



MT ARTHUR COAL CONSOLIDATION PROJECT

Environmental Assessment November 2009



MT ARTHUR COAL CONSOLIDATION PROJECT

ENVIRONMENTAL ASSESSMENT

Prepared by:

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SINGLETON NSW 2330

November 2009

for:

HUNTER VALLEY ENERGY COAL PTY LTD

Thomas Mitchell Drive

PMB 8

MUSWELLBROOK NSW 2333

ENVIRONMENTAL ASSESSMENT STATEMENT

Submission of Environmental Assessment (EA)

Under Section 75H of the *Environmental Planning and Assessment Act 1979*

EA Prepared by

Name

James Bailey

Qualifications

B. Natural Resources, MBA

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In Respect Of

Mt Arthur Coal Consolidation Project

Applicant Name

Hunter Valley Energy Coal Pty Ltd

Applicant Address

Thomas Mitchell Drive

MUSWELLBROOK NSW 2333

Land to be Developed

See **Appendix A** of Environmental Assessment

Proposed Development

Consolidation of Mt Arthur Coal open cut and associated activities as outlined in **Section 4** of the Environmental Assessment.

Environmental Assessment

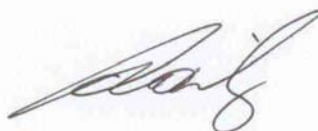
An Environmental Assessment for the Project is attached.

Certification

I certify that I have prepared the contents of the EA, and to the best of my knowledge:

- It is in accordance with Sections 75E and 75F of the *Environmental Planning and Assessment Act 1979*;
- It contains all available information that is relevant to the environmental assessment of the activity to which the statement relates; and
- The information contained in the statement is neither false nor misleading.

Signature



Name

James Bailey
Director

Date

November 2009

EXECUTIVE SUMMARY

BACKGROUND

Hunter Valley Energy Coal is a wholly owned subsidiary of BHP Billiton and owns the Mt Arthur Coal Open Cut and Underground Mines (the Mt Arthur Coal Complex). The Mt Arthur Coal Complex operates as one entity with five different planning approvals under the *Environmental Planning and Assessment Act 1979* including: Mt Arthur North, South Pit Extension, Bayswater No 3 (incorporating the Bayswater No 2 operational areas), Mt Arthur Underground Project and the Exploration Adit.

Mt Arthur Coal is located south west of Muswellbrook in the Upper Hunter Valley of NSW. In 2008, Mt Arthur Coal extracted 14.7 Million tonnes of run of mine coal from the Wittingham coal measures, which equates to approximately 11.9 Million tonnes of product coal.

Mt Arthur Coal has a demonstrated track record in maintaining high standards of environmental performance which consistently meet and often exceed internal corporate commitments, regulatory requirements and external stakeholder expectations. Since commencement of operations, a sophisticated monitoring program has confirmed that the environmental impacts from mining activities have remained well within those predicted and the criteria set by the NSW Government.

Mt Arthur Coal is seeking a contemporary Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979* to consolidate its open cut mining operations planning approvals platform whilst at the same time gaining approval to extend its mining footprint within its current mining leases (the Project). This Environmental Assessment supports this application by addressing the Director-General's Environmental Assessment Requirements and enabling the Minister for Planning to determine the Project Approval as sought.

EXISTING ENVIRONMENT

Regional climatic conditions of the Upper Hunter consist primarily of seasonal variations of hot, wet summers giving way to mild, dry winters resulting in a warm temperate climate. Winter months are dominated by high pressure systems that alternate with cold fronts, combining to form cool, dry conditions. The temperature in summer months is highest in January reaching an average daily high temperature of 31.7°C with July being the coolest month with an average daily low temperature of 3.8°C.

Rainfall in the Upper Hunter Valley is dominant during summer and declining in winter with an annual average rainfall of 640 mm, although in recent years rainfall has been significantly lower than the regional average. Winds predominantly occur from the east south east in summer and from the west north west during winter. Temperature inversions are also known to occur particularly in winter months, during the night and early morning periods.

Mt Arthur Coal is located to the west of the Muswellbrook Anticline, with coal seams generally dipping to the west south west toward the Calool Syncline. Open cut mining methods at Mt Arthur Coal allow the maximum recovery of all coal to the Ramrod Creek coal seam. Exploration drilling and feasibility studies have confirmed that up to 3.8 Billion tonnes (2009 BHP Billiton Annual Report) of resource remains at Mt Arthur Coal within its mining and exploration leases. Current stripping ratios average approximately 1 tonne of Run of Mine coal for every 5 bank cubic metres of overburden removed.

The topography surrounding Mt Arthur Coal is gently undulating to hilly, dominated by Mount Arthur within the mine operational area and Mount Ogilvie to the west. The current dominant land uses within and adjacent to the Project includes open cut coal mining, power generation and industrial activities, rural residential and residential areas and agriculture.

Hunter Valley Energy Coal and its subsidiaries own the majority of land within the EA Boundary, excluding minor areas of Crown land, road reserves and the Drayton Sub-Lease Area. Anglo Coal owns the majority of land to the immediate east and south of the Project, with land further to the south east owned by Macquarie Generation. The Bengalla Joint Venture owns the land to the immediate north of Mt Arthur Coal, across the Hunter River. Private landowners generally occupy land to the north east and west of Mt Arthur Coal.

EXISTING OPERATIONS

Mt Arthur Coal currently operates under separate planning approvals for the Bayswater No 3 Mine, Rail Loading Facility, Mt Arthur North Mine, South Pit Extension, Exploration Adit and the Mt Arthur Underground. Mt Arthur Coal's open cut mine currently operates under four different development consents with over 790 consent conditions.

Open cut mining is conducted via a multi-bench, multi-strip shovel and excavator operations, which provide for the greatest operational flexibility and efficiency in the staged recovery of the coal resource at Mt Arthur Coal. The extraction of coal via open cut methods is currently undertaken from the Mt Arthur North and South Pit Extension area, as well as the Bayswater No 3 area, in which Saddlers Pit is mined using a contract fleet. To date only a limited amount of underground coal has been extracted from the Woodlands Hill seam via the Exploration Adit.

Coal handling and processing is undertaken at the centralised Coal Handling and Preparation Plant. The approved mining operations at Mt Arthur Coal are supported by a range of infrastructure, including administration offices, bathhouses, workshops and storage facilities. Product coal is transported via the Rail Loading Facility for export and via conveyor to Macquarie Generation for domestic power generation.

Mining activities occur 24 hours per day 7 days per week supported by approximately 990 full time equivalent personnel.

Mt Arthur Coal manages environmental issues associated with its operations in accordance with its ISO14001 accredited Environmental Management System and its comprehensive Environmental Monitoring System which enables the effective management and measurement of its environmental performance.

Mt Arthur Coal will ensure its Environmental Management System continues to comply with legal and other requirements in relation to environmental management. The Environmental Management System and Environmental Monitoring Program will be revised and consolidated as appropriate to ensure consistency with the Project and the achievement of the air quality, noise and blasting environmental outcomes described in this Environmental Assessment.

Mt Arthur Coal has in place an extensive offset strategy for the management of impacts from approved mining operations on ecology and Aboriginal heritage known as the Mt Arthur Coal Biodiversity and Heritage Offset Strategy.

THE PROJECT

The Project continues all aspects of Mt Arthur Coal's current activities and specifically seeks approval for the following:

- Consolidation of Mt Arthur Coal's open cut Planning Approvals into one contemporary Project Approval;
- Extending the mine footprint to uncover additional coal reserves within the current mining leases;
- Increasing the approved production levels by 8 Million tonnes per annum up to 36 Million tonnes per annum run of mine coal through:
 - o Increasing open cut coal production by up to 8 Million tonnes per annum; and

- o Having the flexibility to increase either open cut or underground production by an additional 4 Million tonnes per annum if the maximum production from either underground or open cut methods is not being met (to a maximum of 36 Million tonnes per annum from the Mt Arthur Coal Complex);
- Relocation of a section of Edderton Road in approximately 2019 within one of two identified optional corridors;
- Upgrading the existing Mt Arthur Coal, Coal Handling and Preparation Plant to process up to 36 Million tonnes per annum of run of mine coal and allow the inclusion of an ultra-fines plant to re-process fines which will facilitate increased resource recovery and reduce water demand;
- Increasing the approved rail haulage capacity, in line with the increased coal production, from 19 Million tonnes per annum to 27 Million tonnes per annum product coal, with the construction of a second Rail Loading Facility and associated conveyor system;
- Modifying existing infrastructure (such as workshops and bathhouse), construction of additional run of mine coal hoppers and the extension of coal stockpiles; and
- A total workforce of approximately 2,600 at peak production, which represents an increase of approximately 1,610 from current staffing levels of which an estimated 720 positions are directly attributable to the Project.

Through extensive planning, assessment and operational experience, Mt Arthur Coal has developed a thorough understanding of the environmental and social constraints to mining. Detailed mine planning and engineering have identified that maximum resource recovery from the proposed mine extension areas is only feasible via open cut mining methods.

