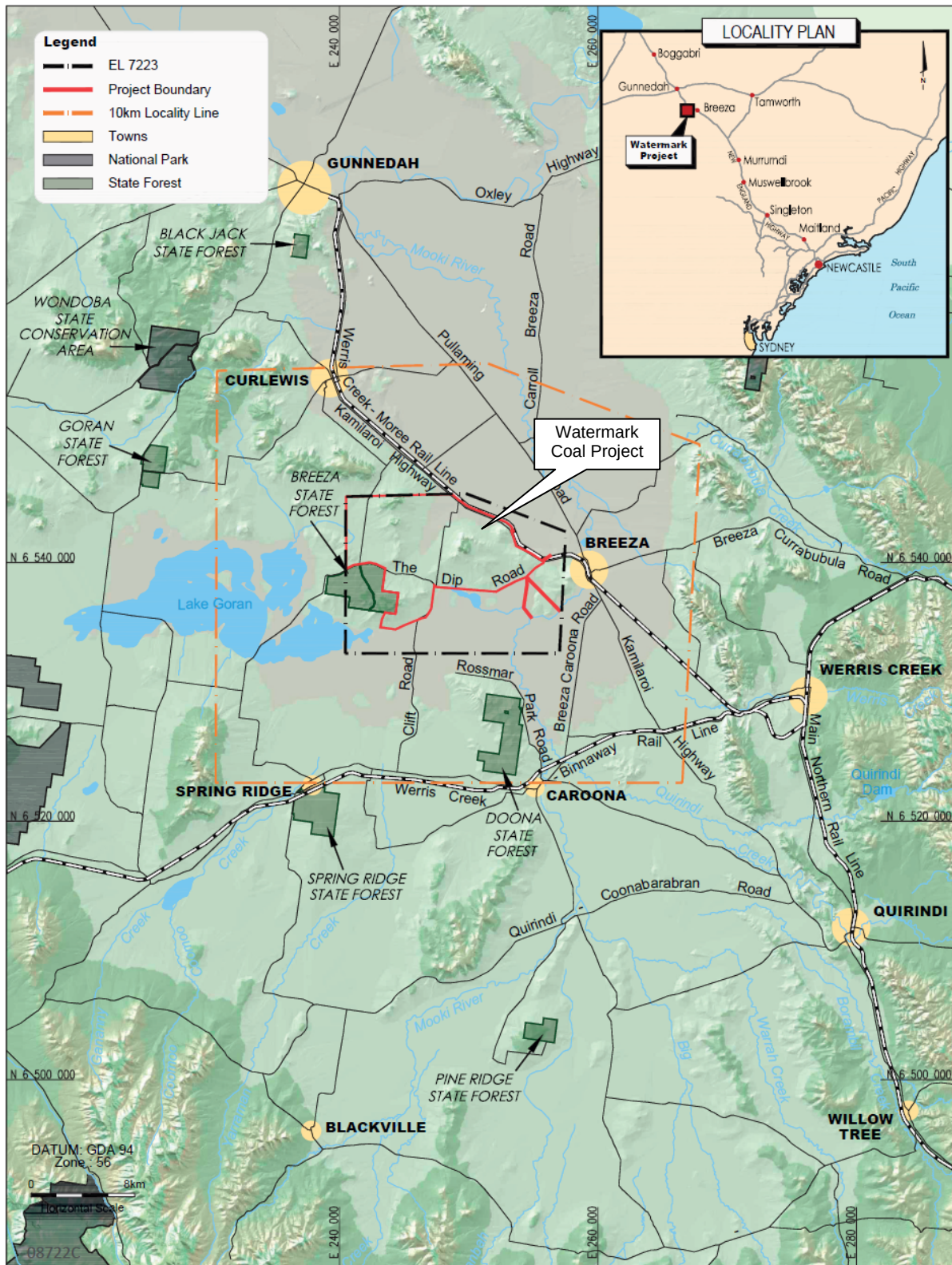


Figure 1: Location of the Watermark Coal Project

Shenhua is a wholly owned subsidiary of the Shenhua Group Corporation Limited (Shenhua Group), the world's largest coal supplier and one of the world's largest integrated energy companies with interests in power generation, railway and port infrastructure, shipping and downstream coal processing (coal to liquids and coal to chemicals). In 2011, Shenhua Group produced over 400 million tonnes of coal from 62 operating mines.

In October 2008, the Minister for Mineral Resources granted Shenhua an exploration licence (EL 7223) over the Mt Watermark area of the Liverpool Plains (see Figure 2). Shenhua paid a record price of \$300 million to secure the EL, which followed a public tender process.

The Watermark EL area is immediately to the north of BHP Billiton's Carroona exploration licence area (EL 6505) also on the Liverpool Plains, which was granted by the Minister for Mineral Resources in April 2006.

The granting of the Watermark and Carroona ELs has generated very strong community concern, particularly about the perceived land use conflicts between mining and farming on the Liverpool Plains and the potential impacts on groundwater resources. In summary, the farmers contend that the 'black soils' of the Plains, together with the dependable high quality water supply in the underlying alluvial aquifer, make the area one of Australia's most fertile and productive agricultural regions, and that this agricultural resource should not be destroyed for the sake of coal mining.

In September 2011, the Minister for Resources and Energy announced strict new conditions on the renewal of the Watermark EL. These included a prohibition from open cut mining or underground longwall mining on or under the areas of the alluvial floodplain and the black soil of the Liverpool Plains. Similar conditions have been placed on BHP's Carroona EL.

Shenhua has since developed the Watermark Coal project in accordance with these conditions, and in February 2013, lodged its Environmental Impact Statement (EIS) for the project³. As detailed in Section 2 below, the project involves extracting coal via open cut methods from 3 separate pits in the area surrounding Mt Watermark, within the 'red soils' of higher ground above the black soils of the Liverpool Plains.

The project would produce mainly (85%) metallurgical coal (semi-soft coking coal) which is used mainly in steel and other metal manufacture, as well as some (15%) thermal coal which is used in electricity generation.

1.2 Location and Setting

The project site is located within the Liverpool Plains, a vast area of grassland plains located in the North West Slopes region of NSW. The Plains cover a total land area of approximately 1.2 million hectares, bordered by the Nandewar Range to the north, the Great Dividing Range to the east, the Liverpool Ranges to the south, and the Warrumbungle Range to the west (see Figure 2).

The area is drained by the Namoi River and its tributaries, including the Mooki River which drains the project site (see Figure 3). These rivers flow generally in a northerly to north-westerly direction, with the Namoi flowing through Gunnedah and Narrabri before turning west to join the Darling River system. There are a number of depressions across the Plains which remain as lakes for long periods after heavy rains. One such ephemeral lake, Lake Goran, is located immediately to the west of the project site and EL (see Figure 1).

The Plains also comprise a number of localised hills and high points, which arise as islands out of the grassland plains. The project site is largely centred around one of these topographic high points, taking in the areas of Mt Watermark, Black Mountain, Smokey Point and Springhurst Hill (see Figure 4). Mt Watermark has an elevation of 512 metres AHD, whereas the surrounding plains areas have an elevation of around 270 metres AHD.

³ BHP Billiton is yet to lodge its Environmental Impact Statement for the Carroona project.
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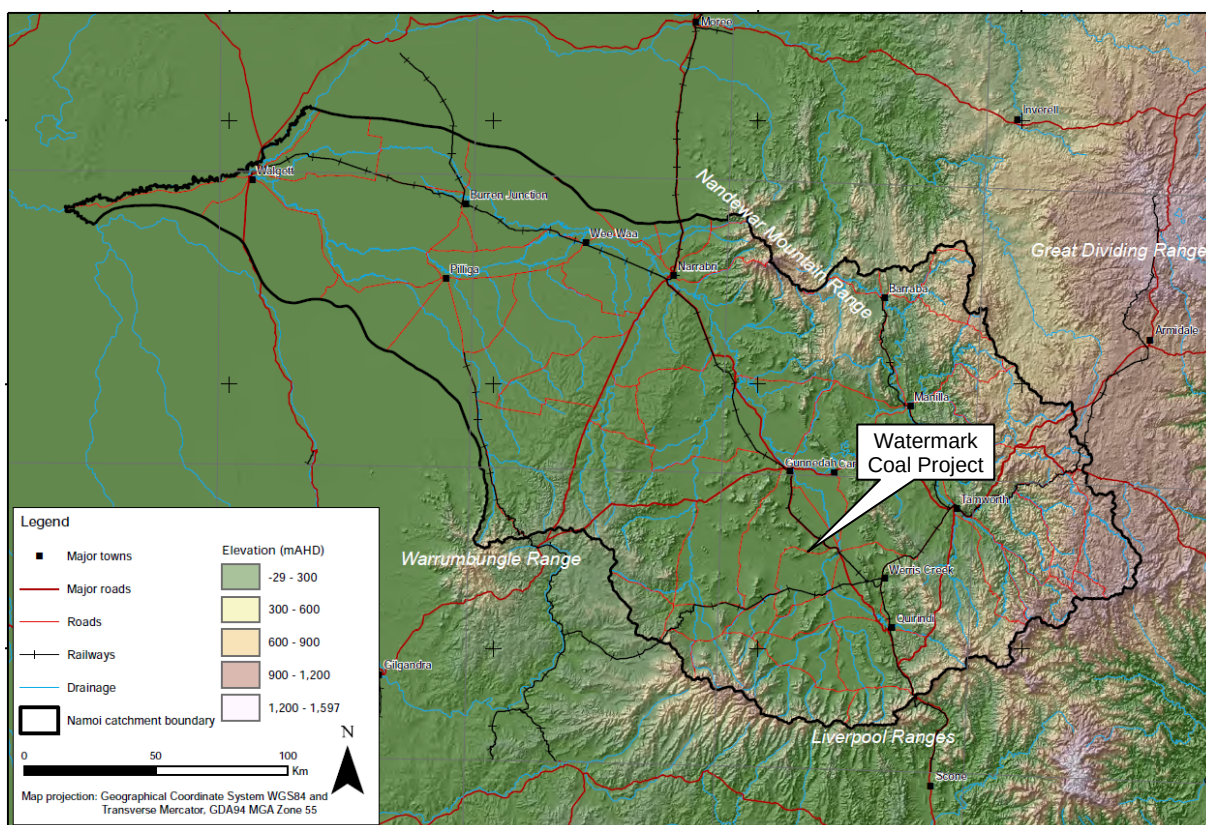


Figure 2: Regional Topography (Source: Namoi Water Study)

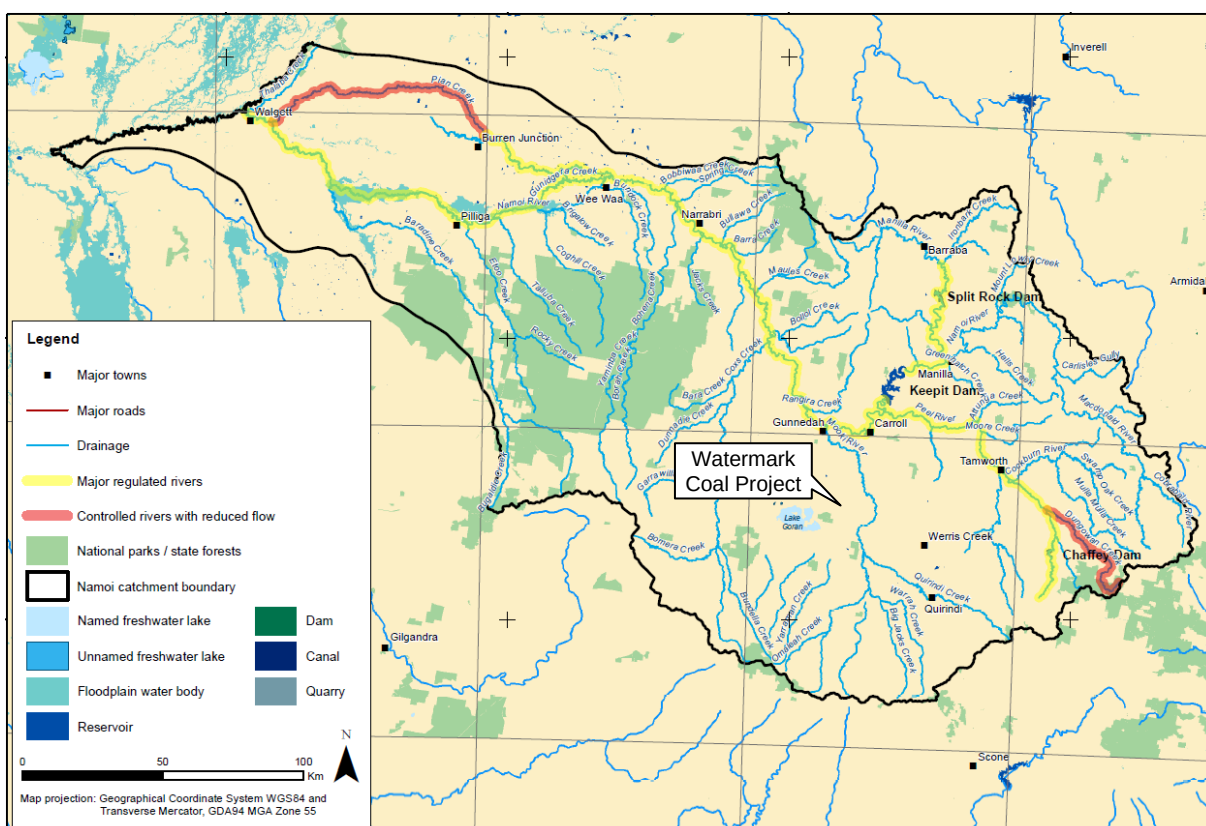


Figure 3: Namoi Catchment and Waterbodies (Source: Namoi Water Study)

The main urban centres in the Liverpool Plains include Gunnedah, Narrabri, Quirindi, Werris Creek and Tamworth. The closest urban settlement to the project site is the small village of Breeza, located on the Kamilaroi Highway approximately 3 kilometres east of the project site. The village has a population of approximately 63 and has only limited services and facilities, including a community hall, fire station, playground, Cenotaph, cemetery and grain silos. It does not have any commercial facilities, although the abandoned general store is still a landmark in the town.

The dominant land use on and surrounding the project site is agriculture, with cropping dominant on the heavily textured black soils of the floodplain and grazing more prevalent on the lightly textured red soils of the higher ground. Cropping includes a range of cereal grains such as wheat, sorghum and barley, along with cotton which is grown widely throughout the district. Land use in the surrounding area is shown on Figure 5, and land ownership is shown on Figure 6.

Breeza State Forest is located immediately to the south-west of the project site, and covers an area of approximately 1,364 hectares. The Forest is currently used for production of white cypress pine, white box and iron bark logs, with the pines last logged in the 1980s. The Forest is not proposed to be directly disturbed by the project.

Shenhua owns all of the land within the project disturbance area, and all land within the wider project boundary, except for a parcel of Crown land on Mt. Watermark.

There are no other mines currently operating in close proximity to the project site, although there are a number of coal mines in the region (as discussed in Section 3.1). Some historical coal mining occurred within the eastern portion of the project site between 1914 and 1916, although this was limited in scale.

BHP Billiton's Carroona EL is located directly to the south of the Watermark EL. Although BHP is yet to finalise its Environmental Impact Statement for the Carroona project, it is understood that the project would be an underground mining operation targeting coal from the ridge country surrounding Carroona and Spring Ridge.

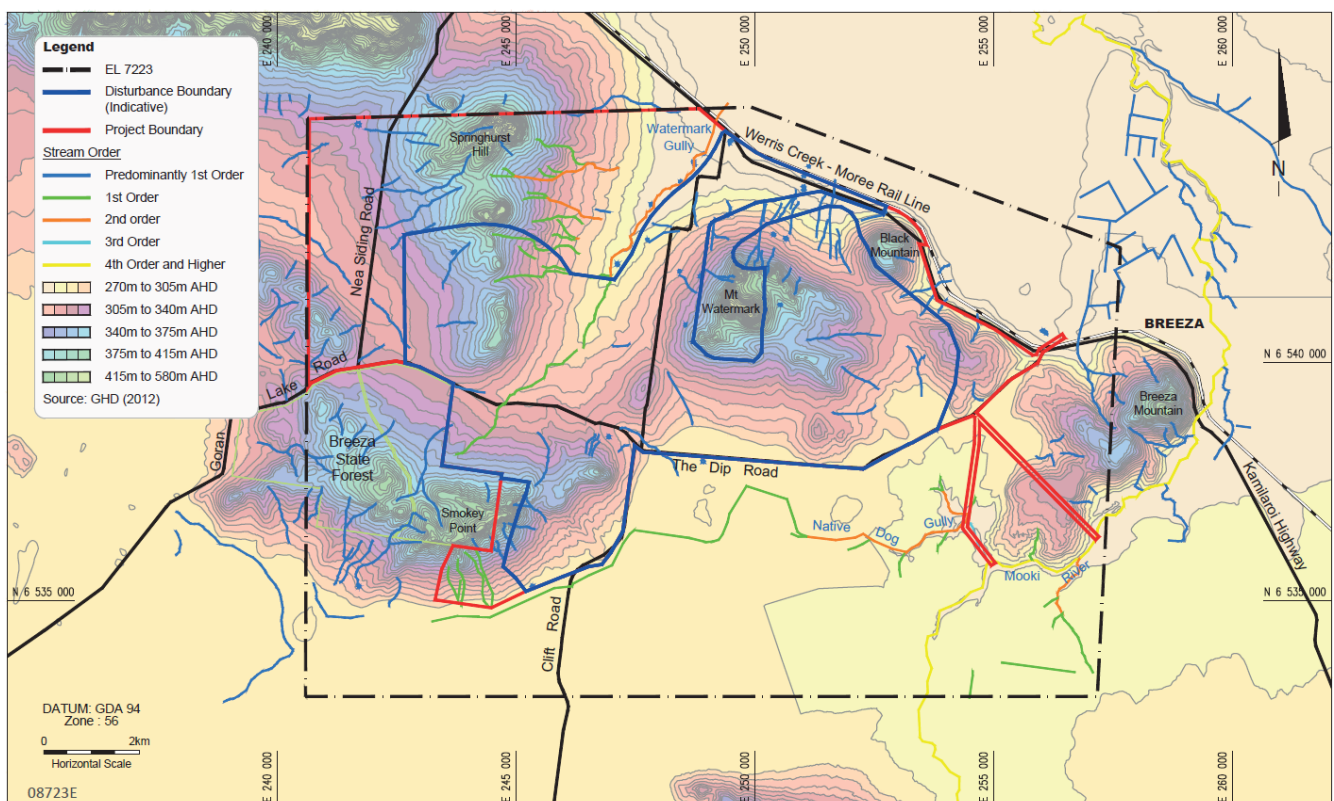


Figure 4: Local Topography and Drainage

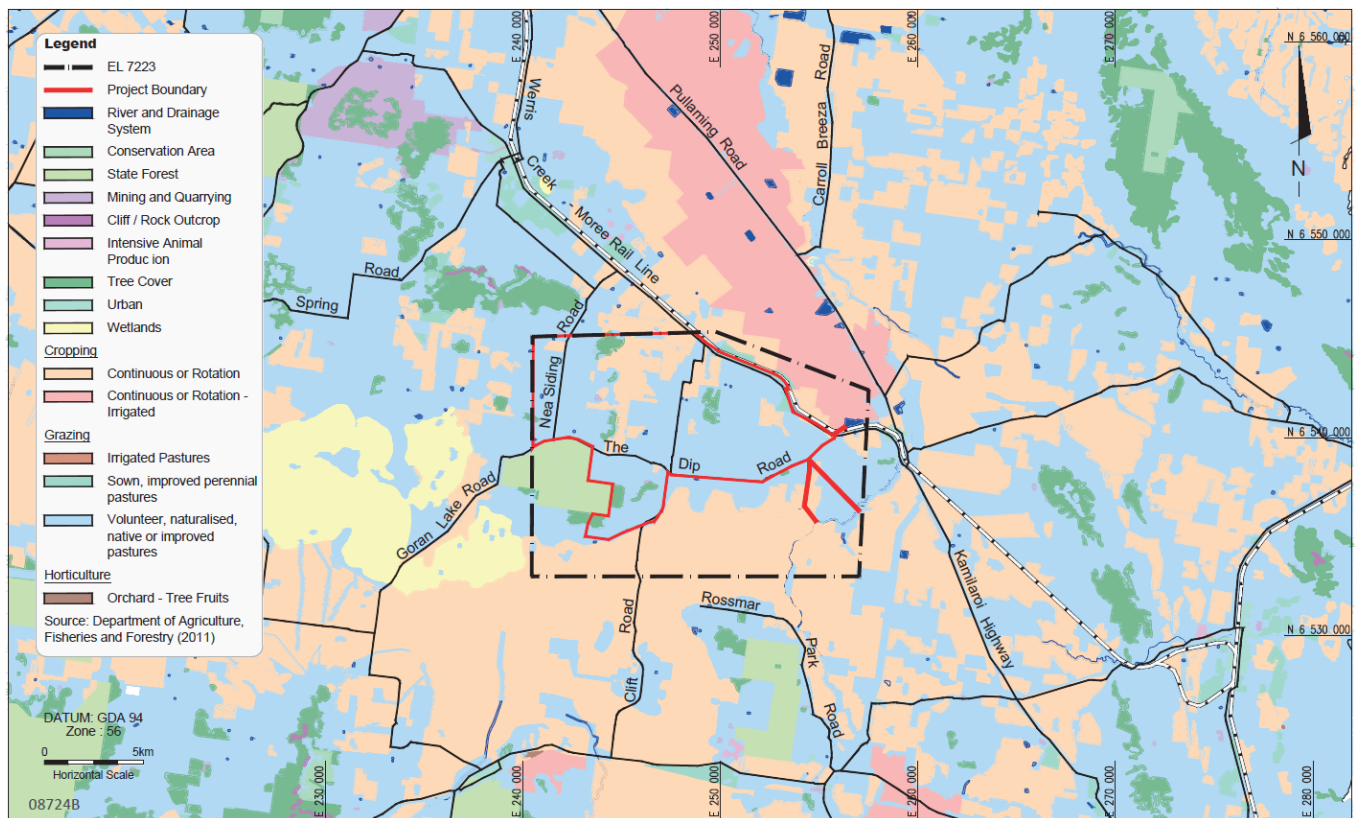


Figure 5: Land Use

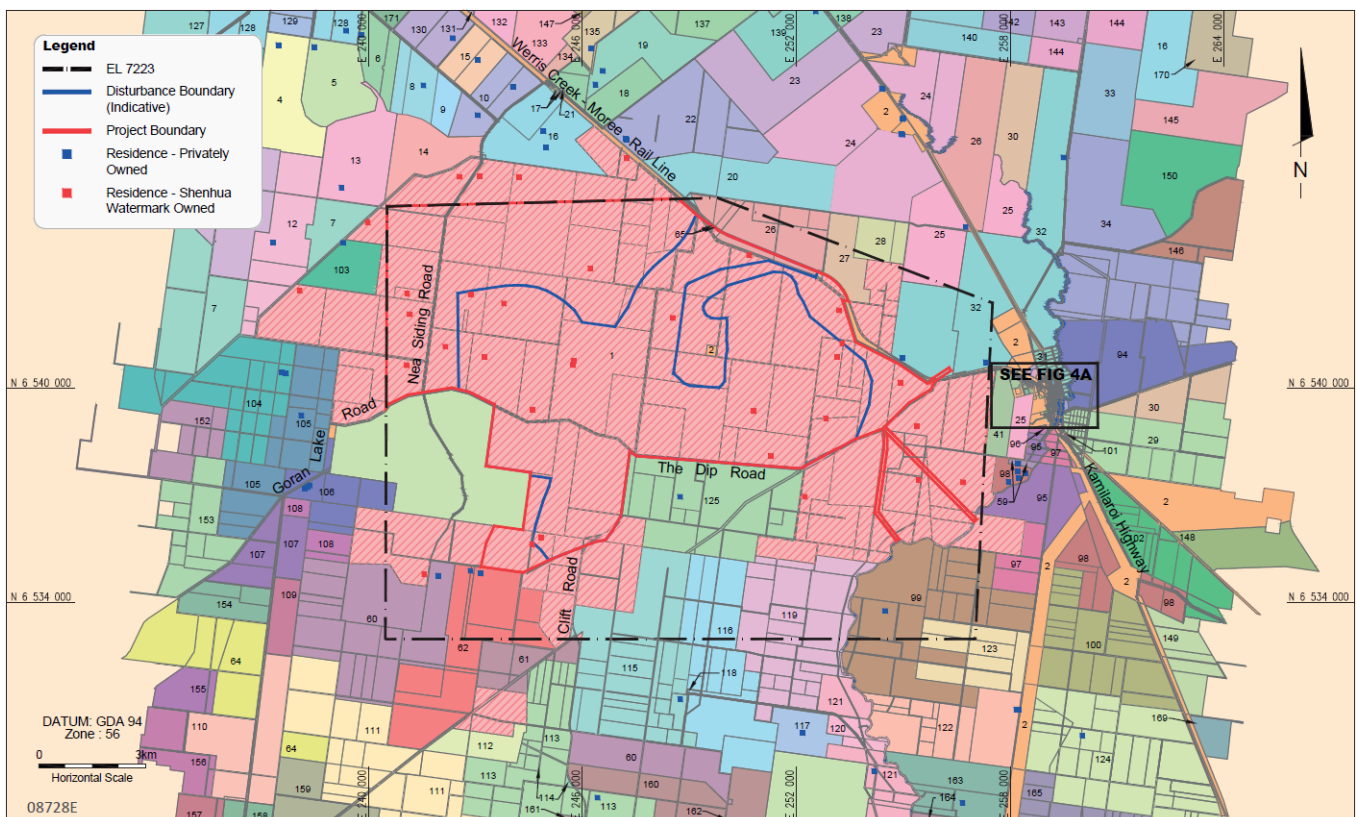


Figure 6: Land Ownership

2. PROPOSED PROJECT

Shenhua is proposing to develop a new open cut mine in the area surrounding Mt Watermark on the Liverpool Plains. Extracted coal would be processed in an on-site Coal Handling and Preparation Plant (CHPP) before being transported to the Port of Newcastle for export via a new rail spur from the Werris Creek – Moree Rail Line.

The project is outlined in the Environmental Impact Statement (EIS) for the development (see Appendix I). The project as originally proposed includes a number of measures to avoid and/or minimise key environmental impacts, including:

- avoiding disturbance of the black soil plains, with a minimum buffer of 150 metres provided to any alluvial black soils;
- avoiding disturbance of the Upper Namoi alluvial aquifers, with a minimum of 900 metres horizontal buffer provided to the highly productive Gunnedah Formation;
- 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 Gunnedah Formation; and
- reducing impacts on biodiversity, Aboriginal sites and agricultural land, and reducing noise and dust impacts, through mine plan adjustments and other measures.

Since the exhibition of the EIS, Shenhua has made some additional changes to further reduce the project's environmental impacts. These are detailed in the Response to Submissions (RTS) for the project (see Appendix G), and include:

- using an 'optimised' mining fleet comprising larger and fewer mining trucks to reduce noise and dust emissions; and
- amending the biodiversity offset strategy to avoid higher value agricultural land and increase ecological benefits.

The major components of the project as amended are summarised below in Table 1, and depicted in Figures 7 to 14.

Table 1: Key Components of the Project

Aspect	Description
Project Summary	Development of an open cut coal mine, involving: • extracting coal from 3 open cut pits, identified as the Eastern Mining Area, Southern Mining Area and Western Mining Area; • constructing and operating a range of infrastructure to support the mine including a coal handling and preparation plant (CHPP); • transporting product coal to the Port of Newcastle for export via a new rail loop, rail spur and related infrastructure; • progressively rehabilitating the site; and • establishing and maintaining biodiversity offset areas and conservation areas to address biodiversity and heritage impacts
Project Life	30 years
Mining and Reserves	Extraction of 268 million tonnes of run-of-mine coal to produce about 159 million tonnes of product coal, comprising: • 133 million tonnes of metallurgical coal with a low ash content (10%); and • 26 million tonnes of thermal coal with a high ash content (18%). The total coal resource in the EL is estimated at 1.8 billion tonnes (including coal under the black soil plains)
Target Coal Seams	Hoskissons and Melvilles Seams. There are deeper coal seams present on the site which are beyond the 30 year mining life (and are not subject to extraction in the current project). There are also shallower coal seams present, however these have a high ash content and are considered uneconomic
Mining Method	Truck and shovel, with cast blasting
Production Rate	Up to 10 million tonnes of run-of-mine coal a year, for up to 6.3 million tonnes of product coal a year

Aspect	Description
<i>Coal Processing & Transport</i>	Coal would be processed on site in the CHPP. Product coal would be transported by rail to the Port of Newcastle for export, via a rail spur and loop from the Werris Creek – Moree Rail Line. The project would generate an average of 8 (and a peak of 16) train movements a day (in + out)
<i>Overburden and Waste Management</i>	Up to 1,629 million bank cubic metres of overburden material would be moved and 108 million tonnes of coal reject and tailings produced. Overburden would initially be placed in out-of-pit emplacements adjacent the mining areas, followed by in-pit emplacement. Coal reject and tailings from the CHPP would be dewatered and co-disposed in the overburden emplacement areas
<i>Infrastructure</i>	Key infrastructure includes: • the CHPP (with a throughput capacity of 10 million tonnes of ROM coal); • administration, workshop and related facilities; • 5 km rail spur and rail loop from the site to the Werris Creek – Moree Rail Line; • 5 km mine access road from the site to the Kamilaroi Highway (generally adjacent to the rail spur), including a 2 km deviation of the Kamilaroi Highway and overpass over the mine rail spur; • water management infrastructure, including a pipeline and pumping station/s to transfer water from the Mooki River and/or a licensed borefield; and • power and communications infrastructure
<i>Roadworks</i>	Kamilaroi Highway deviation and railway overpass. Closure of some local roads including Court Lane, Rowarth Road, Whitby Road, part of The Dip Road and other unnamed paper roads in the project boundary
<i>Employment</i>	600 operational staff and 600 construction workers (during 18 month construction period)
<i>Capital Investment Value</i>	\$850 million
<i>Hours of Operation</i>	24 hours a day, seven days a week (construction and operation)
<i>Rehabilitation and Biodiversity Offsets</i>	The project would disturb 4,084 hectares of land. Of this, about 789 hectares comprises listed endangered ecological communities (EECs), 148 hectares comprises other native woodland and 96 hectares is assessed as comprising Biophysical Strategic Agricultural Land (BSAL). The project disturbance area would be progressively rehabilitated, including the complete backfilling of the Eastern and Southern mining areas, and partial backfilling of the Western Mining Area. The final void in the Western Mining Area (with a depth of 80 metres) would be strategically located to be remote from the black soil plains and to enable access for potential future underground mining (subject to separate approval). The rehabilitated project disturbance area would comprise 2,057 hectares of constructed EEC, 327 hectares of other native woodland vegetation, at least 1,000 hectares of Class III land dedicated to agriculture, and a 100 hectare final void. The rehabilitation strategy and biodiversity offset strategy would ultimately provide for the long term conservation of some 11,186 hectares of land, including 7,972 hectares of EEC