Several mine plan alternatives were considered in recognition of the principles of Ecologically Sustainable Development through various environmental constraints analyses and feasibility studies. The Project as presented in this Environmental Assessment has evolved with a balanced consideration of all potential environmental, social and economic impacts.

REGULATORY FRAMEWORK

A contemporary Project Approval is sought under Part 3A of the *Environmental Planning and Assessment Act 1979*, to replace Mt Arthur Coal's four open cut mining approvals that together have over 790 consent conditions that are often duplicated, and in some cases have conflicting requirements. Existing approvals for activities outside the scope of this Environmental Assessment, including those relating to underground mining operations will continue to apply. At an appropriate time, Hunter Valley Energy Coal will seek to surrender Planning Approvals replaced by this Project Approval as agreed with the Department of Planning.

This Environmental Assessment has been prepared consistent with the Director-General's Environmental Assessment Requirements issued on 21 April 2009 under Section 75F(2) of the *Environmental Planning and Assessment Act 1979*.

In accordance with Section 93F of the *Environmental Planning and Assessment Act 1979*, Mt Arthur Coal is seeking to negotiate a Voluntary Planning Agreement Muswellbrook Shire Council commensurate with the impacts of the Project. If such an agreement is not concluded, Mt Arthur Coal will provide for development contributions linked to the increases in demand for public amenities and services caused by the additional impacts of the Project.

Consistent with Section 147 of the *Environmental Planning and Assessment Act 1979*, no reportable political donations or gifts have been made by Hunter Valley Energy Coal, thus making it available to the Minister to determine the Project Application.

The Project may also require and will seek as required, approvals under additional State and Federal legislation not exempted under Section 75U or granted consistent with Section 75V of the *Environmental Planning and Assessment Act 1979*.

A Referral under the *Environment Protection and Biodiversity Conservation Act 1999* is being drafted for the Mt Arthur Coal Complex including the Mt Arthur Underground and will be submitted to the Commonwealth Department of Environment, Water, Heritage and the Arts as a separate process to the Part 3A *Environmental Planning and Assessment Act 1979* approvals process, due to variations in the definition of the Project under the Referral.

STAKEHOLDER ENGAGEMENT

Mt Arthur Coal has a demonstrated history of undertaking best practice stakeholder engagement, with that undertaken for the Project regarded as a continuation of ongoing dialogue with key community and Government stakeholders as part of the mine's logical progression.

Specific engagement in regard to the Project was undertaken with the aim of identifying stakeholders' issues and ensuring that these issues were appropriately assessed and responded to by Mt Arthur Coal either directly or in the Environmental Assessment.

Engagement was undertaken with near neighbours, the wider Muswellbrook Community, Mt Arthur Coal Community Consultative Committee, Mt Arthur Coal employees, neighbouring mines and industry, service providers, members of Parliament, and other Government regulators including Muswellbrook Shire Council. A Planning Focus Meeting was held on 19 February 2009 with representatives from the Department of Planning, Department of Environment & Climate Change, Department of Water & Energy, Department of Primary Industries, Catchment Management Authority, NSW Department of Premier and Cabinet, Muswellbrook Shire Council and the Project team in attendance.

During January and February 2009, personal interviews were held with 50 near neighbours with an interest in Mt Arthur Coal's operations. Two community information sessions were also facilitated in Muswellbrook in May 2009 to provide information and gain feedback on the Project. Two newsletters were also prepared to provide regular updates on the Project which were distributed to stakeholders.

Issues raised by stakeholders are discussed in detail in the Environmental Assessment. These include: air quality, employment, noise and blasting, visual amenity, property devaluation, surface water, groundwater, traffic, final land use and ecology.

Engagement with the Aboriginal Community occurred in accordance with the *Interim Community Consultation Requirements for Applicants* with 36 individual groups who registered an interest in the Project.

Mt Arthur Coal is committed to continuing its stakeholder engagement program throughout the life of the Project, in accordance with its best practice policies and procedures. Ongoing stakeholder engagement will include regular contact with neighbouring land owners, representatives of key local and State regulatory authorities, industry bodies and the Aboriginal community and the release of public information on environmental performance.

IMPACT ASSESSMENT

A risk assessment was undertaken to identify potential environmental and social issues associated with the Project. The purpose of the risk assessment process was to prioritise and focus the required environmental assessments for the Project in consideration of the Director-General's Environmental Assessment Requirements and the findings from stakeholder engagement. Key findings from the environmental assessments are discussed below.

Air Quality

The independent air quality consultant PAEHolmes completed an air quality and greenhouse gas assessment in accordance with the procedures outlined in the Department of Environment & Climate Change's *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*.

The assessment used a computer-based dispersion model (ISCMOD) to predict ground-level dust concentrations and deposition levels in the vicinity of the Project.

To assess the affect that dust emissions will have on existing air quality, the dispersion model predictions from the three indicative worst-case modelled years (2011, 2016 and 2022) have been compared with relevant air quality criteria.

Mt Arthur Coal's extensive air quality monitoring program measures depositional dust at 21 sites, particulate matter less than 10 microns (PM₁₀) at eight sites every six days, and continuous PM₁₀ using Tapered Element Oscillating Microbalances at four sites. A detailed review of existing monitoring data concluded that the existing annual average PM₁₀ is less than relevant air quality criteria limits at private receivers, there is a significant spatial variation in dust deposition, and there have been occasions when the 24 hour PM₁₀ was above the relevant air quality criterion at all monitoring sites, with these results generally caused by widespread events such as dust storms or bushfire.

The criteria for dust fallout levels are set by the Department of Environment & Climate Change to protect against nuisance impacts and considers cumulative impacts from all dust sources.

The results from the dispersion modelling indicate that the Project considered alone and with other sources is predicted to contribute to some exceedances of air quality criteria at a number of private receivers.

Four private receivers (not in an existing zone of affectation) including receivers 208, 209, 210 and 211, held by two landowners, are predicted to be impacted by dust levels exceeding the annual average 2 g/m²/month deposition level criteria from the Project alone.

Seven private receivers (not in an existing zone of affectation) including receivers 206, 207, 208, 209, 210, 211 and 226, owned by four landowners, are predicted to exceed the 24 hour average PM₁₀ criterion on more than five occasions per year.

Four receivers not in an existing zone of affectation, including receivers 28, 29, 210 and 264 are predicted to be impacted by dust levels above the annual average PM₁₀ criterion of 30 ug/m³ from the Project and other sources.

In total, ten private receivers owned by seven landowners (not in an existing zone of affectation) are anticipated to be impacted by dust levels exceeding the relevant criteria.

Current onsite dust minimisation practices will be continued and enhanced to ensure that the limits predicted in this Environmental Assessment are met at private receivers. In particular Mt Arthur Coal will introduce a dust suppressant product (or other comparably effective alternative) on all permanent active coal and overburden haul roads to minimise the generation of dust. Mt Arthur Coal will review the existing Air Quality Management Plan for the site to incorporate this new measure and any other additional practical management measures which may be implemented as required to ensure the predictions in this Environmental Assessment are met at private receivers.

Greenhouse Gas

The procedure specified in the *National Greenhouse Accounts Factors* has been adopted for this assessment which is consistent with internationally applied methods. Consistent with other coal mining operations, the main sources of greenhouse gas emissions from the Project have been identified as resulting from electricity consumption, fugitive emissions of Carbon Dioxide and Methane, diesel usage, explosives usage, and the transport and end use of the product coal.

When comparing emissions from the Mt Arthur Coal Complex (i.e. from the existing operations at Mt Arthur Coal and the Project) (74 Million tonnes of Carbon Dioxide equivalent per annum) with the estimated current global emissions (3,000 Giga tonnes Carbon Dioxide equivalent per annum), it has been calculated that the average annual emissions of the Mt Arthur Coal Complex from the mining, transport and burning of coal are estimated to be approximately 0.0024% of the current global Carbon Dioxide emissions.

In this context it can be seen that the emissions estimated to result from the Project will not in themselves have any significant impact on global greenhouse gas emissions.

Mt Arthur Coal, through its policies and procedures has committed to continue to undertake regular reviews and monitoring of greenhouse gas emissions and energy efficiency initiatives to ensure that greenhouse gas emissions per tonne of product coal are kept to the minimum practicable level.

Noise

A noise impact assessment for the Project was completed by independent consultants Wilkinson Murray in accordance with the *NSW Industrial Noise Policy* and other relevant guidelines and included a comparison of predicted construction and operational mining noise, road noise and rail noise against relevant Department of Environment & Climate Change criteria.

Predicted noise levels at receivers were calculated using RTA Technology's Environmental Noise Model which has been endorsed by Department of Environment & Climate Change for environmental noise assessment. The proposed open cut Mine Extension Areas have been modelled and combined with the existing approved Mt Arthur Coal activities to represent the total noise generated from the Mt Arthur Coal Complex, including the privately owned components of the rail line.