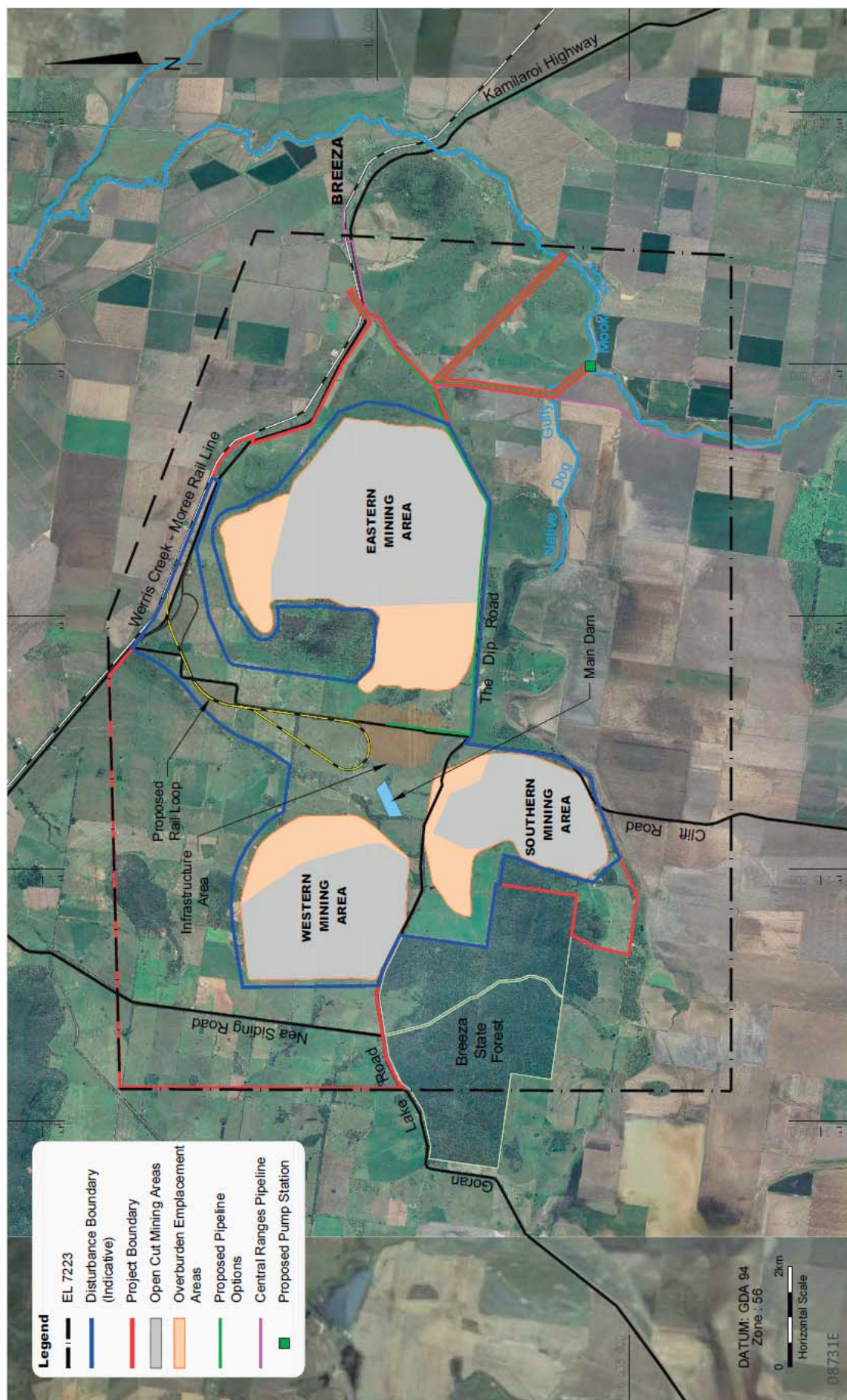


Figure 7: Project Layout

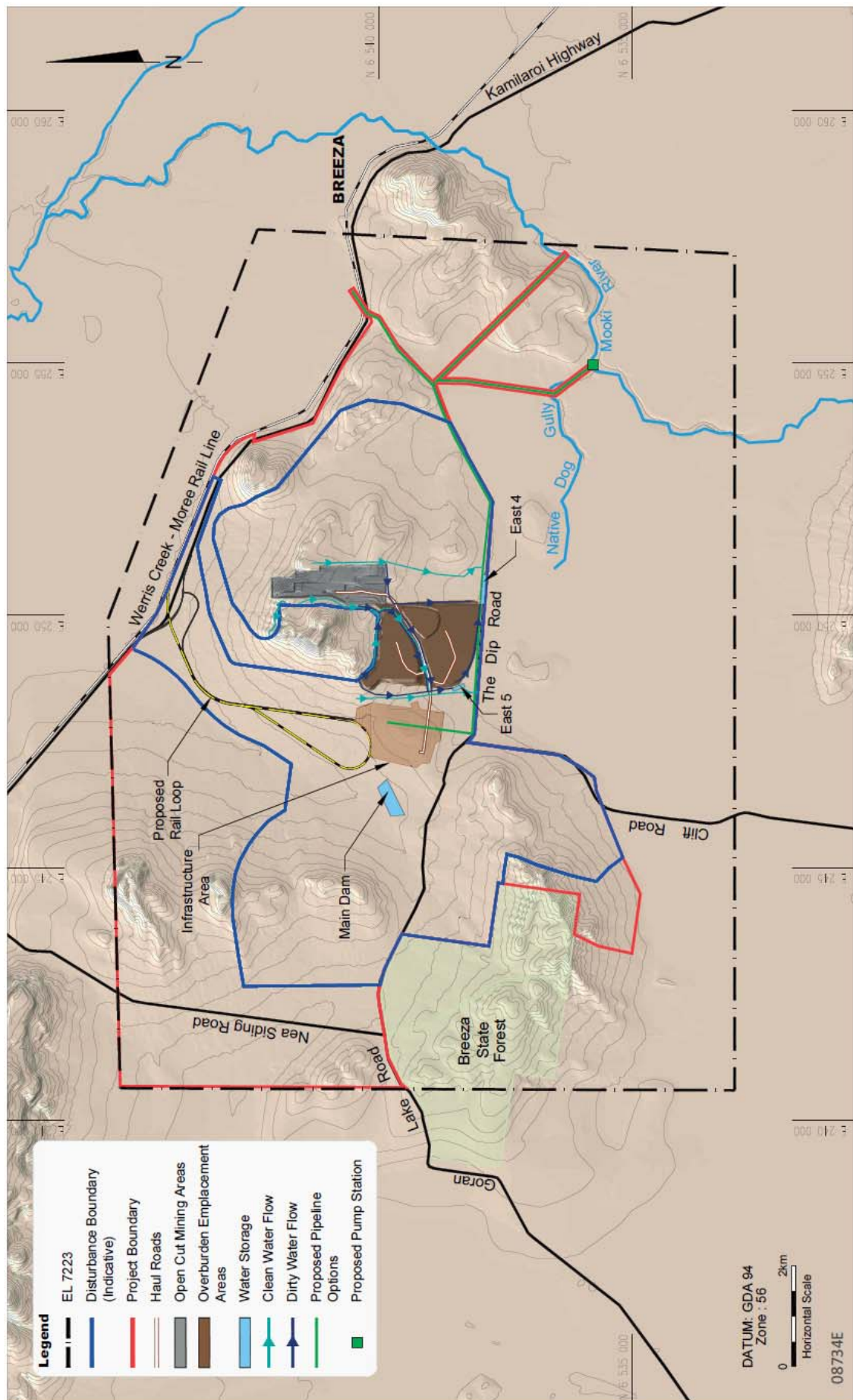


Figure 8: Year 2 Mine Plan

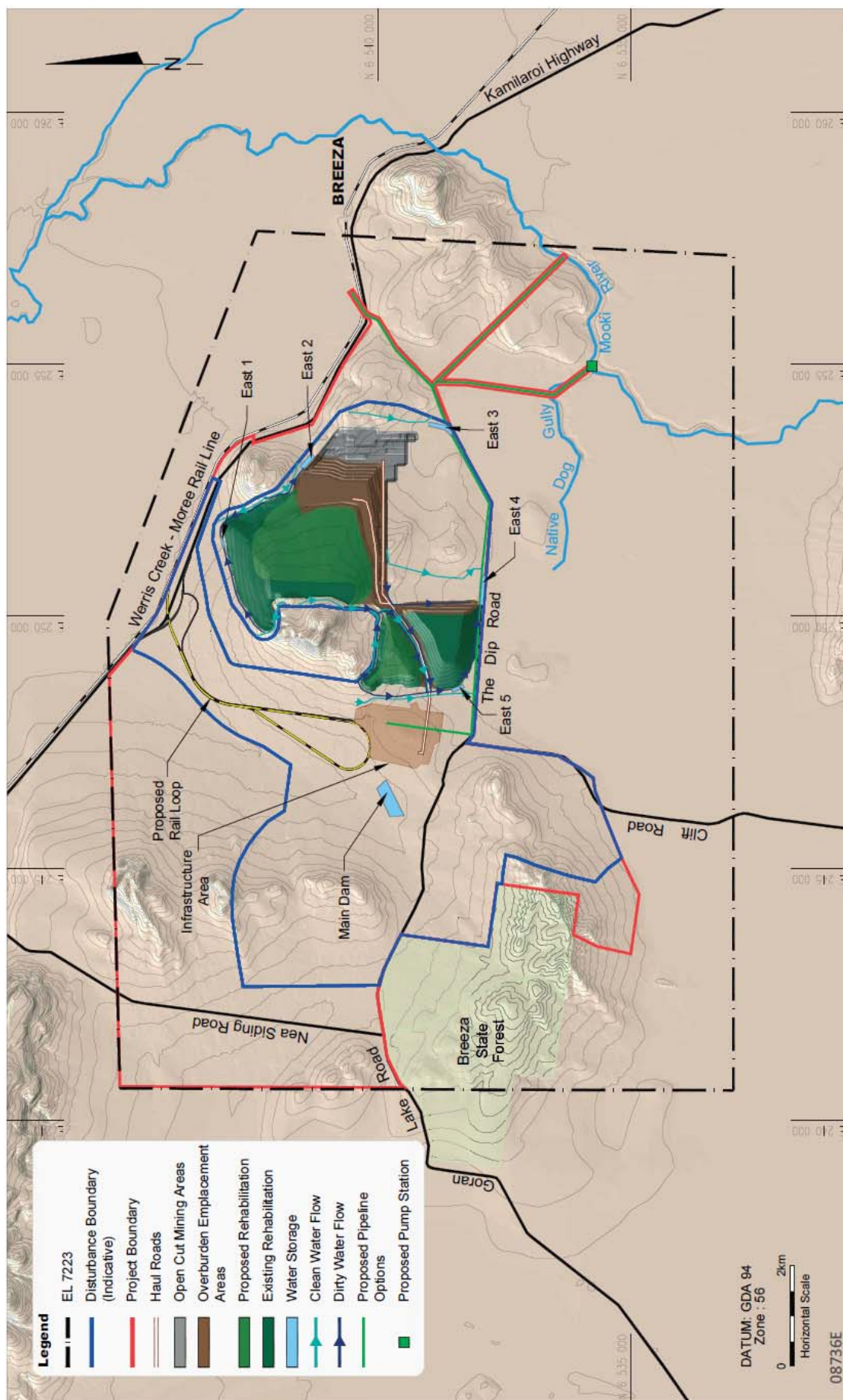


Figure 9: Year 10 Mine Plan

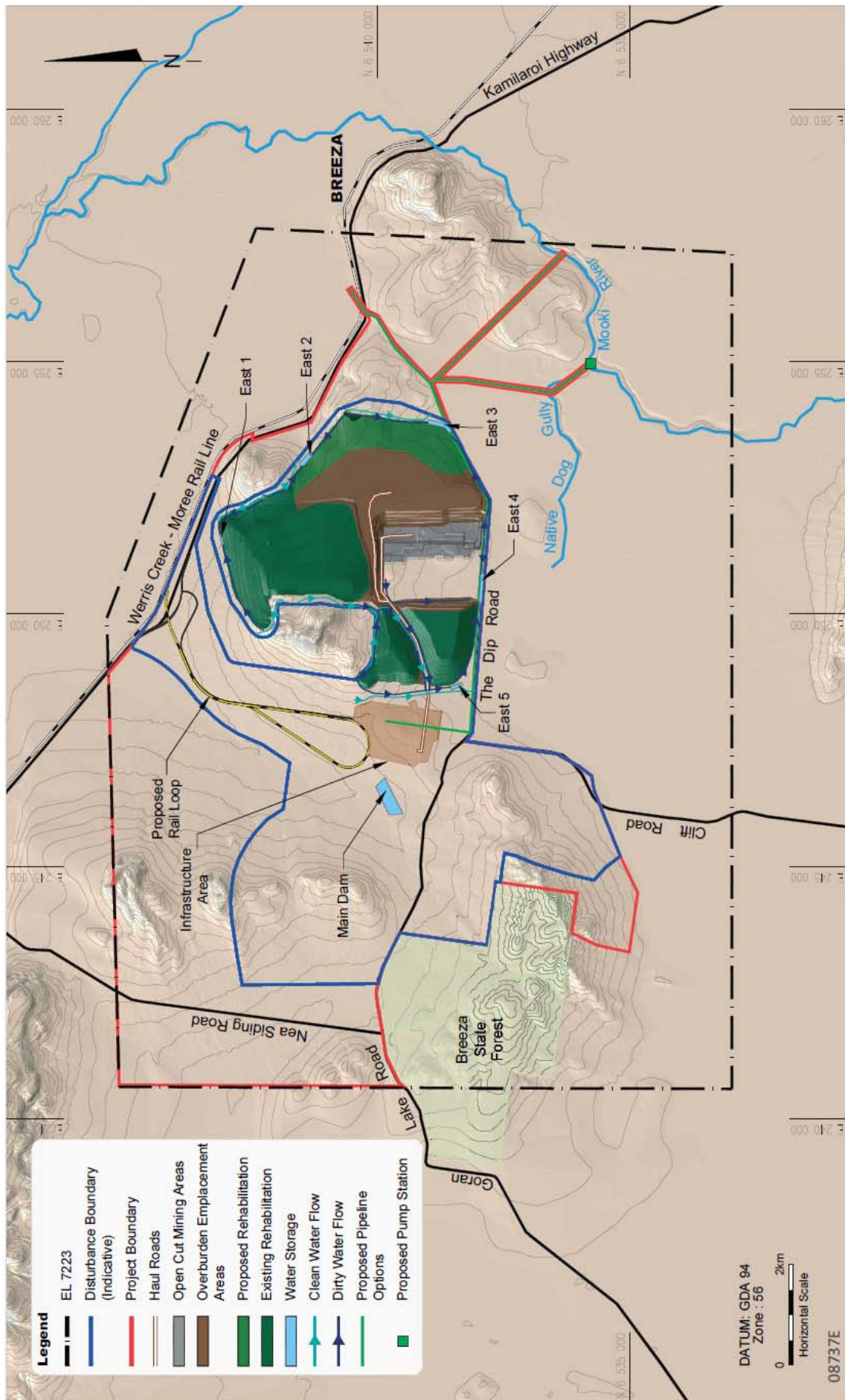


Figure 10: Year 15 Mine Plan

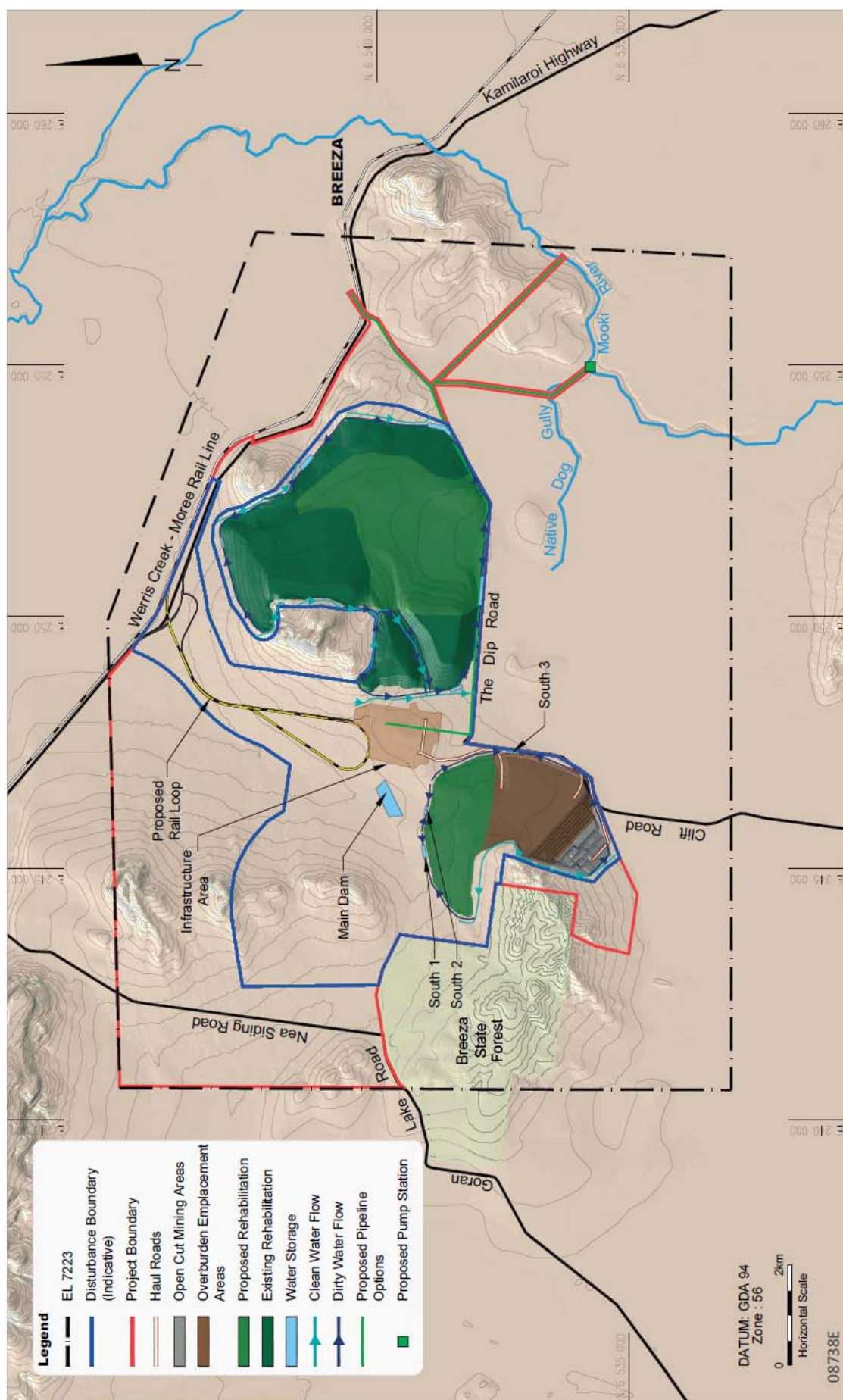


Figure 11: Year 21 Mine Plan

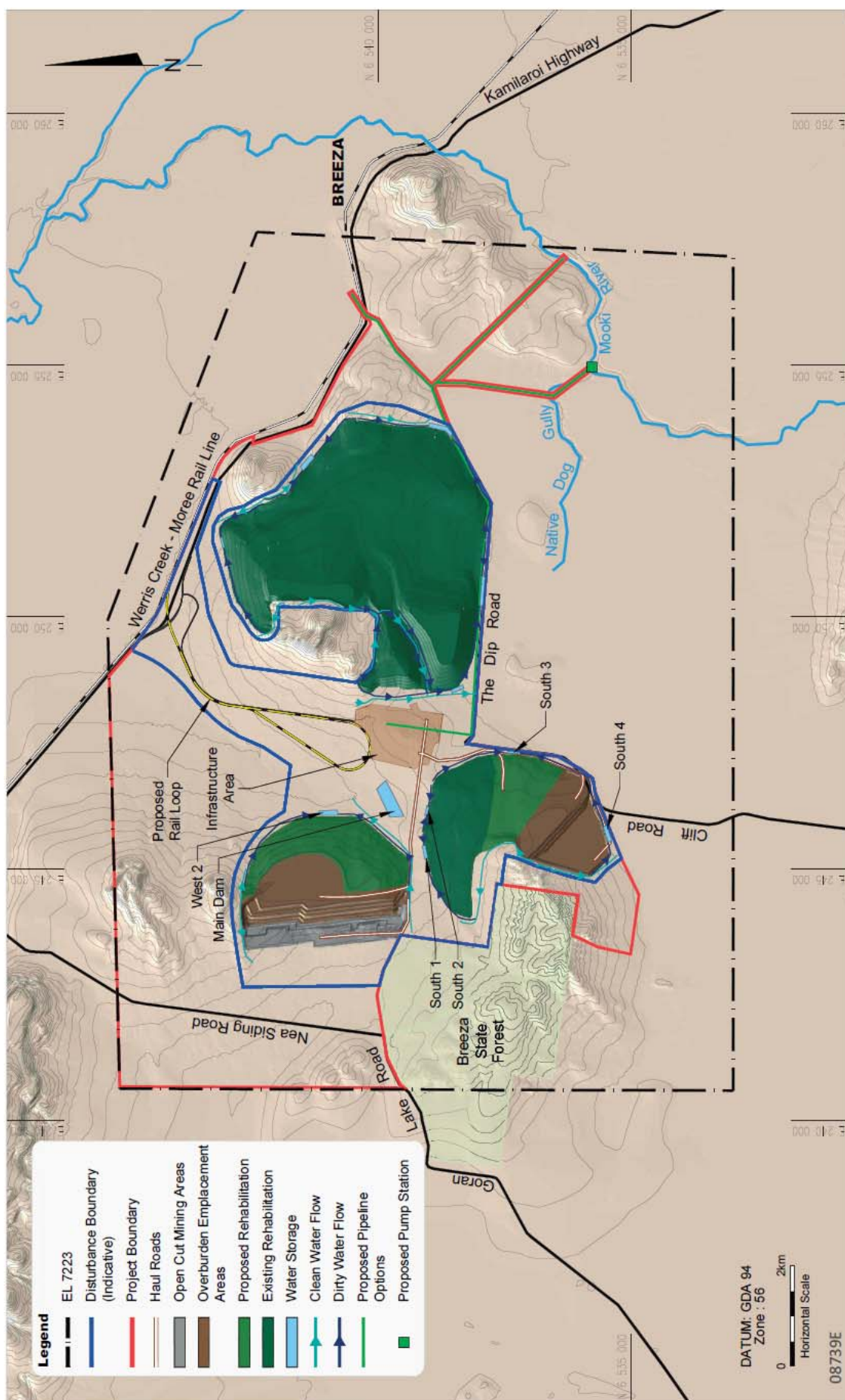


Figure 12: Year 25 Mine Plan

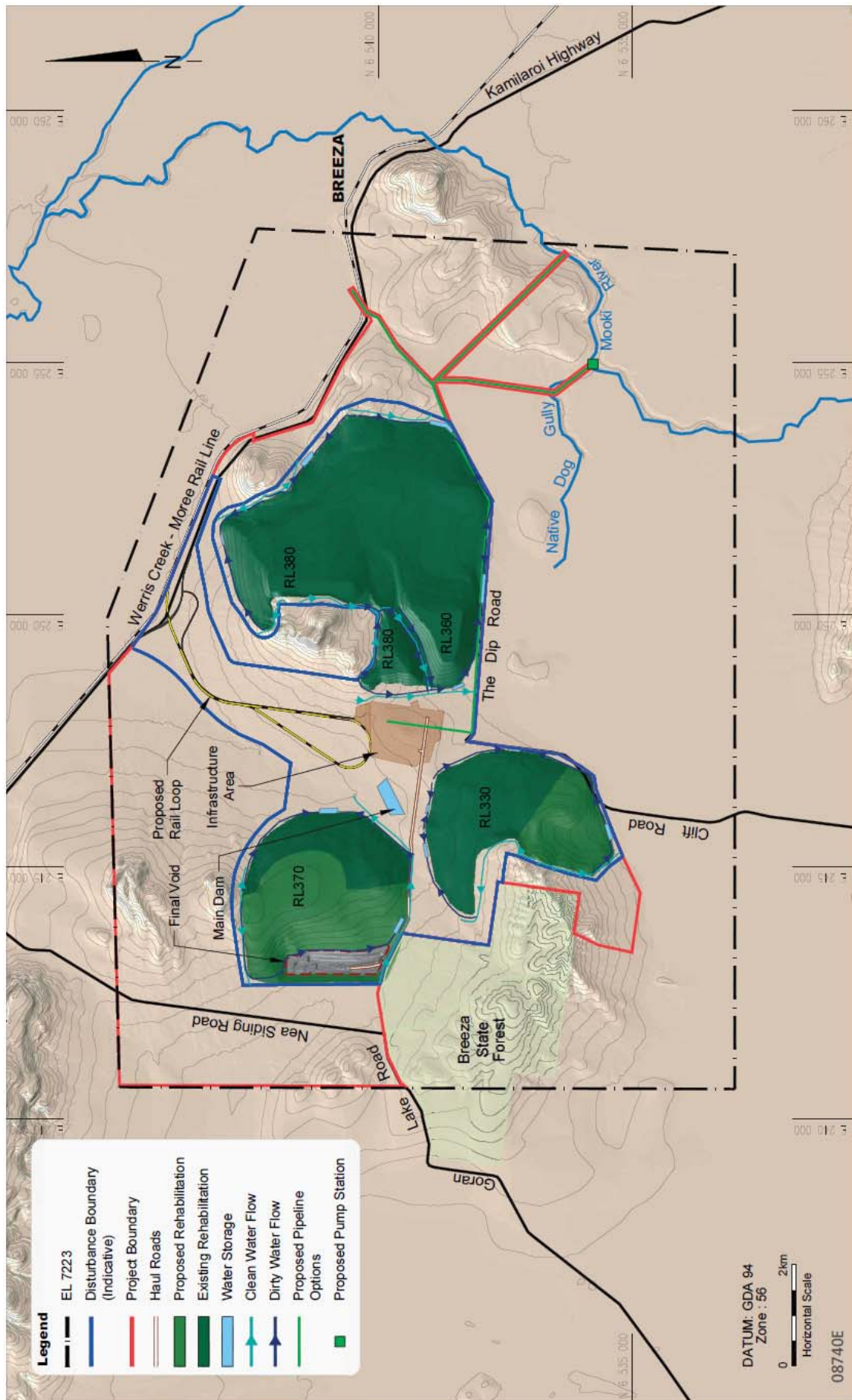


Figure 13: Year 30 Mine Plan

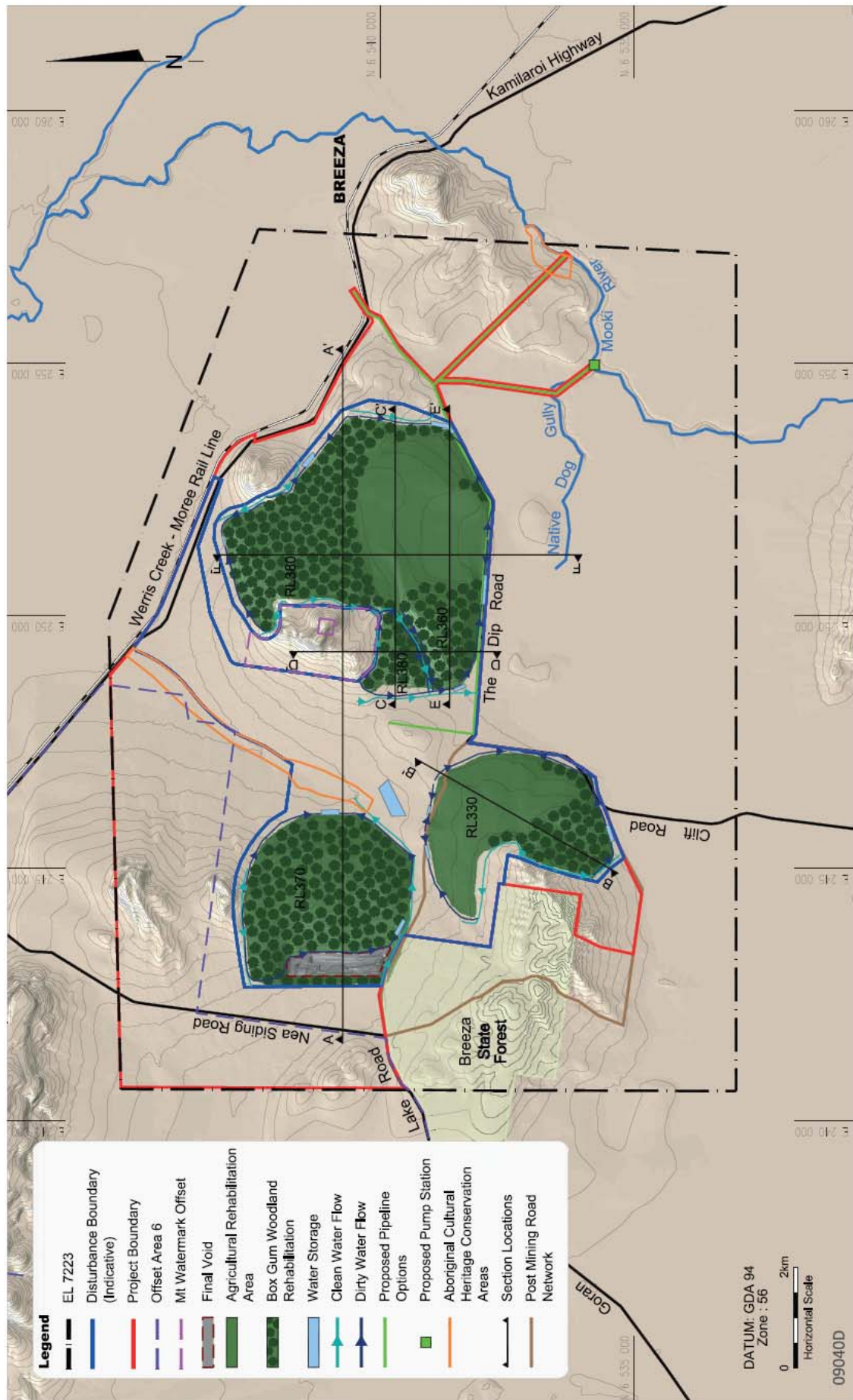


Figure 14: Conceptual Final Landform

3. STRATEGIC CONTEXT

3.1 NSW Coal Industry

Overview

The Department of Planning & Environment (the Department) recognises that society is currently heavily reliant on coal to meet its basic energy needs, both at a domestic and international level. Coal provides around 90% of NSW's electricity needs, 75% of Australia's electricity needs and 40% of the world's electricity needs.

NSW has a large and mature coal industry based around substantial coal resources. These resources are spread over several geological basins, with the key basins forming a broad corridor between the Surat Basin in inland Queensland, through the Gunnedah Basin in the New England region, and to the Sydney Basin which extends to the coast between Newcastle and Wollongong. There are also a number of other small isolated basins, such as the Oakland, Gloucester and Clarence-Moreton Basins (see Figure 15).



Figure 15: NSW Coalfields and Associated Infrastructure

There are 6 coalfields within these basins where coal is currently being extracted and produced. In 2010-11, these coalfields produced approximately 157 million tonnes of saleable coal, including:

- Hunter Coalfield – approximately 60% of NSW production;
- Western Coalfield – approximately 18% of NSW production;
- Newcastle and Gloucester Coalfields – approximately 12% of NSW production;
- Southern Coalfield – approximately 7% of NSW production; and
- Gunnedah Coalfield – approximately 3% of NSW production.

Coal Quality and Markets

The industry produces mainly thermal coal (80%) for use in power generation, but also the more highly valued metallurgical coal (20%) for use in the steel industry. Thermal coal is also known as steaming coal, and metallurgical coal is also known as coking coal or PCI coal. As outlined in Section 2, most (about 85%) of the coal produced by the Watermark Coal Project would be the more highly valued metallurgical coal.

Over the past decade, NSW coal production has grown steadily due to growing demand from Asian export markets (see Figure 16). The majority of NSW coal is exported, with 122 million tonnes of saleable coal, or around 79% of market production, going overseas in 2010-11. NSW coal is currently exported to around 18 countries, with the top 5 destinations in 2010/11 being:

- Japan – approximately 50.3% of exports;
- Republic of Korea – approximately 17.5% of exports;
- Taiwan – approximately 13.5% of exports;
- China – approximately 9.3% of exports; and
- India – approximately 3.5% of exports.

China has become an increasingly important market for NSW coal exports in recent years, with exports to the country increasing almost tenfold since 2007-08. Most of the coal produced from the Watermark Coal Project is likely to be exported to China, or to other Asian export markets.

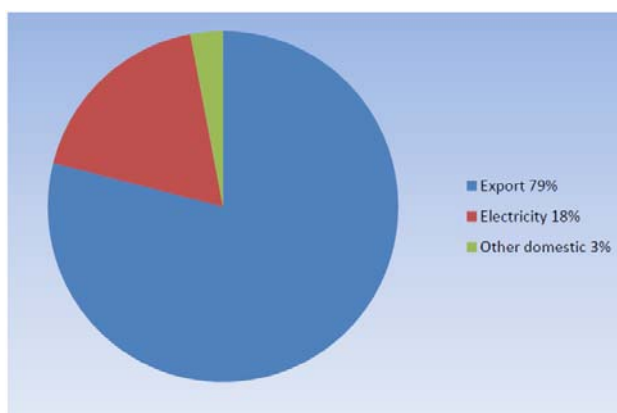


Figure 16: NSW Coal Markets

The main domestic users of coal produced in NSW include 8 power stations near Singleton (Bayswater, Liddell and Redbank), Lithgow (Mt Piper and Wallerawang) and on the Central Coast (Eraring, Vales Point and Munmorah); and the 2 steelworks at Port Kembla and Whyalla in South Australia.

Coal Infrastructure

Infrastructure associated with the NSW coal industry includes a network of railways and rail facilities, and port facilities at Newcastle and Port Kembla. The Hunter Valley Coal Chain – taking in the Port of Newcastle and the mines and infrastructure which deliver coal to the port – is the largest coal export operation in the world. The rail network is shown on Figure 17.

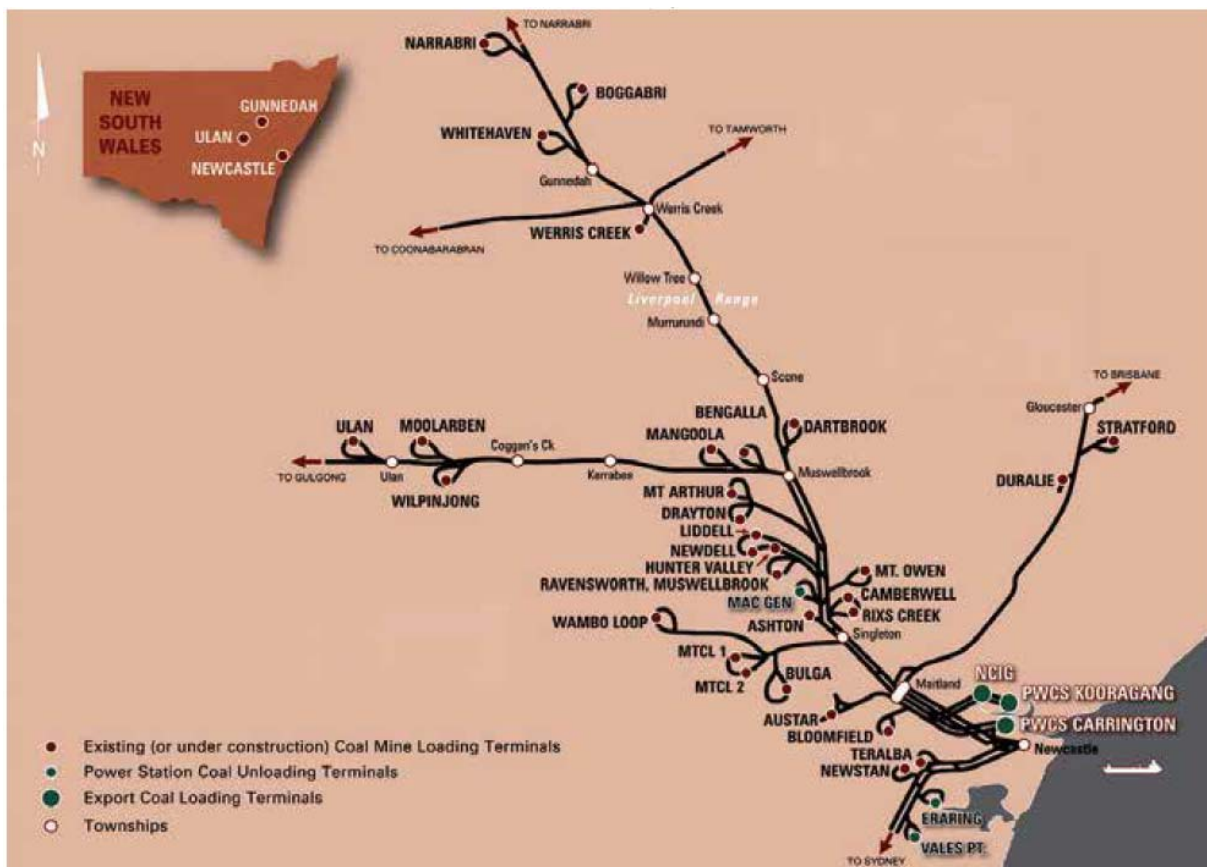


Figure 17: Hunter Valley Coal Chain

Mining Land Use and Water Use

Coal and mineral production titles (including open cut and underground mines and surrounding lease areas) cover approximately 0.48% of the NSW land mass area, or around 385,250 hectares. The actual disturbance area due to mining is estimated at approximately 0.1% of the NSW land area, or just over 80,000 hectares.

The Australian Bureau of Statistics estimates that mining in NSW consumed approximately 1.5% of total water used in NSW in 2010-11, or 78 of the total 5,041 gigalitres consumed during the year. Water use by other land users is detailed in Section 3.2 below.

Economic Significance

NSW is the most important mineral producing State in Australia after Western Australia and Queensland, with NSW generating approximately 12% of the gross value of mineral production in Australia in 2007-08. This contribution has dropped from levels of about 14% in the early 2000's, largely due to higher relative production increases in other States over this time.

The majority of black coal in Australia is produced in NSW and Queensland, with NSW's share of all Australian coal production approximately 37% in 2009-10. This share has decreased from around levels of around 50% in the 1960s, largely due to higher relative production increases in Queensland over this time.

Coal is by far NSW's biggest mineral commodity in terms of value, with the industry generating around 80% of the State's mining income. Total coal production was worth some \$16.2 billion in 2010-11, compared to a total production from all minerals in NSW of approximately \$20 billion.

Coal is also the single largest export in revenue terms from the State, with exports valued at around \$14 billion in 2010-11. This represents around 25% of the State's export revenue. The value of NSW coal exports has more than tripled in the last decade. This is likely continue to grow, particularly with the increasing capacity in port facilities at Newcastle, and increasing demand from Asia.

Domestically, coal supplies 90% of the State's electricity and also provides essential support to the steelworks at Port Kembla and the aluminium smelters in the Hunter.

As at June 2011 the NSW coal mining industry employed 21,000 people. The industry indirectly creates up to another 70,000 jobs in mine and non-mine related industries. Many regional towns and communities are dependent on these jobs.

Coal mining currently makes a significant contribution to public revenue for the Commonwealth, State and local governments. Royalties to the NSW Government generated from coal and exceeded \$1.2 billion in 2010-11.

Gunnedah Coalfield

Coal mining has been undertaken in the Gunnedah Basin since the 1880s. Although it is currently one of the lowest producing coalfields in NSW, production has been increasing in recent years, with saleable coal production increasing by 33% year-on-year in 2010-11, to 7.6 million tonnes.

There are currently 6 operating mines in the coalfield, all of which are producing relatively small amounts of coal compared to some of the larger mines in the Hunter coalfield⁴. Current operating mines and proposed mines in the Gunnedah coalfield are shown on Figure 18 and outlined in the following table.

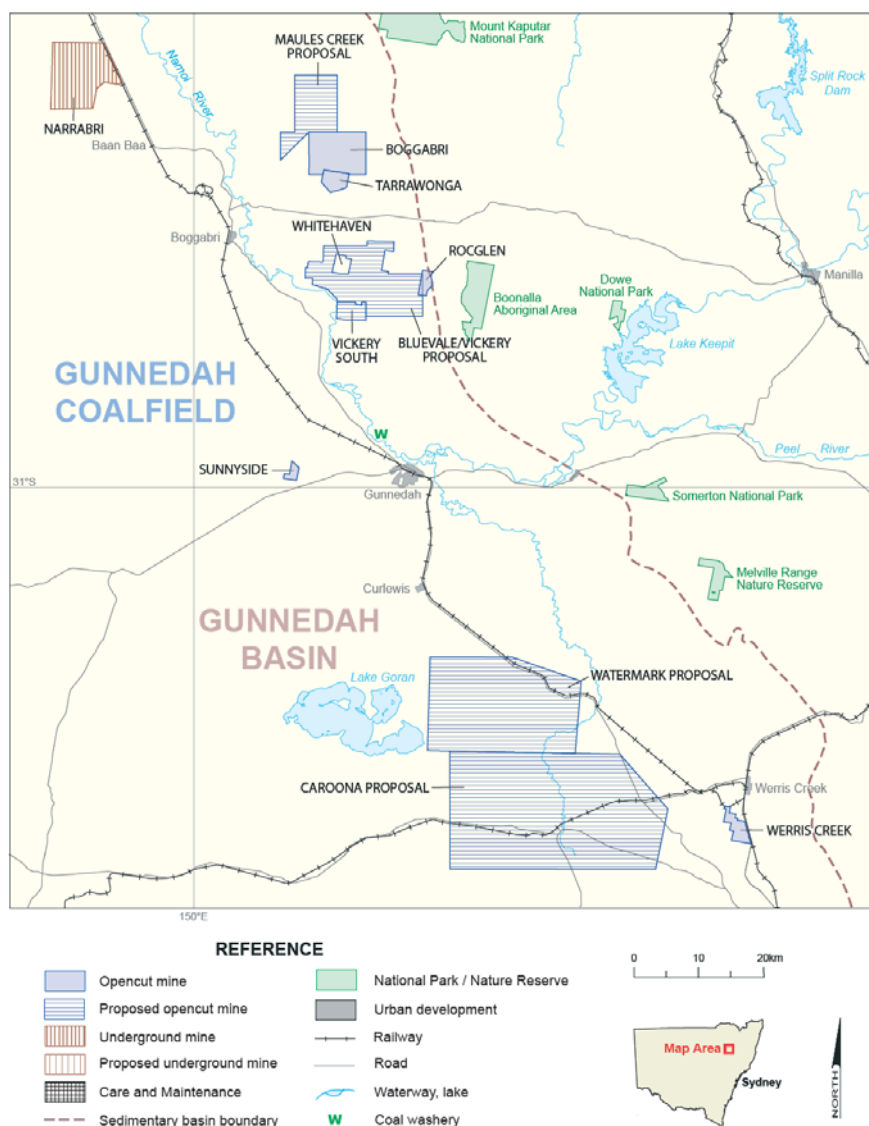


Figure 18: Mines in the Gunnedah Coalfield

⁴ For example, the Mt Arthur mine (the Hunter's largest mine by production) produced almost 14 million tonnes of saleable coal in 2010-11.

Table 2: Gunnedah Coalfield Mines and Production¹

Mine	Saleable Production 2010-11 (Mt)	Coal Reserves 2010-11 (Mt)
Boggabri open cut	2.87	135
Caroona underground proposal	-	na
Maules Creek open cut proposal	-	678
Narrabri underground	0.23	133
Rocglen open cut	0.9	13
Sunnyside open cut	0.28	28
Tarrawonga open cut	1.56	48
Vickery and Vickery south open cut proposal	-	197
Watermark open cut proposal	-	932
Werris Creek open cut	1.8	29

¹ Based on DRE's 2013 New South Wales Coal Industry Profile

Within the Namoi catchment, the prospective area for open cut and underground mining (ie. anything within 400 metres of the surface) occurs in the western 60% of the catchment, with the most prospective area for open cut mines occurring in a relatively thin strip through the middle of the catchment (see Figure 19). This area tends to coincide with areas within or close to the Upper Namoi alluvium, as indicated on Figure 19.

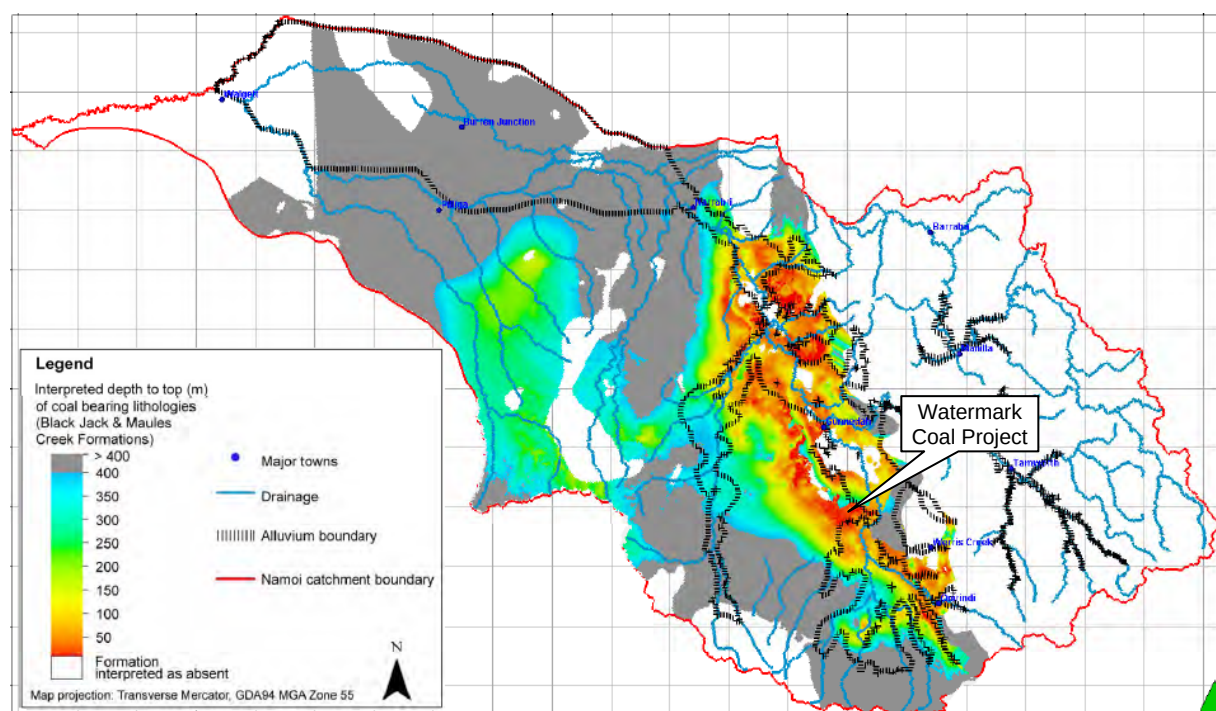


Figure 19: Depth to Coal Resources in the Namoi Catchment

3.2 NSW Agriculture Industry

Overview

The Department also recognises that a sustainable and thriving agricultural industry is critical to satisfy the basic needs of society, and to the strength of the NSW economy.

NSW has a large and diverse agricultural industry, with agricultural production in NSW representing approximately 22.7% of Australia's total agricultural production in 2010-11. NSW's proportion of Australia's total production has decreased marginally since the 1990s, which is likely the result of ongoing drought conditions, particularly between 2002 and 2009.

The gross value of agricultural production in NSW was \$14.5 billion in 2010-11, or 3.4% of the NSW economy. Wheat is the most important agricultural crop grown in NSW, covering the largest area of agricultural land and comprising the largest tonnage of crop produced. Other important crops include

sugar cane, barley, sorghum, canola, cotton, oats and rice. Cattle and sheep are NSW's most important agricultural livestock commodities.

Agriculture is by far NSW's largest industry by land area, with the total area of agricultural landholding under production approximately 56.2 million hectares, or approximately 70% of the NSW land mass. Approximately 7 million hectares of this total is under production for crops, vegetables, fruit and nuts. As outlined in Section 3.1 above, active mining areas cover some 80,000 hectares, or 0.1%, of the NSW land area.

Approximately 90,000 people were employed in agriculture, fisheries and forestry in NSW in June 2011, representing approximately 2.5% of the NSW workforce. As outlined in Section 3.1, mining employs about 21,000 people directly, and around 70,000 indirectly.

The agricultural industry is the largest water user in the State, consuming 2,861 gigalitres, or 57% of the total 5,041 gigalitres consumed in 2010-11. Other major water users in NSW include the water supply industry (including supply system losses) at 18% of total consumption, households at 10% and manufacturing at 3% of total consumption in 2010-11. As outlined in Section 3.1 above, mining consumes approximately 1.5% of total water used in NSW.

The distribution of NSW agricultural land across local government areas, by total gross annual revenue for key agricultural commodities (in 2005-06), is shown on Figures 20 to 23 below. The figures show that the highest value grazing and cropping land in NSW (in terms of gross annual revenue) tends to be fairly widely spread through the New England, North West Slopes, Central West, Riverina, Southern and Murray regions. The Gunnedah and Liverpool Plains LGAs are amongst the higher value agricultural areas in the State.

Analysis of Population Census and Agriculture Census data in Regional New South Wales
Total gross annual revenue of major agricultural commodities, 2005-2006 by Local Government Area

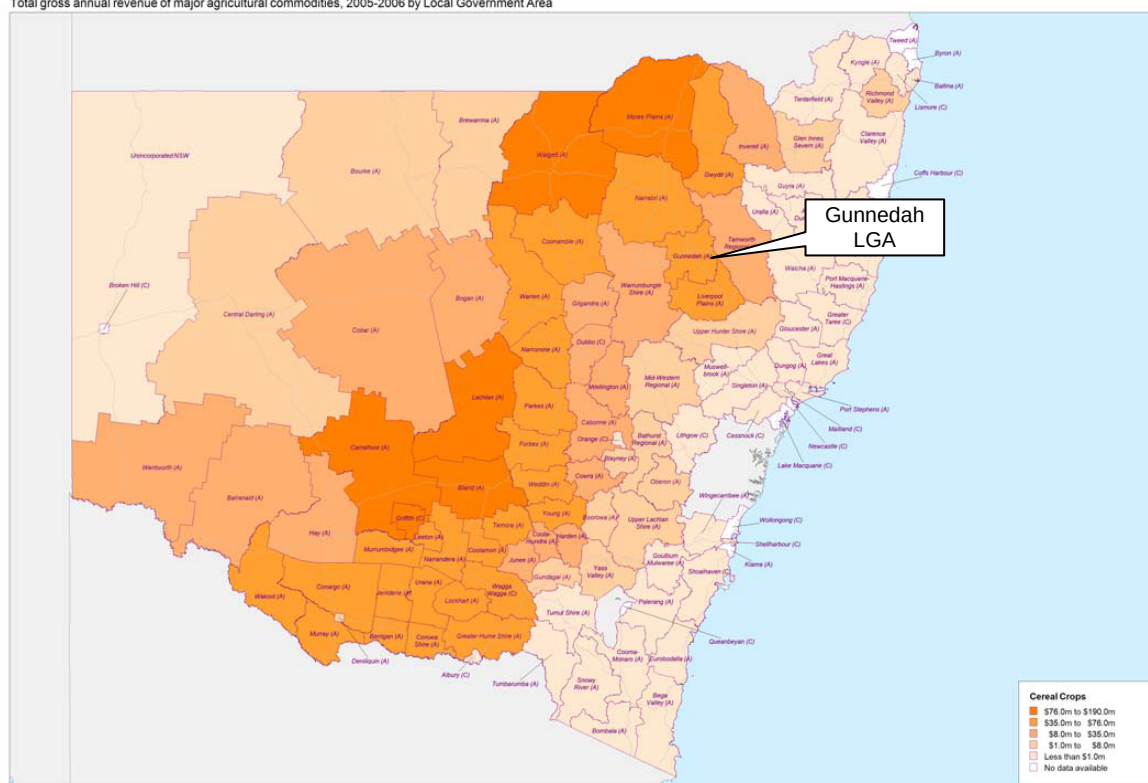


Figure 20: NSW Agricultural Commodity Map – All Agriculture (Source: DPI)

Analysis of Population Census and Agriculture Census data in Regional New South Wales
Total gross annual revenue of major agricultural commodities (Cotton), 2005-2006 by Local Government Area

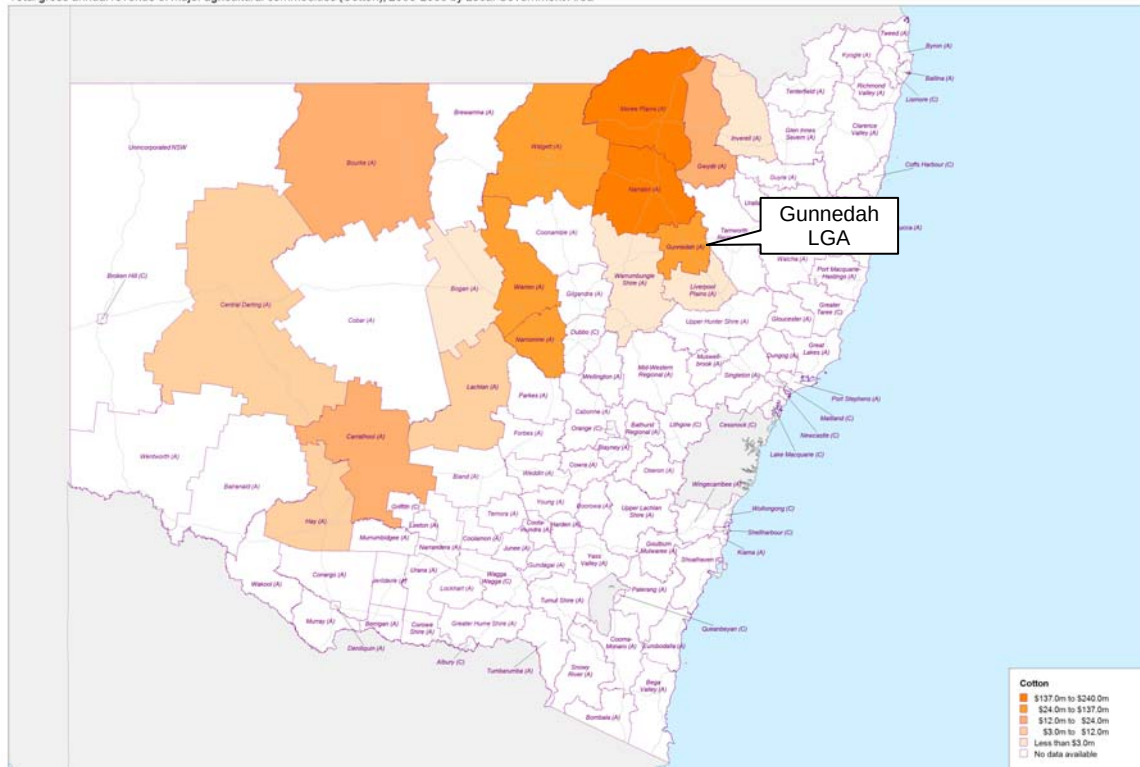


Figure 21: NSW Agricultural Commodity Map – Cotton (Source: DPI)

Analysis of Population Census and Agriculture Census data in Regional New South Wales
Total gross annual revenue of major agricultural commodities (Cereal Crops), 2005-2006 by Local Government Area



Figure 22: NSW Agricultural Commodity Map – Cereal Crops (Source: DPI)

Analysis of Population Census and Agriculture Census data in Regional New South Wales

Total gross annual revenue of major agricultural commodities (Cattle & calves slaughtered), 2005-2006 by Local Government Area



Figure 23: NSW Agricultural Commodity Map – Cattle (Source: DPI)

3.3 Strategic Regional Land Use Policy

In September 2012, the NSW Government released its *Strategic Regional Land Use Policy*, which sets out a range of new policy initiatives aimed at balancing growth in the mining and coal seam gas (CSG) industries with the need to protect important agricultural land and water resources. The policy package consists of:

- a suite of initiatives to better regulate mining and CSG exploration, including requirements for community consultation at the exploration stage;
- creation of a Land and Water Commissioner to oversee the exploration process;
- preparation of comprehensive Strategic Regional Land Use Plans (SRLUPs) for the Upper Hunter and New England North West regions, which amongst other things identify and map strategic agricultural land, including Biophysical Strategic Agricultural Land (BSAL) and Critical Industry Clusters (CICs) for the equine and viticulture industries;
- introduction of a Gateway process, including establishment of an expert Gateway Panel, to independently assess the impacts of mining and CSG projects on strategic agricultural land before proposals can proceed to the DA stage;
- a statewide Aquifer Interference Policy, to protect key groundwater aquifers across the State;
- the requirement for Agricultural Impact Statements (AIS) for all mining and CSG projects; and
- two new codes of practice for the CSG industry, including a ban on the use of BTEX chemicals in drilling and hydraulic fracturing, and a ban on the use of evaporation ponds for the disposal of water associated with petroleum production.

In February 2013, the NSW Government announced a package of additional measures to protect residential areas and CICs from CSG activity. These include:

- prohibition on CSG exploration and production within and under residential areas and CICs, and within 2 kilometres of residential areas;
- establishing the EPA as the lead regulator of environmental and health impacts of CSG activities, with responsibility for compliance and enforcement;
- establishing an office of CSG regulation within the Department of Trade and Investment to enforce other regulations;
- tasking the Chief Scientist and Engineer to conduct an independent review of all CSG activities in NSW; and

- requiring all CSG exploration, assessment and production to hold an Environment Protection Licence.

The Director-General's Requirements (DGRs) for the Watermark Coal Project require the EIS for the project to be prepared in accordance with these new policy requirements (where applicable), including the requirement for an AIS and consideration of the project against the aquifer interference policy and the SRLUP for the New England North West region. Further, the project was referred to the Gateway Panel for advice in accordance with the transitional provisions of the policy.

3.4 New England North West Strategic Regional Land Use Plan

The New England North West SRLUP was published in September 2012, and aims to provide a framework for implementing the NSW Government's commitment to balancing strong economic growth in regional NSW with the protection of the State's most valuable agricultural land and sustainable management of its natural resources.

The SRLUP identifies a total of over 1.5 million hectares of mapped BSAL in the New England North West region, and notes that the region is one of the most highly productive agricultural regions in the State, generating \$1.8 billion of agricultural commodities in 2006. It also recognises that the black soils of the Liverpool Plains are some of the most fertile in Australia.

The Plan also recognises that the coal industry is rapidly developing in the region and a key driver for the local economy, with global coal demand reliably forecast to continue to increase significantly. The Plan identifies that, of the 1.5 million hectares of mapped BSAL in the region, some 1 million hectares also contains an available coal resource.

In this regard, the SRLUP acknowledges that the potential for land use conflict exists, and that one of the key challenges facing the region is ensuring an appropriate balance between competing land uses – particularly achieving co-existence where possible between mining, CSG development and agriculture.

To address these challenges, the SRLUP outlines a range of mechanisms and actions, which are generally consistent with the Strategic Regional Land Use Policy (eg. implementation of the Gateway process, requirements for AIS, etc.).

The project has been developed, and assessed, in a manner that is generally consistent with these actions.

3.5 Namoi Catchment Water Study

The Namoi catchment is recognised as an agricultural area of significance within Australia that includes one of the most intensively developed groundwater resources in NSW.

In response to rising levels of concern within the community about the potential impacts of the growing mining and CSG industry on the significant groundwater and surface water resources of the region, in August 2010 the NSW Government commissioned the Namoi Catchment Water Study (the Study). The purpose of the Study was to investigate the potential cumulative effects of coal resource development activities on catchment water resources. The final study report was completed and published in July 2012.

The Study included catchment-wide modelling of the water resource impacts of a number of different coal and CSG development scenarios, as outlined in the following table.

Table 3: Namoi Catchment Water Study Scenarios

Scenario No.	Description	Mines (number)		CSG fields (No.)
		Open-cut	Underground	
0	No current or future mining or CSG	0	0	0
1	Approved mines & CSG production	6	1	Pilot holes only
2	Approved & planned mines & CSG	10	2	2
3	Extensive & widespread mining & CSG	24	7	8
4	Extensive & widespread mining only	24	7	Pilot holes only
5	Extensive & widespread CSG only	6	1	8
6	Half underground mines beneath alluvium	24	7	8

Scenario 2 represents existing known and planned mines in the catchment, including the Watermark and Caroon coal projects. Scenario 3 is the most intense future resource development scenario, and reflects extensive CSG production and around 60 million tonnes of coal production a year for 90 years. Figure 24 shows the location of the modelled projects under this scenario.

A 7th scenario, involving even more intensive coal development than Scenario 3, was commissioned at the request of the study's stakeholder advisory group, and was undertaken as an addendum to the main report. This scenario assumed an additional 8 underground mines, and earlier development of the mining activities, with production of 160 million tonnes of coal a year. The analysis found that, in general the impacts predicted in Scenario 7 are similar to those predicted in Scenario 3, with the main difference then between the scenarios being the timing of the impacts, rather than the magnitude.

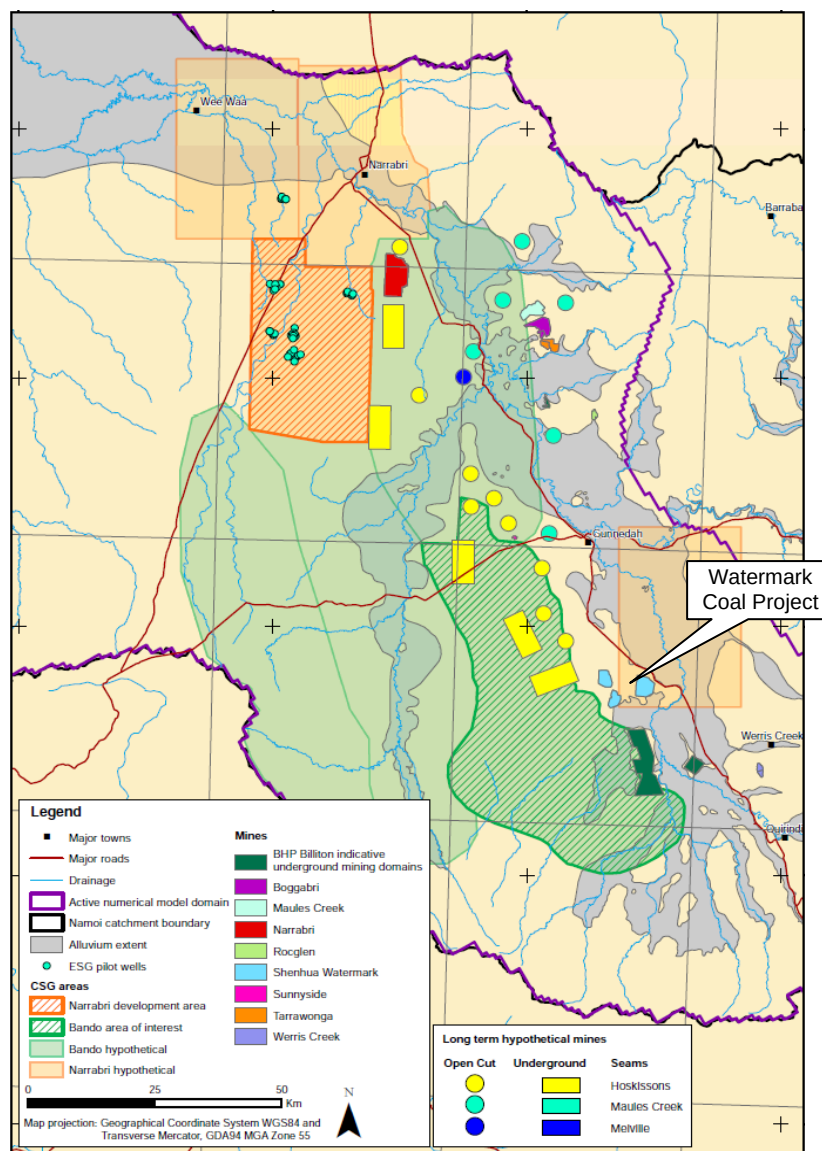


Figure 24: Mining and CSG Projects Modelled in Scenario 3

Water Resources

The Study notes that the key water resources of the Namoi catchment comprise the surface water system of the Namoi River, its tributaries (including the Mooki River which drains the Watermark site), and the alluvial groundwater systems associated with the water courses. The catchment is shown on Figure 3, with overall drainage west towards the Darling River. The Upper Namoi Alluvium (which occurs in the vicinity of the Watermark site) and Lower Namoi Alluvium (which doesn't occur in the vicinity of the Watermark site) form the principal aquifers, and are heavily used for agricultural irrigation (see Figure 25).

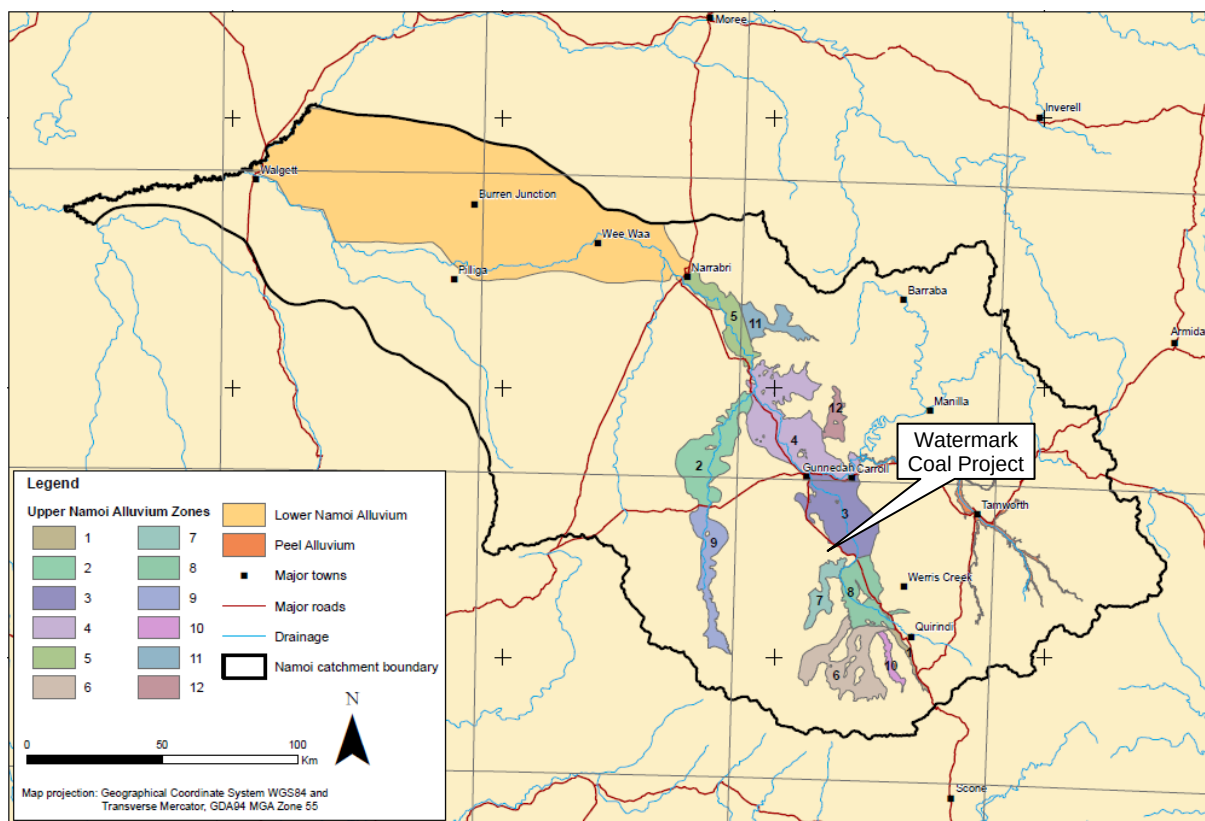


Figure 25: Key Alluvial Aquifers in the Namoi Catchment

The alluvium is characterised by high permeability and storage capacity and good water quality, although it does vary. Smaller scale pumping also occurs from the consolidated or 'hard' rocks that surround and underlie the alluvium.

Under the relevant water sharing plans (see Section 6.1 for further detail), the Upper Namoi Alluvium is subdivided into 12 separate management zones, and the hard rock units and lesser alluvial aquifers are managed as separate areas. These zones are shown on Figure 26, and the Study adopted the same zones for the purposes of its assessment. The Watermark mining areas are located within the hard rock unit, adjacent to Zone 7 of the Upper Namoi Alluvium, and in proximity to Zones 3 and 8.

The Study notes that most of the Upper Namoi alluvial zones are in close proximity to the coal bearing formations (see Figure 19), with the prospective area for coal mining extending a maximum of 50 kilometres to the west of the Upper Namoi Alluvium. Beyond this, the depth to coal bearing formations is likely to be excessive for mine development.

Potential Impacts

The Study notes that mining and CSG projects have the potential to impact the region's water resources at both the broad scale and local scale, and that the local scale impacts cannot be determined by a catchment wide study. Accordingly, the Study stresses that the model is not designed to replace the need or requirement for project specific detailed investigations, supplemented by comprehensive monitoring and appropriate operational management for approved projects.

The primary broad scale pathways by which mining and CSG projects can impact water resources are identified as:

1. interception of rainfall and runoff – which can result in:
 - (i) reduced recharge to groundwater systems; and
 - (ii) reduced surface water flows and quality changes; and
2. flow of groundwater to mining voids/wells – which can result in:
 - (i) leakage from aquifers;
 - (ii) mixing of different quality groundwater;
 - (iii) reduced flow from groundwater to rivers; and
 - (iv) increased leakage from rivers to groundwater.

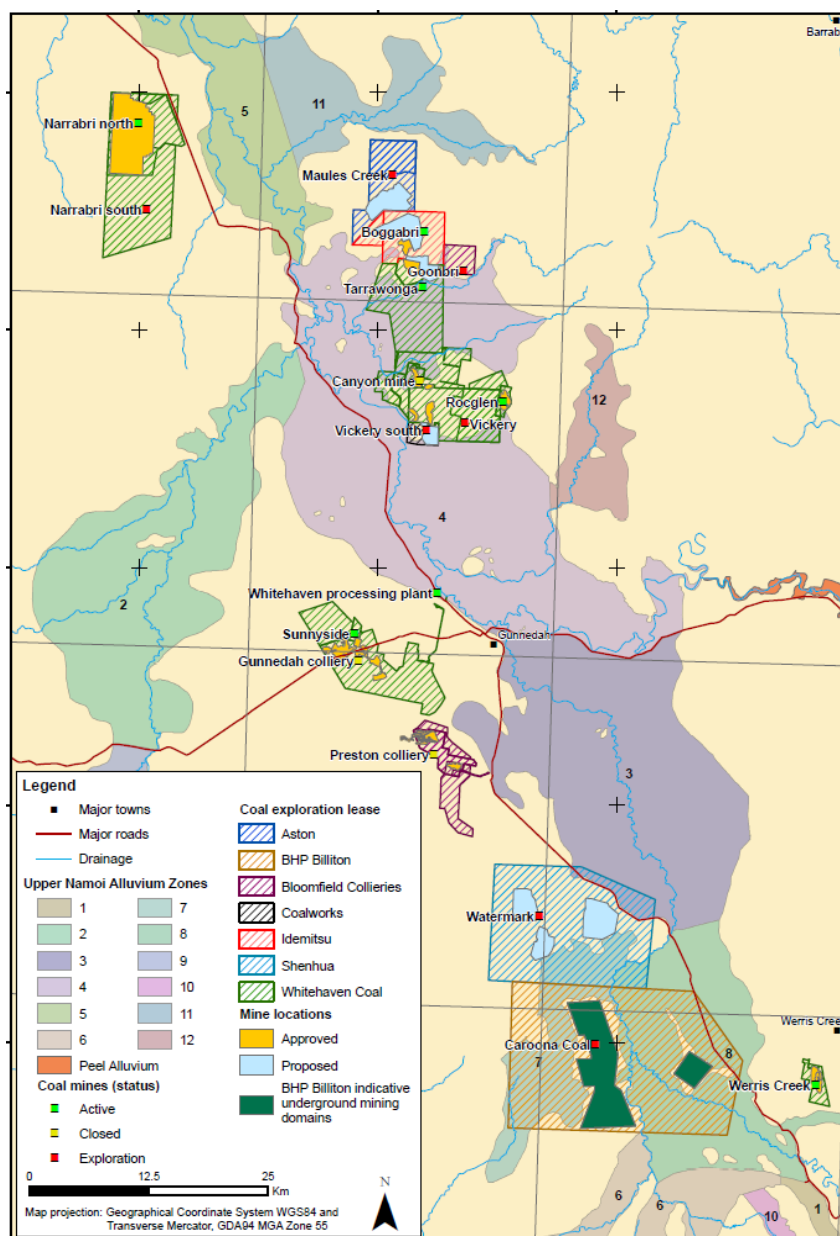


Figure 26: Alluvial Aquifers in the area surrounding the Watermark site

Study Findings

The Study found that mining and CSG developments in the Namoi catchment are unlikely to have significant regional scale impacts on water resources. Local scale impacts are more likely, particularly due to the cumulative effects of numerous developments in close proximity. The impacts would be mainly on the groundwater levels in the hard rock aquifer, and in the local vicinity of the mines or CSG fields. However, some impacts are predicted in Upper Namoi Zone 7 (ie. in the vicinity of the Watermark and Carooda project sites) and Zone 11 where numerous developments are possible.

The predicted impacts on water availability from coal and gas developments compared to non-coal related activities (ie. agriculture and other uses) is shown on Figures 27 and 28.

The modelling indicates that both the Lower and Upper Namoi Alluvium will experience a relatively low impact for both Scenario 2 and 3, when compared to existing anthropogenic water use impacts (ie. background water use for irrigation, stock and domestic, and public supply). However, the hard rock groundwater system is likely to experience a high impact relative to background water use, particularly for Scenario 3.

Detailed consideration of the incremental and cumulative water resources impacts associated with the Watermark Coal Project is provided in Section 6.1 below.

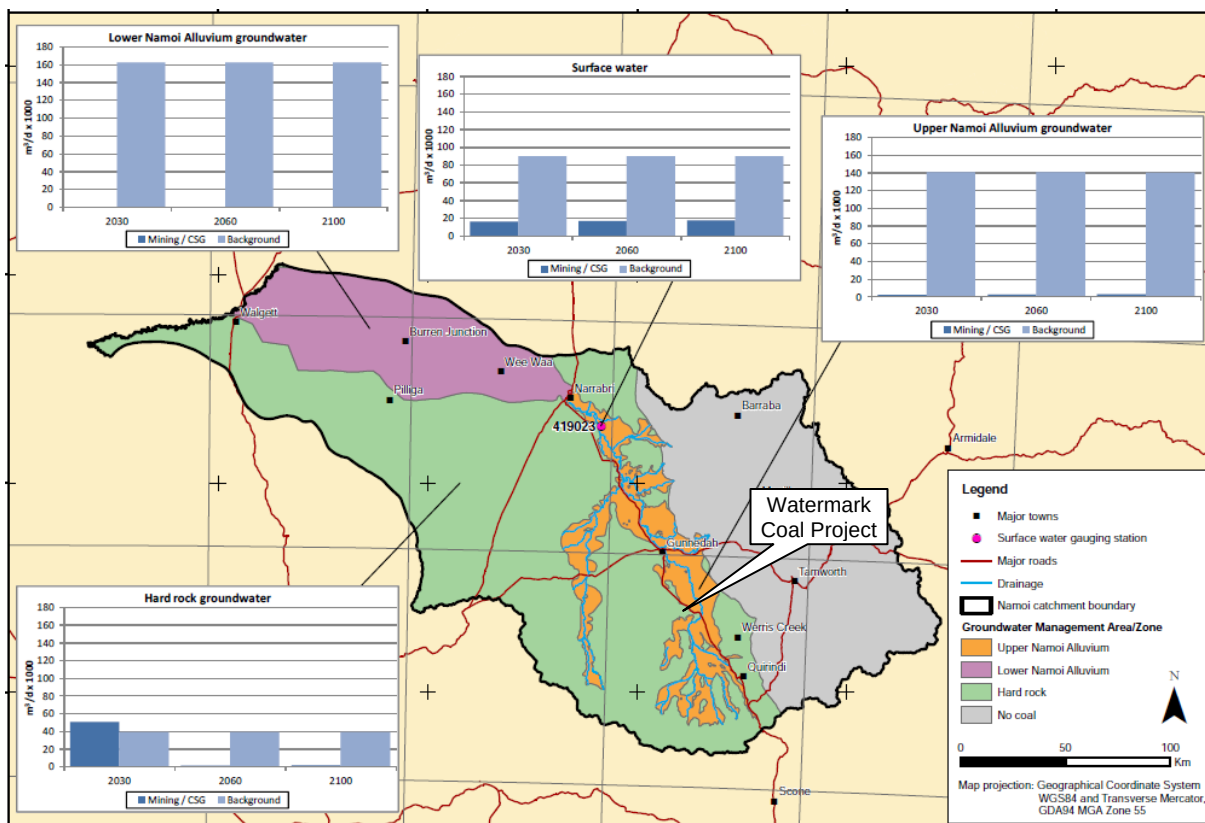


Figure 27: Predicted Impacts on Water Availability – Scenario 2

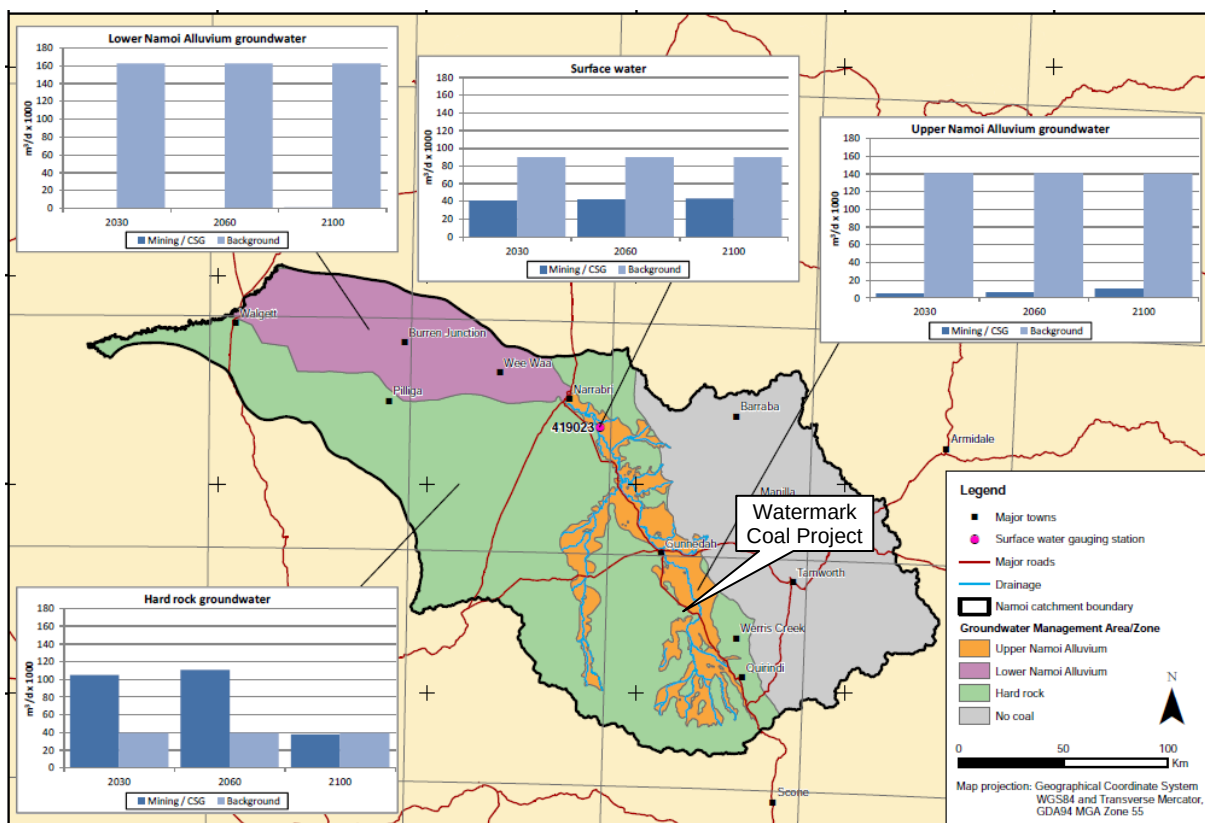


Figure 28: Predicted Impacts on Water Availability – Scenario 3

4. STATUTORY CONTEXT

4.1 State Significant Development

The proposed development is declared to be State Significant Development under Section 89C of the *Environmental Planning & Assessment Act 1979* (EP&A Act) as it is 'development for the purposes of coal mining', which is specified in clause 5 of schedule 1 to *State Environmental Planning Policy (State and Regional Development) 2011*.

Consequently, the Minister for Planning is the consent authority for the development. However, the development application falls within the Minister's delegation to the Planning Assessment Commission (PAC) dated 14 September 2011, because there were more than 25 public submissions in the nature of objections. Consequently, the PAC must determine the application.

4.2 Permissibility

The project site is located in the Gunnedah local government area. Under the *Gunnedah Local Environmental Plan 2012* (Gunnedah LEP) the vast majority of the subject land, including all land within the project disturbance area, is zoned RU1 (Primary Production) (see Figure 29). Open cut mining is permissible with development consent in this zone.

Two small portions of land within the project site, but outside the project disturbance area, are zoned E3 (Environmental Management) under the LEP⁵. Mining is prohibited in the E3 zone. However, *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* provides that open cut mining is permissible on any land where agriculture may be carried out, and agriculture may be carried out in the E3 zone.

Consequently, the project is permissible with development consent on all land within the project site and the PAC may determine the application.



Figure 29: Land Zoning

4.3 Environmental Planning Instruments

Under Section 79C of the EP&A Act the consent authority is required to consider amongst other things the provisions of relevant environmental planning instruments (EPIs), including any exhibited draft EPIs and development control plans.

⁵ The portion of E3 zoned land adjacent to Mt Watermark falls within the on-site biodiversity offset area for the project.
NSW Government
Planning & Environment

The Department has considered the project against the relevant provisions of several EPIs (see Appendix B), as well as Shenhua's consideration of these instruments (see Appendix I). The key instruments include:

- *Gunnedah LEP 2012*;
- *SEPP No.33 – Hazardous and Offensive Development*;
- *SEPP No.44 – Koala Habitat Protection*;
- *SEPP No.55 – Remediation of Land*;
- *SEPP (State and Regional Development) 2011*;
- *SEPP (Infrastructure) 2007* (the Infrastructure SEPP); and
- *SEPP (Mining, Petroleum and Extractive Industries) 2007* (the Mining SEPP).

On 4 November 2013, the NSW Government amended the Mining SEPP to clarify the decision-making process for proposals for the mining of mineral resources, including coal. The amendment introduced a clear statutory requirement that the consent authority must consider the significance of the resource, both to the State and the region where it is located, as part of its decision-making process. While the amendment made clear that the significance of the resource is an important factor in the decision-making process, it is not the only factor, and environmental, social and economic impacts continue to be significant considerations. The Department has included careful consideration of the significance of the project's coal resource in its assessment (see Section 6).

Based on its assessment of these instruments and its broader environmental assessment in Section 6, the Department is satisfied that the Watermark Coal project can be undertaken in a manner that is consistent with the aims, objectives and provisions of these instruments. However, this satisfaction is subject to a range of mitigation, monitoring and management measures, particularly in relation to Koala habitat protection.

4.4 Integrated and Other NSW Approvals

Under Section 89J of the EP&A Act, a number of other approvals are integrated into the State Significant Development approval process, and consequently are not required to be separately obtained for the proposal. These include:

- various approvals relating to heritage required under the *National Parks and Wildlife Act 1974* and the *Heritage Act 1997*;
- an authorisation under the *Native Vegetation Act 2003* for the clearing of native vegetation; and
- certain water approvals under the *Water Management Act 2000*.

Under Section 89K of the EP&A Act, a number of further approvals are required, but must be substantially consistent with any development consent for the proposal. These include:

- a mining lease under the *Mining Act 1992*;
- an environment protection licence under the *Protection of the Environment Operations Act 1997*; and
- approvals for roads and intersection construction under the *Roads Act 1993*.

Shenhua also requires other approvals for the project which are not integrated into the State Significant Development approval process, including:

- approval under the *Crown Lands Act 1989* for any works on Crown land;
- approvals under the *Roads Act 1993* from Gunnedah Shire Council (as the responsible roads authority) to permanently close roads within the project area;
- approvals under the *Coal Mine Health and Safety Act 2002*, for the co-disposal of rejects and tailings in the emplacement areas;
- approval for prescribed dams under the *Dams Safety Act 1978*;
- licences to relocate Koalas under the *National Parks and Wildlife Act 1974*; and
- certain water licences under the *Water Act 1912* and the *Water Management Act 2000*.

The Department has consulted the relevant public authorities responsible for granting these integrated and other approvals, and considered the relevant issues relating to these approvals in its assessment of the project (see Section 5 and Section 6).

4.5 Commonwealth Approvals

Shenhua also needs to obtain an approval from the Commonwealth Minister for the Environment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), because the project is a 'controlled action' under that Act due to the potential for significant impact to listed threatened species and communities and listed migratory species.

The Commonwealth Department of the Environment (DOE) has accredited the State Significant Development approval process for the Watermark Coal Project. This means that assessment of both State and Commonwealth matters has been integrated into a single assessment process. Nevertheless, it is important to recognise that the Commonwealth Minister maintains an independent approval role for the project, and is expected to undertake this determination following the PAC's determination.

4.6 Exhibition and Notification

Under Section 89F of the EP&A Act the Director-General was required to publicly exhibit the Environmental Impact Statement (EIS) for the project for at least 30 days. After accepting the EIS for the project, the Department:

- publicly exhibited the EIS for almost 2 months from 28 February 2013 to 26 April 2013 at the:
 - o Department's Information Centre in Sydney;
 - o Gunnedah Shire Council, Liverpool Plains Shire Council and Tamworth Regional Council offices, and the Gunnedah Library;
 - o Nature Conservation Council's office; and
 - o Department's website;
- notified relevant State government authorities and the Councils by letter;
- notified relevant electricity supply and transmission authorities, in accordance with the Infrastructure SEPP;
- notified relevant road authorities, in accordance with the Mining SEPP;
- notified Aboriginal stakeholder groups, in accordance with the Gunnedah LEP; and
- advertised the exhibition in the Namoi Valley Independent, Northern Daily Leader and Sydney Morning Herald newspapers.

In undertaking these processes, the Department has satisfied the notification requirements of Section 89F of the EP&A Act, the Mining SEPP, the Infrastructure SEPP and the Gunnedah LEP.

During the assessment process the Department also made other documents publicly available on its website, including:

- the development application;
- Director-General's environmental assessment requirements;
- EIS;
- submissions received during the exhibition of the EIS; and
- Shenhua's responses to the issues raised in submissions (the Response to Submissions).

4.7 Gateway Panel Advice

The new Gateway process established under the *Strategic Regional Land Use Policy* (see Section 3.3) and the Mining SEPP does not apply to the Watermark Coal Project, as the DGRs for the project were issued prior to the release of the SRLUP in September 2012⁶.

Nonetheless, the project was referred to the Mining & Petroleum Gateway Panel for advice in accordance with the provisions of the SRLUP and clause 21 of the Mining SEPP. Specifically, the Director-General sought the Panel's advice on:

- the significance of the project's potential impacts on BSAL; and
- whether any additional reasonable and feasible mitigation measures could be implemented to materially reduce the potential impacts of the project BSAL.

The Panel's advice was received on 10 January 2014 (see Appendix F), and is discussed in Section 5 below⁷.

⁶ Clause 50A(3) of the *Environmental Planning and Assessment Regulation 2000* provides that a gateway certificate or site verification certificate (verifying that the land is not BSAL) is not required if the DGRs for the development were issued on, or before, 10 September 2012. The DGRs for the Watermark Coal Project were issued in April 2012.

4.8 PAC Review

On 8 May 2013, the then Minister for Planning & Infrastructure asked the PAC to review the merits of the Watermark Coal Project. Due to the level of interest in the project, the Minister also requested that the PAC hold public hearings during the review.

On 15 November 2013, the then Minister revised his request to require the PAC to consider the Department's preliminary assessment report (ie. this report) as part of its review, and also made some minor changes to the PAC's terms of reference.

The terms of reference for the PAC review are reproduced in Table 4 below.