A review of the background operational noise criteria was completed with seven zones identified (Zones A to Zone G) and incorporated into the model. A worst-case single meteorological condition of a temperature inversion strength at night of 4° per 100 m has also been modelled which provides the best correlation with measured noise levels and is consistent with previous assessments at Mt Arthur Coal.

Where noise from the Project has been predicted to influence private receivers, all Zones are predominantly influenced by activities associated with mining activities (with the exception of Zone G which is predominantly influenced by rail noise) with the following key findings:

- Noise at all private receivers is predicted to comply with the amenity criteria;
- Noise at some receivers is predicted to exceed the intrusive criterion;
- Noise at receivers 101 and 102 is predicted to exceed the intrusive criterion by more than 5 dBA (receiver 101 has rights of acquisition upon request within the Mt Arthur Underground approval); and
- Noise at receiver 212 is predicted to exceed the intrusive criterion by more than 5 dBA (this receiver has rights of acquisition upon request from an adjacent mining operation).

Exceedances of relevant criteria were not predicted at any additional private receivers for sleep disturbance, road traffic noise or rail noise.

Ongoing research and development of noise attenuation and mitigation at Mt Arthur Coal have resulted in predicted noise impacts being minimised since the commencement of mining operations. This has been achieved through onsite management activities (including noise monitoring, construction of noise bunds, operational controls and relocation of equipment, routine sound power level testing of mobile equipment, and consideration of noise impacts during mine planning).

A review of the existing Noise Management Plan will be undertaken for the Project and Mt Arthur Coal will continue to ensure that the predictions in the Environmental Assessment are met at private receivers through the implementation of required onsite management activities.

Blasting

A blast impact assessment for the Project was completed by Wilkinson Murray in accordance with Australian and New Zealand Environment Conservation Council Guidelines. An additional assessment was conducted by Heritage building specialist Bill Jordan & Associates to confirm appropriate blasting criteria for two State listed heritage items (Edinglassie and Rous Lench homesteads) located immediately to the north of the Project and owned by Mt Arthur Coal.

Extensive experience in blasting has been developed at the Bayswater No 2 & 3 and Mt Arthur North mining areas. Current practice at Mt Arthur Coal commits to achieving relevant criteria at all potentially affected locations utilising available technology. This includes the modelling of all blasts to predict impacts ensuring a reasonable level of certainty of impacts.

The assessment determined that if blasting occurred with a Maximum Instantaneous Charge of 1,681 kg over the entire proposed mining area, relevant criteria will be exceeded at a number of sensitive locations in defined areas to the north of Mt Arthur Coal. Alternate blasting methods will be adopted in these areas to meet the relevant criteria at sensitive receivers.

Should Mt Arthur Coal wish to conduct full scale blasting within these areas in the future, trial blasts will be conducted to demonstrate compliance with relevant criteria. At all other private receivers, blasting using current practices is predicted to meet relevant criteria.

Appropriate criteria for Edinglassie and Rous Lench of 133 dBL overpressure and 10 mm/s vibration have been recommended for the Project in the absence of further research and consultation with the NSW Heritage Office. To achieve these criteria, Mt Arthur Coal will adopt additional controls, as required.

Visual and Lighting

Integral Landscape Architecture and Visual Planning completed a visual and lighting assessment of the potential impacts of the Project. The assessment considered views to the Project from representative viewing locations to: the west along Denman Road and Roxburgh Vineyard; the north at Roxburgh Road, Racecourse Road, South Muswellbrook and Ironbark Ridge Estate; and to the south on the Golden Highway. At each of these locations, photomontages were completed to illustrate existing views, those projected during 2011, 2016 and 2022 (as representative phases of the Project mine life) and the conceptual final landform.

The assessment determined that a high level of visual impact may be experienced at some receivers due to the Project. This is predominately created by views of the active mining face and the development of the outer and active faces of the overburden emplacement areas; and loss of view to distant mountains created by the overburden emplacement areas.

Where views are available onto the outer face of overburden emplacement area, impacts will be dynamic throughout the life of the Project. Receivers experiencing impacts of this type include eastern viewing locations including Muswellbrook, Aberdeen, New England Highway, parts of Denman Road and the Main Northern Railway Line, as well as rural receivers in this sector.

Initial impacts of this type may be high, depending on the extent of unconsolidated overburden emplacement areas seen as a percentage of the primary view zone and the view as a whole. This impact will however, be reduced to moderate and low as rehabilitation progresses as part of the Project.

Where views are available onto the active face of the overburden emplacement area, visual effect levels cannot be reduced onsite and any required mitigation measures will therefore need to be established at applicable viewing locations. The sites that may require such consideration to reduce high visual impact levels are similar to those currently experienced and include Roxburgh Vineyard, some receivers on Roxburgh Road and parts of Denman Road itself, with possible consideration of areas within the Pukara Estate Olive Grove.

View loss as a result of the Project is due to distant hill features (such as Mount Arthur) being obscured by the overburden emplacement areas. These impacts are predicted to be generally experienced by receivers in areas of lower elevation, while elevated areas will generally retain much of their existing views of these features. As such, the Racecourse Road (and Sheppard Avenue) viewing location and other receivers to the north of Mt Arthur Coal at similar elevations, will experience the greatest impact due to the loss of views of distant hill features as a result of the Project.

Mitigation and management measures to reduce the visual impacts from the Project will include both onsite and individual offsite treatments. Mt Arthur Coal will prepare a guideline for treatment methods for primary and secondary view areas from affected residences; consultation requirements with residents in those key areas of high sensitivity, and action plans to mitigate visual impacts of the Project (depending on extent of visibility and its sensitivity). This will be detailed in a report to be submitted to DoP.

Two types of lighting have been considered in the assessment: directly visible light sources and general night-glow (diffuse light) that results from light of sufficient strength being reflected into the atmosphere.

Locations that have direct line of sight to Mt Arthur Coal lighting are elevated locations such as Roxburgh Road and Roxburgh Vineyard that overlook the screening topography and vegetation. These locations are considerably distant from Mt Arthur Coal, which will provide mitigation of these effects.

A diffuse effect of light and its interaction with atmospheric conditions may from time to time create a glow around the Project. The influence of the surrounding mining operations and associated lighting activities will reduce the visual impact of diffuse light generated. The diffuse night lighting effect of the Project will be similar to that which is currently experienced and will include the diffuse lighting effects created by Bengalla Mine, Drayton Mine, Muswellbrook township and the existing operations of Mt Arthur Coal.

Ecology

Independent ecological consultants Cumberland Ecology completed an ecological assessment for the Project in accordance with relevant guidelines. The ecological assessment describes the ecological values within the Environmental Assessment Boundary in consideration of the regional context in which it lies, and assesses the impacts of the Project on flora and fauna, particularly threatened species and communities listed under the *Threatened Species Conservation Act 1995*. The assessment also addresses impacts on Matters of National Environmental Significance as listed under the *Environment Protection and Biodiversity Conservation Act 1999*.

A background literature review confirmed that extensive fieldwork and scientifically robust surveys have been conducted at Mt Arthur Coal over a period of nine years to 2009. Following the review of existing information and survey findings, additional field surveys were undertaken from spring 2008 to autumn 2009 within the five proposed Mine Extension Areas for the Project. No aquatic studies were required to be undertaken as no permanent streams or wetlands exist within the Mine Extension Areas.

No Groundwater Dependant Ecosystems were identified, or are anticipated to occur within the Mine Extension Areas.

The predominant vegetation element within the Environmental Assessment Boundary is grassland, present as a result of the clearing of woodland and forest communities dominated by a variety of native grass and forest species. This vegetation community also includes the presence of many exotic species as is typical of grazing lands.

Threatened flora species identified within the Environmental Assessment Boundary from field surveys or identified as having the potential to occur include: the Weeping Myall, Tiger Orchid, Painted Diuris and Lobed Blue-grass.

A total of 181 fauna species have been recorded within the Environmental Assessment Boundary, including nine amphibian, 108 bird, 44 mammal and 20 reptile species since 2000.

Non-threatened species that were commonly recorded included feral species (European Red Fox and Rabbit), Eastern Grey Kangaroo, Swamp Wallaby, Red-necked Wallaby and a suite of bat species. The Common Brushtail Possum and Common Wombat were also consistently recorded.

15 of the fauna species identified are listed under environmental legislation. Of these, 13 are declared threatened under the *Threatened Species Conservation Act 1995*, one of which is also listed under the *Environment Protection and Biodiversity Conservation Act 1999*. Two species listed as Migratory under the *Environment Protection and Biodiversity Conservation Act 1999* have also been identified within the Environmental Assessment Boundary.

Threatened fauna species identified as present within the Environmental Assessment Boundary or identified as having the potential to occur include: Speckled Warbler, White-throated Needletail, Brown Treecreeper, Diamond Firetail, Rainbow Bee-eater, Hooded Robin, Grey-Crowned Babbler (eastern subspecies), Turquoise Parrot, Masked Owl, Yellow-bellied Sheath-tail-bat and Parma Wallaby.