Table 4: Terms of Reference for the Watermark Coal Project PAC Review

1.	Carry out a review of the Watermark Coal Project, and:
a)	consider the EIS for the project, the issues raised in submissions, the formal response to submissions, any advice from the Gateway Panel on the project, and any other relevant information provided on the project during the course of the review;
b)	consider the [Department's] preliminary assessment report,
c)	assess the merits of the project as a whole, paying particular attention to the: • impacts of the project on strategic agricultural land, as identified in the New England North West Strategic Regional Land Use Plan, including the impacts on existing agricultural land use in the areas surrounding the project; • water resource impacts of the project, including direct and indirect impacts on the Upper Namoi alluvial aquifer and downstream surface water resources; • health and amenity impacts of the project, with a specific focus on whether all reasonable and feasible noise and dust mitigation measures are being employed to avoid and/or minimise these impacts; • long term land use impacts of the project and the suitability and feasibility of the proposed rehabilitation strategy, including the final landform, final void and the proposed rehabilitation of agricultural land; and, if necessary,
d)	recommend further measures to avoid, minimise and/or offset the potential impacts of the project.
2.	Conduct public hearings during the review as soon as practicable after the [Department] provides a copy of its preliminary assessment report for the project to the Planning Assessment Commission.
3.	Submit its final report on the review to the [Department] within 6 weeks of the public hearings, unless the Director-General of the [Department] agrees otherwise.

Once it receives the PAC's review report, the Department will finalise its assessment of the merits of the project and refer the project application back to the PAC for determination.

4.9 Objects of the EP&A Act

The Minister must consider the objects of the EP&A Act when making decisions under the Act. The objects of most relevance to the Minister's decision on whether or not to approve the project are found in Section 5(a)(i),(ii),(vi) and (vii). They are:

To encourage:

- (i) *the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment;*
- (ii) *the promotion and co-ordination of the orderly and economic use and development of land;*
- (vi) *the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats; and*
- (vii) *ecologically sustainable development.*

The Department is satisfied that the project encourages the proper development of resources (Object 5(a)(i)) and the promotion of orderly and economic use of land (Object 5(a)(ii)), particularly as the

⁷ Prior to the establishment of the Gateway Panel, the Department had engaged Mr Terry Short to undertake an independent review of the project. With Mr Short's subsequent engagement as Panel chair, the independent review was discontinued given that the Panel's advice addressed the matters that were to be considered by the independent review.

project is a permissible land use and the subject coal resource is significant from a State and regional perspective.

However, the Department also recognises the potential conflict with other land uses (particularly agriculture), and has assessed the potential impacts on these land uses in detail in Section 6 of this report.

Consideration of environmental protection (Object 5(a)(vi)) is provided in Section 6 of this report. Following its consideration, the Department is satisfied that the project is able to be undertaken in a manner that would maintain or improve the biodiversity values of the region in the medium to long-term. The Department is also satisfied that the impacts to threatened species and habitats can be managed and/or mitigated by imposing appropriate conditions, including the requirement to implement a comprehensive biodiversity offset strategy and rehabilitation strategy.

The Department has considered the encouragement of ecologically sustainable development (Object 5(a)(vii)) in its assessment of the project. This assessment integrates all significant socio-economic and environmental considerations and seeks to avoid any potential serious or irreversible environmental damage, based on an assessment of risk-weighted consequences. Shenhua has also considered the project in the light of the ESD principles. Following its consideration, the Department is satisfied that the project is able to be carried out in a manner that is consistent with the principles of ESD.

5. CONSULTATION

The Department received a total of 133 submissions on the project in response to the exhibition of the EIS, including:

- 12 from public authorities;
- 14 from special interest groups; and
- 107 submissions from the general public.

The Department also received correspondence from the Commonwealth Department of the Environment (DOE), as part of the accredited assessment process under the EPBC Act. This included correspondence from the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC), established under the EPBC Act to provide independent scientific advice on the potential impacts of large mining and CSG projects on water resources.

Shenhua provided its response to the issues raised in these submissions in November 2013 (see Appendix G).

Since the exhibition of the EIS and receipt of the Response to Submissions, the Department has consulted further with Shenhua and several public authorities and other stakeholders (including the Caroon Coal Action Group), which has included site visits and meetings to discuss key issues. As outlined in Section 4.7, the Department also sought the advice of the newly established NSW Gateway Panel on the project.

A summary of the issues raised in submissions is provided below, focusing on the residual issues where stakeholders have provided additional submissions following the EIS. Full copies of the submissions are provided in Appendix H, and the Gateway Panel's advice is attached in Appendix F.

5.1 Public Authorities

None of the public authorities object to the project. However most of the authorities raised concerns about the potential impacts of the project, and made recommendations as to how these impacts should be avoided or minimised.

Division of Resources and Energy (DRE) (within the Department of Trade & Investment, Regional Infrastructure & Services) noted the general requirement for a mining lease, and requested additional information in relation to rehabilitation, particularly with regard to domain-specific rehabilitation objectives and completion criteria, rehabilitation planning (eg. where agricultural land and woodland areas would be located) and trigger actions for remedial actions and contingency measures. Shenhua provided additional information addressing these matters in its Response to Submissions,

but DRE was still of the view that more detailed information on these matters should be provided. However, it accepted that these matters could be addressed through conditions as part of the detailed Rehabilitation Management Plan for the project.

The Department has assessed the various environmental aspects associated with rehabilitation as part of its detailed consideration of the project, and is satisfied that there is sufficient information for the purposes of development assessment and decision making (see Section 6). The Department has recommended conditions consistent with DRE's recommendations.

Environment Protection Authority (EPA) initially raised a number of concerns related to noise, air quality, water (especially the water balance and obtaining enough water for effective dust control) and justification for the final void. Shenhua addressed many of these issues in its Response to Submissions, which included undertaking a 'mine optimisation review' to reduce noise and dust emissions. Notwithstanding, EPA has noted the following residual concerns and/or issues:

- **Noise:**
 - o lack of detail on consultation with the surrounding community on the acceptability of the residual operational noise impacts;
 - o lack of discussion on the proposed mitigation to residences to address residual noise impacts above the relevant criteria;
 - o noted that there were no predicted operational noise impacts above the criteria until at least Year 5, which allows significant lead time to undertake additional consultation and negotiation, and mitigation at affected residences;
 - o recommended a number of operational noise and blasting conditions;
 - o recommended that low frequency noise be included in noise monitoring for the project;
 - o recommended that only best practice locomotives and rolling stock be used for the project;
- **Air Quality:**
 - o recommended that best practice dust control measures be employed, and a comprehensive Air Quality Management Plan be prepared;
 - o noted the predicted 1 hr NO₂ criteria exceedances (up to 8 hrs/yr) during blasting events in poor dispersion conditions, and recommended that the Blast Management Plan includes provisions to avoid blasting in these conditions;
- **Surface Water:**
 - o noted that the water balance uses very low water application rates (ie. 1.92 mm/day, plus chemical suppressants), which brings into question the ability to achieve the stated 85% dust control efficiency. The EPA cautioned that if this application rate proves ineffective (and more water is required), then there will be significant implications for the water balance;
 - o recommends a minimum 80% dust control efficiency, in line with its best practice Dust Stop Pollution Reduction Programs;
 - o noted that the stated water for dust control is dependent on obtaining adequate water licences; and
- **Final Void:**
 - o recommends continual review of the final void as the project progresses to minimise, and if possible avoid, the need for the final void.

Office of Environment and Heritage (OEH) initially raised concerns about the adequacy of the assessment of groundwater dependent ecosystems, Aboriginal scarred trees, Koalas and particularly the adequacy of the proposed biodiversity offset strategy. Since the EIS, Shenhua has enhanced the offset strategy in consultation with OEH (and the Department and DOE), and sought to address the other issues raised by OEH.

Following this additional work and Shenhua's commitment to the enhanced offset strategy, OEH has confirmed that it is now satisfied that the general biodiversity and cultural heritage impacts have been adequately addressed. However, OEH noted that a number of issues require further attention prior to its endorsement of the Koala Plan of Management.

OEH's Heritage Division (which provided separate submissions) also does not have any significant concerns about the historic heritage impacts of the project, and recommended conditions requiring a detailed Heritage Management Plan, including provisions for:

- protection of the former Watermark Public School site during construction;

- archival recording of all identified historic heritage items prior to construction;
- archaeological excavation works (where required) to be undertaken in accordance with Heritage Council guidelines; and
- that Conservation Management Plans be prepared for identified heritage farm complexes.

Department of Primary Industries (DPI) provided comments from its range of divisions, including the NSW Office of Water (NOW), Office of Agricultural Sustainability & Food Security (OAS&FS), Forestry Corporation NSW (Forestry), Fisheries NSW and Crown Lands.

NOW raised a number of residual concerns following Shenhua's Response to Submissions, including:

- that Shenhua had not secured, or demonstrated the ability to secure, the required water licence entitlements for all but one of the applicable water sources;
- that there were a number of uncertainties associated with the groundwater modelling and impact assessment (including impacts on stygofauna and groundwater dependent ecosystems, salinity budget and floodplain management), and that well designed monitoring and regular model verification would be critical to lessen ongoing uncertainty; and
- that because of the uncertainties, available mitigation and make-good provisions should be considered.

NOW subsequently consulted further with Shenhua in relation to these residual issues, and reviewed the findings of the independent groundwater review commissioned by the Department (see Section 6.1). Following this additional review, NOW confirmed that it was satisfied that its residual issues had been adequately addressed, with key conclusions and recommendations including:

- that the groundwater model is fit-for-purpose and suitable for the assessment of the project;
- that Shenhua should be required to obtain adequate water licences to account for water take prior to commencing mining operations;
- that the groundwater model should be verified and updated on a regular basis;
- that a comprehensive Water Management Plan should be prepared;
- that the flood levee should be designed to prevent inundation of the pit in floods of at least 100 year ARI severity; and
- that proposed flood mitigation measures to reduce impacts on Watermark Gully and the Kamilaroi Highway be developed in consultation with NOW.

OAS&FS also raised a number of residual concerns following the Response to Submissions about the potential impacts on agricultural resources. Its key concerns included:

- incomplete identification of BSAL affected by the project, particularly BSAL in the biodiversity offset areas;
- potential errors in soil stripping calculations, which could affect the amount of soil available for rehabilitation;
- risks and uncertainties around rehabilitation of the disturbance area to agricultural land;
- potential indirect impacts on surrounding agricultural land users, particularly from dust;
- possible risks to agricultural water supplies; and
- management of socio-economic impacts and visual impacts.

OAS&FS subsequently consulted further with Shenhua in relation to these residual issues, which included a site inspection and provision of additional information. Following this additional review and site inspection, OAS&FS confirmed that it accepts Shenhua's analysis of the amount of BSAL on the site, and that it accepts there is a reasonable probability that there would be adequate soil volumes for rehabilitation, subject to careful rehabilitation planning.

Forestry did not raise any concerns about the project, but requested that it be kept advised of the project status given its proximity to Breeza State Forest.

Fisheries NSW did not raise any significant concerns, and recommended that it be consulted regarding rehabilitation of the riparian areas in the Mooki River Biodiversity Offset Area, and in relation to the potential water pipeline and pump station on the Mooki River.

Crown Lands did not raise any significant concerns, and recommended that its standard conditions regarding occupation of Crown land and closure of Crown roads be applied to the project. The

Department notes that Shenhua would be required to obtain these approvals separately to any planning approval for the project.

NSW Health raised a number of issues and/or concerns, relating to:

- **Noise:**
 - o that the acceptability of the predicted noise impacts and proposed mitigation measures to the affected residents should be addressed;
 - o recommended that a detailed complaints handling mechanism be employed enabling rapid corrective action;
- **Air Quality:**
 - o recommended that Shenhua be required to take all reasonable and feasible measures to ensure that particulate emissions from all sources are kept as low as reasonable practicable;
 - o questioned the ability to achieve the adopted 85% dust control efficiency;
 - o supports measures to address potential impacts to domestic water supplies (eg. through installation of first flush systems on the rainwater tank supplies to affected residences); and
- **Social Impacts:**
 - o recommended that the success of community engagement be monitored over time, and noted that it would be useful if it were subject to independent assessment.

Namoi Catchment Management Authority (CMA) initially raised a number of concerns, with key issues relating to:

- **Final Void:**
 - o particularly in relation to long term salinity of the void;
- **Water Quality:**
 - o recommended that management plans include objectives to maximise clean water runoff;
- **Biodiversity:**
 - o recommended that Offset Area 6 be retained for agriculture;
- **Soils and Rehabilitation:**
 - o particularly the ability to rehabilitate land to support cropping; and
 - o recommended that coal rejects be adequately buried and encapsulated in overburden emplacements.

Following the Response to Submissions, the CMA acknowledged the effort that Shenhua had made to address its issues through changes to the project and provision of additional information.

Roads and Maritime Services (RMS) raised residual concerns relating to:

- the proposed Kamilaroi Highway deviation and overpass, noting that inadequate detail had been provided on the works;
- potential inconsistencies between identified traffic conditions for some intersections; and
- potential flooding impacts on the Watermark Gully causeway on the Kamilaroi Highway.

RMS noted that the proposed road and rail works would require separate approvals under the *Roads Act 1993* and the *Rail Safety (Adoption of National Law) Act 2012*, and that Shenhua would 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.

Transport for NSW (TfNSW) raised some concerns about the potential impacts and interactions of the project on rail capacity, rail network upgrades and rail traffic interactions with agriculture, and requested that ARTC be consulted in regard to these issues.

Australian Rail Track Corporation (ARTC) raised no concerns about these issues or the project in general.

Australian Astronomical Observatory (AAO) made comment on the potential for the project to affect the Sidings Springs Observatory (located about 120 kilometres from the mine) by way of light, dust and seismic disturbance, and recommended that Shenhua be required to consult with AAO regarding implementation of measures to ensure the observatory is not affected, including:

- monitoring of light and dust levels; and

- adoption of best practice technology and operating measures to reduce emissions.

The Commonwealth **Department of the Environment (DOE)** initially raised concerns about the adequacy of the biodiversity offset strategy, but has since consulted with Shenhua, OEH and the Department in relation to Shenhua's enhanced offset strategy.

DOE noted that the revised biodiversity offset strategy provides adequate direct offsets for Commonwealth-listed threatened species, but that the offsets for some endangered ecological communities (EECs), particularly the 'Grey Box' EEC, still falls (marginally) short of its direct offset requirements. DOE recommended that further compensatory measures be required for the Grey Box EEC.

DOE also provided advice from the Commonwealth's Independent Expert Scientific Committee (IESC), which has been established to provide DOE with advice in relation to water-related impacts of large coal and CSG projects. The IESC encouraged consideration of the potential cumulative impacts of the project on water resources, and considered that the project has a risk of increasing salinity in the region, particularly associated with overflow from water storages, long term seepage from overburden emplacements and voids, connectivity between aquifers and vegetation removal. The Committee made a number of comments on the adequacy of the water assessments undertaken for the project, and made recommendations to reduce impacts, including requirements for detailed water management plans, flood mitigation (of the Eastern Mining Area), and mitigating salinity through implementation of dryland salinity management measures (eg. revegetation). The Department has engaged independent surface water and groundwater experts to review the potential water resource impacts of the project in detail (see Section 6.1).

NSW Mining and Petroleum Gateway Panel (the Gateway Panel) raised a number of concerns in relation to the BSAL assessment for the project, in particular that Shenhua:

- had not defined the project area for BSAL assessment correctly;
- had not applied the BSAL verification protocol correctly;
- should undertake further salinity modelling of the final void; and
- should amend the project to 'clearly show that the project will not significantly reduce the agricultural productivity of any BSAL'.

The Gateway Panel requested that these issues be addressed by Shenhua, with the subsequent information provided back to the Panel for further consideration. However, as outlined in Section 4.7, as a gateway certificate is not required for the project the Department only sought the Panel's advice on the project's potential impacts on BSAL for consideration in the assessment of the proposal.

Accordingly, the Department has considered the issues raised by the Panel in its assessment of the project, including the perceived paucity of information in relation to certain matters, particularly the uncertainty about the area of BSAL within the site. The Department notes that the issues raised by the Panel are similar to issues raised by other submitters including the OAF&FS, and the Department has duly considered these issues in its assessment. Water resources-related issues associated with the project have also been considered by independent experts engaged by the Department (see Section 6.1).

Gunnedah Shire Council (GSC) does not object to the project, but has raised a number of residual concerns and/or issues relating to:

- **Roads:**
 - o inadequacies associated with the traffic impact assessment;
 - o the need to upgrade a number of local roads and intersections as a result of the project and the required road closures;
 - o funding for ongoing road maintenance;
- **Flooding:**
 - o particularly in relation to increased flooding risk on the Watermark Gully causeway on the Kamilaroi Highway;
- **Water Resources:**
 - o ensuring ongoing sustainable water supply is available to surrounding landholders;
 - o recommended that independent experts be engaged to review the water resource assessments;

- **Socio-economics:**
 - o encouraging the workforce to live locally;
 - o provision of apprenticeships and training programs for local people;
 - o ensuring that the full range of socio-economic costs and benefits are considered;
 - o ensuring that the full range of environmental impacts (particularly in relation to noise, dust, visual and water) on surrounding land users is appropriately considered;
 - o ensuring consideration is given to potential cumulative impacts, including hard and soft infrastructure needs;
 - o ensuring due consideration is given to potential impacts on agriculture; and
 - o ensuring that Shenhua provides a financial contributions package (via a Voluntary Planning Agreement) that provides agreed contributions towards repair and maintenance of local roads, general community enhancement and compensation for project-related administration and management costs incurred by Council.

Liverpool Plains Shire Council (LPSC) also does not object to the project, but has raised a number of residual concerns and/or issues relating to:

- **Roads:**
 - o inadequacies associated with the traffic impact assessment, and the need to upgrade local roads and intersections as a result of the project;
 - o the need to consider flooding of local roads;
- **Socio-economics:**
 - o ensuring that Shenhua provides financial contributions toward road upgrades and maintenance, and its ongoing project-related administrative costs, in addition to contributions towards community facilities; and
- **Cumulative Impacts:**
 - o ensuring that cumulative impacts are appropriately considered, particularly in respect of traffic and transport related impacts.

5.2 Community and Interest Groups

Of the 121 submissions from special interest groups and the general public, all but 3 objected to or raised concerns about the project.

Special Interest Groups Submissions

Special interest groups that made submissions include:

- Caroon Coal Action Group;
- Breeza Progress Association;
- SOS Liverpool Plains;
- NSW Farmers Association⁸;
- Hunter Environment Lobby;
- Marys Mount Protection Alliance;
- Namoi Water;
- Namoi Community Network;
- Northern Inland Council for the Environment;
- NTS Corp;
- The Wilderness Society;
- Cotton Australia; and
- Construction, Forestry, Mining and Energy Union (CFMEU).

All of the groups, with the exception of the CFMEU, either objected to or raised concerns in relation to the project. A summary of the groups and their concerns is outlined below.

Caroon Coal Action Group (CCAG) comprises a group of concerned local landowners and community members and was formed in 2006 in response to the coal exploration licences issued for the Caroon and Watermark coal projects. CCAG seeks to ensure that mining and CSG development 'does not destroy the environment, agricultural production, people's livelihoods, health and attachment to the land'. CCAG's website (www.ccag.org.au) notes that it is not opposed to mining per se, and that it has consistently argued for the role of independent science in the planning process.

⁸ Two submissions, including one from the parent association and one from the Gunnedah District Council
NSW Government
Planning & Environment

CCAG has produced very detailed submissions on the project (in response to the EIS and Response to Submissions), prepared by specialist environmental consultants Earth Systems on the organisation's behalf. Many of the other submissions from special interest groups and the general public acknowledge and support the CCAG submissions.

CCAG's submissions raise a broad range of concerns, with key concerns including:

- *General:*
 - o mining developments will pose unacceptable risks to the agricultural future of the Namoi Valley, and co-existence with mining companies is not possible here;
 - o gaps in baseline data, especially in relation to water quality and geochemistry, meteorology, archaeology and cultural heritage;
 - o inadequate risk assessment and limited detail on mitigation measures and environmental management plans;
- *Water resources:*
 - o Namoi catchment is one of the nation's most productive, and protecting the integrity of its water resources is essential to maintain agricultural viability;
 - o long term impacts associated with the final void, particularly with regard to salinity;
 - o mining on the floodplain appears to breach conditions of the EL;
 - o water sources and supply requirements from each water source not adequately quantified;
 - o lack of consistency about the need to discharge potentially contaminated (saline) water from the site;
 - o inadequacy of the salinity balance;
 - o long term seepage of saline, acidic or contaminated water from overburden emplacements and mine waste;
- *Soils and Agriculture:*
 - o including direct loss of agricultural land and indirect impacts on surrounding agriculture;
 - o uncertainty associated with rehabilitation of agricultural land, and availability of suitable soils for revegetation;
 - o subsidence of backfilled material not addressed;
- *Air quality and greenhouse gases:*
 - o meteorological (wind) data not representative of long term variation in the locality;
 - o inadequacy of greenhouse gas accounting and mitigation strategies;
- *Biodiversity:*
 - o inadequacy of Koala Plan of Management and assessment on highly mobile fauna;
 - o inadequacy of offsets assessment, particularly in relation to Commonwealth guidelines;
- *Socio-economics and health:*
 - o uncertainty about physical and health impacts;
- *Archaeology and heritage:*
 - o inadequacy of survey coverage; and
 - o procedures required to address discovery of previously unidentified sites.

Breeza Progress Association (BPA) was formed in 2005 to represent the community of Breeza 'as a united voice', and comprises community members that 'want to progress the village ahead'. BPA objects to the project, with its major concerns including:

- *General:*
 - o potential health impacts, particularly related to air, noise and blasting;
 - o impacts on some of the best farming country in Australia, if not the world;
- *Air Quality:*
 - o impacts on town water supplies through contamination of rainwater tanks (from dust deposition) and impacts on bores;
 - o meteorological (wind) data not representative of long term variation in the locality;
 - o effects associated with blast-related emissions;
- *Water resources:*
 - o contamination of the Mooki River and loss of flows;
 - o lack of consistency about the need to discharge potentially contaminated (saline) water from the site;
- *Noise and light:*
 - o due to the close proximity to the village;

- **Archaeology and heritage:**
 - o impacts on Aboriginal axe grinding groove sites and scarred trees;
- **Biodiversity:**
 - o impacts on the local Koala population, and potential isolation of the Breeza population;
- **Traffic:**
 - o impacts on local roads and traffic safety; and
 - o Shenhua should be required to contribute to road funding.

SOS Liverpool Plains (SOS) represents a group of about 60 country and city women, and was formed in 2007 with the mission of raising awareness of the effects of coal and CSG development on the people, communities, land, air and water. SOS raised a number of concerns broadly similar to those raised by CCAG, with key issues including impacts on biodiversity, Koalas, health (including dust emissions from coal trains), agriculture, water and noise (including low frequency noise). SOS's submission included a specialist review by Soil Futures Consulting, which raised a number of concerns including increased salt loading of the Mooki River, the ability to rehabilitate to agricultural land, and surface water flow declines in watercourses such as Watermark Gully.

NSW Farmers Association stressed the importance of agriculture and the Liverpool Plains to the people and economy of NSW, noting that the Liverpool Plains is an 'iconic food and fibre producing region'. Whilst recognising the importance of woodland re-establishment, the Association questioned why only 1,000 hectares of the project disturbance area was proposed to be rehabilitated to agricultural land, and noted that it supports the concept 'no net loss' of agricultural land. The Association was critical of the loss of BSAL in the offset areas as originally proposed (Shenhua has subsequently amended the offset strategy to avoid the BSAL), and made a number of comments and/or recommendations in relation to agriculture (including adequacy of the Agricultural Impact Statement), water resources, air quality, visual impacts and socio-economics.

The Association's Gunnedah District Council raised concerns about the project's potential impacts on water resources, biodiversity, Koala habitat, Aboriginal heritage, air quality, noise and socio-economic impacts on Breeza residents.

Hunter Environment Lobby is a Hunter-based community environmental organization, and raised broad concerns relating to noise, dust, soil degradation and run-off, and rehabilitation.

Marys Mount Protection Alliance (MMPA) comprises a group of concerned residents in proximity to the 'Kahlua' CSG project about 30 kilometres west of Gunnedah. MMPA raised concerns similar to those raised by the NSW Farmers Association's Gunnedah District Council.

Namoi Water is a peak industry group representing irrigated agricultural land users in the Peel, Upper Namoi and Lower Namoi valleys, and has approximately 1,000 members. The organisation criticised the issuing of the exploration lease for the project, noting that the project would have significant impacts on the region's water and agricultural resources. Its key water-related concerns include reduced groundwater availability to agricultural users and the environment, reduced surface water run-off, potential spills from mine water storages, mining on the floodplain, water quality impacts and long term impacts associated with, and justification for, the final void. It also raised concerns regarding socio-economic, air quality and biodiversity impacts.

Namoi Community Network (NCN) is an affiliated committee under Namoi Water, established in 2011 to oversee the development of the Namoi Water Study. NCN noted that the Namoi Water Study demonstrated that mining and extractive industry projects will impact the region's water resources, including impacts on water quality and impacts on aquifers, and criticised the perceived lack of reference to the findings of the Study. NCN also raised concerns in relation to air quality (including impacts to plant growth), biodiversity, Koalas, the final void (and potential future underground mining), rail traffic, noise and Aboriginal heritage.

Northern Inland Council for the Environment (NICE) is a community environmental organisation formed to campaign against mining activities in the Pilliga and Leard State Forests. NICE raised a number of concerns relating to water resources (particularly saline overflows from water storages), the final void, socio-economics and biodiversity (particularly the adequacy of the biodiversity offsets).

NTS Corp is the native title service provider for Aboriginal traditional owners in NSW and the ACT. It noted that the project site is within the native title claim for the Gomeroi People. The organisation criticised aspects of the Aboriginal cultural heritage assessment undertaken for the project, particularly in relation to the consultation process, involvement of traditional owners in the cultural heritage assessment, implementation of the recommendations made by Aboriginal groups, deficiencies in the ethno-historical analysis and a focus on scientific archaeology rather than cultural heritage value.

The Wilderness Society (Newcastle Branch) raised a range of concerns similar to other groups, with key concerns relating to the impacts of the project on Koalas and the adequacy of the original biodiversity offset strategy. With regard to Koalas, the Society noted that the density of Koalas on the site is higher than previous assessments (which brings into question the methodology used in the assessment, and is disputed by Australian Koala Foundation which believes there are less Koalas in the LGA), that the proposed translocation is not consistent with NSW policies, and that the proposed relocation areas had not been properly assessed.

Cotton Australia is a peak industry group representing around 1,500 cotton farming families in NSW and Queensland. The organization noted that it remains extremely concerned about the project and urges the highest level of scientific scrutiny in light of the potential impacts on the prime agricultural lands that neighbour the project site.

Construction, Forestry, Mining and Energy Union (CFMEU) represents over 120,000 members in the construction, forestry, mining and energy industries. The Union's Northern District Branch made a detailed submission supporting the project, citing its socio-economic benefits to the State. The submission noted that the socio-economic and environmental impacts of the project have been avoided or minimised as far as practicable.

General Public Submissions

Submissions from the general public were received from rural landowners surrounding the project site, residents of Breeza, residents of surrounding communities in the Gunnedah and Liverpool Plain LGAs, as well as individuals in the wider region.

Of the 107 public submissions, all but 2 objected to or raised concerns about the project.

The 2 submissions in support of the project (including one from a Councillor of LPSC) cited the economic and social opportunities and benefits that the project would generate, that the project avoids the high quality black soil plains and appears to minimise environmental impacts, and that it is well located near existing rail and port infrastructure.

The submissions objecting to and/or raising concerns cited a range of issues, with the key issues indicated in Figure 30 below.

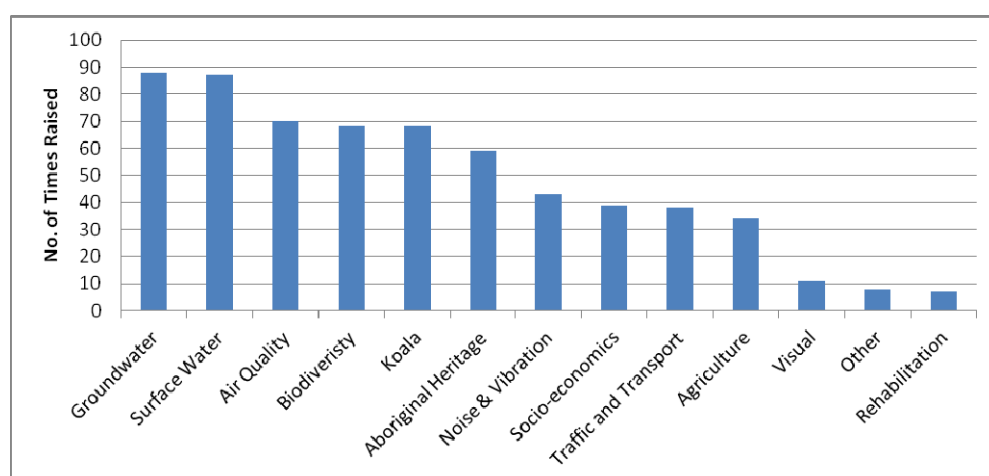


Figure 30: Key Issues Raised in Public Submissions

5.3 Summary of Key Issues Raised in Submissions

Whilst a wide range of issues were raised in the submissions, the key residual issues were related to the project's direct and cumulative impacts on:

- *Water resources* – particularly impacts to the significant Upper Namoi alluvial aquifer, the potential for saline water releases from mine water storages and long term seepage/migration from the overburden emplacements and final void;
- *Noise, vibration and dust* – including amenity and health-related impacts to surrounding residents, impacts to surrounding agricultural land use and issues associated with the assessment methodologies (including meteorological data used);
- *Biodiversity* – particularly the adequacy of the biodiversity offset strategy and potential impacts on Koalas;
- *Aboriginal heritage* – particularly the loss of Aboriginal sites within the project disturbance area;
- *Socio-economics, including agriculture* – particularly impacts on agricultural resources, impacts on local and regional infrastructure and community services, and ongoing impacts associated with the proposed rehabilitation strategy (including potential future expansion);
- *Traffic* – particularly impacts on local roads and increased rail traffic; and
- *Visual amenity*.

The Department has considered these and other issues associated with the project in its assessment of the project.

6. ASSESSMENT

In its assessment of the merits of the project application the Department has considered the:

- EIS, submissions, responses to submissions, and additional information provided by Shenhua and public authorities;
- the independent groundwater review, surface water review and traffic review;
- the Gateway Panel's advice on the project;
- relevant environmental planning instruments, policies and guidelines; and
- relevant provisions of the EP&A Act, including the objects of the Act.

6.1 Water Resources

Introduction

The potential impacts on water resources has long been recognised as a key risk associated with the development of the Gunnedah Coalfield.

As outlined in Section 3.5, the Namoi Catchment Water Study was commissioned in response to rising levels of concern within the community about the potential impacts of the growing mining and CSG industry on the significant groundwater and surface water resources in the region.

Whilst the study found that mining and CSG developments in the Namoi catchment are unlikely to have significant regional scale impacts on water resources – even with very substantial coal and CSG development scenarios – local scale impacts are more likely. The study noted that these local scale impacts cannot be determined by a catchment wide study (as undertaken in the Namoi Water Study), and stressed the need for comprehensive project-specific investigations, supplemented by comprehensive monitoring and operational management plans for approved projects.

In this regard, a number of specialist water resource assessments and reviews have now been undertaken for the Watermark Coal Project to assess the incremental and cumulative affects of the project.

To this end, the EIS includes specialist groundwater and surface water assessments, undertaken by Australasian Groundwater & Environmental Consultants and WRM Water & Environment, respectively.

Secondly, the EIS also includes a peer review of the groundwater assessment, undertaken by Dr Noel Merrick of Heritage Computing.

Thirdly, the EIS includes a number of subsidiary assessments to supplement the water resource assessments, with the key ones including:

- a transient electro-magnetic geophysical survey, by Groundwater Imaging, to define the extent of the alluvial material within and adjacent to the site, and identify potential conduits or barriers for groundwater flow from the mining area;
- a geochemical assessment, by RGS Environmental, to assess the quality of leachate (and hence groundwater) produced from spoil materials associated with the mine;
- a geomorphology assessment, by GHD, to define and characterise the watercourses in the project site;
- a seepage water quality assessment, by Terrenus Earth Sciences, to assess potential impacts associated with long term seepage from the three mining areas and overburden emplacements; and
- a stygofauna assessment, by Ecological, to assess the potential for impacts on subterranean fauna (ie. stygofauna), a groundwater dependent ecosystem.

Fourthly, the Department engaged Dr Frans Kalf of Kalf & Associates to undertake an independent review of the groundwater assessments and groundwater-related issues raised in submissions, and Dr Steve Perrens of Evans & Peck to undertake a similar independent review of the project's surface water impacts. These reviews are attached in Appendix C and Appendix D, respectively.

Finally, the project's water resource impacts were reviewed by specialist hydrogeologists of the NSW Gateway Panel, as part of the Gateway Panel's advice on the project, and by the Commonwealth's Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC).

The Department is satisfied that the body of work undertaken to assess the potential water resources impacts of the project has been substantial, and has involved reviews by some of the State's most respected water specialists. Based on these assessments the Department, NOW, Dr Kalf and Dr Perrens are satisfied that a thorough and robust prediction of the project's potential water resource impacts has now been undertaken, and that the assessments include satisfactory sensitivity analysis to account for the range of potential water resource impacts.

The Gateway Panel was also generally satisfied with the groundwater assessments, but did raise some residual concerns about salinity predictions in the final void and in surrounding aquifers, and noted that it considered the cumulative assessment to be minimal.

Catchment Context

The site is located in the Mooki River Catchment, a tributary of the Namoi River. Runoff from the site drains in 3 directions before entering the Mooki River (see Figure 31), either:

- north via Watermark Gully or other unnamed drainage lines;
- south to Native Dog Gully; or
- west towards Lake Goran, a large ephemeral lake which overflows intermittently (about every 5 years) to the east via Native Dog Gully.

The Mooki River catchment covers roughly 3,800 km², or about 9% of the total Namoi catchment area (of 42,000 km²). The Mooki River catchment area to Breeza, located 5km downstream of the project site, is 3,630 km². The River has a mean annual flow at this point of approximately 107 gigalitres, although this varies widely depending on rainfall. The river does periodically cease to flow, with zero flows occurring approximately 15% of the time at Breeza.

Watermark Gully has a catchment area upstream of the Kamilaroi Highway of approximately 39 km². It is an ephemeral stream, being dry 98% of the time and flowing only in response to significant rainfall events. Native Dog Gully is also ephemeral, and has a catchment area of approx 72 km² to the Mooki River (excluding the Lake Goran catchment area). Lake Goran has a catchment area of approximately 1,320 km², storing approximately 131,000 megalitres (ML) below the overflow level of 296.5m AHD.

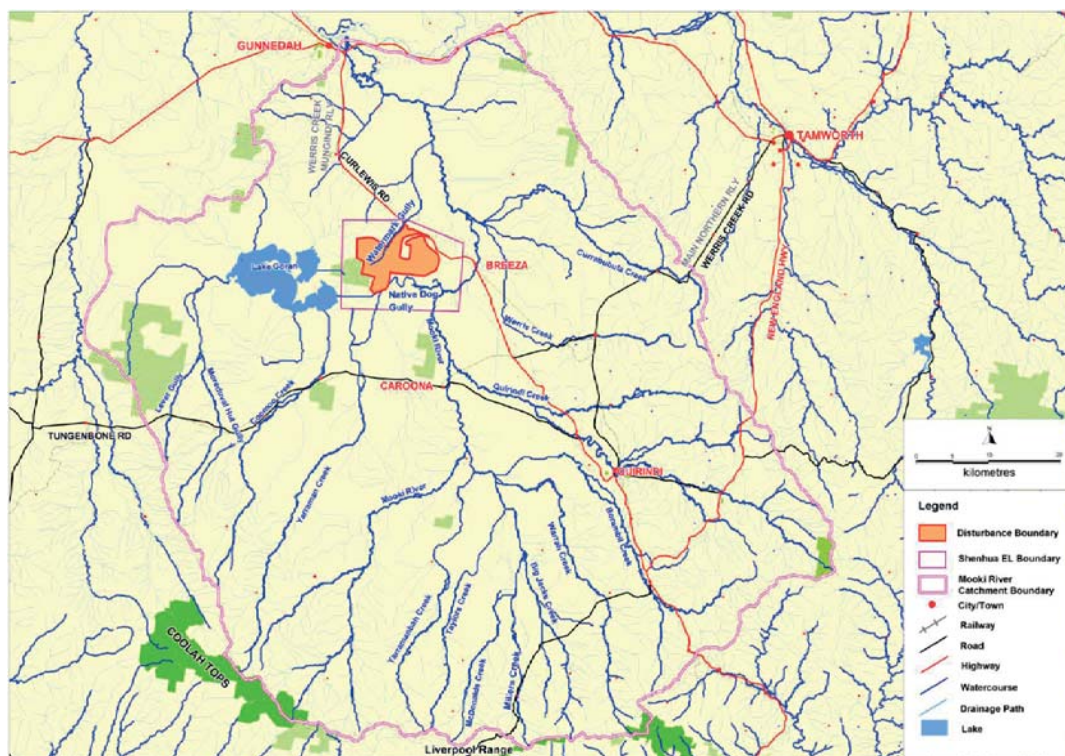


Figure 31: Mooki River Catchment

Groundwater Aquifer Context

There are two main aquifer resources in the vicinity of the project area, namely the:

- Upper Namoi alluvial aquifer; and
- Permian 'hard rock' aquifers associated with deeper bedrock strata including coal seams, weathered rock, sandstones, fracture zones and volcanics.

The Upper Namoi alluvial aquifer is the key groundwater resource in the locality. It comprises 2 major formations representing the black soil alluvials, including;

- the Narrabri Formation – the uppermost unit typically comprising a clay dominated aquitard. Average yield is 50 L/s and quality is brackish to saline, with total dissolved solids (TDS) greater than 10,000mg/L, which is not suitable for beef cattle production⁹; and
- the Gunnedah Formation – the underlying alluvials composed of thick beds of porous sand and gravel separated by clays. The aquifer is characterised by high permeability and variable yield (ranging from 5 to >50 L/s). Water quality is significantly better than that of the Narrabri Formation, and is typically fresh to slightly brackish (approximately 1,200 mg/L to 3,000 mg/L) in areas west of the Mooki River.

Recharge to the Upper Namoi alluvium occurs mainly at the base of the Liverpool Ranges, and from river leakage, including from the Mooki River.

Given its better quality, the Gunnedah Formation is commonly referred to as the primary aquifer system in the region, and is extensively used for irrigation, stock and domestic, and for town water supply. The location of the alluvial formations in relation to the project site is shown on Figures 32 and 33.

⁹ Sheep can tolerate up to 13,000 mg/L, therefore a small portion may be suitable for limited livestock production.