The Eastern Freetail-Bat, Squirrel Glider, Grey-headed Flying-Fox, Large-Eared Pied Bat, Eastern False Pipistrelle, Eastern Bent-Wing Bat, Large-Footed Myotis, Greater Broad-Nosed Bat and Eastern Cave Bat were also identified as occurring or having a potential to occur.

The areas to be impacted over the life of the Project consist of approximately 240 hectares of forest and woodland and 750 hectares of native understory.

This includes the proposed clearance of 116 hectares of Box Gum Woodland and 700 hectares of Box Gum Woodland understory, which together is listed as the White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community under the *Threatened Species Conservation Act 1995*.

No communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* will be disturbed by the Project, with the proposed Mine Extension Areas being modified to avoid impacting a known occurrence of Hunter Floodplain Red Gum Woodland, which is listed as a Critically Endangered Ecological Community under the *Environment Protection Biodiversity and Conservation Act 1999*.

The clearance of vegetation required for the Project will directly remove habitat for a range of threatened fauna species. Three known individuals of Lobed Blue Grass (listed under the *Threatened Species Conservation Act 1995*) will be impacted by the Project. Extensive areas of grassland will remain with actual and potential habitat for this species and thus, a viable local population is anticipated to exist in the long term. One occurrence of the *Threatened Species Conservation Act 1995* listed threatened orchid, Tiger Orchid, was identified within a Mine Extension Area and will be translocated to the Saddlers Creek Conservation Area, where there is a known population. No other threatened flora species will be impacted by the Project.

Assessments of Significance for those listed threatened species relevant to the Project have been completed.

In the absence of mitigation or compensatory management measures, mining of the Mine Extension Areas would have a significant impact upon the *Threatened Species Conservation Act 1995* listed White Box Yellow Box Blakely's Red Gum Woodland and some threatened flora and fauna species. In the short term, the Project will increase the degree of fragmentation of treed habitats within the landscape of the Mt Arthur Coal Complex which will also result in the temporary removal of tree hollows, which are a wildlife resource used by a number of threatened bats, birds and the Squirrel Glider.

Management measures proposed for the Project have followed the Department of Environment & Climate Change's policy for assessing the ecological impacts of proposed developments, with the aim to avoid, mitigate or offset all identified impacts.

Specific mitigation measures to be implemented for the Project to ensure the ongoing viability of threatened flora and fauna species and communities within the Environmental Assessment Boundary include:

- Revision and consolidation of the existing Flora and Fauna Management Plans to include the Project and proposed Offset Strategy;
- Replanting of some mine rehabilitation areas with local native plant species in order to provide additional flora and fauna habitats, in the long term;
- The continuation of flora and fauna monitoring in accordance with the Mt Arthur Coal Environmental Management System to provide ongoing feedback about the condition of vegetation and habitat values across the Environmental Assessment Boundary;
- Establishing nest boxes, where necessary, to maintain effective fauna habitat at Mt Arthur Coal;
- Translocation of individuals of the threatened Tiger Orchid located in Mine Extension Area 5 to an appropriate Conservation Area; and

- Continue to complete pre-clearance surveys within areas to be cleared and where possible, translocate detected threatened flora and fauna into protected habitat.

With the implementation of these measures, in conjunction to the proposed Offset Areas for the Project and the overall Mt Arthur Coal Complex Offset Strategy, it is believed that habitat for threatened flora and fauna in the Environmental Assessment Boundary will remain viable in the long term and at a minimum maintain the biodiversity conservation value of the region.

Mt Arthur Coal Complex Offset Strategy

Mt Arthur Coal has an established Biodiversity and Heritage Offset Strategy that was developed to mitigate and offset the ecological impacts arising from previous mining approvals. As a key component of the existing Biodiversity and Heritage Offset Strategy, Mt Arthur Coal has established two Conservation Areas - the Mount Arthur Conservation Area and the Saddlers Creek Conservation Area which total approximately 395 hectares.

The Mt Arthur Coal Complex Offset Strategy addresses the impacts predicted for the Project by providing additional new offset areas, and builds upon existing offset commitments at the site. The strategy provides a holistic approach to heritage and biodiversity management at Mt Arthur Coal by consolidating existing offset commitments from previous Planning Approvals and proposed offset commitments required to mitigate impacts of the Project.

The Mt Arthur Coal Complex Offset Strategy has specifically been developed to integrate the newly proposed offset areas with local and regional corridors, existing Conservation Areas and Mt Arthur Coal's existing biodiversity conservation commitments.

The Mt Arthur Coal Complex Offset Strategy will consolidate and supersede the existing Biodiversity and Heritage Offset Strategy and will consist of areas of existing native remnant vegetation, future regeneration areas and both existing and future rehabilitation areas.

These areas are spread across the Environmental Assessment Boundary to ensure connectivity, and are strategically located to provide linkages to surrounding native vegetation. The Proposed Offset Areas for the Project include an area adjacent to Thomas Mitchell Drive. The Proposed Offset Areas are generally consistent with the principles for offsets developed by the Commonwealth and State.

The Proposed Offset Areas aim to augment the current Biodiversity and Heritage Offset Strategy and improve and maintain the ecological condition of the landscape within the locality. It will achieve this through conserving, improving and creating woodland and forest communities, including habitat for threatened species, such that the net area of vegetation communities and the condition of habitats increases over time.

The new Proposed Offset Areas for the Project will be provided through the protection and enhancement of 495 hectares of land outside the Environmental Assessment Boundary and mining lease boundary (Thomas Mitchell Drive Offset Area) and 222 hectares of land within the Environmental Assessment Boundary (Onsite Offset Area).

The Proposed Offset Areas will be implemented as part of the overall Mt Arthur Coal Complex Offset Strategy for impacts to biodiversity, with a 2:1 offset ratio for the loss of all native forest and woodland, and a 1:1 offset ratio for native derived grassland proposed to be cleared by the Project. Further to the Proposed Offset Areas, approximately 500 hectares of rehabilitated land will be returned to native woodland and forest after mining providing a total vegetation offset of 1,200 hectares.

Connectivity of the Proposed Offset Areas and the existing Conservation Areas will be provided for in the long term through the implementation of corridors comprising of existing and proposed Woodland Areas. The Proposed Offset Area abuts a Travelling Stock Reserve that provides connectivity with the Drayton Wildlife Refuge, thus further contributing to the enhancement of the proposed Mt Arthur Coal Complex Offset Strategy on a regional level and complements other local biodiversity conservation efforts.

A management plan will be prepared to guide the long term management of flora and fauna within the Proposed Offset Areas and ensure the development and implementation of a scientifically based process for the re-establishment of the White Box Yellow Box Blakely's Red Gum Woodland on Mt Arthur Coal's rehabilitation.

Aboriginal Heritage

ENSR Australia (trading as AECOM) prepared an Aboriginal archaeology and cultural heritage impact assessment for the Project to review and assess the nature of the archaeological landscape at Mt Arthur Coal, and assess the potential impacts that the Project may have.

The Environmental Assessment Boundary has been subject to some of the most detailed Aboriginal heritage assessments and archaeological salvage projects ever conducted in NSW. In total, 663 Aboriginal sites are registered in the NSW Department of Climate Change's Aboriginal Heritage Information Management System within the Environmental Assessment Boundary.

Open camp sites consisting of stone artefacts are the most common sites, with three grinding groove sites also known to be present. To complement previous work, an additional field survey was completed by two Archaeologists and representatives from 24 local Aboriginal groups over a 12 day period in March 2009. This field assessment included the proposed Thomas Mitchell Drive Offset Area.

A total of 94 previously unrecorded sites were identified during the field survey of which 94% were isolated finds and scattered artefacts, two were scarred trees and a Potential Archaeological Deposit. These results are largely consistent with results from previous surveys in both the Environmental Assessment Boundary and the wider Upper Hunter Valley region.

The extension of mining operations proposed as part of the Project will impact a total of 91 additional sites recorded in previous surveys and 11 newly identified sites.

No impact from the Project is proposed to any scarred trees or the three known sets of grinding grooves, however a working group may be established to consider the potential for relocation of the grinding grooves site to a location remote from mining activities.

The Project will impact three Heritage Management Zones established in 2001 which were selected not due to their heritage value, but rather because they were areas not proposed to be disturbed by mining at that time. To compensate for the disturbance of these areas, an alternative Offset Area is proposed.

Mt Arthur Coal will advance the implementation of the heritage offset commitments made for the Mt Arthur Underground including the creation of the Mount Arthur and Saddlers Creek Conservation Areas, the establishment of the Keeping Place and training, as part of the Project.

The salvage and the protection of any remaining Aboriginal objects within the Environmental Assessment Boundary will continue to be managed in accordance with a revised Aboriginal Archaeology & Cultural Heritage Management Plan in consultation with the local Aboriginal community and Department of Environment & Climate Change.