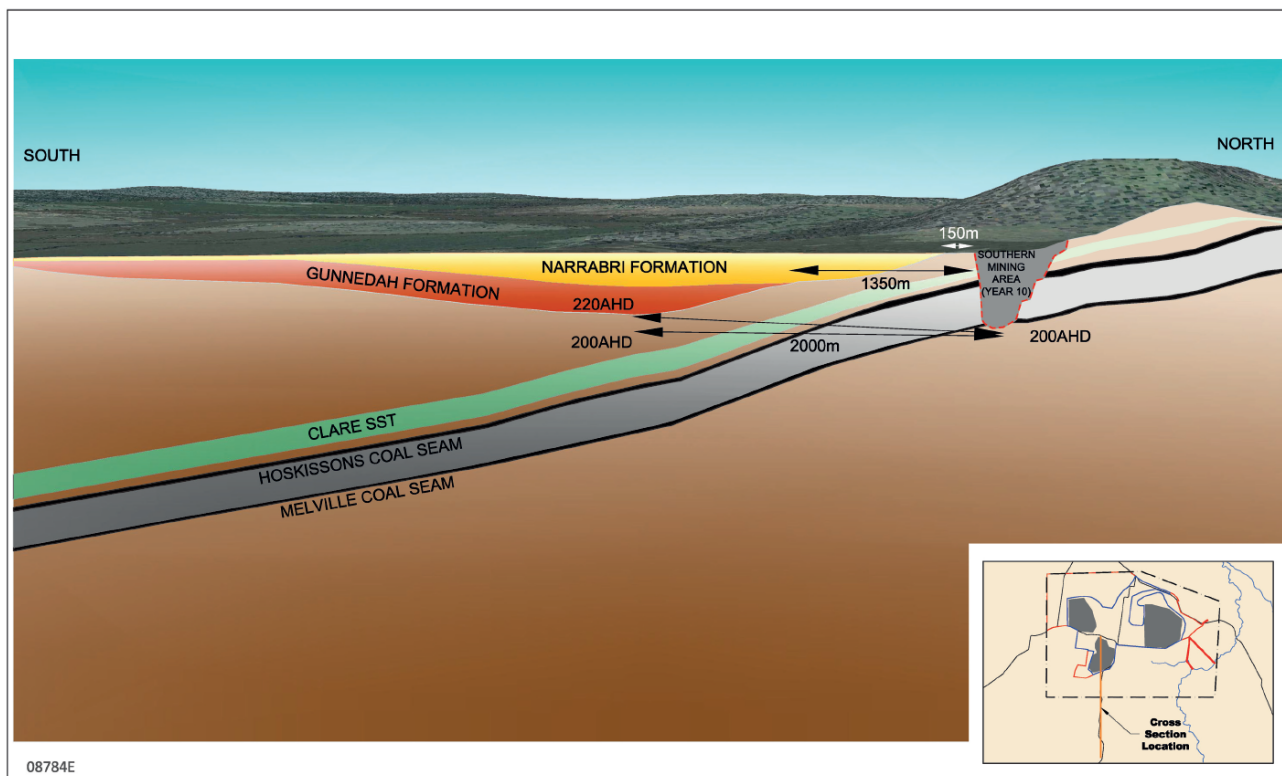


Figure 32: Alluvial Formations Cross Section

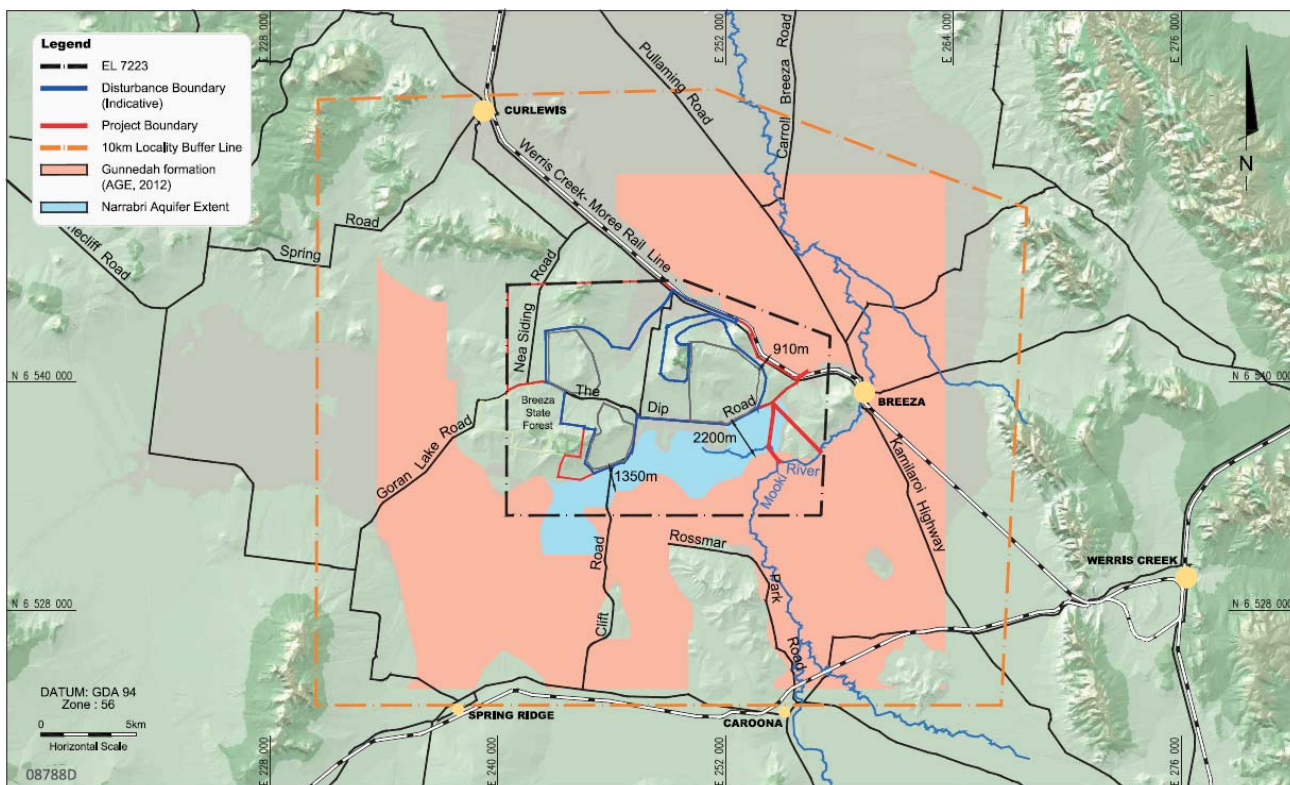


Figure 33: Alluvial Formations

The Permian hard rock aquifer is of lower yield and quality, with yields from bores in the formation typically less than 1 L/s. Salinity is variable, ranging from less than 3,000 mg/L in the upper ridgelines, 5,000-10,000 mg/L down slope of the ridges and 10,000-20,000 mg/L away from the elevated terrain and toward the alluvial plains. The aquifer is recharged via rainfall infiltration into weathered sandstone outcrops and fracture zones in elevated areas.

The varying value of the aquifers in the region is highlighted by Dr Kalf, whose review notes that:

"While there can often be a perception that all groundwater in the Gunnedah Basin is of prime importance, the hydrogeological evidence is that groundwater in the Permian strata where mining is to be conducted and elsewhere in the Basin is of poor quality with the bulk of salinity in the mining region that ranges from brackish to saline...There is better groundwater quality suitable for irrigation in the nearby deeper alluvium (Gunnedah Formation) with the overlying Narrabri alluvial Formation also having a very much higher salinity. The alluvium overall is impacted by naturally occurring inflow of the Permian groundwater creating higher salinity particularly along the margins of the alluvial flats..."

A total of 508 registered groundwater monitoring and pumping bores are located within a 10 km radius of the project boundary, with most of these abstracting groundwater from the Gunnedah Formation for irrigation purposes (see Figure 34).

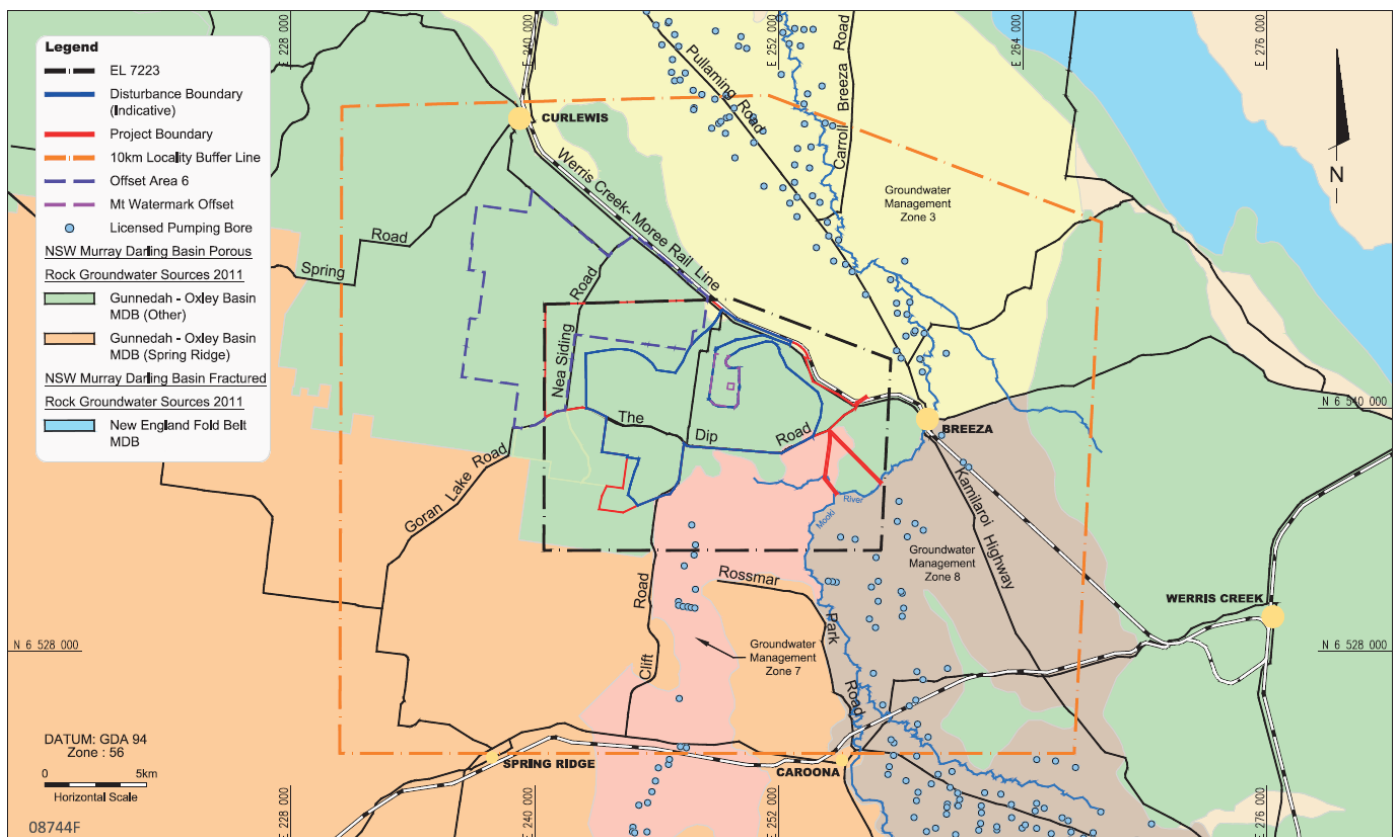


Figure 34: Groundwater Management Zones and Registered Bores

There are two main water sharing plans that regulate groundwater use in the area that are of relevance to the project¹⁰.

Use of groundwater from the Upper Namoi alluvial aquifer is regulated under *Water Sharing Plan for the Upper & Lower Namoi Groundwater Sources 2003*. The project site is located in the vicinity of Zones 3, 7 and 8 of the Plan, but the disturbance area is predominately outside these zones (see

¹⁰ There are other water sharing plans in the region, but the project is not predicted to have any significant impact on these resources.

Figure 34). Aquifer access licences in Zones 3, 7 and 8 total just over 50,000 ML/yr under the Water Sharing Plan.

Use of groundwater in the hard rock aquifer surrounding the site is regulated under the *Water Sharing Plan for the Murray-Darling Basin Porous Rock Groundwater Sources 2011*. Under the Porous Rock Water Sharing Plan, the project is located primarily in the 'Gunnedah-Oxley Basin MDB (Other)' zone, although a small portion of the south west corner of the EL is located in the 'Gunnedah-Oxley Basin MDB (Spring Ridge)' zone. The long term annual average extraction limit for access licences in the Other and Spring Ridge zones is 199,893 ML/yr, not including supplementary water.

Use of surface water in the vicinity of the project site is regulated under the *Water Sharing Plan for the Phillips Creek, Mooki River, Quirindi Creek and Warrah Creek Water Sources 2003*. Water licences in the Mooki River water source total approximately 27,450 ML/yr under the Plan.

Avoidance and Mitigation Measures

In response to concerns raised by regulators and community stakeholders about the importance of protecting the highly productive black soil plains and the aquifers upon which they rely, Shenhua has designed the project to provide a minimum 150 metre buffer to the alluvial black soils, constraining the project to the ridge country of the EL.

In this regard, the project disturbance area provides:

- a minimum 150 metre buffer to the black soils associated with the (poorer quality) Narrabri Formation; and
- a minimum 900 metre buffer to the highly productive Gunnedah Formation aquifer. (As indicated on Figure 32, the closest occurrence is 900 metres to the north-east of the Eastern Mining Area. To the south, the aquifer is more than 1.3km from the project disturbance area).

This key avoidance measure would significantly reduce the potential impacts on the region's highly valued groundwater resources.

The water resource assessments are also based on a number of other avoidance and mitigation measures that Shenhua would implement to minimise, mitigate and/or compensate water-related impacts of the project. These measures include:

- backfilling the Eastern and Southern Mining Area voids, and designing the residual void in the Western Mining Area to be as remote as possible from the alluvial aquifers;
- avoiding disturbance of the majority of Watermark Gully, the only notable well-defined watercourse within the project disturbance boundary;
- avoiding flood-affected areas as far as practicable, and establishing levees in the two residual areas that may be inundated in extreme events (see further discussion below); and
- implementing standard best practice water management measures including:
 - o diverting clean 'run-on' water around mining areas;
 - o collecting and treating run-off water from overburden emplacement areas in sediment basins, with discharge only if water meets applicable criteria;
 - o maintaining a dirty water management system designed to capture run-off and process water within the mine (ie. saline water that has come into contact with coal or other saline material), with no discharge to the external environment;
 - o recycling process water from the CHPP, via the dirty water management system;
 - o preparing and implementing detailed water management plans and monitoring programs; and
 - o obtaining applicable licenses for all water used and discharged from the site.

Impacts on Groundwater Flows

The groundwater modelling indicates that seepage into the pits would average 180 ML/yr over the life of the project, peaking at 756 ML/yr in Year 23. Total inflows over the life of the project are estimated at 5,500 ML.

All of these direct inflows would be from the Permian hard rock aquifer. As outlined above, the mining areas would not directly impact the Gunnedah and Narrabri Formations, however regional depressurisation in the underlying Permian strata is predicted to induce downward vertical flow from the overlying alluvial aquifers near the mining areas, or reduce upward flow from the Permian to the alluvial in areas further from the mining areas.

The zone of depression in the Permian aquifer is predicted to extend to a maximum of:

- 1.8 km from the Eastern Mining Area;
- 3.2 km from the Southern Mining Area; and
- 1.0 km from the Western Mining Area.

These changes are predicted to result in relatively small indirect losses from the alluvials in groundwater management zones 3, 7 and 8 under the *Water Sharing Plan for the Upper & Lower Namoi Groundwater Sources 2003*, as outlined in the following table.

Table 5: Water Loss from Alluvial Aquifers

Groundwater Management Zone	Cumulative over Project Life (ML)	Average Loss (ML/yr)	Peak Loss (ML/yr)
3	14	0.5	1.1
7	1,020	34	101.8
8	-35*	-1.2*	0.4

* A negative number indicates a net gain to the alluvials

These losses represent a very small component of these groundwater sources (see Table 7 below), with the peak loss (ie. about 103 ML) amounting to less than the usage from a single licensed agricultural bore in the region, which averages 142 ML/year in the Upper Namoi alluvium.

The groundwater assessment also notes that most (90%) of the alluvial transfer loss would occur in the Narrabri Formation, which contains poor quality water and is not targeted by surrounding groundwater users.

Further, groundwater losses in the alluvials would recover relatively quickly following mining, as detailed under a separate heading below.

Dr Kalf accepted the findings of the groundwater modelling and assessment. To ensure that the modelling is periodically reviewed and updated, Dr Kalf recommended that Shenhua be required to periodically validate the model (recommended as 2 years after mining commences, then after an additional 5 years and 5 years after mining is completed). The Department agrees in principle, but has recommended that the model be validated on a more regular basis given the importance of the groundwater resource (ie. every 3 years, in conjunction with independent environmental audits).

The Department has also recommended conditions requiring Shenhua to appropriately account for all water used by the project, as outlined in more detail below.

Impacts on Groundwater Users

There are 4 privately-owned bores to the south of the Southern Mining Area that are predicted to experience water level reductions of greater than 1 metre, with the largest reduction predicted to be 1.4 metres. These bores are shown on Figure 35. A further 31 bores are predicted to experience maximum groundwater level reductions of greater than or equal to 0.1 metres.

The change in groundwater levels is not expected to result in any significant reduction in pumping yield from the privately-owned bores. The predicted water level reductions are also well within the 'minimal impact consideration' trigger in the Aquifer Interference Policy (ie. 2 metre drawdown at privately-owned bores). Further, the groundwater levels in the bores are predicted to recover within 5 years following mining with the backfilling of the mining pits.

The Department accepts that the assessment indicates that the project is unlikely to result in any significant impact to groundwater users in the locality. Nevertheless, the Department has recommended conditions requiring Shenhua to monitor impacts on surrounding groundwater users bores and to provide compensatory water supplies in the unlikely event that a user's water supplies are adversely affected by the project.

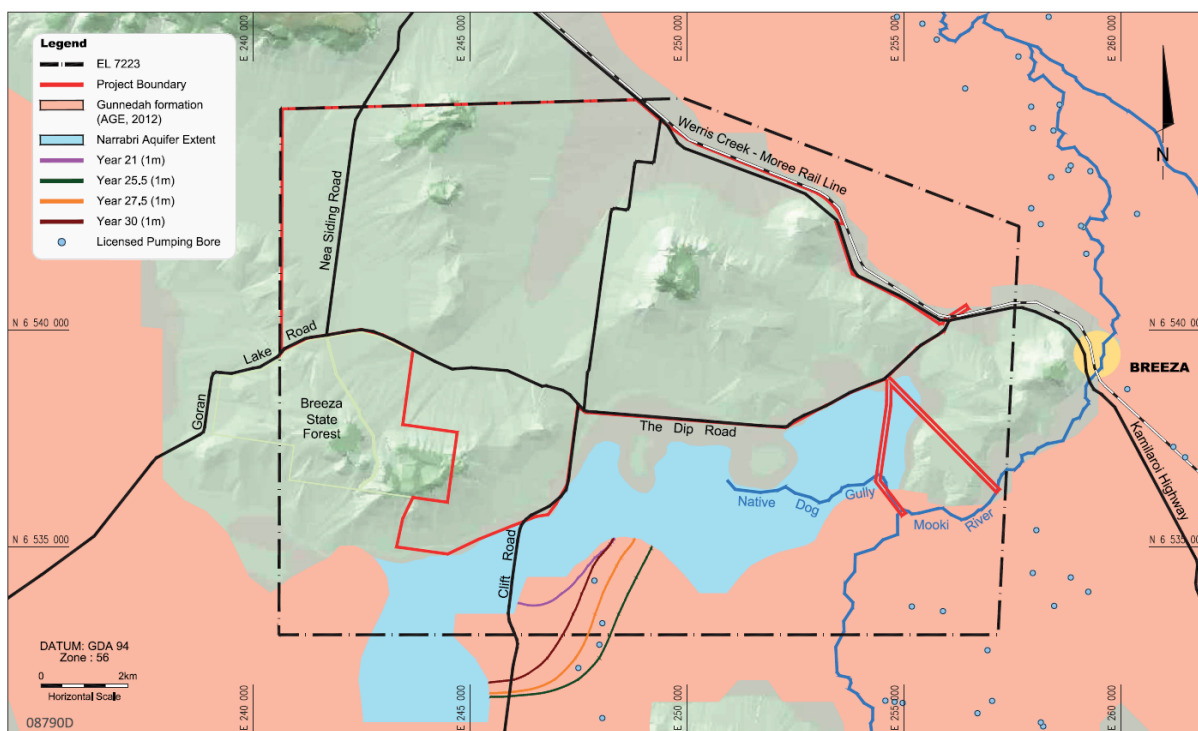


Figure 35: Groundwater Depressurisation and Affected Bores

Changes to Groundwater Quality

The seepage water quality assessment and geochemical assessment indicate that groundwater aquifers in the vicinity of the project disturbance area have salinity levels that are generally higher than the salinity of leachate that would be produced by the mining areas including the overburden emplacements, and therefore the project is expected to have low to negligible impact on local groundwater quality. Further consideration of long term seepage from overburden emplacements and the final void is provided under a separate heading below.

Some submissions raised concerns about the potential for 'cross-contamination' associated with potentially increased connectivity between aquifers. Dr Kalf was satisfied that this issue would not occur, and would more likely occur as a result of private bore pumping.

Impacts on Surface Water Flows

The project would affect surface water flows in surrounding waterbodies including the Mooki River, Watermark Gully, Native Dog Gully and Lake Goran through two main mechanisms, namely:

- directly reducing catchment areas (and therefore catchment flows) by interception of rainfall and runoff; or
- indirectly through groundwater depressurisation, resulting in reduced flow from groundwater to waterbodies and/or increased leakage from waterbodies to groundwater.

The maximum captured catchment areas during the project would represent approximately¹¹:

- 14% of the Watermark Gully catchment;
- 29% of the Native Dog Gully catchment; and
- 0.3% of the Lake Goran catchment.

These areas represent less than 1% of the Mooki River Catchment (to the Mooki River's confluence with Watermark Gully). Accordingly, whilst the project would have some impacts on surface water flows in local ephemeral creeks during mining, any impacts on the broader regional catchment would be minor.

The captured catchment areas would gradually reduce as the mine is rehabilitated, with post-mining local catchments increasing or decreasing marginally due to changes in catchment boundaries following rehabilitation. The main long term loss from the Mooki River catchment as a whole would be

¹¹ These areas were updated in the Response to Submissions.
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to the Lake Goran catchment, which would be reduced by around 0.5%, in part due to flows captured by the Western Mining Area final void. The surface water assessment concludes that this loss would have no measureable impact on inflows to the lake.

With regard to reductions in surface water flows due to groundwater depressurisation, the groundwater assessment predicts that the project would result in a total flow from the Mooki River to the underlying alluvial aquifer of 323 ML over the life of the project (max 0.13 ML/day), or a total of 489 ML including post mining loss until groundwater recovery (ie. 30 years post mining). On an annualised basis this loss is negligible, at less than 0.02% of the mean flow of the Mooki River (at Breeza).

Following groundwater recovery, baseflow to the Mooki River is predicted to actually increase by a small amount (ie. 0.02 ML/day), due to additional recharge through the overburden material.

The area of groundwater depressurisation would also extend below Lake Goran, although this drawdown is predicted to be very small (ie. 0.01 m) and is not expected to have any measureable impact on the lake water levels.

Surface Water Quality

One of the key concerns raised by farmers and landowners in the surrounding areas is the potential for the project to impact surface water quality, particularly via increases in salinity, which could occur through changes to catchment flows and pollution due to uncontrolled releases (overflows) from the project's sediment basins.

It is important to note that there would be no uncontrolled releases from the mine water system (ie. the high salinity water that has come into contact with coal), which would be collected in the base of the pit in the event of any overflow of the mine's storage system. The pit(s) would have ample storage capacity to accept any overflow of mine water.

Based on the proposed water management system, pre-development and full-development salt loads discharging to local catchments is presented in the following table.

Table 6: Long Term Surface Water Salt Balance

Source	Salt Load (t/day)	
	Existing	Year 30
Watermark Gully		
Catchment flows	2.4	2.5
Sediment dam overflows	0.0	0.8
Total	2.4	3.3
Native Dog Gully		
Catchment flows	3.0	2.9
Sediment dam overflows	0.0	0.2
Total	3.0	3.1
Lake Goran		
Catchment flows	59.9	59.6
Sediment dam overflows	0.0	0.0
Total	59.9	59.6
Gross offsite salt load	65.2	66.0

The assessment indicates that, on a regional basis, the project is unlikely to result in any significant increase in regional salinity levels, (ie. an increase of <1% across the catchments). However, the Watermark Gully catchment is predicted to experience localised increases in salinity of up to 33% towards the end of the project, with the increase due to overflows from the project sediment basins during high rainfall events.

With regard to these sediment basin overflows, Shenhua notes that:

"Under most rainfall conditions, water accumulating in sediment dams will be pumped back into the mine water system for recycling to meet water demands for coal processing and dust suppression. However, during major rainfall events that exceed the capacity of the sediment dams (which are designed to a government-specified standard), some overflows from sediment dams may occur after a period of time to allow any suspended sediment to settle out of suspension."

Dr Steve Perrens considered this issue in detail (see Appendix D), noting that the data showed that overflows would constitute a 'relatively significant proportion' of overall runoff, with overflows accounting for an average of 30% (and a range of between 18% to 44%) of annual runoff over the life of the mine. Spill days per year would average 10 for a median rainfall year (or 30 days for a 90 percentile wet year). He also noted that for some mining years, the consequent salt loads may be higher than the years used in the modelling (eg. Year 29 salt loads are likely to be higher than Year 30 salt loads as shown in Table 6 above).

Nonetheless, Dr Perrens also noted that the salt contribution from sediment dams is likely to have been overestimated by the model (in some cases by around 50%), and that the salt loads are likely to be conservative and that, in practice, any increase is unlikely to be detectable from the background variation (background salinity varies considerably due to the ephemeral nature of the watercourses). In addition, if operational monitoring showed that salt loads discharging from the sediment basins were of concern, Dr Perrens noted that modifications to the size and operating regime for the basins would allow an increased percentage of runoff to be transferred back to the mine water management system and thereby reduce the actual exported salt loads.

Ultimately, Dr Perrens concluded that the salinity risk is able to be adequately managed using a number of reasonable and feasible strategies, including:

- ensuring selective stripping of soils to avoid reuse of soils that pose a salinity or sodicity risk. In this regard, some soil landscape units within the project disturbance area – including the Fullwoods Road unit subsoil and the Booloocooroo unit – have high salinity and should not be used in rehabilitation, and instead be buried in the overburden emplacements in locations where they can not contribute to long term groundwater seepage;
- managing sediment basin sizing and operating regimes to manage salt loads (as outlined above);
- preventing long term saline groundwater seepage from overburden emplacements through measures such as:
 - o designing the geometry of emplacements to minimise groundwater recharge into the emplacements; and
 - o implementing established dryland salinity measures, in particular through planting deeper rooted trees on higher areas of the emplacements, and salt tolerant vegetation in the lower areas where long term seepage is predicted.

Dr Perrens recommends that these measures are guided by a detailed surface water and groundwater monitoring program, including periodic re-assessment of groundwater predictions (say every 5 years) and the implications for groundwater seepage and salt loads.

The Department accepts and has recommended conditions consistent with Dr Perrens' recommendations. However, as noted above the Department has recommended that the groundwater model, along with the surface water model, salt balance and water balance be validated on a more regular basis (ie. every 3 years), given the significance of the resource to the region.

Water Balance and Water Sharing

The water balance assessment indicates that during wet years, the mine's water requirements would be met entirely through local runoff and groundwater inflows. However, during average and dry years external supplies would be required, with a relatively modest 170 ML/year required in an average year and up to a predicted maximum of 600 ML/yr during very dry conditions (ie. 10 percentile dry year).

Dr Perrens questioned some of the assumed water demands used in the water balance modelling (including that the water demand from the CHPP and haul road dust suppression may be underestimated), but concluded that any uncertainty could be managed as part of the operational management planning for the project.

Where external water is required, Shenhua proposes to source this water through either:

- a bore field to extract groundwater from the groundwater management zones 3, 7 or 8; and/or
- a pump to extract water from the Mooki River, although further analysis in the Response to Submissions indicates that the Mooki River is likely to be dry in times when make-up water is required, therefore this option is unlikely to be feasible.

A summary of total water use (or 'take') associated with the project – including direct water use and impacts on the various water sources – is presented in the following table.

Table 7: Predicted Water Take

Water Source	Predicted Peak Annual Water Take (ML)		Share Component held by Shenhua (units)	Long Term Average Annual Extraction Limit (units)
	During Mining	After Mining		
Namoi Groundwater Zone 3	1.1	0*	Nil	17,300 +supplementary
Namoi Groundwater Zone 7	101.8	0*	42	3,700 +supplementary
Namoi Groundwater Zone 8	0.4	0*	164	16,000 +supplementary
Porous Rock (Gunnedah-Oxley Basin – Other)	756	0*	240	
Porous Rock (Gunnedah-Oxley Basin – Spring Ridge)	33	0*	Nil	199,893
Mooki River	47.5	0*	Nil	***30,350 units currently issued
Lake Goran	0	0*	1,223**	***32,171 units currently issued
Make-up Water (Zone 3, 7 or 8 or Mooki River)	600	0	Nil	N/A

* Long term net gain exceeds predicted losses immediately following mining

** Subject to issuance of certificate of title

*** Annual extraction limit calculated under cl.35 of WSP

NOW and a number of other submissions raised the issue that Shenhua does not currently hold adequate water licences for all water take associated with the project – for all but one of the relevant water sources.

In its Response to Submissions, Shenhua committed to ensuring that it held appropriate licences to account for the water take predictions up to Year 20 of the project, prior to the commencement of any mining operations. It also noted that this commitment was possible as it already held the required water licences to account for all water take up to Year 20, apart from the required one megalitre from groundwater management zone 3, which are readily available on the open market.

The Department accepts that the water take from all of the water sources is very small compared to the annual extraction limits and issued shares in each water source (ie. maximum of about 3% in groundwater management zone 7), and therefore that there is sufficient depth in the market for each water source to accommodate the water take associated with the project.

In this regard, the Department is satisfied that the water use associated with the project is unlikely to have a significant impact on water availability and water supply in the applicable water sources. The Department notes that, like any other significant water user in the State, access to adequate water supplies is a commercial risk for Shenhua. And like any other significant water user, if Shenhua is not able to secure enough water to meet its demands (eg. if existing allocations are reduced due to drought), its operations may need to be curtailed, or it may need to investigate additional water efficiency measures. This is consistent with the water sharing and water efficiency principles established under the Water Management Act.

That said, consistent with NOW's recommendation the Department believes that Shenhua should be required to demonstrate that it has secured adequate water supplies to account for the maximum predicted water demand for mining operations in each of the three mining areas, prior to commencing mining operations in each area.

The Department also believes that it would be preferable that the make-up water is obtained from the lower quality and less utilised Porous Rock aquifer, rather than from groundwater management zones 3, 7 or 8 or the Mooki River. Whilst it also acknowledges that gaining access to bores of sufficient

yield in the hard rock aquifer may be difficult (due to generally low yields), the Department has nonetheless recommended conditions requiring Shenhua to use its reasonable endeavours to obtain the make-up water from the hard rock aquifer.

Flooding

The project has been located largely outside flood affected land, however two relatively small areas are within the 1 in 100 year flood level as modelled in the surface water assessment (see Figures 36 and 37), including:

- the south-east corner of the Eastern Mining Area, which would be affected by regional flooding in the Mooki River, with inundation up to:
 - 1.7m in the 1 in 100 year event, with velocities less than 0.1 m/s;
 - 4.3m in the Probable Maximum Flood (PMF); and
- the south-east corner of the Western Mining Area, which would be affected by localised flooding in the headwaters of Watermark Gully.

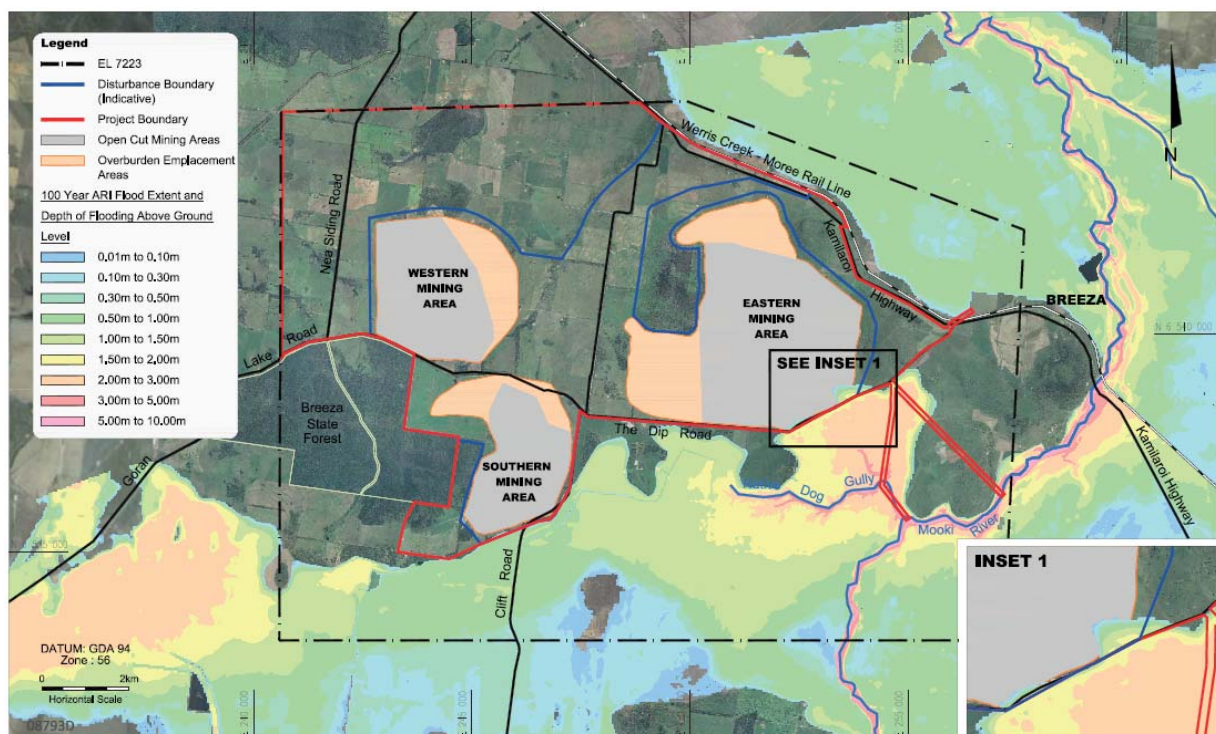


Figure 36: Flooding – Mooki River

With regard to the flooding of the Mooki River in the Eastern Mining Area, the EIS notes that 'limited and minor flood levees will be constructed as required in potential inundation areas', but provides no more detail on the levees. Given the predicted flood levels, levee height in the south-east corner would be in the order of 5 metres.

Whilst the Department does not consider this levee height to be minor, it is satisfied that the construction of the levee in this location is unlikely to have any significant affect on flood levels or behaviour on the surrounding floodplain. In this regard, the flood assessment indicates that the localised levee would increase flood levels on the adjacent floodplain by less than 5 mm in the 1 in 100 year event (grading to negligible within 100-200 metres from the project boundary), and have a negligible effect on the flood storage volume of the floodplain (ie. about 2% of the flood storage volume in the local northern Native Dog Gully floodplain). Dr Perrens also concluded that from a flood impact perspective, this impact is considered to have no consequences.

NOW recommended that the flood levee be designed to prevent inundation of the pit in floods of at least 100 year ARI, and that Shenhua should consider the benefit of excluding even greater floods to lower operational risk. The Department believes that this risk, both operationally and environmentally, should be minimised and has therefore recommended conditions requiring the levee to be built to exclude the PMF.

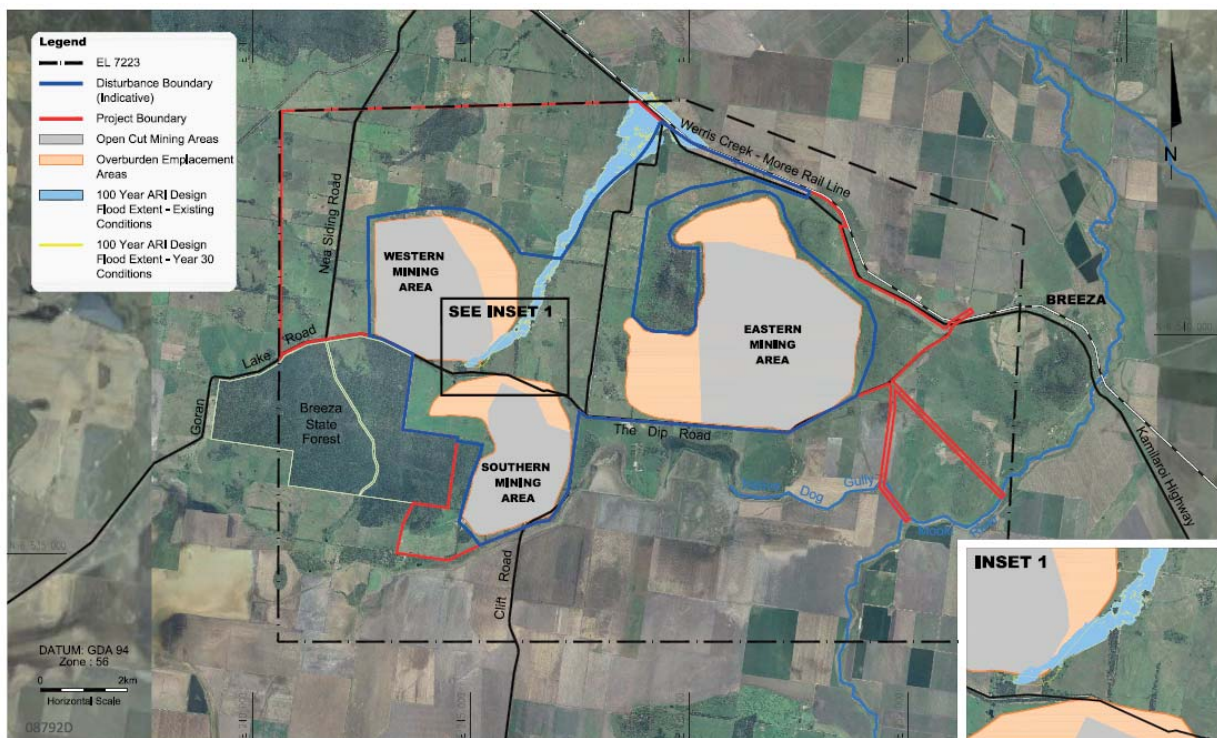


Figure 37: Flooding – Watermark Gully

With regard to the localised flooding in the upper reaches of Watermark Gully, the flood assessment indicates that the (largely undefined) headwaters of the creek would be diverted further to the east around the proposal overburden emplacement associated with the Western Mining Area. The assessment¹² predicts that the project would result in some localised changes to flood levels in Watermark Gully (due largely to catchment size changes¹³), with peak flood levels downstream of the Kamilaroi Highway increasing by:

- 40 mm in the 1 in 2 year event;
- 30 mm in the 1 in 100 year event; and
- 50 mm in the PMF¹⁴.

No significant change to flood velocities are predicted.

RMS and Gunnedah Council raised concerns about the potential for these flood level changes in the lower reaches of Watermark Gully to affect flooding heights and frequency of key infrastructure including the Kamilaroi Highway.

Given that the proposed deviation of the highway is approximately 200 metres to the east of the existing Watermark Gully causeway on the highway, Council recommended that Shenhua should be required to upgrade the causeway simultaneously with the other highway diversion works.

Shenhua's additional flood modelling found that:

- the maximum 2 year ARI flood depth on the highway for both existing and post-mining conditions would be less than 300 mm, meaning that the project would not affect trafficability in this event; and
- for the 100 year event, the duration of flows greater than 300 mm deep would increase by 30 minutes, to 11 hours.

Whilst concluding that this impact is minimal, Shenhua has nonetheless committed to ensuring that the project maintains the catchment at pre-mining flood flow rates and velocities, via construction of an appropriately sized detention basin.

¹² The Response to Submissions provided an updated and more detailed flood assessment for Watermark Gully.

¹³ The Watermark Gully catchment would increase by 3.6km² to 43.0km² post-mining.

¹⁴ Based on the original flood modelling in the EIS.

The Department accepts that with such a basin, post-mining flows would be able to be restricted to no more than pre-mining flows, and there would therefore be no need or justification for upgrade of the Kamilaroi Highway causeway or other local roads to mitigate flood risk. The Department has recommended conditions reinforcing Shenhua's commitment, requiring Shenhua to ensure that flows in Watermark Gully mimic pre-development flows for all flood events up to and including the 1 in 100 year ARI event.