In addition, the establishment of a 495 hectare Offset Area east of Thomas Mitchell Drive is proposed, which will be managed to ensure the protection of Aboriginal objects and the enhancement of Aboriginal cultural heritage. The significance assessment conducted for the proposed Offset Area found that it is comprised of sites of at least comparable, and in some cases much higher value to those in the three existing Heritage Management Zones, and as such offers a more suitable and sustainable conservation offset.

Non-Aboriginal Heritage

An assessment was undertaken by Archaeology Australia to determine the potential impacts of the Project on Non-Aboriginal heritage items in accordance with relevant NSW Heritage Guidelines.

The assessment included historical and archival research and searches of the relevant Commonwealth and State heritage lists, a review of previous heritage assessments and a field survey of the areas not previously subject to assessment along the Edderton Road Realignment Options.

A total of nine sites were identified with a potential to be impacted by the Project, three of which are outside the Environmental Assessment Boundary but have been assessed in relation to impacts from blasting.

The Belmont Homestead Complex and Beer Homestead slab hut sites will be impacted by the Project. Mt Arthur Coal will undertake archival recordings of the Belmont Homestead Complex and Beer Homestead slab hut prior to any disturbance or relocation of these sites. No other sites will be impacted by the Project.

Surface Water

A surface water impact assessment was undertaken by Gilbert & Associates which included a site water balance, local and regional water balance and a discussion on impacts to water resources including water users and riparian vegetation in the vicinity of the Project.

Mt Arthur Coal's water management system prescribes the process relied upon to effectively source, capture, divert, store, monitor, utilise and reticulate water onsite and is based on adherence to well-established, best water management practices in the Australian mining industry. Mt Arthur Coal has a monitoring program in place which commenced in 1995 with water quality monitored at numerous sites, including local creeks and mine water dams.

Environment Protection Licence 11457 permits discharge of excess mine water during periods of high flow in accordance with the Hunter River Salinity Trading Scheme at up to 450 megalitres per day.

A multi-year dynamic water balance model was developed for the Project based on a deterministic single year water balance model.

The model simulates all inflows, outflows, transfers and changes in storage of water onsite on a daily continuous basis from 2009 to 2022. Calculated demand for the Project averages approximately 12,958 megalitres per year with the majority of this able to be sourced from site rainfall runoff and an average of 17% sourced from licensed extraction from the Hunter River.

Extraction from the Hunter River throughout the life of the Project has been predicted to remain well within the current total licensed volume for a majority of the time with the exception of extreme drought years where, should this eventuate, Mt Arthur Coal will investigate and implement other measures.

Mt Arthur Coal has not been required to discharge to date in accordance with the Hunter River Salinity Trading Scheme. The Mt Arthur Underground Environmental Assessment confirmed that, even with the additional water make resulting from the underground mining activities, Mt Arthur Coal would continue to operate within the rules of the Hunter River Salinity Trading Scheme.

This Environmental Assessment has determined that the Project will result in an average decrease of 159 megalitres per annum of surplus mine water, thus confirming that Mt Arthur Coal will be readily able to continue to operate within the rules of the scheme.

Surface water will continue to be managed in accordance with the existing Site Water Management Plan which will be reviewed as needed to ensure that it meets the changing requirements of the Project.

Flood bund protection will be constructed between Denman Road and the Environmental Assessment Boundary where the topography is less than the 1955 peak flood level in the Hunter River (considered representative of a 1 in 100 year flood event in Muswellbrook) plus 0.5 metre freeboard, at a height of approximately 1.4 metre within the former Whites Creek channel.

Groundwater

A groundwater impact assessment was undertaken by Australasian Groundwater and Environmental Consultants. Three aquifer systems exist in the region and include: alluvial aquifer associated with the Hunter River and a smaller alluvial aquifer associated with Saddlers Creek, weathered bedrock near the ground surface; and the coal seams of the Permian Wittingham Coal Measures.

A search of the Department of Water & Energy database of registered bores and wells indicates that there are approximate about 32 registered bores within a 5 kilometre radius of the Environmental Assessment Boundary.

The majority of which are licensed for stock use with 20 on Mt Arthur Coal owned land. The Department of Water and Energy database indicates that those bores to be impacted by the depressurisation of the coal seam aquifers are located on Mt Arthur Coal land and there are no private registered bores on the southern side of the Hunter River within the predicted cone of depression for the Project.

The groundwater assessment utilised a three-dimensional transient, groundwater flow model (FEFLOW) for the area that was developed to provide predictive simulations of the impact of the Project (including Mt Arthur Underground) on the groundwater regime.

Previous open cut mining has led to the cumulative depressurisation of the coal seams and water bearing layers in the interburden in and surrounding the Environmental Assessment Boundary and a subsequent drawdown in the piezometric surface / water table up to 3.25 kilometres, on the southern side of the Hunter River.

By 2016, it is predicted that the cumulative cone of depression resulting from the Mt Arthur Coal Complex will extend beneath the Hunter River alluvium on the southern side of the river.

Modelling demonstrates that the cones of depression from the Bengalla Mine and Mt Arthur Coal operations will not join beneath the Hunter River. By 2022, the cumulative impact with Bengalla Mine will be significantly reduced with its closure in 2017 or continuation of mining to the west away from the Hunter River.

The groundwater simulation indicates that from 2009 to 2016 the pit inflow rates rise from Permian coal seam aquifers from 0.85 megalitres per day to 2.45 megalitres per day. From 2016 onwards, pit inflows are predicted to reduce due to the growing impact of the Mt Arthur Underground and a general decline of the regional Permian coal seam groundwater table. From the peak inflow in 2016 of 2.45 megalitres per day, the groundwater inflow stabilises in the latter years of mining at approximately 2.3 megalitres per day.

Approximately 0.2 megalitres per day of brackish water currently flows from the Permian coal seam aquifers towards the Hunter River and discharges into the base of the alluvium, which by mid 2011 is predicted to cease.

Subsequent to mid 2011, the direction of groundwater flow is predicted to reverse resulting in recharge to the Permian coal seam aquifers, which by 2022 is conservatively estimated to increase to 0.74 megalitres per day.

Field investigations undertaken for the Project have confirmed that a narrow band of alluvium exists along Whites and Fairford Creeks. The stratigraphic sequence of this alluvium is generally consistent with that of the Hunter River alluvium, suggesting a possibility of hydraulic interconnection.

The Project is also predicted to result in the reduction in the rate of the groundwater flow from the Permian coal seam aquifers to the alluvial aquifer of Saddlers Creek. By 2011 the flow direction in the Permian aquifer is predicted to reverse stabilising at a rate of approximately 0.09 megalitres per day by 2019.

Dependent on further investigations and consultation with NSW Department of Water & Energy, a compacted clay filled cut-off trench, bentonite slurry trench, or other such mitigation measure as agreed will be installed across the small section of Whites and Fairford Creeks' alluvium in advance of the limit of mining to prevent any inflow of water from the Hunter River alluviums through the mine endwall into the pit.

Additional monitoring piezometers will be installed to monitor depressurisation and groundwater quality as required.

Mt Arthur Coal will continue to monitor hydro-geomorphological conditions and scrutinise for evidence of any groundwater ingress or endwall instability indicators as it progresses the previously approved mining towards the Hunter River alluvials.

Mining (other than that already approved in the Mt Arthur North Environmental Impact Statement) will not extend beyond a nominal 150 metre buffer zone from the Hunter River alluvials until agreement is reached with the Department of Water and Energy regarding the installation of a lower permeability barrier along the point of connections of mining and the alluvium or other appropriate safeguards.

Mt Arthur Coal will undertake a census of privately owned groundwater bores to ascertain their current usage and provide a baseline against which to compare any future impacts.

A revision to the existing Water Management Plan to incorporate the Project will be undertaken, as required to ensure that it meets the changing requirements of the Project.

Economics

An economics assessment was undertaken by Gillespie Economics which determined the costs and benefits of the Project.

The benefit cost analysis compared the Project to the base case (i.e. the continuation of operations at Mt Arthur Coal until 2022 at approved levels of production up to 20 Million tonnes per annum run of mine coal from open cut and up to 8 Million tonnes per annum run of mine coal from underground mining).

The Project represents a quantified net benefit of approximately \$1,832 Million (although this excludes some external environmental impacts of the Project which cannot be quantified, and the economic and social benefits of employment provided by the Project which also have not been quantified) and should be considered as a minimum threshold value. As such, the unquantified environmental impacts of the Project, after mitigation by Hunter Valley Energy Coal, would need to be valued at greater than this amount to make the Project questionable from an economic perspective.

Input-Output tables were used to estimate the total contributions to the regional and State economy, with the following results:

- Regional economy benefits:
 - o \$635 Million in annual direct and indirect regional output or business turnover;
 - o \$343 Million in annual direct and indirect regional value added;
 - o \$79 Million in annual household income;
 - o 860 direct and indirect jobs; and
- State economy benefits:
 - o \$948 Million in annual direct and indirect output or business turnover;
 - o \$496 Million in annual direct and indirect value added;
 - o \$169 Million in annual household income; and
 - o 1,989 direct and indirect jobs.

Social

Coakes Consulting completed a social impact assessment for the Project which reports that Mt Arthur Coal's employees tend to live in the townships of Muswellbrook, Singleton and Scone, with the Muswellbrook Local Government Area population having grown by 3.3% between the 2001 and 2006 Census periods.

This has been facilitated by growth in key sectors such as Professional, Scientific and Technical services (62.3%) and Mining which increased its employment rates by 39.7% from 2001 – 2006. This is significant, given that the mining sector has been the primary employer over the last decade, employing up to 17% of Muswellbrook's total workforce.

Population impacts are likely to be experienced in Muswellbrook, with the Project-specific peak workforce influx likely to result in approximately 746 new community members moving to Muswellbrook.

It is unlikely that this will occur concurrently and as such, a more gradual phasing of new personnel into the region will afford local communities and service providers the opportunity to adjust and improve current capacities where required to manage the changing demands of population growth.

It is unlikely that there will be any cumulative construction workforce impacts for the region, particularly on key service sectors such as the temporary accommodation sector.

The social impact assessment also examined the cumulative impact from Mt Arthur Coal and Mangoola Mine at their peak operational phases.

Mt Arthur Coal's peak production phase is likely to commence in 2014 and Mangoola Mine's peak production workforce is unlikely to be fully phased in until 2019. This time lag is likely to afford key service providers in the Muswellbrook Local Government Area the opportunity to work constructively with the respective companies in effectively planning for the anticipated and progressive population growth in coming years.

Mt Arthur Coal has been operating since the 1960's and has a well developed community investment program and a robust program of community engagement which will continue to provide further information on issues of interest to the community.

Mt Arthur Coal is seeking to negotiate a Voluntary Planning Agreement with Muswellbrook Shire Council, commensurate with the impacts of the Project. If such an agreement is not concluded, Mt Arthur Coal will provide for development contributions linked to the increases in demand for public amenities and services caused by the additional impacts of the Project.

Waste

Mt Arthur Coal has an existing comprehensive Total Waste Management System which was developed to consolidate the disposal, tracking and reporting of all waste generated onsite including general waste, recycling and workshop waste.

Mt Arthur Coal has documented procedures for the minimisation, storage, transport, disposal, tracking and reporting of waste generated onsite. A spill response procedure is also in place that describes the measures to be followed in the event of a spill incident.

The current Waste Management System will continue to be utilised for the Project with the Sewage Treatment Plant upgraded and or duplicated as required.

Soils and Land Resources

GSS Environmental completed a soils and land use assessment for the Project which determined that soil types within the Environmental Assessment Boundary include soil horizons which exhibit a slight to high potential for dispersion which will be managed to ensure that the subsoils are not exposed without suitable controls being implemented.

The potential for acid generation from regolith material (topsoil and subsoil) within the Mine Extension Areas is low. A determination of pre-mining and post-mining agricultural suitability found that the majority of land within the Mine Extension Areas is Class 4 and will remain Class 4 post-mining.

Best practice management measures will continue to be undertaken at Mt Arthur Coal to reduce the potential for degradation during mine rehabilitation to achieve the desired post-mining land capability and agricultural suitability outcome.

Rehabilitation and Final Landform

Mt Arthur Coal has extensive experience in achieving successful mine rehabilitation, with rehabilitation works being completed for various mining areas onsite over the last 45 years. Rehabilitated areas will continue to be managed in accordance with the methods currently in place at Mt Arthur Coal under the Environmental Management System which includes commitments to progressive rehabilitation and monitoring.

Sufficient coal reserves exist within Mt Arthur Coal's mining and exploration leases to enable coal mining beyond 2022 pending the granting of future Planning Approvals. In the unlikely event that mining does cease at Mt Arthur Coal in 2022, a strategy has been developed to ensure the minimisation of mine void areas and the creation of an acceptable post mining landform. This includes a Conceptual Final Landform which has been developed for the Project consistent with the Department of Primary Industry's *Synoptic Plan* that aims to link existing vegetation communities within and surrounding the Environmental Assessment Boundary with rehabilitation areas to provide corridors for the movement of fauna.

The translocation of topsoil and vegetative material containing an appropriate seed bank to rehabilitation areas will be undertaken to assist in the recreation of 500 hectares of Box Gum Woodland understorey.

Hazard Analysis

A review of the relevant components of the Project has confirmed that the Project is not considered to be Potentially Hazardous or Offensive. As such, a detailed preliminary hazardous analysis is not required.

All hazardous materials associated with the Project will continue to be transported by a licensed contractor in accordance with the relevant Australian Standard and legislation. Mt Arthur Coal will continue to utilise its Environmental Management System and Occupational Health and Safety procedures to manage the hazards and risks associated with the Project.

Traffic and Transport

A traffic impact assessment was undertaken for the Project by Hansen Bailey in accordance with the *Guide to Traffic Generating Developments*. The main vehicular road access to the Project is via the Mt Arthur Coal Access Road which runs west off Thomas Mitchell Drive, however there are a number of alternative accesses used to access other areas of the site.

Thomas Mitchell Drive connects to the New England Highway (in the east) and Denman Road (in the west) and is a moderately trafficked road carrying predominantly industrial, mining and rural related traffic.

The greatest impact of the Project on the surrounding road network will be on Thomas Mitchell Drive in 2014, where the future traffic volumes have been predicted to increase by up to a maximum of 10.5 % and 9.1 % north and south of the Mt Arthur Coal Access Road intersection, respectively.

Level of service is a qualitative measure of the operational conditions within a traffic stream as perceived by motorists and passengers and was assessed for predominant intersections in relation predicted to Project impacts. In 2011, the current level of service experienced by road users is not predicted to change as a result of the construction phase of the Project.

The full operation of the Project in 2014 will not cause any change to the level of service experienced by road users, with the exception of Thomas Mitchell Drive, between the Mt Arthur Coal Access Road and Denman Road.

An intersection performance assessment was also undertaken for key intersections around the Project using the intersection simulation software, SIDRA which was used to determine the level of service for each turning movement and for each intersection as a whole in 2011 and 2019.

The SIDRA analysis found that the Denman Road / Thomas Mitchell Drive and New England Highway / Thomas Mitchell Drive intersections will perform 'at capacity' / 'unsatisfactory' with the Project in 2019. Mt Arthur Coal will consult with the Muswellbrook Shire Council and the NSW Roads and Traffic Authority regarding a relevant contribution proportionate to usage for upgrade works for both intersections at a time when impacts are predicted.

The proposed Edderton Road realignment will result in an increased travel time of up to 3 minutes from Muswellbrook direction and a decrease of up to 1.7 minutes from Denman direction.

The detailed design of the proposed Edderton Road realignment, and subsequent relocation and reconstruction of the Denman Road / Edderton Road intersection will be completed in consultation with the relevant regulators.

Temporary road closures required for safety purposes where blasting occurs within 500 metres of public roads will continue to be undertaken in accordance with the Mt Arthur Coal Road Closure Management Plan.

Additional train movements will impact the accessibility to the New England Highway for some residents at Antiene due to their reliance on a low level railway crossing. Ongoing liaison with adjacent industry and these residents will be undertaken to address access to properties along Antiene Railway Station Road.

JUSTIFICATION

Mt Arthur Coal is an existing open cut coal mining operation which has successfully operated for over 45 years under a variety of Planning Approvals within several mining leases.

The Project provides access to the largest remaining open cut coal resource in the Muswellbrook Local Government Area with over 122 Million tonnes of accessible export quality coal available in the proposed Mine Extension Areas alone.

The Project represents the continuation of previously anticipated mining to ensure the methodical and complete extraction of all economically viable open cut coal reserves within the currently held mining leases as the mine progresses to the west.

The Project is a natural progression of the intended land use which will initially utilise the existing employee resource, infrastructure and equipment fleet in operation at the mine prior to its supplementation. Whilst allowing current mining operations to progress in an orderly manner, the Project will provide the mine the flexibility to increase its coal production rate in response to both domestic and international energy demand trends.

To date, coal production rates have been constrained by both rail and port capacity limitations. As the bottlenecks in the coal chain are resolved, there is a need for increased flexibility in mine production rates to enable Mt Arthur Coal to respond to market demand within the rapidly increasing NSW coal chain capacity.

Due to the ongoing commitment to best practice environmental management, the progression of mining will not greatly extend Mt Arthur Coal's current environmental footprint despite the proposed increase in the scale of operations. The Project is in keeping with the existing regional land use as it abuts two other coal mining project areas, is immediately opposite a third to the north of the Hunter River, and is located in close proximity to Bayswater Power Station to the south (the NSW Government's largest supplier of energy to the eastern seaboard power grid).