Development in the Floodplain

Some submissions also noted that the development in the flood-affected areas of the site appears to contradict condition 48 of the EL for the Watermark project, which excludes open cut mining anywhere on the 'floodplain'.

The term 'floodplain' is not defined in the EL. Subsequent to exhibition of the EIS, the Minister for Resources and Energy endorsed the following definition of floodplain for the purposes of the EL:

'A floodplain is an area of low-lying, nearly flat plain adjacent to a river, formed mainly of river sediment and subject to regular flooding.'

The Watermark Gully flood-affected land within the project disturbance boundary is not low lying, being located within the upper reaches of the creek above the surrounding flood plain. Accordingly, the Department believes that the proposed disturbance in this area is outside the floodplain as defined for the purposes of the EL.

The flood affected land in the south-east corner of the Eastern Mining Area is lower lying and nearly flat, but it is outside the alluvial sediments associated with the Narrabri Formation and the Gunnedah Formation, and it is not subject to regular flooding. Dr Perrens considered this issue and added that this flood-affected area is not adjacent to a river (with the Mooki River approximately 3.5 kilometres away at the closest point) and would only be subject to minor incursion in a 1 in 20 year flood event and therefore is not considered to be subject to regular flooding.

Further, DRE has not raised any concerns about the proposed mine plan and the floodplain.

Consequently, the Department is satisfied for the purposes of its assessment that the project is consistent with the restrictions under condition 48 of the EL.

Groundwater Dependent Ecosystems

Groundwater dependent ecosystems (GDEs) are ecosystems which require access to groundwater (beyond soil-based groundwater from rainfall) to meet all or some of their water requirements. There are no significant GDEs in the area surrounding the Watermark project area that would be affected by the project. The EIS also includes a stygofauna (subterranean fauna) assessment, which did not identify any stygofauna on or near the project site and concluded that it is unlikely that any occur.

The Department is satisfied that the project is unlikely to significantly affect any sensitive GDEs or any extant stygofauna populations, given the relatively small predicted regional groundwater impacts.

Long Term Impacts and Final Void

As outlined above, groundwater levels would recover in the Eastern and Southern Mining Areas once they are backfilled, eventually exceeding pre-mining levels due to increased recharge on the backfilled overburden material.

These two mining areas would not present a long term groundwater sink, and there would be a zone of seepage in topographical low points at the base of the rehabilitated emplacements about 30 years after the completion of mining as groundwater levels in the overburden emplacements reached the surface. Dr Kalf agrees that most if not all of this seepage would evaporate given the relatively low predicted seepage rates, and accepts that the project is likely to slowly reduce the salinity of groundwater around the mined area post-mining, due to increased recharge through the backfilled material.

Dr Perrens also did not raise significant concerns about long term impacts of this seepage, but noted that management actions to manage or mitigate the predicted seepage would need to be undertaken during mining and rehabilitation to reduce long term risk. These measures include selective stripping

of soils, designing emplacements to minimise recharge and implementing dryland salinity measures (as outlined in the surface water quality section above). The Department has reflected these measures in its recommended conditions regarding water resources, biodiversity and rehabilitation management.

With regard to the Western Mining Area, groundwater levels are predicted by the 'MODFLOW' groundwater model to slowly recover and reach equilibrium after about 2,000 years at approximately 303 m AHD, due to the ongoing influence of the final void. These groundwater levels immediately surrounding the void would be about 1 to 2 metres below the regional water table, indicating that the pit lake void would act as a long term groundwater sink.

A second model, 'OPSIM', was also used to assess final recovery in the void. This model is based on simulation of daily rainfall (including storms), rather than average annual rainfall used in the MODFLOW model.

The OPSIM model predicts that water levels in the void would stabilise much more quickly, at about 280-290 m AHD after approximately 100 years.

Both models indicate that the final void water level would stabilise well below the crest height of the final void (ie. overflow level of 310 m AHD), and therefore there is no risk of external spillage of (saline) void water to the external environment.

The void lake would continue to increase in salinity over time as a result of evaporation from the lake surface, reaching a salinity comparable to seawater after about 400 years. Dr Perrens notes that the salinity would be expected to continue to increase progressively until the lake becomes hypersaline, which would suppress the evaporation rate and lead to a slightly higher equilibrium water level. Notwithstanding, both Dr Perrens and Dr Kalf agree that the final void lake level is likely to reach equilibrium at a level substantially below the overflow level, and that in the long term, the lake would remain a sink for regional groundwater. Accordingly, the lake would not pose a threat to the surrounding environment.

The Department accepts these findings, and is satisfied that the final void is unlikely to present any long term risk to regional water resources, with ongoing impacts restricted to the localised area within and immediately surrounding the void. The Department notes that Shenhua would be required to appropriately account for any long term groundwater take in accordance with the provisions of the Water Management Act (eg. through acquiring and retiring adequate water access licences), although the groundwater assessment indicates that the project would not result in any net long term groundwater take (see above).

Some submissions argued that Shenhua should be required to backfill the final void completely. The Department has considered this issue, and notes that Shenhua has designed the project to:

- fully backfill 2 of the 3 mining pits, and to locate the residual final void in the Western Mining Area as far as practicable from the alluvial aquifers;
- minimise the final void's catchment (ie. 100 hectares) and depth (ie. 80 metres below natural ground surface) as far as practicable; and
- ensure that the final void is as compatible with the surrounding landscape as practicable, including battering the slopes of the low wall to 10 degrees and blasting the high wall to reduce slopes and ensure long term safety.

These considerable measures would cost approximately \$340 million to achieve. Full backfilling of the final void would:

- involve very significant additional cost (ie. approximately \$460 million);
- require re-disturbance of rehabilitated overburden emplacements, with consequent environmental impacts; and
- affect potential future access to the deeper coal seams in the EL (which may be accessed via the highwall using underground mining methods, subject to separate approvals), potentially sterilising a significant coal resource.

For these reasons, the Department accepts that complete backfilling of the final void is not practicable or warranted. Nevertheless, the Department has recommended conditions requiring Shenhua to

minimise the size and catchment of the final void as far as practicable, and to minimise any ongoing environmental impacts.

Cumulative Impacts

The EIS acknowledges that the other mining and coal seam gas projects in the Liverpool Plains, including BHP's Caroon Coal Project, may also result in depressurisation of the Permian strata and result in cumulative drawdown effects. However, as Shenhua does not have access to the BHP or CSG data to use in a cumulative assessment, the groundwater assessment relies on the detailed regional-scale assessment undertaken in the Namoi Water Study.

The assessment notes that the cumulative affect of the Watermark, Caroon Coal and CSG projects (based on the Namoi Water Study's Scenario 2 modelling – see Section 3.5) would extend the zone of depressurisation in the Gunnedah Formation, particularly in the area to the south of Watermark and to the north of Caroon Coal (ie. particularly in Groundwater Management Zone 7, which would experience a maximum drawdown of between 1.0 and 1.5 metres).

Some submissions argued that the cumulative assessment is minimal and that Shenhua should be required to undertake a cumulative or more regional assessment based on Scenario 3 in the Namoi Water Study (ie. the most extensive mining and CSG development scenario). However, the Department is satisfied that the cumulative assessment should be restricted to approved and/or planned projects (rather than hypothetical projects) where the potential impacts are reasonably well known, as is the standard approach for cumulative impact assessment.

The Department notes that as subsequent projects are developed, more detailed project-specific cumulative assessments will be required to be undertaken (using available data) by each successive applicant, which will appropriately consider cumulative impacts associated with existing and planned projects. These subsequent projects (including the Caroon Coal Project) will need to closely consider the cumulative impacts on the region's water resources.

At present, cumulative impacts are limited as the Watermark project is the first in this area and groundwater depressurisation does not interact with drawdowns associated with any other projects. Total cumulative water use associated with mining projects in the region is also minor compared to water use associated with other land uses, especially agriculture (as outlined in Section 3.5).

That said, the Department acknowledges that water is a finite and highly valued resource in the Liverpool Plains. In this regard, the Department notes that the water sharing principles established under the Water Management Act and relevant water sharing plans provides an equitable and appropriate means for addressing cumulative impacts on the water resources of the region. The Department also acknowledges the comprehensive assessment undertaken in the Namoi Water Study, which indicates that the development of coal and gas projects in the Namoi catchment are unlikely to result in significant catchment-wide impacts.

Conclusion

The Department is satisfied that Shenhua has designed the project to avoid significant impacts on key water resources, particularly through avoiding disturbance of the highly productive Upper Namoi alluvial aquifers, providing buffers of at least 150 metres to the less valued Narrabri Formation, and 900 metres to the highly valued Gunnedah Formation.

Based on this key mitigation measure, and following very comprehensive groundwater and surface water assessment – including regional level water studies (ie. the Namoi Water Study), detailed project-specific groundwater and surface water modelling, peer review by recognised groundwater expert Dr Noel Merrick, and independent peer review by recognised experts Dr Frans Kalf and Dr Steve Perrens – the Department is satisfied that the project is unlikely to significantly affect groundwater and surface water resources, water users or the environment.

However, the Department recognises the importance of the protection of the region's water resources to the people of the Namoi Catchment, and has recommended a broad suite of conditions to ensure that this occurs. These include conditions requiring Shenhua to:

- ensure that it has sufficient water for all stages of the project, and if necessary, adjust the scale of mining operations on site to match its available water supply;

- ensure that it has adequate water access licences to account for all water used by the project, prior to the commencement of mining in each pit;
- not discharge any mine water (ie. 'dirty' or saline water) from the site under any circumstances;
- ensure that all surface water discharges of non-mine water from the site comply with the limits set in any environment protection licence;
- provide compensatory water supplies to any private landowner whose supply is found to be adversely affected by the project, in the unlikely event that this occurs;
- comply with a range of water management performance measures and rehabilitation objectives;
- implement best practice dryland salinity measures as part of the Biodiversity Management Plan;
- prepare and implement a comprehensive Water Management Plan for the project, including a:
 - o water balance;
 - o salt balance;
 - o surface water management plan and monitoring program;
 - o groundwater management plan and monitoring program;
 - o program to regularly (every 3 years) validate the water balance, salt balance, surface water model and groundwater model; and
 - o a protocol to minimise any cumulative water-related impacts.

6.2 Noise, Blasting and Air Quality

Introduction

As outlined in Section 1.2, Shenhua owns all of the land within the project disturbance area, and all land within the wider project boundary, except for a parcel of Crown land on Mt. Watermark (see Figure 6).

Privately-owned land surrounds the project boundary, apart from Breeza State Forest which is located to the south-west. Most of the surrounding privately-owned land comprises broad scale agricultural farmland with associated homesteads and structures, although the small village of Breeza is located adjacent to the Kamilaroi Highway approximately 5 kilometres to the east of the project disturbance area, and 3 kilometres from the project boundary. The village has population of approximately 63.

The EIS includes specialist acoustics and air quality assessments, undertaken by Bridges Acoustics and PAE Holmes respectively. The assessments were undertaken in accordance with applicable guidelines, in particular the *NSW Industrial Noise Policy (INP)* and EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*.

The noise assessment includes an assessment of blasting related impacts, and the EIS also includes a specialist assessment of blasting impacts on landforms and slopes, which was undertaken by SCT Operations.

Since the EIS, Shenhua has undertaken a 'mine planning optimisation review', which has led to the adoption of a modified equipment fleet for the project using larger and fewer trucks, with the result of an overall lowering of noise and dust emissions. The RTS includes revised noise modelling based on the optimised fleet. Revised air quality modelling was not undertaken in the RTS, however the emissions inventory for Year 25 of the project (the year of highest total emissions for the project) was re-calculated, with a decrease in emissions of approximately 15% utilising the optimised fleet. Whilst the RTS did not update the consequent modelling of dust impacts at surrounding receivers, Shenhua noted that the optimisation review ensures further conservatism of the emissions presented in the EIS.

Subsequent to the RTS, Shenhua undertook revised air modelling for Year 21 of the project, to assess the implications of the optimisation review on some broad acre agricultural properties located to the south of the project site (particularly Properties 60, 115 and 116). Year 21 was modelled as it was the only modelled year in which significant dust impacts were predicted at these properties. The additional modelling is attached in Appendix G.

The assessments indicate that background noise and dust levels in the local area are relatively low, and typical of the rural environment. Background noise levels gathered through long term monitoring in winter, spring and summer range from about 25 dBA to 45dBA, with most levels at or lower than 30 dBA. Noise decibel levels in the high 30's and 40's occur at all assessment locations generally in the summer (day, evening and night), as a result of the influence of insects. These higher levels have been conservatively ignored for the purposes for the noise assessment, and a blanket 30 dBA

background level (or 'rating background level', RBL) has been adopted at all receiver locations for the purposes of the assessment^{15,16}.

In accordance with the provisions of the INP, the adopted RBL leads to a project specific noise level (PSNL) criteria for the project's operational noise emissions of 35 dBA for all receivers for all time periods (ie. RBL + 5 dBA). The operational noise assessment includes consideration of low frequency noise, with applicable modifying factors applied to the adopted sound power levels for relevant equipment and the CHPP.

Background dust levels are generally within applicable air quality guidelines, with occasional exceedances of 24-hour goals due to regional dust sources, such as bushfires and dust storms.

Meteorological data for the purposes of the noise and dust assessment was gathered from Shenhua's 2 on-site meteorological stations (over a period of 1 year in 2010/11), and a Bureau of Meteorology (BOM) monitoring station at Tamworth Airport. In accordance with the provisions of the INP, the noise assessment included modelling under both calm conditions and noise enhancing conditions including prevailing winds (east, south and west/south-west) and temperature inversions.

Some submitters claimed that the wind data used was not representative of the long term variation in the region, particularly with regard to the air quality assessment. Submitters argued that stronger winds, particularly in the winter months, tend to come from the west and north-west, rather than south-east and east as indicated in the on-site meteorological stations used in the EIS.

Shenhua subsequently provided additional meteorological data in its RTS, including 2012 and 2013 data from its on-site meteorological stations, data from the Carroona Coal Project meteorological station, and data from the Gunnedah and Tamworth BOM stations. The data indicates that on an annualised basis, predominant winds are from the south to east quadrant, but that this does vary during the year, with more westerly winds in winter. Shenhua notes that while the predominant winds across most sites have a south south-easterly component, winds from all directions are measured and captured in the full year of hourly varying data used in the air quality dispersion model.

Reasonable and Feasible Mitigation Measures

The noise, blasting and air quality assessments are based on a number of avoidance and mitigation measures that Shenhua would undertake to reduce noise, vibration and air emissions associated with the project, including:

- optimising the mining fleet by using the largest possible truck size (within the constraints of the mine plan) to minimise vehicle trips and dust emissions (as outlined above);
- fitting all mobile plant with best practice noise attenuation;
- cladding the CHPP on all sides and the roof;
- partially enclosing the ROM coal hopper to minimise dust;
- enclosing elevated conveyor and conveyor transfer points;
- using a large radius rail loop to minimise train wheel squeal;
- avoiding use of mobile plant on elevated and exposed sections of the overburden emplacements and in other sensitive areas at night;
- avoiding drilling in higher elevations (less than 6 metres below natural ground level) at night;
- locating haul roads in shielded locations away from receivers;
- managing blast sizes to meet applicable overpressure and ground vibration criteria at all times;
- using blast mats (or equivalent) on Aboriginal axe grinding grooves to avoid impacts, and undertaking dilapidation assessments of all identified historic heritage items;
- implementing standard best practice measures to minimise safety risks associated with fly rock;
- delaying blasts in adverse weather conditions;
- using water sprays, filters and dust sprays to minimise dust emissions from applicable plant;
- achieving an 85% dust control efficiency on haul roads using speed control signage, water carts and/or dust suppressants;
- minimising disturbance, undertaking progressive rehabilitation and prompt revegetation/stabilisation of overburden emplacements to minimise dust; and

¹⁵ In accordance with the provisions of the INP, 30 dBA is the lowest RBL to be adopted for the purposes of noise impact assessment.

¹⁶ A higher daytime RBL of 31 dBA was assessed for areas to the north east of the mine, however the additional 1 dBA has been conservatively ignored for the purposes of the assessment.

- implementing real time dust and noise monitoring systems and active management systems to manage day-to-day operations.

Shenhua also considered the potential to restrict mining to the day and evening periods only (ie. no night time operations) to mitigate noise, however it discounted this measure as the increased mining intensity required during the day and evening periods to maintain an economic project would result in higher impacts during the day than the predicted night time impacts. Consequently, day-time only operations would actually increase the number of affected receivers.

Three further scenarios involving reduced mining intensity at night were also considered (ie. idling 1, 2 and 3 of the 4 mining fleets at night) were also considered. Idling 1 fleet would only reduce noise levels by 1 dBA, which would not be perceptible. The other scenarios found that noise reductions of between 3 and 6 dBA could be achieved; however they would also result in a loss of revenue of between \$149-297 million per annum, 1.5-2.4 million tonnes of product coal and 50-75 full time equivalent staff. These mine plans were consequently discounted, given the adverse economic outcomes, and result in a large amount of coal resource being sterilised (or uneconomic) due to mining inefficiencies.

NSW Health noted that the dust control efficiency used in the air quality assessment was 85%, whereas the 'Katestone Report'¹⁷ found that most mines only achieve a control factor of 50-75% for haul road dust suppression. Accordingly, NSW Health questioned whether the air quality impacts have been underestimated. Shenhua responded by reiterating its commitment to the 85% control efficiency, citing numerous monitoring results which indicate that modern dust suppressants can achieve the adopted dust control efficiency.

Following the RTS and the mine optimisation review, the EPA confirmed that it was satisfied that Shenhua had adequately addressed all reasonable and feasible on-site mitigation measures. However, it noted that it *'is still concerned about the lack of detail about individual consultation and any success or otherwise with impacted residents on the acceptability of the noise limits above the PSNL'*, and that the RTS *'did not include any discussion on proposed mitigation to residences to address residual noise impacts above the PSNL'*.

The Department is satisfied that Shenhua has adequately considered reasonable and feasible noise and dust mitigation measures associated with the project, and is also satisfied with the level of consultation undertaken for the project. The Department has conservatively assumed that all privately-owned receivers with predicted residual noise impacts above the PSNL are not accepting of these impacts, and has completed its assessment on this basis. The Department has also considered potential mitigation to residence to address residual noise impacts.

Summary of Predicted Noise, Blasting and Air Quality Impacts

With the adopted mitigation measures in place, the assessment indicates that the project would result in residual impacts on a number of privately-owned properties in the area surrounding the project site. A summary of the affected properties is presented in the following table.

Table 8: Summary of Affected Privately-Owned Properties

Property	Significantly Affected Residence		Additional Significantly Affected Land (>25% affected)		Moderately Affected Residence		Marginally Affected Residence
	Noise	Dust	Noise	Dust	Noise	Dust	Noise
20			✓				
25 ¹					✓ (25b)	✓ (25b)	
26			✓	✓			
27			✓	✓			
28			✓	✓			
32 ¹	✓ (32c)	✓ (32c)			✓ (32b)		
35							✓
39					✓		
40							✓
41					✓		

¹⁷ NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining, prepared by Katestone Environmental Pty Ltd for the OEH (June 2011).
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Property	Significantly Affected Residence		Additional Significantly Affected Land (>25% affected)		Moderately Affected Residence		Marginally Affected Residence
	Noise	Dust	Noise	Dust	Noise	Dust	Noise
43							✓
60		✓			✓		
61			✓				
62 ¹	✓ (62a)	✓ (62a, 62b)			✓ (62b)		
65			✓				
103 ²		✓			✓		
125	✓	✓					
Sub-total	3	6	6	3	7	1	3
Total Properties ³	5		6		7		3
Total Residences	6		-		7		3
1	Property contains multiple residences (affected residence/s shown in brackets).						
2	Although formally assessed as moderately noise affected, the Department has recommended that this residence be granted acquisition rights for noise as well as air quality because the assessed worst case operational noise level (ie. 39.9dBA) is very close to the 40dBA contour, the land is more than 25% significantly affected, and because of the potential sleep disturbance impacts at the residence (see below).						
3	17 properties in total would be marginally to significantly affected.						

As outlined in the table, the project is predicted to result in significant residual noise and/or dust impacts on 11 privately-owned properties, and a further 6 privately-owned properties would be marginally to moderately affected. The properties comprise a total of 6 residences that would be significantly affected, with a further 10 that would be marginally to moderately affected.

These impacts are discussed in the following sections.

The Department notes that, whilst the number of affected properties is not insignificant, the level of residual noise and dust affectation associated with the project is similar to contemporary mining projects in the Gunnedah and Hunter coalfields, particularly for greenfield projects (ie. new mines). Examples of such greenfield projects include:

- Maules Creek Coal Project (10_0138), approved on 23 October 2012: 6 privately-owned properties were predicted to significantly exceed applicable noise and/or dust criteria, although the PAC ultimately granted acquisition rights to 12 landowners;
- Moolarben Coal Project (05_0117), approved on 6 September 2007: 16 privately-owned properties were within the acquisition area for the project;
- Anvil Hill (now Mangoola) Coal Project (06_0014), approved on 7 June 2007: 36 privately-owned properties were within the acquisition area for the project;
- Mt Owen Coal Project (DA 14-1-2004), approved 8 December 2004: 18 private properties were within the acquisition area for the project;
- Mt Pleasant Coal Project (DA 92/97), approved 22 December 1999: Some 47 private properties were within the acquisition area for the project; and
- Bengalla Coal Project (DA 211/93), approved 7 August 94: Some 21 private properties were within the acquisition area for the project.

Operational Noise Impacts

The predicted worst case operational noise impacts for all modelled scenarios is shown on Figure 38, and a summary of the affected receivers and the Department's preferred management approach is presented in Table 9.

Table 9: Summary of Operational Noise Limit Exceedances.

Noise Exceedance	Management Approach	No. Affected Private Properties	Property ID
Marginally affected residences (1-2dB exceedance)	Noise mitigation at source	3	35, 40, 43
Moderately affected residences (3-5dB exceedance)	Noise mitigation, including mitigation at residence	7	25b, 32b, 39, 41, 60, 62b, 103 ¹
Significantly affected residences (>5dB exceedance)	Acquisition	3	32c, 62a, 125

Noise Exceedance	Management Approach	No. Affected Private Properties	Property ID
Additional significantly affected land (>5dB exceedance on >25% of land)	Acquisition	6	20, 26, 27, 28, 61, 65
Total		13 residences 17 properties	
1	Although formally assessed as moderately noise affected, the Department has recommended that this residence be granted acquisition rights for noise because the assessed worst case operational noise level (ie. 39.9dBA) is very close to the 40dBA contour, the land is more than 25% significantly affected, and because of the potential sleep disturbance impacts at the residence (see below).		

As outlined in the table, there are 3 privately-owned residences that are predicted to be significantly affected by operational noise at some stage during the project, and a further 10 privately-owned residences that are predicted to be marginally to moderately affected. A further 6 privately-owned properties are predicted to be significantly affected over more than 25% of the land area.

The revised modelling indicates that the optimisation review has reduced the area of affectation considerably, with the pre-optimisation modelling as presented in the EIS indicating that 7 privately-owned residences would be significantly affected, and 17 privately-owned residences would be marginally to moderately affected¹⁸.

The residual affected privately-owned properties are all located in the rural area surrounding the project (on most sides), with the affected area not extending to the urban area of Breeza (see Figure 38).

A summary of the worst case noise levels at the significantly affected residences is presented in the following table.

Table 10: Significantly Affected Residences (significant exceedances in bold), dBA

Residence	Direction from Mine	Criteria	Worst Case Predicted Noise Level		
			Day Neutral	Day Prevailing	Evening/Night
32c	NE	35	30	42	41
62a	SW		30	39	41
125	S		38	45	48

Each of the significantly affected residences are located on large rural land holdings, with the landholdings extending to areas outside the 40 dBA contour, and in most cases the 35 dBA contour (except for Property 125, which is located immediately south of the mine, wholly within the 40 dBA contour).

The Department also notes that for most of the surrounding receivers (with the exception of the significantly affected residences), noise levels would remain below the applicable amenity criteria in the INP – ie. 50 dBA for the day, 45 dBA for the evening and 40 dBA for the night period.

Further, the Department acknowledges that the noise assessment is based on worst case scenarios with all equipment assessed to be operating under noise enhancing weather conditions. As outlined above, Shenhua has committed to the development of a real-time noise monitoring and management system for the project. This uses a combination of real-time noise monitoring and weather forecasting to guide the day-to-day planning of mining operations, and prevent noise impacts during adverse weather conditions. Such 'active' management systems are increasingly being used in the Hunter Valley, with results indicating that predicted impacts are able to be significantly reduced or eliminated.

With such a system in place, the Department believes that the number of marginally, moderately and significantly affected properties could be further reduced. Accordingly, the Department has recommended conditions requiring Shenhua to develop and implement such a system, as part of a comprehensive noise management plan for the project.

¹⁸ Excluding properties that have been acquired by Shenhua since the EIS (ie. Properties 4, 13 and 14).
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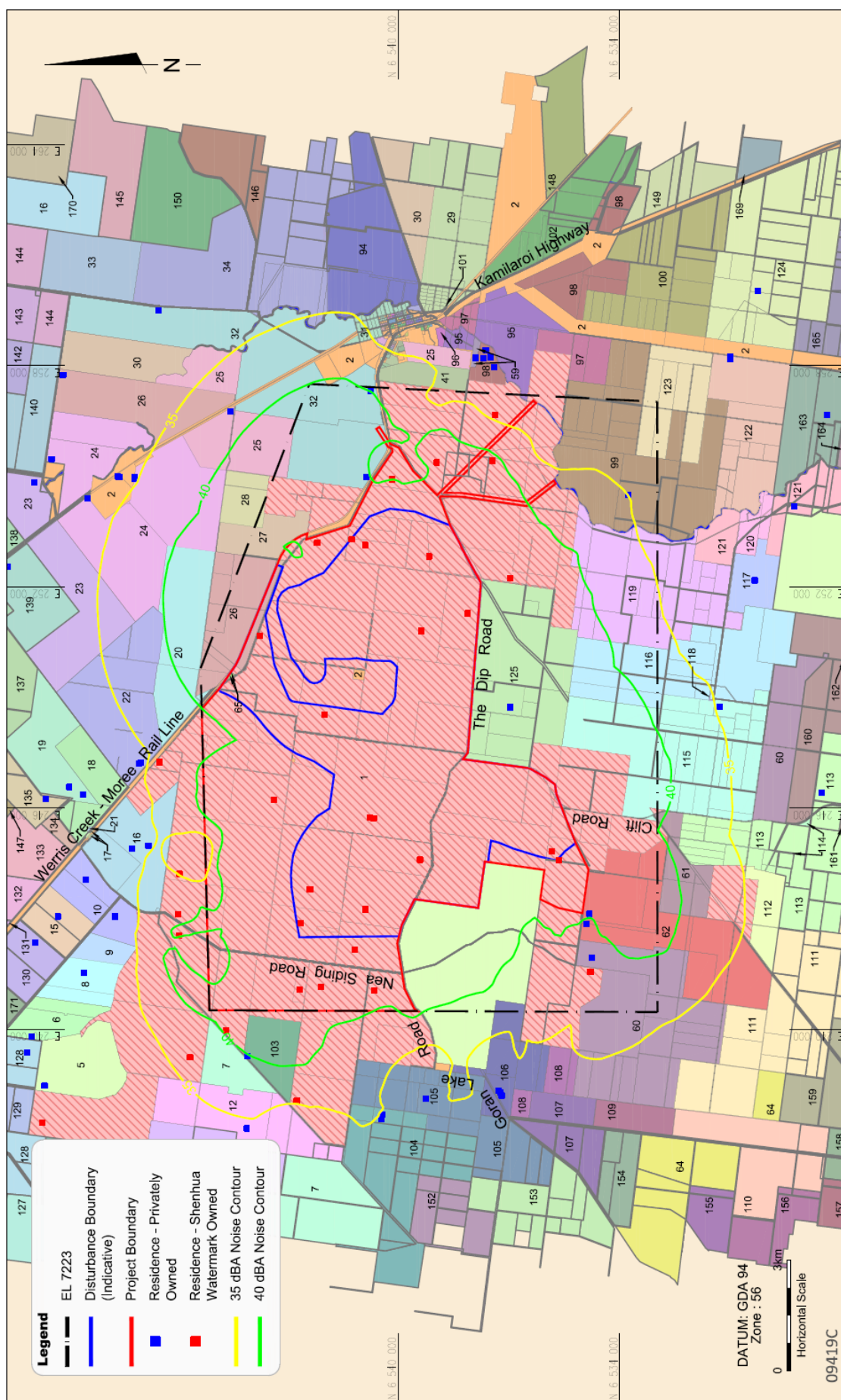


Figure 38: Operational Noise Impacts (All Years, Evening/Night)

Whilst the active management system is considered appropriate, there is some risk to the practical implementation of the system and proposed noise mitigation measures assumed as part of the noise model. Accordingly, the Department has recommended conditions requiring Shenhua to:

- acquire the properties predicted to be significantly affected properties, if requested by landowner;
- undertake additional noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at residences which are predicted to be significantly or moderately affected, if requested by landowner;
- comply with contemporary operational noise limits;
- develop a comprehensive Noise Management Plan, including real-time noise monitoring and an active management system which includes an early warning alert system to identify and manage potential exceedances;
- independently investigate noise complaints and undertake applicable management measures; and
- communicate mining operations with the community, including publicly reporting all monitoring results, and effectively responding to enquiries and complaints.

With regard to the additional landholdings that are predicted to be affected over more than 25% of the land area (but where the residence is not predicted to be significantly impacted), the Department acknowledges that the properties are largely broad acre cropping/agricultural land, and that higher noise levels are unlikely to significantly affect agricultural productivity of the land. In some recent coal mining approvals in the Gunnedah Basin – including the Boggabri Coal Project and the Maules Creek Coal Project – the PAC has diverged from longstanding NSW policy and withheld granting acquisition rights to these properties because of the limited impact.

The Department has considered this approach for the project (ie. withholding acquisition rights for these properties), but does not recommend its adoption for two main reasons. Firstly, some of the affected landholdings are very close to the project disturbance areas (eg. Properties 26 and 27), and would likely experience considerable amenity impacts. The project is likely to have a significant impact on the development potential and/or private property rights of these landholdings (including subdivision potential), which ought to be compensated for.

Secondly, granting acquisitions rights to these landowners does not compel the landowners to sell, it merely provides them with an option to sell their land (for a price as if unaffected by the project) if the owner decides that he or she is unable or unwilling to live with project-related impacts.

Consequently, the Department has recommended that its longstanding policy of providing acquisition rights to the properties where more than 25% of the landholding is significantly affected is applied to the project. The Department has also recommended conditions requiring Shenhua to maintain the agricultural productivity of any farmland that it does acquire (that is outside the operational areas of the project), to ensure that the agricultural productivity of these lands is maintained in the event that the landowner chooses to exercise his/her acquisition rights.

Construction Noise

Construction-related noise activities – including construction of the Kamilaroi Highway overpass, rail spur and loop, CHPP, mine access road and mine haul roads – have been assessed against the operational noise criterion (ie. 35 dBA). The assessment indicates that construction noise levels would remain within the applicable criteria for all receivers except Property 125, which would experience construction noise levels similar to or less than the predicted operational noise levels.

Sleep Disturbance

Intermittent and sharp project-related noises during the night time period – eg. reversing dozers and train wagon shunting – have the potential to cause sleep disturbance impacts. Shenhua believes that with the implementation of the noise mitigation measures outlined above, any exceedances of the applicable sleep disturbance criterion (ie. 45dBA L_{Amax}) are unlikely.

Notwithstanding, the noise assessment includes a worst case assessment of the potential for the sleep disturbance in the absence of the proposed noise control measures. The assessment indicates that maximum noise levels at night would comply with the sleep disturbance criteria at all receivers

with the exception of residences on Properties 32, 103 and 125 – all of which are also predicted to be significantly affected by operational noise at the residence or over the land area.

As outlined above, the Department has recommended conditions requiring Shenhua to acquire these properties on request, and to undertake additional architectural noise treatments on the residences at the landowners request.

The Department has also recommended conditions requiring Shenhua to implement the adopted best practice noise controls, and to comply with the relevant sleep disturbance criteria at all receivers outside the acquisition zone.

Road Traffic Noise

The project would provide direct access to the Kamilaroi Highway via the Mine Access Road. The traffic noise assessment indicates that the construction and operational phases of the project would increase noise levels at residences close to the highway by less than 1 dBA, with total traffic noise levels remaining below the applicable 60 dBA $L_{Aeq,15hr}$ traffic noise criteria at all privately-owned receivers.

Rail Traffic Noise

Rail noise on the proposed rail spur and loop was assessed as part of the operational noise assessment considered above.

The project would generate an average of 8 train movements a day (in + out), and a maximum of 16 movements a day, on the Werris Creek-Moree Railway Line and the Main Northern Railway. This would increase train movements on the Werris Creek Line from about 49 trains a day¹⁹ to 59 trains a day. The rail noise assessment indicates that the existing and approved rail traffic exceeds the applicable night noise criteria (i.e. 60 dBA L_{Aeq}) at about 39 residences on the Werris Creek-Moree Railway Line and Main Northern Railway between the site and Muswellbrook (with noise levels up to about 65 dBA).

If project-related traffic were added to this traffic, rail noise levels are predicted to increase by a further 0.6 dBA L_{Aeq} , which would result in night time exceedances at a further 3 residences between Breeza and Willow Tree. On busy days, the rail noise contribution from Watermark trains would be higher, however it would be likely that this additional noise increase would be offset by a commensurate reduction in train movements from other mines using the railway.

One way of reducing night time rail noise increases would be to restrict train movements at night to minimise sleep disturbance. However, the Department notes that rail scheduling and the selection of rolling stock would both be largely beyond the control of Shenhua, with the Australian Rail Track Corporation (ARTC) and other bulk freight carriers being the entities which are responsible for the haulage and timing of coal delivery on the wider public rail network. The approval authority (ie. the PAC in this instance) does not have the power to include conditions in a project approval that place requirements on a third party, such as ARTC.

The Department acknowledges that ARTC's Environment Protection Licence (EPL) currently includes a Pollution Reduction Program requirement to minimise noise emissions. As part of this program, ARTC is required to monitor locomotive, noise levels, audit noise performance of locomotives, maintain an environmental hotline and implement all reasonable and feasible noise mitigation and management measures to reduce rail noise impacts. The Department is satisfied that these current measures are appropriate to mitigate rail noise associated with the project.

Notwithstanding, the Department has recommended conditions requiring Shenhua to:

- ensure that the project only uses locomotives that comply with the noise limits in ARTC's EPL;
- use its best endeavours to ensure that rolling stock are selected to minimise noise; and
- implement all reasonable and feasible measures to minimise rail noise associated with the project.

¹⁹ Including existing train traffic and traffic from approved and recently proposed mining projects.
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Cumulative Noise

Although there are no other approved or pending industrial noise sources that could contribute to the cumulative industrial noise levels in the locality, the EIS includes consideration of the potential cumulative impacts associated with the (conceptual) Carroona Coal Project. Whilst details of that project are yet to be confirmed, the conceptual noise assessment indicates that cumulative noise impacts associated with the Watermark and Carroona coal projects are unlikely particularly given the underground nature of the as the Carroona Coal Project. Notwithstanding, the Department has recommended conditions requiring Shenhua to co-ordinate noise management with any nearby mines to cumulative noise impacts.

Blasting and Vibration

The project involves blasting to facilitate removal of both overburden and coal, with up to 240 blasts proposed per year, or approximately 5 per week, undertaken between the hours of 9am to 5pm Monday to Saturday.

Blasting has the potential to affect people, structures or private property in a number of ways, including:

- annoyance and discomfort, or 'amenity impacts';
- structural damage to homes, buildings, property improvements, infrastructure heritage items and significant landforms;
- direct risks to the safety of people and livestock due to rock projectiles, or 'flyrock'; and
- blast fumes.

Blast fume-related impacts are addressed separately in the air quality assessment (see separate section below).

The blast assessment indicates that all blasting activities for the full range of blast sizes would remain below applicable amenity and structural damage criteria at all privately-owned residences, as shown in the following table.

Table 11: Worst Case Blast Impacts

Receiver ID	Amenity Criteria		Structural Damage Criteria		Predicted Level (@ max 2000kg MIC)	
	Airblast	Vibration	Airblast	Vibration	Airblast	Vibration
Privately-owned properties (worst case)	115 dB (Lin) for 95% of blasts in any year 120 dB (Lin) for 100% of blasts	5 mm/sec for 95% of blasts in any year 10 mm/sec for 100% of blasts	133 dB (Lin)	10 mm/sec	113	4.4
Shenhua-owned	3	Not adopted – as owned by company	133 dB (Lin) ¹	15 mm/sec ¹	120	13.1
owned	7				109	2.5
heritage	12				111	3.3
homesteads	13				114	4.9
Breeza Cemetery	N/A	N/A	N/A	2	N/A	0.9
Central Ranges Gas Pipeline	N/A	N/A	N/A	25	N/A	8.3

1 As adopted by Shenhua

Four Shenhua-owned farm complexes with some local heritage significance (see Section 6.5 for details) would be subject to some blast-related vibration and overpressure, with one of the homesteads (ie. Farm Complex 3 - The Wilgas) predicted to exceed the amenity criteria for all blast sizes.

Vibration and overpressure at this residence would be below the adopted structural criteria (of 15 mm/sec and 133 dB), however the Department notes that: (1) the adopted 15 mm/sec ground vibration criteria is higher than that adopted for privately-owned residences; and (2) Shenhua does not appear to have undertaken any specific engineering assessments on the building (or other heritage homesteads) to confirm the acceptability of the adopted criteria. In this regard, heritage buildings can be more susceptible to blast-related impacts and site specific assessment is often required to determine appropriate vibration limits.

Shenhua has committed to engaging a qualified expert to inspect the heritage buildings and confirm appropriate ground vibration and overpressure limits for each building. Whilst it would be preferable that these inspections occurred prior to determination of the project, the Department concedes that in practice blasting is able to be readily managed to achieve any reasonable set limit, through blast management practices such as reducing MIC size. In the absence of expert advice, the Department has recommended conditions requiring Shenhua to ensure that blasting does not damage the heritage farm complexes (and other heritage items), and to develop specific blasting criteria for the items based on site specific geotechnical investigations, as part of the Blast Management Plan.

Axe-grinding groove WM-GG2-11 is located adjacent to the Eastern Mining Area, and has the potential to be impacted by blast-related 'over break' (ie. cracking). The blasting impacts on landforms and slopes assessment indicates that a 100 metre buffer between blasting operations and the axe grinding groove would be sufficient to protect the site, and that the grinding groove site is well outside this buffer.

The risk of flyrock damage to the grinding groove site would be controlled by covering the grooves with blast mats or other materials when blasting within 500 metres of the grooves.

With regard to safety risks, it is noted that one privately-owned landholding (Property 125), some local roads (including the Kamilaroi Highway (in one small area) and The Dip Road), and other publicly accessible areas (including Breeza State Forest) are located within the range of potential flyrock impact (ie. approximately 500 metres) (see Figure 39). To manage safety risks associated with flyrock, the Department has recommended conditions restricting blasting to no closer than 500 metres of any privately-owned land or other land not owned by Shenhua, unless the company has:

- a written agreement with the landowner to allow blasting to be carried out closer to the land; or
- demonstrated to the Department's satisfaction that the blasting can be carried out without compromising the safety of people or livestock, and updated the mine's Blast Management Plan to include the specific measures that would be implemented to ensure this.

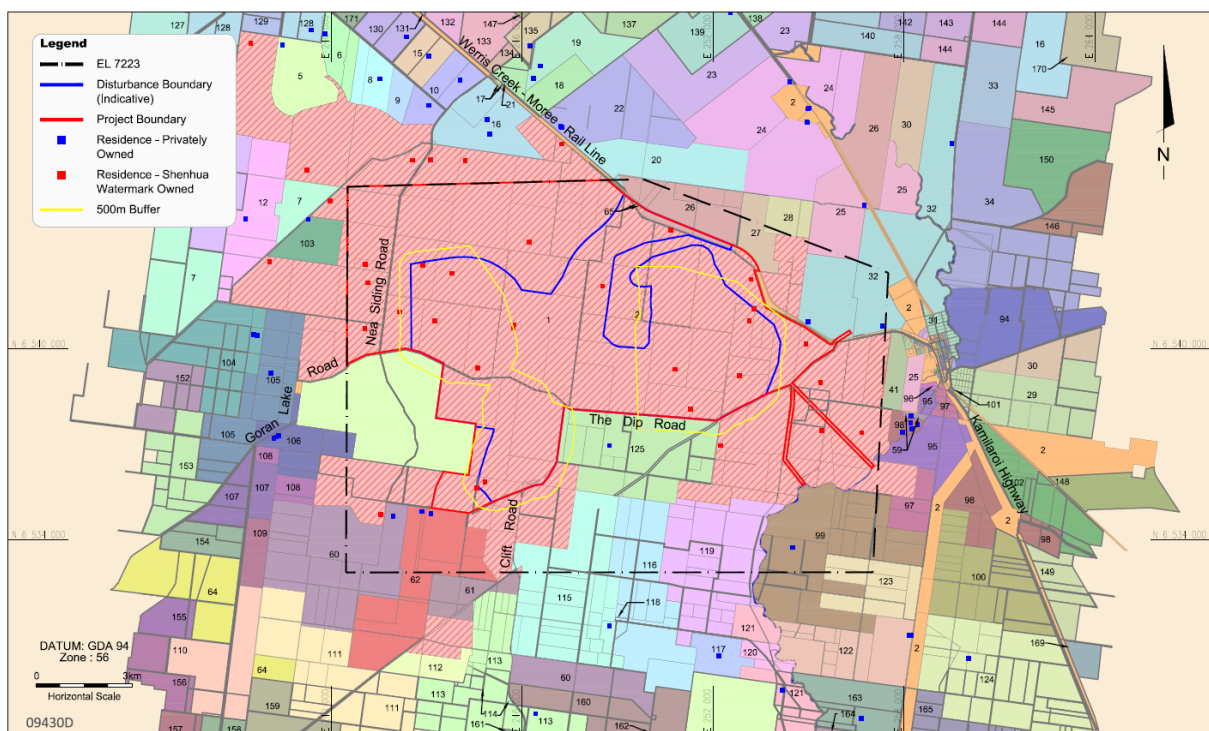


Figure 39: Flyrock Buffer Zone

In conclusion, the Department is satisfied that blasting and blast-related operations can be readily managed to meet the applicable amenity and structural damage criteria at all surrounding private residences, structures and heritage items, subject to implementation of strict blast management measures. To ensure this occurs, the Department has recommended conditions requiring Shenhua to:

- manage blasting operations to comply with all relevant criteria at private properties and public infrastructure;
- limit blast frequency and hours;
- keep the public notified and up-to-date regarding blasting operations, and facilitate feedback and complaint management;
- provide for structural property inspections and investigations on request;
- repair any structural damage to buildings or infrastructure caused by the project;
- manage blasting operations to avoid flyrock related safety risks; and
- develop a comprehensive Blast Management Plan.

Dust Impacts

The predicted worst case operational dust impacts for all modelled scenarios is shown on Figure 40, and a summary of the affected receivers is predicted in Table 12 below. As noted above, for most operating years these results conservatively reflect the original modelling undertaken for the EIS, and do not reflect the optimisation review undertaken for the RTS, which indicates that dust emissions sources may be reduced by around 15%. However, the results do reflect the revised modelling undertaken for Year 21 for properties to the south of the project site.

As outlined in Table 12, only 24-hour PM₁₀ levels are predicted to exceed the applicable air quality criteria, with average-annual dust levels and dust deposition rates all expected to remain within applicable criteria of all privately-owned residences.

All of the significantly dust affected privately-owned properties are located in the rural area surrounding the mine, and all of the affected residences are also predicted to be significantly or moderately affected by project-related noise.

Table 12: Dust Affected Privately-Owned Properties (exceedances only shown)

Receiver	Direction from Mine	Worst Case Dust Level (all years)							
		PM ₁₀ (50µg/m ³)		PM _{2.5} (50µg/m ³)		TSP (50µg/m ³)		Dust deposition (g/m ² /month)	
		24 Hour		Annual	24 Hour	Annual	Annual	Project alone	Project and other sources
		Max.	Days >50µg/m ³						
Criteria		50	5	30	25¹	8¹	90	2	4
Significantly Affected Residences									
62a	SW	152	26	-	-	-	-	-	-
62b	SW	131	20	-	-	-	-	-	-
125	S	86	6	-	-	-	-	-	-
Moderately Affected Residences									
25b	NE	57	1	-	-	-	-	-	-
32c ²	NE	82	5	-	-	-	-	-	-
60 ²	SW	80	7	-	-	-	-	-	-
Additional Properties >25% Significantly Affected³									
26	N								
27	N	>50	>5	-	-	-	-	-	-
28	NE								

1 Advisory reporting standard only – there is no currently adopted air quality criteria for PM_{2.5}.

2 The residence is predicted to be significantly affected by cumulative 24-hour PM₁₀ – see below.

3 Two additional properties (Properties 115 and 116) were originally predicted to also be significantly affected over more than 25% of the landholding, however the revised modelling undertaken for the mine optimisation review indicates that these properties would not be significantly affected.

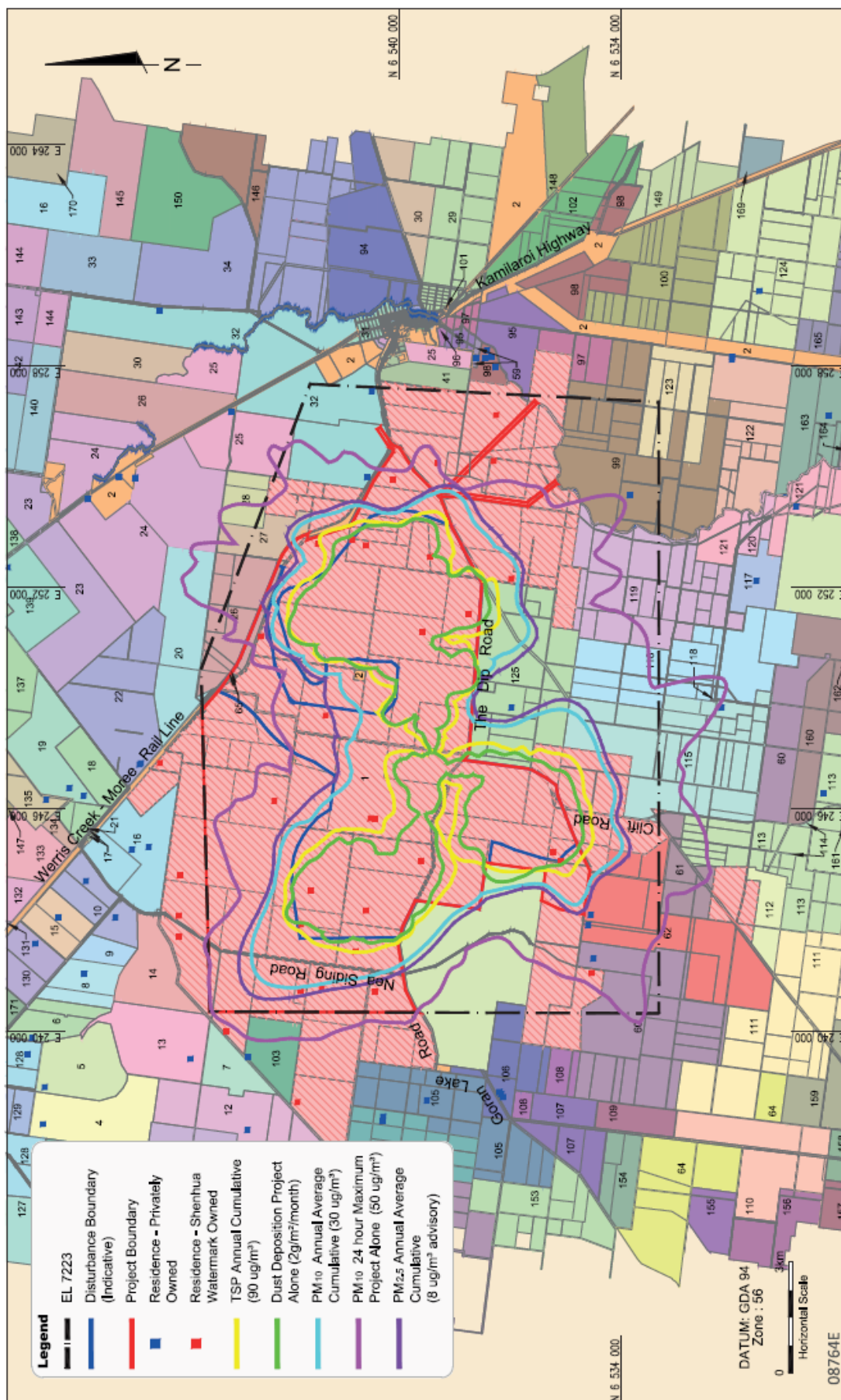


Figure 40: Worst Case Dust Contours – All Years

(Nb. The figure does not reflect the revised modelling for Year 21, which has constricted the contours to the south of the mine)

Cumulative 24-hr PM₁₀ Impacts

Whilst the air quality assessment's quantitative assessment includes cumulative analysis for TSP, dust deposition and annual average PM₁₀, the analysis of 24-hour PM₁₀ impacts is based on a project-only basis, as cumulative assessment of 24-hour PM₁₀ is problematic for a number of technical reasons (including the large variance in background 24-hour PM₁₀ levels).

To address cumulative 24-hour PM₁₀ impacts in some manner, the assessment includes a 'Monte Carlo Simulation' (which is essentially a random sampling statistical tool) to examine the probability of cumulative 24-hour PM₁₀ levels exceeding the applicable 50 µg/m³ goal, based on available data. This assessment indicates that the residences most likely to experience 24-hour PM₁₀ impacts are generally those already predicted to be affected by the project alone (ie. Residences 62a, 62b and 125), however there are 3 other residences where the 50 µg/m³ 24-hour PM₁₀ criteria may be exceeded for more than 5 days a year, namely:

- Property 32c – up to 20 days over 50 µg/m³ a year;
- Property 60 – up to 11 days²⁰ over 50 µg/m³ a year; and
- Property 103 – up to 7 days over 50 µg/m³ a year.

Properties 32 and 103 are also predicted to be significantly affected by operational noise associated with the project.

A small number of additional properties are predicted to exceed the cumulative 24-hour PM₁₀ criteria on 1 or 2 days a year, which is within the applicable air quality criteria.

The air quality assessment indicates that the operational dust-related impacts of the project on surrounding receivers would be similar or less than the operational noise impacts.

The Department notes that the modelling has not taken into consideration active (or adaptive) management measures to reduce air emissions during dusty conditions (especially during dry and windy conditions). As with active noise management, active air quality management uses a combination of real-time dust monitoring and weather forecasting to guide the day-to-day planning of mining operations, to prevent air quality impacts during these adverse weather conditions.

As outlined above, such active management systems are starting to become more and more common for mining projects in places like the Hunter Valley, with results indicating that predicted impacts (particularly in relation to 24-hour PM₁₀) are able to be significantly reduced or eliminated due to adaptive management in response to weather conditions. As outlined above, Shenhua has committed to the implementation of an active management system for the project.

Given the predicted project-specific impacts and the potential for wider cumulative impacts, the Department has recommended conditions requiring Shenhua to develop and implement an active dust management system for the project, as part of a comprehensive Air Quality Management Plan for the mine. With such a system, the Department believes that Shenhua should be able to avoid or at least reduce many of the predicted 24-hour PM₁₀ impacts.

Nevertheless, the Department accepts that there is some risk to the practical implementation of the system, and has recommended that Shenhua be required to acquire the 8 properties predicted to be significantly affected (ie. Properties 26, 27, 28, 32, 60, 62, 103 and 125), if requested by the landowner. The Department has also recommended a range of best practice air quality management measures for the project, including requiring Shenhua to:

- comply with contemporary air quality criteria, for properties outside the predicted affected area;
- acquire any additional residence or property if dust emissions exceed the applicable land acquisition criteria, if requested by the landowner;
- undertake additional dust mitigation measures (such as air filters or air conditioning) at privately-owned or mine-owned residences predicted to be significantly or moderately affected, if requested by the landowner (or the tenant of any mine-owned residence);
- develop a comprehensive Air Quality Management Plan, including a real-time dust monitoring program and an active management system which includes an early warning alert system to identify and manage potential exceedances;

²⁰ Based on the revised modelling undertaken for Year 21.
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- independently investigate air quality complaints and undertake applicable management measures;
- notify the affected landowners and tenants of the potential health-related impacts associated with mine dust;
- allow tenants of affected mine-owned residences to terminate tenancy agreements without penalty;
- respond effectively to enquiries or complaints; and
- publicly report on its environmental performance.

Other Air Emissions

The air quality assessment also includes consideration of oxides of nitrogen (NO_x), sulphur dioxide (SO₂) and particulates associated with blasting fumes, diesel use and potential spontaneous combustion.

Modelling for NO_x found that there could be a maximum of 8 hours per year (from 2,920 available hours) at any privately-owned receiver (ie. at Property 32c) where NO_x levels could exceed the applicable impact assessment criteria (ie. 246 µg/m³ over 1 hour). Most of these exceedances were found to occur in the late afternoon (between 4pm and 5pm) in poor dispersion (ie. stable) conditions.

To address this potential issue, Shenhua has committed to avoiding blasts in such conditions, and to applying best practice blasting techniques to minimise the formation of NO_x (such as ensuring appropriate oxygen balance for explosives and minimising time between drilling, loading and blasting).

The Department is satisfied that blasting operations should be able to be managed to avoid NO_x exceedances subject to the implementation of these controls, and has recommended conditions in this regard.

Modelling for other emissions associated with blasting and diesel use indicates that the project would comfortably comply with the applicable criteria. The assessment does note that some of the coal from the project (from the Lower Hoskinssons seam) does have the potential for spontaneous combustion due to its high sulphur content. To address this risk, Shenhua propose to mix the higher sulphur material with low spontaneous combustion risk material, in accordance in standard best practice spontaneous combustion management measures in the coal industry. The Department is satisfied that the risk of spontaneous combustion is able to be readily managed in this regard.

Coal Transport Emissions

Some submissions (including Liverpool Plains Shire Council) raised concerns about dust emissions from coal trains, with some recommending that coal wagons be required to be covered and/or dust suppressants applied to minimise emissions.

The EIS includes consideration of this issue, citing a Queensland Rail study in 2008 that found that fugitive coal dust at the edge of a typical rail corridor is within applicable criteria, and that there was minimal risk of adverse impacts throughout the rail network. It also cites an ARTC Study in 2013 that compared particulate emissions from coal trains, passenger trains and freight trains. That study found no substantial difference between trains types at one of the study sites. It did find a statistical difference at the other study site, although it found no statistical difference between loaded and unloaded coal trains.

Based on these studies, the Department does not believe that there is any evidence that coal trains are causing any significant adverse dust-related impacts on the rail network. Notwithstanding, the Department acknowledges that Shenhua has committed to the installation of a water spray/dust suppressant system at the train load out facility, and has recommended conditions reinforcing this commitment.

The Department also notes that ARTC is responsible for the management of the wider rail network, and that its EPL includes a requirement to prepare a Pollution Reduction Program that includes, amongst other things, requirements on ARTC to evaluate and reduce coal emissions on the rail network.

Dust Impacts on Cotton and Other Agricultural Products

A number of submissions from surrounding farmers in the locality raised concerns about dust deposition from the project affecting cotton quality (and therefore the prices received for cotton crops) and other crop products (eg. grains, legumes and vegetables). One nearby farming operation (Warmoll & Waugh) noted that it owns and operates a seed/grain grading and packing plant very close to the mine site (adjacent to Property 32c), and included letters in its submission from its customers indicating that its organic supply contracts could be threatened if dust were to impact its crops. Warmoll & Waugh noted that rejection of a shipment of its products could be ruinous to its business.

The Agricultural Impact Statement in the EIS includes considerations of dust impacts on grazing, plant growth and cotton quality. The AIS concludes that the project is unlikely to have any impacts on grazing animals and plant growth at the predicted dust deposition levels (and predicted noise levels). This conclusion is consistent with the Department's findings on other comparable mining projects, and the Department is satisfied the project is unlikely to result in any adverse impacts in this regard, noting that grazing and agriculture continue to successfully operate adjacent to many other mines in NSW and Australia.

With regard to impacts on cotton quality, the AIS included a literature review and consultation with industry professionals including the Australian Cotton Ginners Association.

The literature review cites a CSIRO study in 2006/07 that found that Australia had the lowest of contaminants imported by an international cotton mill with no mention of dust, sand or grit. The consultation found that in incidental cases of road dust on crops, the dust was easily and effectively removed at the pre-cleaning phase of the ginning process and did not affect cotton quality.

The key determinant of potential dust impacts to crops is dust deposition – ie. that portion of air emissions that settles on a given area. The AIS concludes that, given the predicted comfortable compliance with the applicable dust deposition criteria, the project would not impact on cotton quality. In this regard, the worst case increase in dust deposition at any receiver location is 0.4 g/m²/month, compared to the applicable criterion of 2 g/m²/month; and the worst case cumulative dust deposition level is 2 g/m²/month, compared to the applicable criterion of 4 g/m²/month.

The Department accepts that the predicted dust deposition levels are low and well within amenity limits and levels typically experienced in agricultural areas. Consequently, the Department believes that there is no evidence that suggests that the project would have an adverse impact on cotton quality or on any other organic and non-organic crop production and processing activities in the locality, or that farmers contracts and licences would be adversely affected by the project.

The recommendations to apply real-time monitoring and active dust (and noise) management systems would assist in reducing off site dust (and noise) levels.

Conclusion

The Department is satisfied that Shenhua has designed the project with number of reasonable and feasible measures so as to avoid or mitigate the noise, blasting and/or air emissions from the project.

However, even with the implementation of these measures, the project would result in significant noise and/or dust impacts at 11 privately-owned properties, including 6 residences.

The project would also have marginal to moderate noise and/or dust impacts on a further 10 privately-owned residences.

This level of impact is consistent with other large contemporary mining projects, particularly large, greenfield projects such as the Watermark Coal Project.

Importantly, the Department believes that the agricultural productivity of all of these affected landholdings is unlikely to be significantly affected by the project, and that most of the significantly affected residences are located on large broad acre properties that extend outside the affectation area.

The Department has recommended a broad range of conditions to ensure that the mine operates in accordance with best practice with regard to noise, blasting, and air quality, including requirements on Shenhua to:

- comply with contemporary applicable noise, blasting and air quality criteria;
- acquire the privately-owned properties predicted to be significantly affected, if requested by the landowner;
- acquire any additional residence or property if dust emissions exceed the applicable land acquisition criteria, if requested by the landowner;
- implement noise and/or air quality mitigation measures (such as double glazing, insulation, air-filters and/or air conditioning) on request at the significantly or moderately-affected residences;
- develop detailed Noise, Air Quality and Blast Management Plans, including real-time noise and dust monitoring and active management systems to identify and manage potential exceedances as they occur;
- notify the affected landowners and tenants of the potential health-related impacts associated with mine dust;
- allow tenants of affected mine-owned residences to terminate tenancy agreements without penalty;
- limit blast frequency and hours, and coordinate blasting operations with neighbouring mines;
- keep residences notified and up to date regarding blasting operations, and facilitate feedback and complaint management;
- provide for structural property inspections and investigations on request;
- repair any structural damage to buildings or infrastructure caused by the project;
- manage blasting operations to avoid fly-rock related safety risks;
- independently investigate complaints and implement applicable corrective and other management measures; and
- communicate regularly with the community, including publicly reporting all monitoring results, and effectively responding to enquiries and complaints.

With the implementation of these measures, the Department is satisfied that the project's noise, blasting and air quality impacts can be adequately minimised, managed and/or at least compensated for.

6.3 Greenhouse Gas Emissions

The EIS includes a greenhouse gas (GHG) emissions assessment, undertaken by PAE Holmes. The assessment was undertaken in accordance with applicable GHG guidelines, including the *National Greenhouse Account (NGA) Factors*, July 2010.

The assessment calculates direct and indirect GHG emissions associated with the project, including 'Scope 1' emissions (ie. direct GHG emissions from sources controlled by Shenhua), 'Scope 2' emissions (ie. indirect emissions associated with the import of electricity) and 'Scope 3' emissions (ie. other indirect emissions, such as those associated with the downstream combustion of product coal). The calculated GHG emissions associated with the project are presented in the Table 13.

Table 13: Direct and Indirect GHG Emissions

Scope	GHG source(s)	Total GHG emissions (tonnes carbon dioxide equivalent, TCO ₂ -e)
Scope 1	Mining and extraction related	7,674,839
Scope 2	Upstream electricity	741,576
Scope 3	Downstream emissions, eg transport of product coal	1,594,340
	Downstream coal use	402,137,483
Total (exc. downstream coal use)		10,010,755
Total (inc. downstream coal use)		412,148,238
Average Annual GHG Emissions		13,738,274

The assessment indicates that 98% of the total GHG emissions generated as a consequence of the project are those associated with the downstream burning of the product coal at power stations – ie. Scope 3 indirect emissions. The annual average GHG emissions over the life of the project, including coal combustion, are estimated to be 0.04% of annual global GHG emissions. Annual Scope 1 GHG

emissions associated with the project represent approximately 0.04% of Australia's commitment under the Kyoto Protocol (ie. 591 Mt CO₂-e).

The Department acknowledges the threat posed by global warming/climate change, but does not believe that this threat should necessarily preclude the approval of this project.

Rather, the consideration of the project application with regard to GHG impacts needs to be balanced with consideration to:

- the project's contribution to global warming/climate change;
- whether refusing the project application would reduce global GHG emissions;
- the need for the project;
- the benefits of the project, including job creation and its contribution to the NSW economy;
- the objects of the EP&A Act, including the encouragement of ESD; and
- available GHG impact mitigation measures.

Following consideration of the project's contribution to global warming/climate change, the Department is satisfied that the project's contribution to global GHG emissions, even when assessed on a full life cycle basis (ie. including downstream GHG emissions), would be very small.

It must be noted that if the project was not allowed to proceed, the resultant gap in the coal supply would be almost certainly filled by another coal resource either in NSW, Australia or overseas. In other words, removing the GHG emissions from the project would not likely result in any decrease in global CO₂ emissions. This point illustrates the reality that the key response to the issue of global warming/climate change needs to be made at a policy or strategic planning level, outside and above the NSW planning assessment process.

The need for the project and its benefits are discussed in Section 3 and 6.8. Based on its consideration, the Department is satisfied that there is a clear need for the development of new coal deposits, for at least the foreseeable future, to meet society's basic energy needs. The Department is also satisfied that the project would have considerable socio-economic benefits.

The objects of the EP&A Act are outlined in Section 4.9, and these objects have informed the Department's assessment of the project. With regard to the principles of ESD, the Department acknowledges that global warming/climate change presents a clear threat of serious or irreversible environmental damage, as well as a threat to intergenerational equity and a threat to the conservation of biological diversity. However, the Department is satisfied that the project itself does not present such a threat (as the emissions from the project itself are minor in a global and national context), and it must also be acknowledged that the downstream energy and other socio-economic benefits generated by the project would also benefit future generations, particularly through the shoring up of national and international energy needs.

Shenhua has committed to a range of GHG impact mitigation measures, which would be administered via an Energy Savings Action Plan, including implementation of a detailed energy monitoring program. The Department has recommended conditions requiring Shenhua to implement all reasonable and feasible measures to minimise greenhouse gas emissions.

The Department does not believe it is reasonable to apply other requirements to Shenhua through the NSW planning system to significantly reduce GHG emissions, including Scope 3 emissions associated with the downstream burning of the product coal. Any such impost – for example a CO₂ levy on product coal – would unfairly penalise Shenhua and its ability to compete in the energy industry. The Department believes that such an ad hoc approach to the issue of global warming/climate change is not in the public interest. The Department is satisfied that much more effective measures have been, and are continuing to be, planned and implemented at the State, national and international levels to combat global warming/climate change.

6.4 Biodiversity

Introduction

As a result of its long history of farming, and the natural ecological characteristics of the low-lying areas, most of the project site comprises low diversity grassland and pasture. Woodland areas are generally restricted to the localised high points around Mt Watermark, Springhurst Hill and Smokey

Point, and along ephemeral watercourses (particularly Watermark Gully), as well as in scattered remnants across the site.

The largest area of treed vegetation in the vicinity of the site is in Breeza State Forest, located within the EL but immediately to the south-west of the project disturbance area.

The project site, its surrounds, and the Gunnedah LGA in general have an abundant population of Koalas, and a range of other threatened species have been identified in the locality.

To assess the project's impacts on biodiversity, the EIS includes a specialist ecological assessment undertaken by Cumberland Ecology. A draft Koala Plan of Management (KPoM) was also prepared by Cumberland Ecology, with input and peer review by nationally-recognised Koala experts including Dr Stephen Phillips of Biolink Ecological Consultants, Dr Kath Handasyde of the University of Melbourne and Dr Matthew Crowther of the University of Sydney.

A supplementary ecological assessment providing a revised biodiversity offset strategy was also prepared by Shenhua with Cumberland Ecology, in response to issues raised about the original assessment and particularly the adequacy of the original biodiversity offset strategy.

Avoidance and Mitigation

The ecological assessments are based on a number of avoidance and mitigation measures that Shenhua would implement to minimise impacts on the biodiversity values of the site as far as practicable. These measures include:

- designing the project to avoid disturbance of Breeza State Forest, Mt Watermark, Watermark Gully and the black soil plains, which provide important Koala habitat;
- designing the overburden emplacement for the Eastern Mining Area to avoid a 143 hectare area of endangered ecological community;
- positioning the mine infrastructure area to avoid preferred Koala habitat;
- progressively clearing and rehabilitating the site;
- undertaking pre-clearance surveys and vegetation clearing protocols;
- undertaking weed and pest control;
- implementing flora and fauna monitoring programs; and
- implementing fauna rescue and translocation programs, including for the Koala.

These measures would be supplemented by a biodiversity offset strategy to compensate for the residual biodiversity impacts of the project. The offset strategy comprises on-site and off-site offset areas, and was revised and enhanced in response to concerns raised during exhibition of the EIS. It is discussed under a separate heading below.

The draft KPoM (which was also revised and enhanced following the EIS) also includes a number of specific measures for avoiding and/or mitigating impacts on Koalas. These are detailed under a separate heading below.

Vegetation and Flora Impacts

The project would disturb (clear) approximately 4,084 hectares of land. A summary of the vegetation communities within the project disturbance area, and their conservation significance, is presented in Table 14, and shown on Figure 41.

Table 14: Vegetation Community Impacts

Community	Conservation Significance		Area to be Cleared (ha)
	TSC Act	EPBC Act	
White Box Grassy Woodland	EEC	CEEC	517
Regenerating White Box Grassy Woodland	EEC	CEEC	28
Blakely's Red Gum Grassy Woodland	EEC	CEEC	89
Regenerating Blakely's Red Gum Grassy Woodland	EEC	CEEC	17
Yellow Box Grassy Woodland	EEC	CEEC	14
White Box/Yellow Box/Blakely's Red Gum Woodland	EEC	CEEC	0
Derived Native Grassland	EEC	CEEC	73
Sub-total Box Gum Woodland EEC			738
Inland Grey Box Grassy Woodland	EEC	EEC	30
Weeping Myall Woodland	EEC	EEC	3

Community	Conservation Significance		Area to be Cleared (ha)
	TSC Act	EPBC Act	
Brigalow	EEC	EEC	0
Semi-evergreen Vine Thicket	EEC	EEC	0
Fuzzy Box Woodland	EEC	-	18
Sub-total Other EEC			51
Other Woodland Communities*	-	-	148
Sub-total Other Woodland Communities			148
Low Diversity Native Grassland	-	-	1,691
Cropland / Exotic Pasture	-	-	1,393
Cleared Areas (roads, dams, buildings, etc.)	-	-	63
Sub-total Other			3,147
Total			4,084

* Other woodland communities within the disturbance area include Poplar Box Woodland, Belah Woodland, Whitewood Woodland, Tumbledown Red Gum Grassy Open Woodland, White Box Shrubby Woodland, Regenerating White Box Shrubby Woodland and Blakely's Red Gum Shrubby Woodland.

As outlined in the table, approximately 789 hectares of the vegetation to be cleared by the project constitutes an endangered or critically endangered ecological community (ie. EEC or CEEC) listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Most of this comprises communities commonly known as Box Gum Woodland, as well as derived native grassland (DNG) which, if left undisturbed and/or actively managed, would likely regenerate back to Box Gum Woodland over time.

One of the key issues initially raised by OEH was whether the assessed low diversity native grassland should also be classified as DNG, particularly as some of it appeared to be as diverse as the classified DNG. However, following provision of additional survey information and data, OEH confirmed that it was satisfied that the low diversity grassland does not constitute Box Gum Woodland DNG.

The woodland EEC's identified within the project site area are typically located on fertile soils that have historically been sought after by agricultural and other land uses, and as such have been extensively cleared in the region. The communities are generally poorly represented in the public conservation reserve system, again due to their occurrence on fertile and sought after arable land.

The ecological assessment concludes that, notwithstanding the above avoidance measures, the project would have a significant impact on these ECCs/CEECs in the absence of 'substantial' mitigation and offsetting measures.

The Department recognises that the project would remove a considerable area of good quality EEC and other native vegetation. Consequently, the Department (including OEH) and DOE agree that, for the project to be able to meet the general principles of 'improving or maintaining' biodiversity values over the medium to long term, it would require significant biodiversity offsets of suitable size and quality. This issue is discussed under a separate sub-heading below.

The ecological assessments identified one threatened flora species on the site, Lobed Blue Grass (*Bothriochloa biloba*), which is listed as vulnerable under the TSC Act. This species occurs mainly along Nea Siding Road and The Dip Road, and is partly within the disturbance area for the project. Four other species were also identified as potentially occurring within the project site, including:

- Bluegrass (*Dichanthium setosum*);
- Finger Panic Grass (*Digitaria porrecta*);
- Slender Darling-pea (*Swainsona murrayana*); and
- Ooline (*Cadellia pentastylis*).

The EIS includes tests of significance for each of these individual flora species, which concluded that the project is unlikely to result in any significant impact on the abundance, range and distribution of the species, given that large areas of similar habitat occur in the locality outside the project disturbance area.

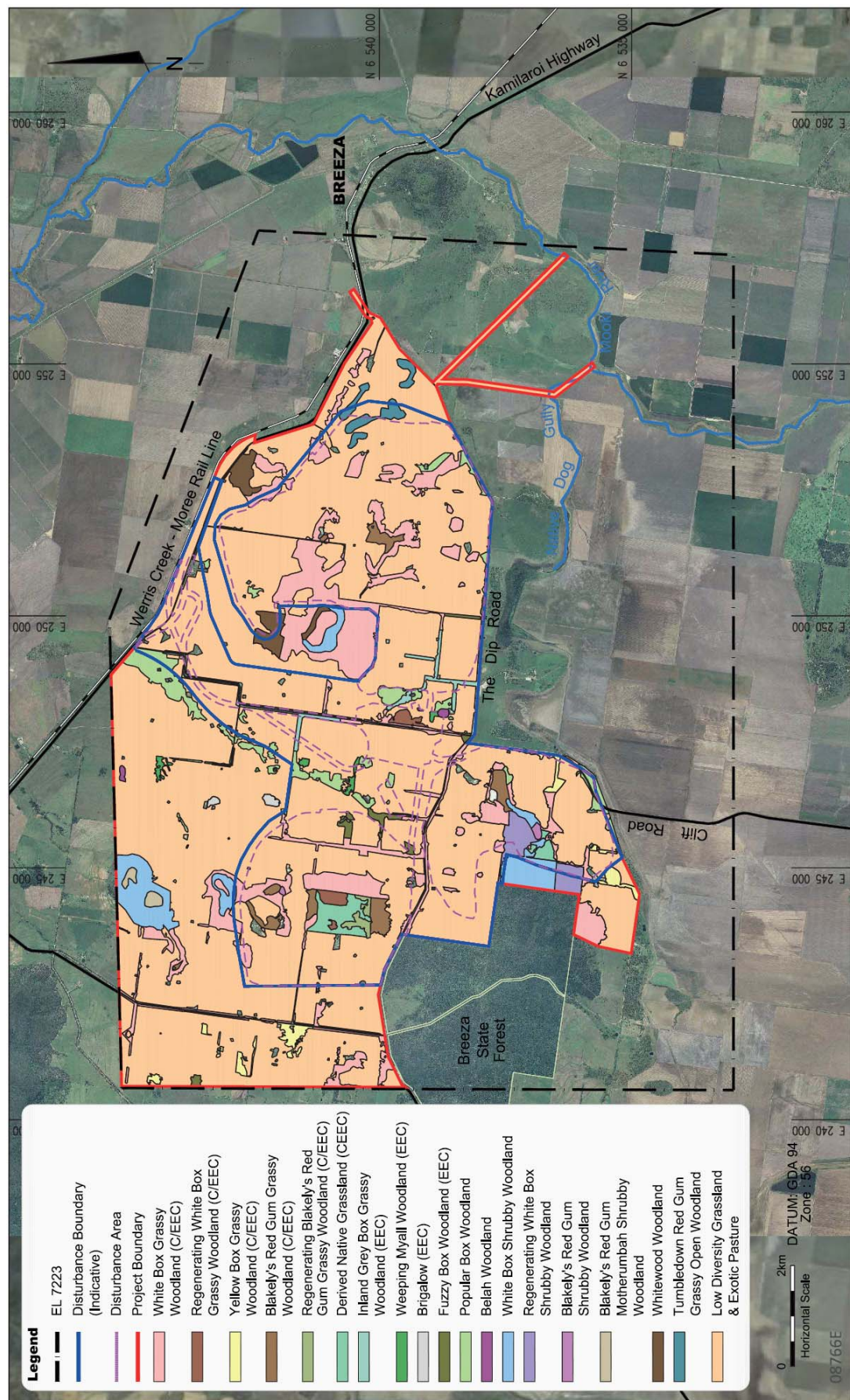


Figure 41: Vegetation Communities

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 sagittatus</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 melanosternon</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 norfolkensis</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:**
 - o **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;
 - o **Survey and assessment of disturbance site:**
 - to fully detail the resident Koala population prior to the (progressive) clearing;
 - o **Translocation timing:**
 - to be undertaken outside of mating and key rearing periods, and poor weather;
- **During translocation:**
 - o **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;
 - o **Capture protocol:**
 - using only personnel with considerable regional Koala capture experience;
 - o **Handling protocol:**
 - including minimising handling time and monitoring stress levels;
 - o **Data collection protocol:**
 - including measurement and checking of key Koala statistics;
 - o **Health assessment:**
 - including blood sampling, disease examination and health checklist;

- o *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;
- o *Transport protocol:*
- o *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:**
 - o *Visual surveys on release:*
 - 1 day, 7 days and 14 days after release, then at regular intervals for at least 4 months;
 - o *Health assessment:*
 - after 12 months, GPS/radio collars to be removed and a 12 month post-release health check undertaken;
 - o *Annual SAT survey:*
 - non-invasive SAT surveys 1 year post-release and annually thereafter; and
 - o *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;
 - o detailed baseline data on the resident Koala population and Koala habitat on site and in the biodiversity offset areas and release areas;
 - o identification of threats to Koalas and habitat;
 - o measures to mitigate and manage the identified impacts, including a detailed KTMP;
 - o a program to monitor Koala health and habitat;
 - o implement the commitment to indirect Koala mitigation, such as the \$180,000 contribution to the ARC Linkage Project; and
 - o 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