The Project involves the extension of mining operations at Mt Arthur Coal through a mine plan which has been specifically designed to minimise adverse economic, social and environmental impacts, optimise final landform and provide suitable offsets.

In particular, the proposed mine plan will ensure that a sufficient section of the eastern flank of Macleans Hill will remain to assist in reducing impacts from mining operations to receivers to the east and north of Mt Arthur Coal.

Mt Arthur Coal has previously established two Conservation Areas which are intended to be gazetted as Conservation Areas under the *National Parks and Wildlife Act 1974*.

To offset the ecological and Aboriginal archaeological heritage impacts of the progression of mining, Mt Arthur Coal is proposing to establish an additional 495 hectare Proposed Offset Area to the east of the Project, which contains various threatened fauna and flora species and Aboriginal heritage sites. It is envisaged that this Offset Area, due to its accessibility will accommodate teaching and research and will be an ideal location for the proposed Aboriginal Cultural Heritage Keeping Place which is to be established by Mt Arthur Coal under previous planning approvals.

Further to this, Mt Arthur Coal is proposing to establish an additional 222 hectare Proposed Offset Area within the Environmental Assessment Boundary for ecological offsets. Approximately 500 hectares of land will also be returned to native woodland and forest after mining.

The need for the Project is demonstrated by the substantial net economic benefits that it will realise to both the Hunter Region and State of NSW through the generation of additional employment, export revenue, taxes and royalties.

The mine plan put forward considers and balances the maximisation of coal recovery with the minimisation of environmental impacts in accordance with the principles of Ecologically Sustainable Development. Where impacts have been identified, these have been proposed to be mitigated with best practice environmental management initiatives.

The application of a comprehensive, contemporary environmental assessment has not identified any significant adverse residual economic, social or environmental impacts associated with the Project.

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Appendix I	Visual Impact Assessment
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1 BACKGROUND

1.1 INTRODUCTION

Hunter Valley Energy Coal Pty Limited (HVEC), a wholly owned subsidiary of BHP Billiton, operates the Mt Arthur Coal Mine Complex (Mt Arthur Coal Complex). Mt Arthur Coal Complex includes the combined approved operational areas of the Mt Arthur North Mine, the Bayswater No 2 Mine, Bayswater No 3 Mine, South Pit Extension and the Mt Arthur Underground project. The Mt Arthur Coal Complex is located south west of Muswellbrook in the Upper Hunter Valley, NSW within the proclaimed Muswellbrook Mine Subsidence District and the Muswellbrook Local Government Area (LGA) (**Figure 1**).

Development within the Mt Arthur Coal Complex commenced in the early 1960s in the Bayswater No 2 open cut mining area. Coal production progressively increased and approval to extract coal from the Bayswater No 3 open cut was granted in 1994. To support the expanding development at Bayswater No 3 and cease coal transport by public road, approval was obtained in November 2000 for the construction and operation of the Rail Loading Facility and Spur Line. This connects to the Main Northern Railway Line to allow export coal to be transported directly to Newcastle. In May 2001, the Mt Arthur North (MAN) open cut operation was approved to permit the extraction of up to 15 Million tonnes per annum (Mtpa) of Run of Mine (ROM) coal and the construction and use of associated infrastructure and facilities.

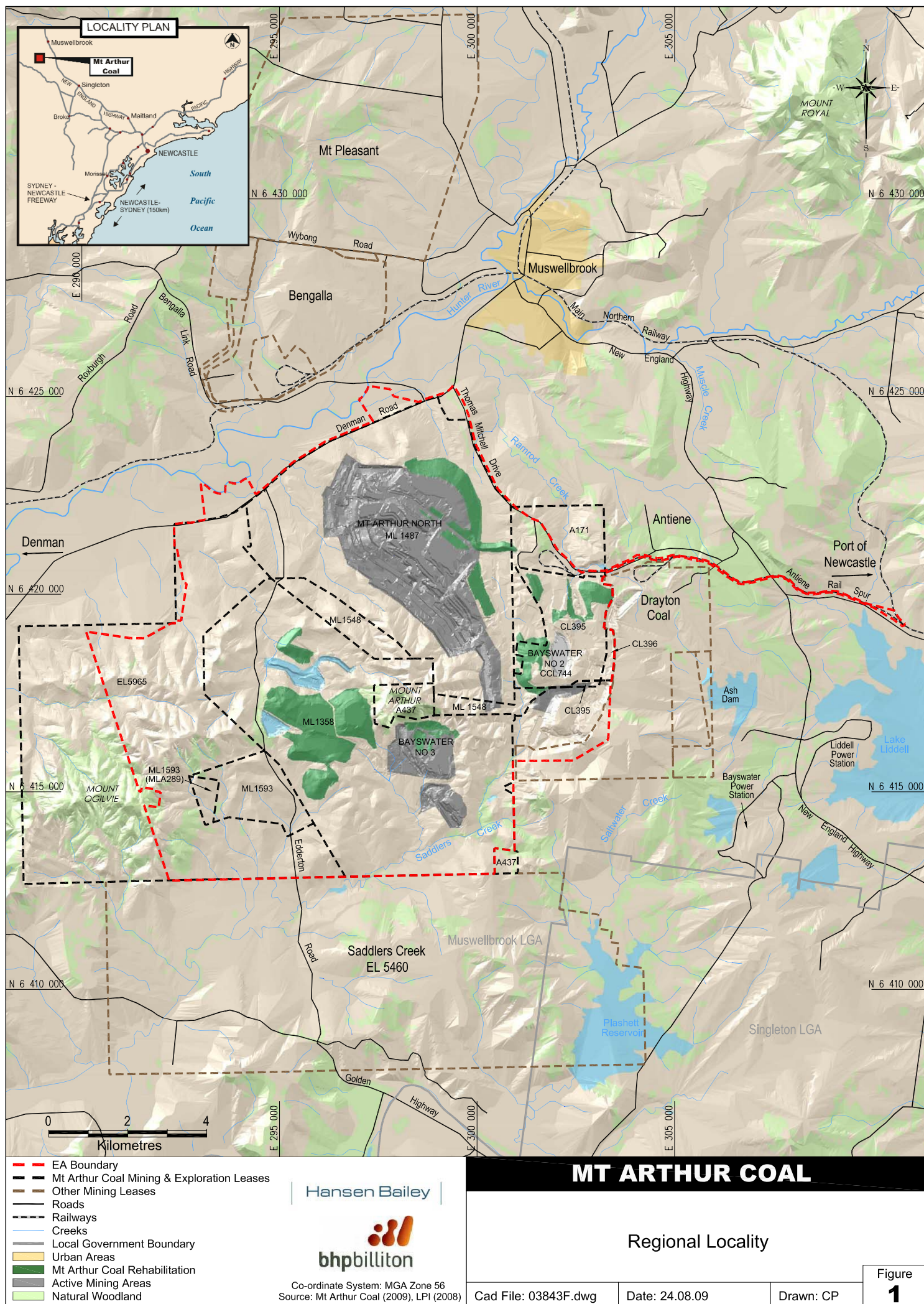
Subsequent approvals were granted for Mt Arthur Coal Complex including the development of an Exploration Adit in 2006, an extension to the MAN South Pit in 2008 and the Mt Arthur Underground Project (MAU) and infrastructure upgrades in 2008. The Mt Arthur Coal Complex has approval to produce up to 28 Mtpa of ROM coal from the combined complex of which 8 Mtpa is from underground mining methods.

Coal production from the MAN mining area has been the focus of Mt Arthur Coal's operations since 2002. Open cut coal mining at the Mt Arthur Coal Complex is conducted via shovel and excavator and supporting truck fleet. Since 2007, the development of the underground Exploration Adit has been undertaken. The purpose of the Exploration Adit was to assess underground mining conditions and geology to assist in determining the optimum mine plan for the MAU. The Exploration Adit was completed in May 2009.

In 2008, 14.7 Million tonnes (Mt) of ROM coal was mined from the combined open cut and underground Exploration Adit operations from the Woodlands Hill seam to the Ramrod Creek seam within the Wittingham coal measures. This equated to approximately 11.9 Mt of product coal produced for export and domestic markets. Product coal is transported via the Rail Loading Facility through the Port of Newcastle for export, and via conveyor to Macquarie Generation owned power stations. The current mine plan for the Mt Arthur Coal Complex is illustrated on **Figure 1**.

HVEC is committed to maintaining high standards of environmental performance to meet and where feasible, exceed internal corporate commitments, regulatory requirements and external stakeholder expectations. In some instances, this commitment extends to global leading practice to minimise impacts on the environment and community. Since commencement of operations, HVEC has continued to meet its environmental monitoring predictions and criteria in all areas.

Recent upgrades to the site's industry-leading Real Time Environmental Monitoring System to increase the sensitivity of the blast monitoring capture system and air quality monitoring system, waste reduction programs, and ongoing investigations into reducing energy use and greenhouse gas emissions (including the use of biodiesel trials) provide examples of HVEC's ongoing commitment to best practice and continual improvement.