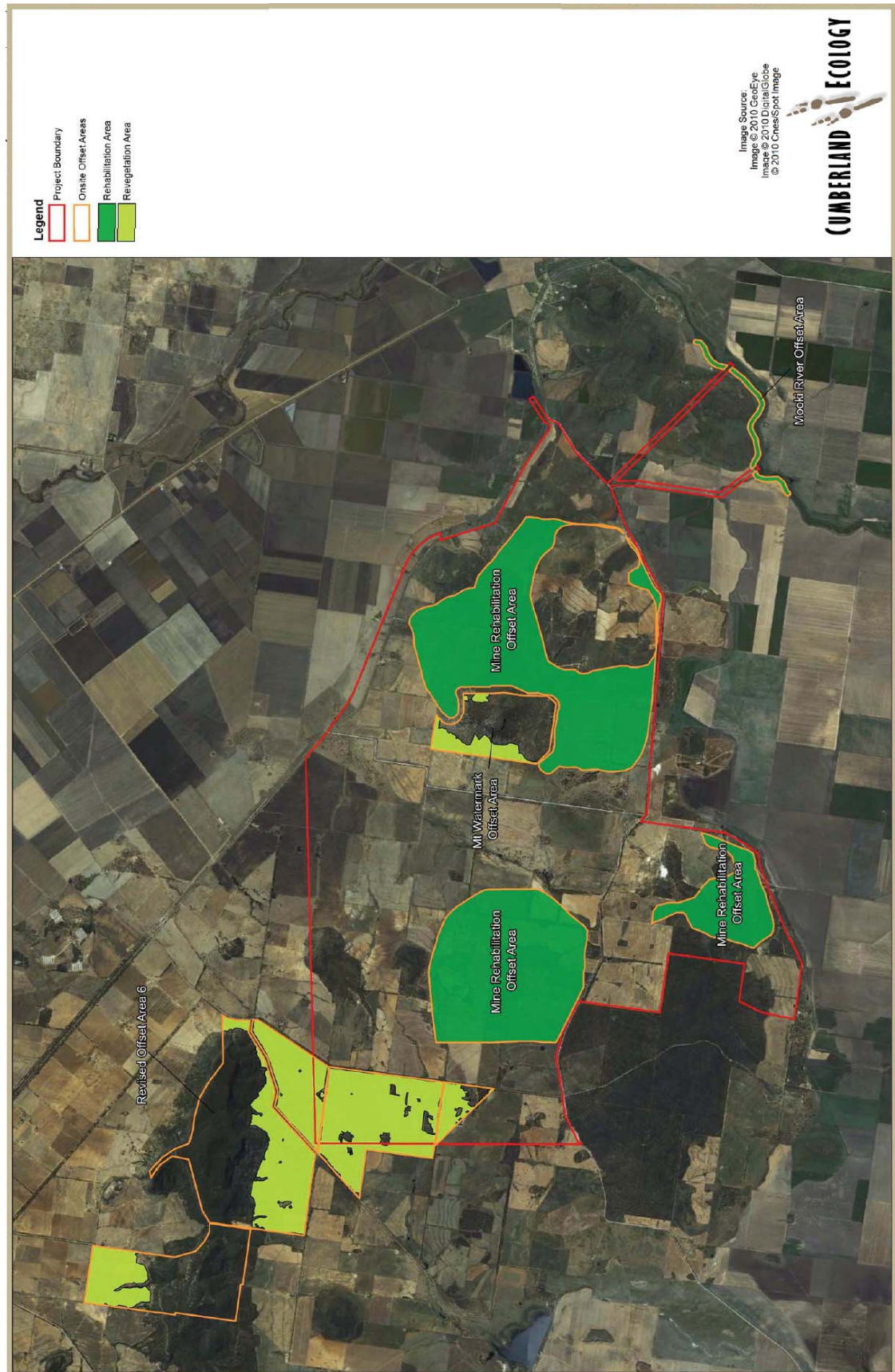


Figure 43: On-site Biodiversity Offset Areas

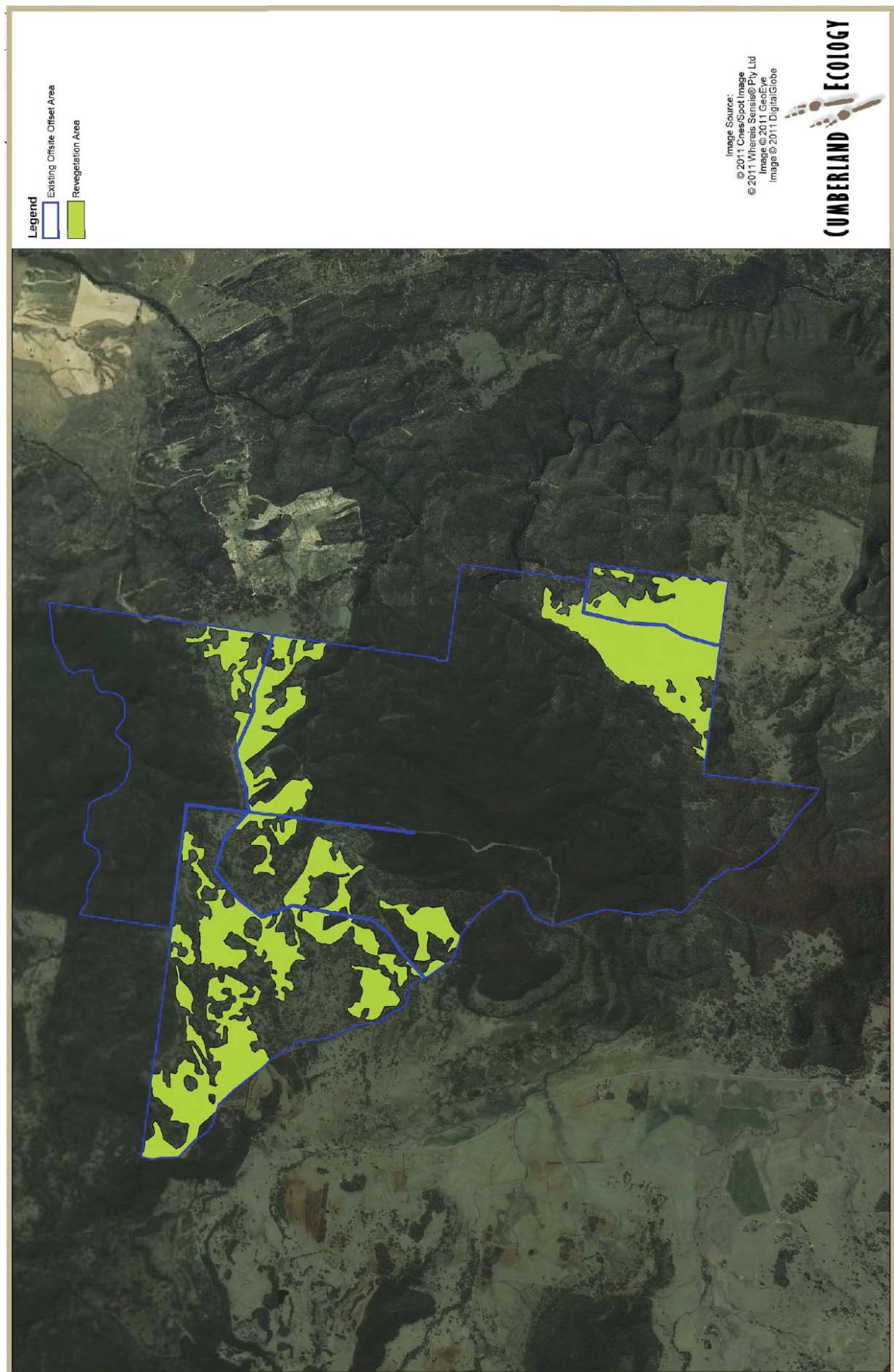


Figure 44: Off-site Biodiversity Offset Areas – Barraba Offset Area

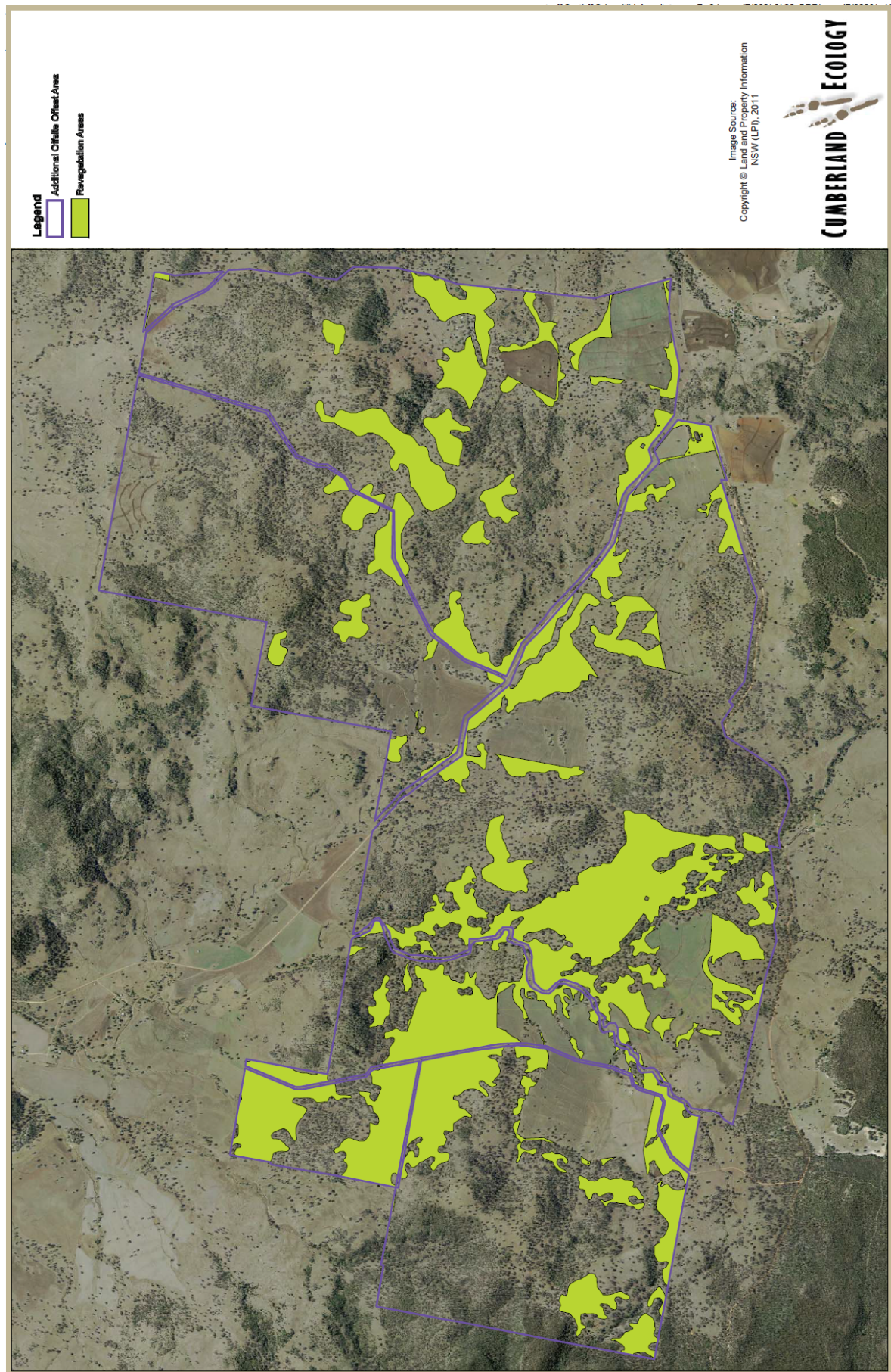


Figure 45: Off-site Biodiversity Offset Areas – Mt Erin and Glendowda Offset Area

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).

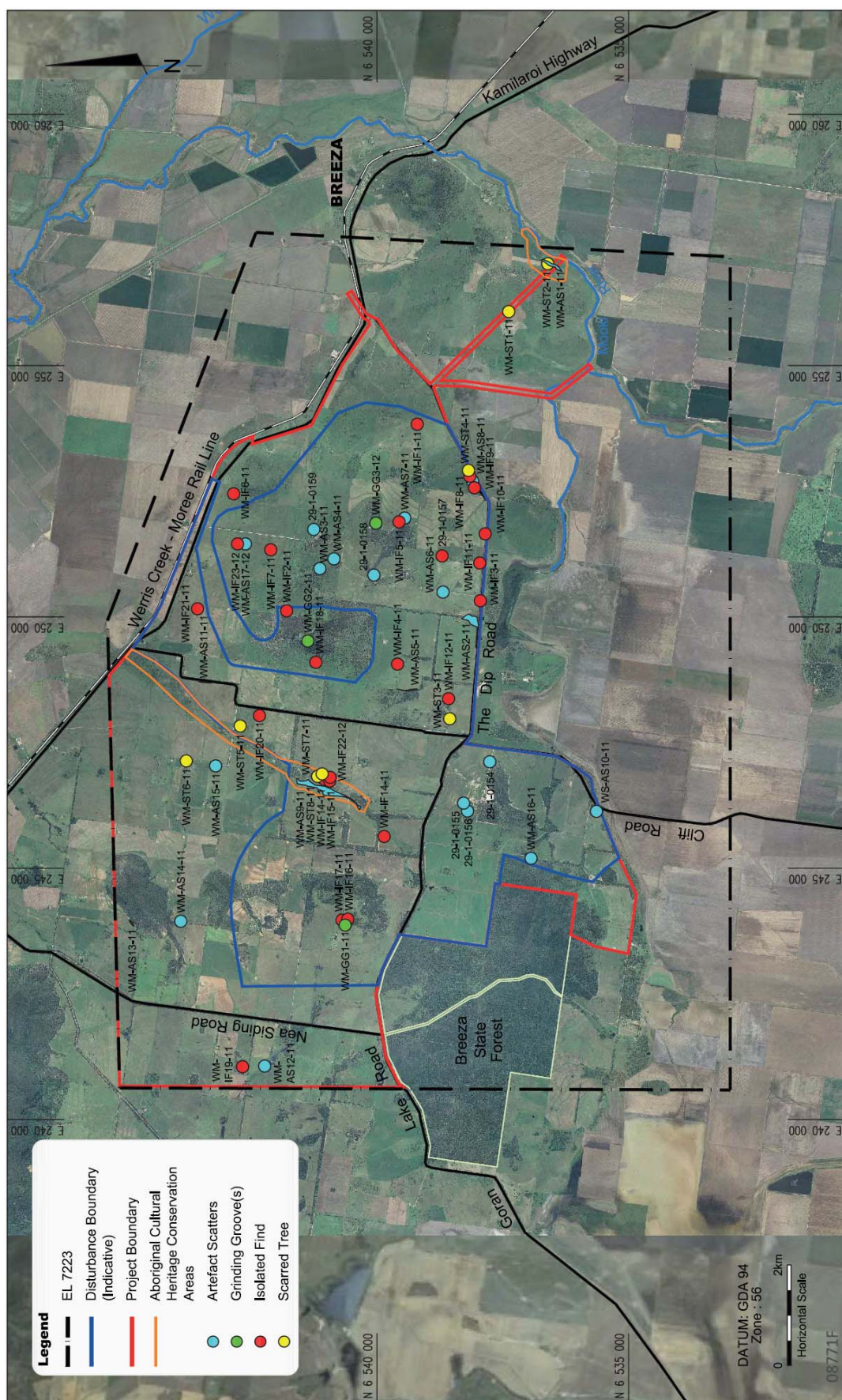


Figure 46: Aboriginal Heritage Sites

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:
 - o 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.

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

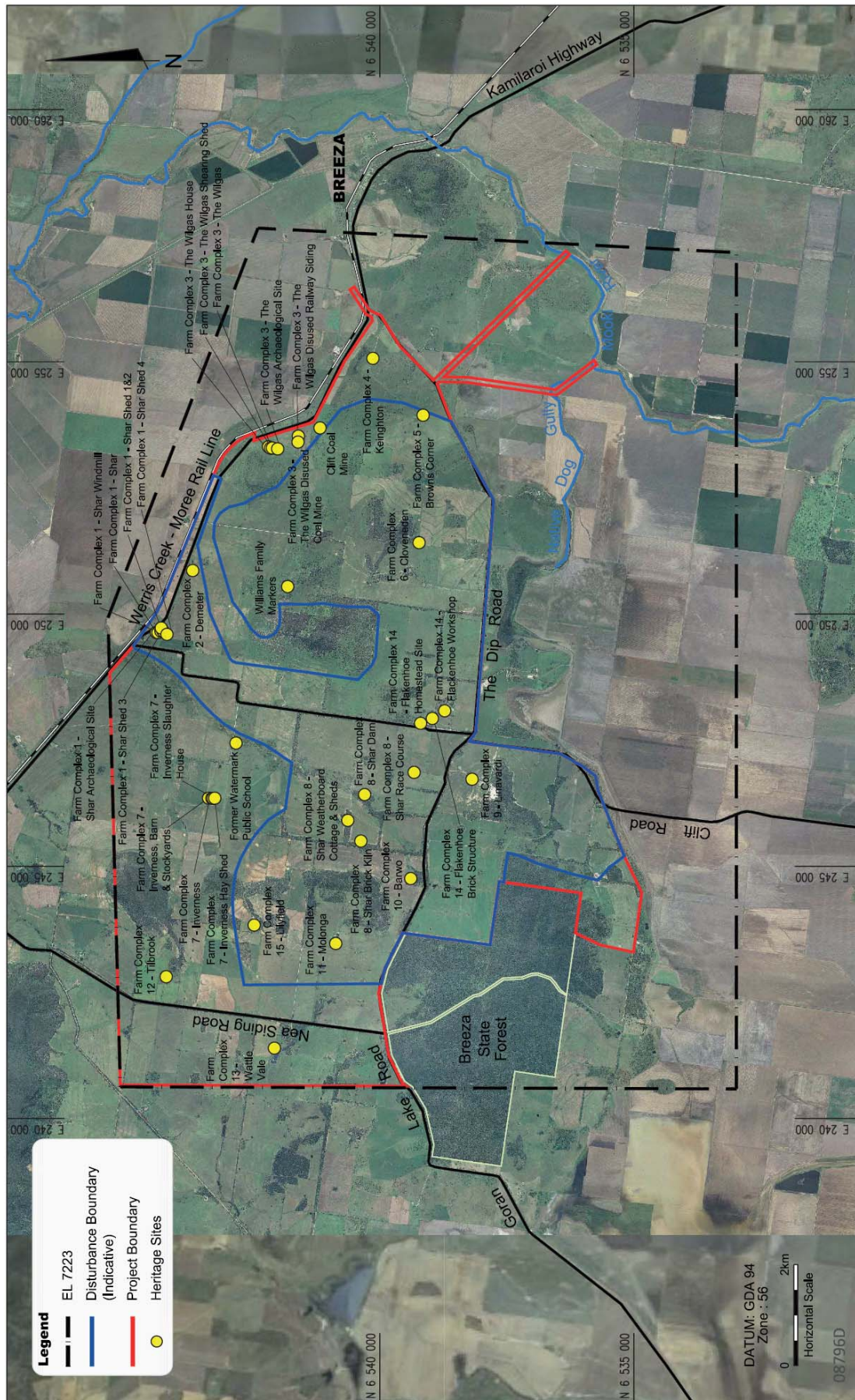


Figure 47: Historic Heritage Sites

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), Curlewish to the north (approximately 12 kilometres away), and Carroona 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, Caroona 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.

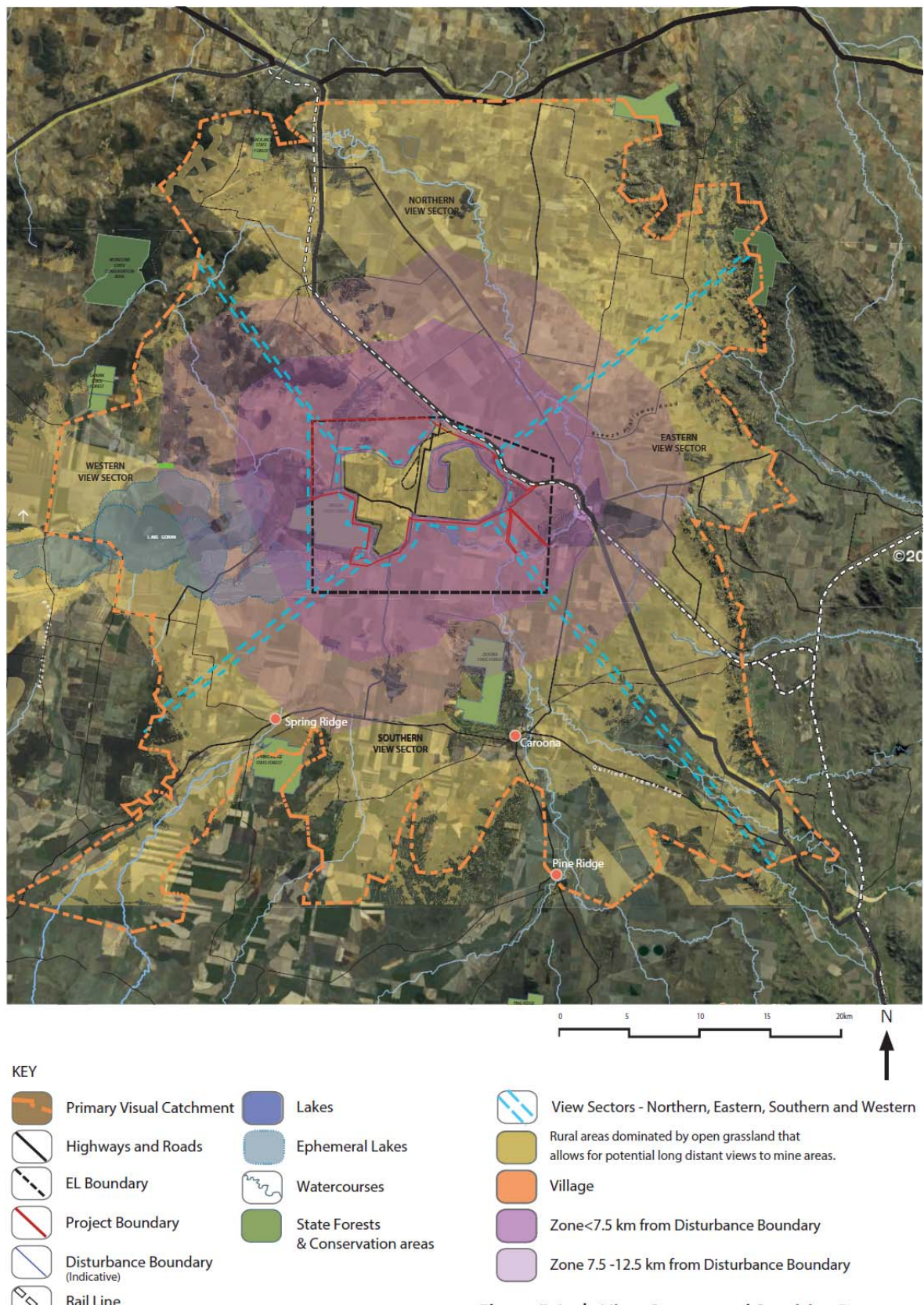


Figure 48: View Sectors



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).

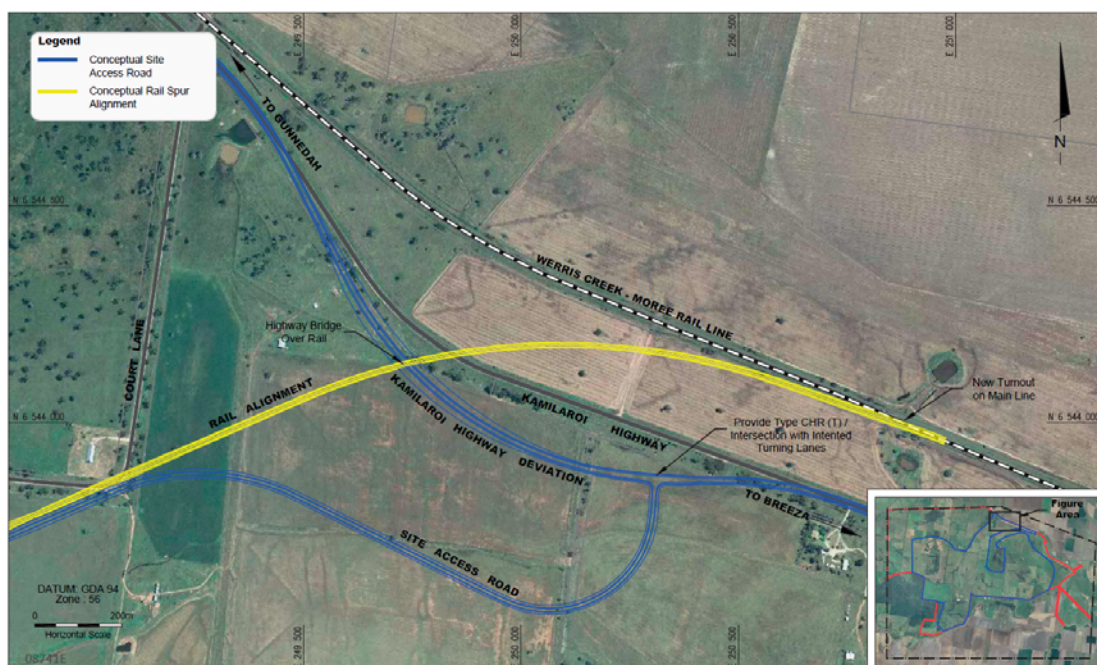


Figure 50: Conceptual Road and Rail Alignments

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).

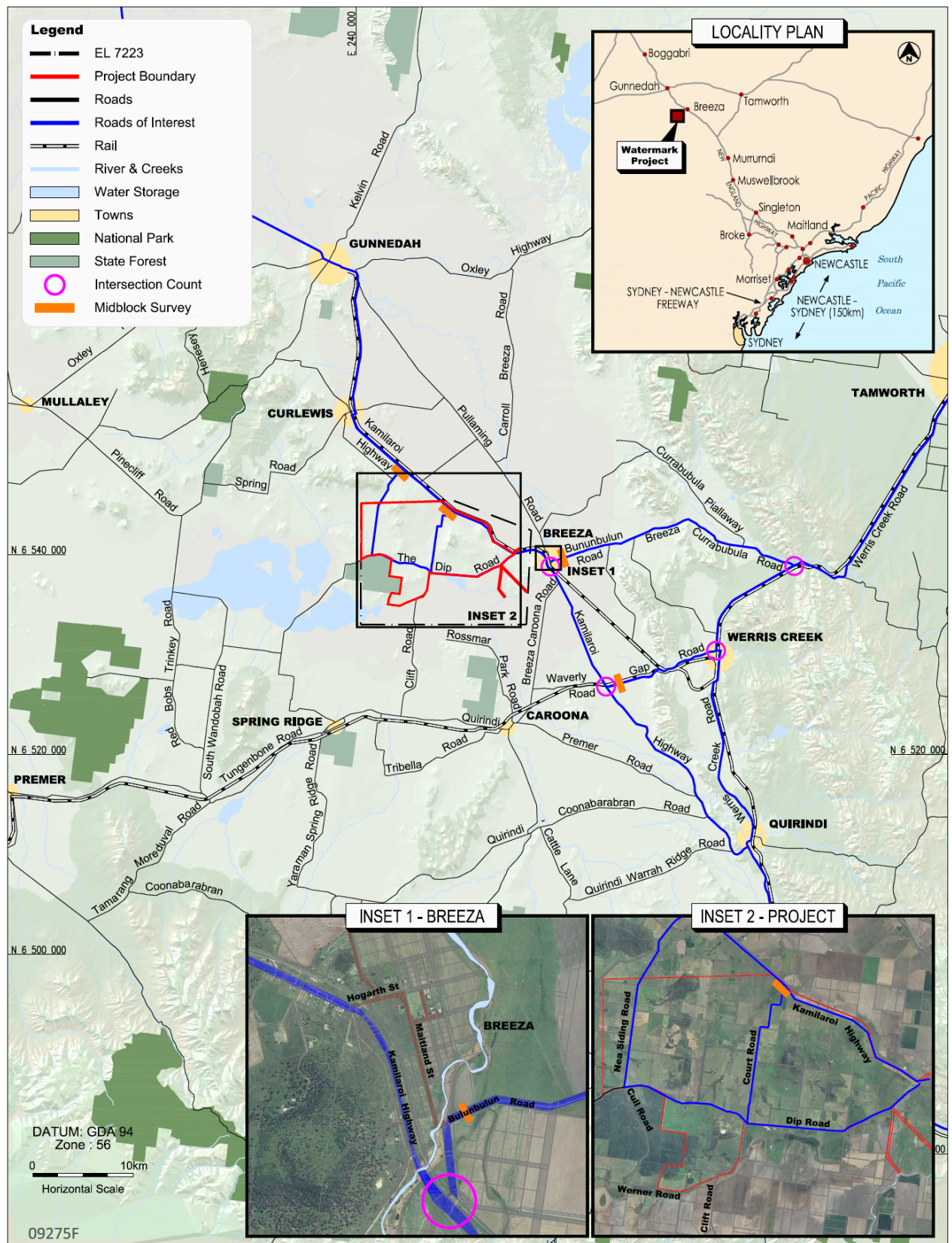


Figure 52: Regional Road Network

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: • 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 Ardglen (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.
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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 & Namoi 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: • Apprenticeships; • Traineeships; and • Graduate placement programs. The employment options will include: • 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: • The Mooki Murrumbidgee Program, currently at Quirindi High School; • The Clontarf Foundation program currently operating at Oxley 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 retainment of medical staff at the Gunnedah Rural Health Centre.
16.	Provide information on mental health, counselling 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: • 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	• 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	• Value of coal production • Residual value of capital and land at end of project life
Potential externalities	• Greenhouse gas impacts • Agricultural production • Noise impacts • Blasting impacts • Air quality impacts • Surface water impacts • Groundwater impacts • Ecology impacts	• 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
• 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.
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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).

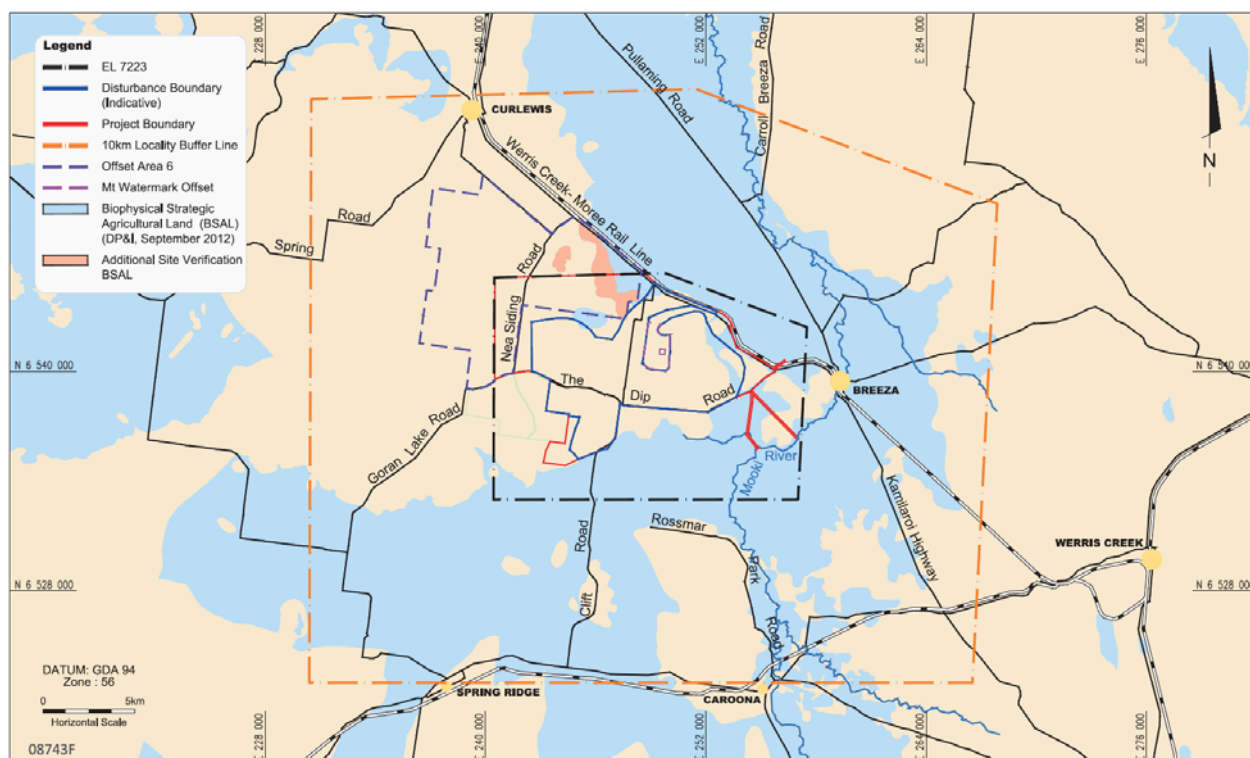


Figure 54: Mapped Biophysical Strategic Agricultural Land

³¹ Land with high quality soil and water resources capable of sustaining high levels of agricultural productivity.
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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).
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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).

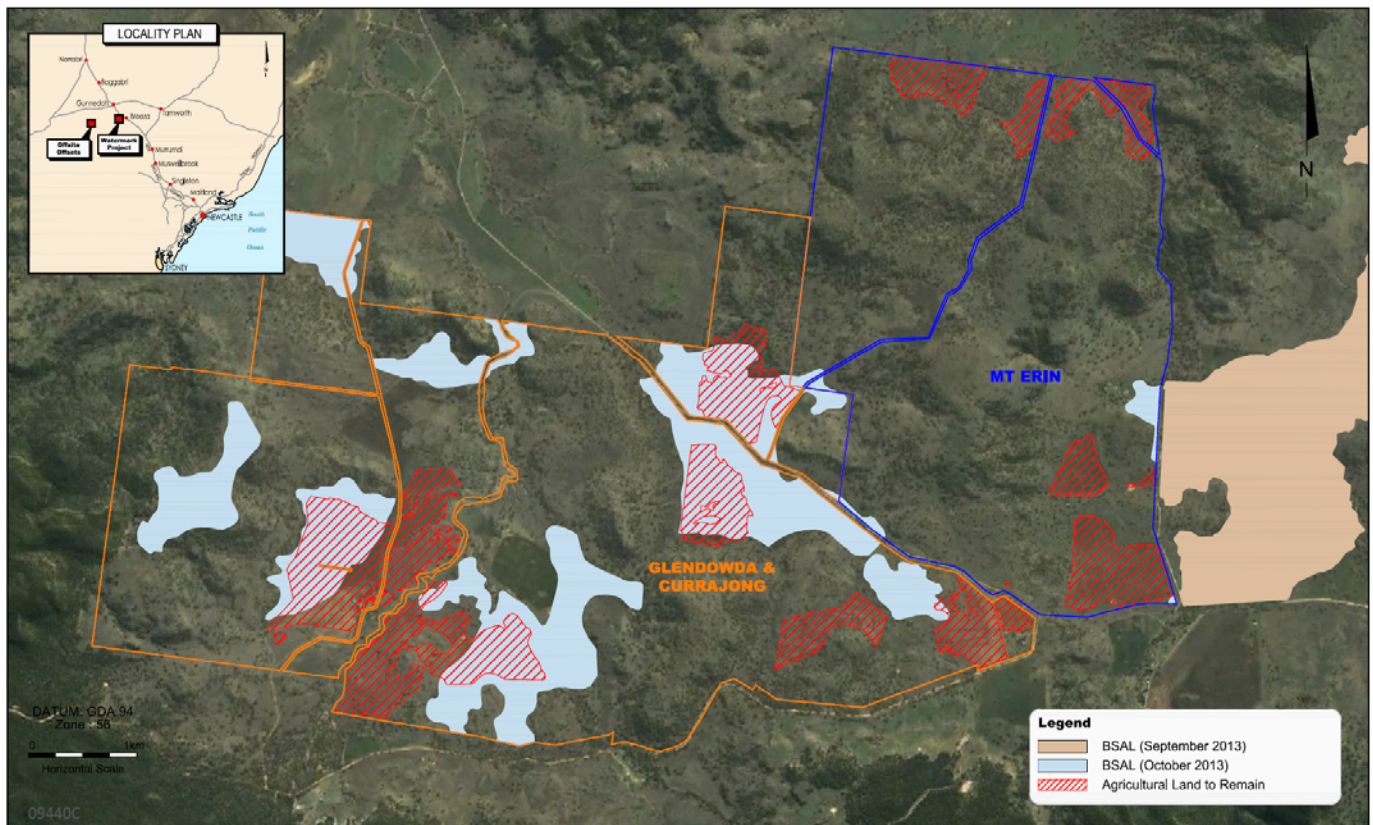


Figure 55: Additional Off-site Biodiversity Offset Area – BSAL

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.

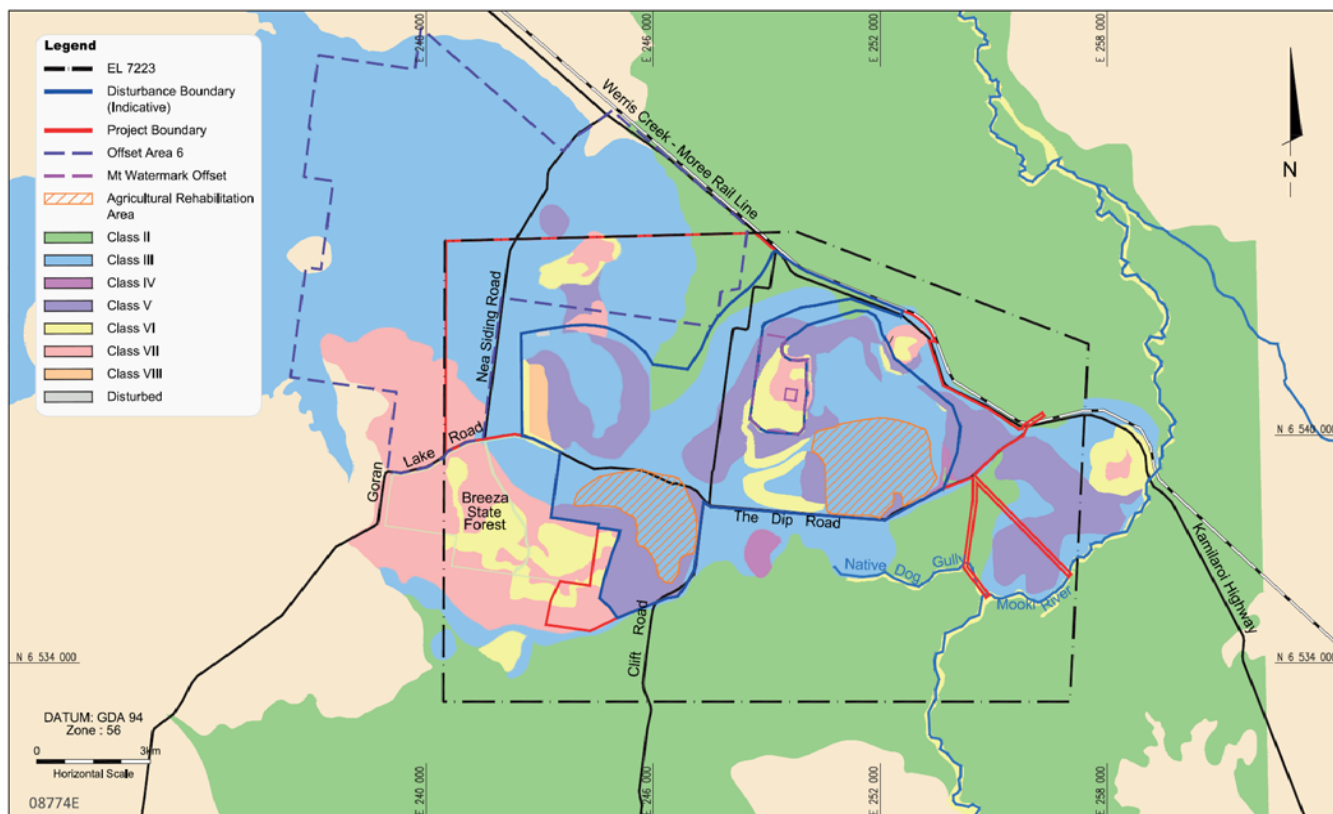


Figure 56: Post Mining Land Capability

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):
 - o achieve detailed performance and completion criteria for agricultural land;
 - o maintain and periodically review a detailed soil balance;
 - o prepare and implement a comprehensive plan for reinstating Class I-III agricultural land and BSAL;
 - o a protocol for periodic trials to demonstrate that the stated land capability is being achieved; and
 - o 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.

 13.5.14
Mike Young
Manager
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 13/5/14

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Director
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APPENDIX A: RECOMMENDED CONDITIONS OF CONSENT

APPENDIX B: CONSIDERATION OF ENVIRONMENTAL PLANNING INSTRUMENTS

SEPP No.33 – Hazardous and Offensive Development

The Department is satisfied that the project is not potentially hazardous or offensive, and that the proposal is generally consistent with the aims, objectives, and requirements of SEPP 33.

SEPP No.44 – Koala Habitat Protection

The project site contains core Koala habitat. As required under clause 9 of SEPP 44, Shenhua has prepared a draft Koala Plan of Management (KPoM) for the development, in accordance with the guidelines specified in the SEPP.

The Department has considered the draft KPoM and the potential impacts of the project on Koalas (see Section 6.4), and is satisfied that the project is able to be carried out in a manner that is consistent with the aims, objectives and provisions of SEPP 44, subject to the implementation of a range of Koala and Koala habitat mitigation, monitoring and management measures.

SEPP No.55 – Remediation of Land

The Department is satisfied that the project area does not have a significant risk of contamination given its historical land-use, and that the project is generally consistent with the aims, objectives, and provisions of SEPP 55.

SEPP (Infrastructure) 2007

In accordance with clause 104 of the Infrastructure SEPP, the application was referred to the RMS. The matters raised in the RMS's submission on the project were considered by the Department and conditions of approval in relation to approvals under the Roads Act have been incorporated by the Department.

SEPP (Mining, Petroleum Production and Extractive Industries) 2007

Under clause 7 of the Mining SEPP, the project is permissible with consent.

Part 3 of the Mining SEPP lists a number of matters that a consent authority must consider before determining an application for consent for development for the purposes of mining, including:

- the significance of the resource;
- certain non-discretionary development standards in relation to noise, air quality, blasting and aquifer interference;
- compatibility with other land uses;
- natural resource management and environmental management;
- resource recovery;
- transport; and
- rehabilitation.

The Department has considered all of these matters in its assessment. The Department is satisfied that the project is able to be managed in a manner that is generally consistent with these provisions.

Part 4AA of the SEPP applies to mining and petroleum development on strategic agricultural land, and sets out the requirements in relation to the provision of gateway certificates for such development.

However, as the DGRs for the project were issued prior to 10 September 2012, the SEPP's savings provisions provide that Part 4AA does not apply to the project. Notwithstanding, in accordance with clause 21(2) of the SEPP, the Director-General sought the advice of the Gateway Panel in relation to the project (see Section 4.7).

Based on its assessment of the development, the Department is satisfied that the project is able to be managed in a manner that is generally consistent with the aims, objectives and provisions of the SEPP.

Gunnedah LEP 2012

The zoning and permissibility of the development under the Gunnedah LEP is addressed in Section 4.2 of this report.

There are no other provisions of the LEP that substantially govern the development, and the Department is satisfied that the project can be managed in a manner that is generally consistent with the aims, objectives and provisions of the LEP.

APPENDIX C: INDEPENDENT GROUNDWATER REVIEW

See attached CD ROM

APPENDIX D: INDEPENDENT SURFACE WATER REVIEW

See attached CD ROM

APPENDIX E: INDEPENDENT TRAFFIC REVIEW

See attached CD ROM

APPENDIX F: GATEWAY PANEL ADVICE

See attached CD ROM

APPENDIX G: RESPONSES TO SUBMISSIONS

See attached CD ROM

APPENDIX H: SUBMISSIONS

See attached CD ROM

APPENDIX I: ENVIRONMENTAL IMPACT STATEMENT

See attached CD ROM