HVEC is committed to implementing leading environmental practice onsite and investigating innovative community and environmental management measures throughout the development of the Project.

1.2 PROPONENT

The Project proponent is HVEC (which operates the Mt Arthur Coal Complex). The address details for HVEC are:

Hunter Valley Energy Coal Pty Ltd

Private Mail Bag 8

Thomas Mitchell Drive

MUSWELLBROOK NSW 2333

Phone: 02 6542 4800

Fax: 02 6542 4801

<http://www.bhpbilliton.com/bb/ourBusinesses/energyCoal/mtArthurCoal.jsp>

HVEC's registered office contact details are:

Hunter Valley Energy Coal

Rialto Towers

Level 29, 525 Collins St

MELBOURNE VIC 3000

1.3 DOCUMENT PURPOSE

HVEC seeks Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for a contemporary Planning Approval for its open cut operations and the mining of additional areas within its mining leases (the Project).

A Major Projects Application and supporting Preliminary Environmental Assessment (PEA) were submitted to the Department of Planning (DoP) in March 2009 under section 75E of Part 3A of the EP&A Act. Subsequently, the Director-General's Environmental Assessment Requirements (EARs) were issued by DoP on 21 April 2009.

This Environmental Assessment (EA) fulfils the requirements of the Director-General's EARs and assesses the social, economic and environmental impacts of the Project to enable the Minister for Planning to grant the Project Approval as sought. A checklist of each EAR and where it is addressed in the EA is presented in **Section 6**.

The EA applies to the Project Application Boundary (EA Boundary) as shown on **Figure 1** and supports the Application for Project Approval. The EA Boundary is consistent with the Project Approval area for the MAU.

1.4 DOCUMENT STRUCTURE

The EA consists of four volumes. Volume 1 encompasses the main report and presents a description of the Project, a summary of associated environmental, social and economic impacts and proposed mitigation and management measures, as follows:

- **Section 2** provides relevant information on the existing environmental setting;
- **Section 3** describes the existing mining operations at the Mt Arthur Coal Complex, environmental management system and existing biodiversity and heritage commitments;
- **Section 4** provides a detailed description of the Project;
- **Section 5** introduces the regulatory framework relevant to the Project;
- **Section 6** details stakeholder engagement undertaken and discusses issues raised. Specifically, this section lists the Director-General's EARs and identifies where these matters are addressed in the EA;
- **Section 7** outlines the risk assessment process adopted to rank all identified environmental and social issues as high, medium and low to assist in directing the environmental assessment focus;

- **Section 8** assesses environmental and social issues and outlines management and mitigation measures proposed for the Project including proposed Offset Strategies;
- **Section 9** presents Mt Arthur Coal's Statement of Commitments for the Project;
- **Section 10** provides a detailed justification for the Project;
- **Section 11** lists Abbreviations used throughout the EA;
- **Section 12** provides a list of all materials referenced in the EA; and
- **Section 13** provides a full list of the EA Study Team.

Volume 1 also contains regulatory documents and correspondence, stakeholder engagement materials and the risk assessment conducted for the EA. Volumes 2, 3, 4, 5 and 6 present all of the remaining technical assessments which support the EA.

2 EXISTING ENVIRONMENT

This section provides a discussion on the existing climate, geology, topography and land use surrounding the Mt Arthur Coal Complex. Land ownership is also discussed as relevant to the Project.

2.1 CLIMATE

Regional climatic conditions of the Upper Hunter consist primarily of seasonal variations of hot, wet summers giving way to mild, dry winters resulting in a warm temperate climate. Winter months are dominated by high pressure systems that alternate with cold fronts, combining to form cool, dry conditions. In these cooler, drier months from mid-autumn to late spring regular frosts and fog are common.

Summer months are largely dominated by synoptic high pressure systems that lie over the Great Australian Bight producing dry conditions and warm temperatures. Synoptic low pressure systems occur intermittently during summer, resulting in periods of heavy rain and thunderstorms.

In addition to Mt Arthur Coal's meteorological data from Macleans Hill, the Bureau of Meteorology (BoM) monitoring stations at Jerrys Plains and Scone have also been relied upon during the preparation of the EA. The locations and recording periods for these stations relative to the Mt Arthur Coal Complex are provided in **Table 1**. Meteorological data is summarised in **Table 2** and discussed with key parameters below.

2.1.1 Temperature and Humidity

Temperature recorded at Jerrys Plains indicates that summer months are warm with January reaching a mean daily high temperature of 31.7°C (see **Table 2**). July is the coolest month recorded at Jerrys Plains, with a mean daily low temperature of 3.8°C.

Humidity levels exhibit variability and seasonal flux throughout the year. Mean morning (9 am) humidity levels range from 59% - 78% and mean afternoon (3 pm) humidity levels range from 39% - 58%. Spring months are generally drier than the rest of the year.

2.1.2 Rainfall

Rainfall in the Upper Hunter Valley is summer dominant with falls peaking in summer and declining in winter. The annual mean rainfall for Jerrys Plains is 640 mm, falling on 67 rain days. Rainfall at Mt Arthur Coal in recent years has been significantly lower than the regional mean, with a mean annual rainfall of 521 mm. Typical mean rainfall in the Upper Hunter ranges from 42 mm up to 72 mm per month with summer months being predominantly wetter than the cooler winter months.

2.1.3 Evaporation

Data from the BoM Scone Meteorological Station was utilised to assess representative evaporation trends in the Upper Hunter (**Table 2**) as the Jerrys Plains BoM station and Mt Arthur Coal's Macleans Hill Station do not record evaporation data.

The higher daily evaporation in summer months highlights a direct correlation between increased temperature and afternoon winds in the Upper Hunter. Evaporation is greater than annual precipitation with the mean monthly pan evaporation rates varying seasonally from 217 mm during January to 48 mm in June, with an annual mean of 1,599 mm.

2.1.4 Wind Speed and Direction

Annual and seasonal windroses prepared for the Macleans Hill Station shown on **Figure 2** indicate that the Mt Arthur Coal Complex predominately receives winds from the east south east in summer and from the west north west during winter. Autumn and spring months experience a combination of these wind conditions.

Table 1
Meteorological Stations

Name	Operator	Station No	Location	Period of Record
Jerrys Plains	BoM	061086	Approximately 12 km south of EA Boundary	1884 – current
Scone	BoM	061089	Approximately 27 km north of EA Boundary	1950 – current
Macleans Hill	Mt Arthur Coal	N/A	Northern section of the Mt Arthur Coal Complex inside the EA Boundary	2003 – current

Table 2
Meteorological Data Summary

Month	Mean Daily Temperature (°C)				Mean Monthly Rainfall (mm)		Mean Monthly Rain Days		Mean Monthly Relative Humidity (%)*		Mean Monthly Evaporation (mm)*
	Jerrys Plains		Macleans Hill		Jerrys Plains	Macleans Hill	Jerrys Plains	Macleans Hill	Mean Monthly Relative Humidity (%)*		
	Min	Max	Min	Max					9 am	3 pm	
January	17.1	31.7	17.8	29.6	77.4	52.7	6.5	4.6	67.0	43.0	217.0
February	17.0	30.9	17.4	28.9	71.8	87.0	5.9	6.1	73.0	47.0	192.2
March	15.0	28.9	15.0	25.7	58.0	40.3	5.7	5.4	72.0	47.0	155.0
April	10.9	25.3	11.7	22.5	43.9	27.5	4.9	4.1	70.0	47.0	108.0
May	7.4	21.3	8.0	19.3	40.4	26.4	4.9	3.9	76.0	56.0	68.2
June	5.2	18.0	6.4	15.9	47.5	57.8	5.4	6.5	78.0	58.0	48.0
July	3.8	17.4	6.4	15.3	43.6	26.2	5.2	4.2	75.0	54.0	55.8
August	4.4	19.4	6.0	17.6	36.5	33.4	5.2	4.3	68.0	46.0	83.7
September	6.9	22.8	8.7	20.7	41.6	31.7	5.2	4.5	62.0	43.0	117.0
October	10.3	26.3	12.0	24.6	52.2	33.3	5.9	3.7	59.0	42.0	158.1
November	13.1	29.1	13.8	25.8	59.9	58.5	6.2	7.5	61.0	41.0	183.0
December	15.7	31.3	15.8	28.3	67.6	46.8	6.3	6.3	61.0	39.0	213.0
Annual Mean	10.6	25.2	11.5	22.8	640.5	521.6	67.3	61.1	69.0	47.0	1,599.0

*Scone Meteorological Station

Source: BoM, 2009

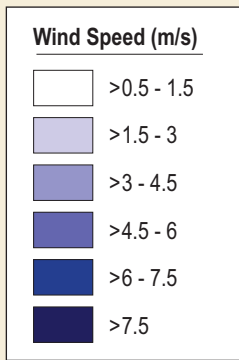
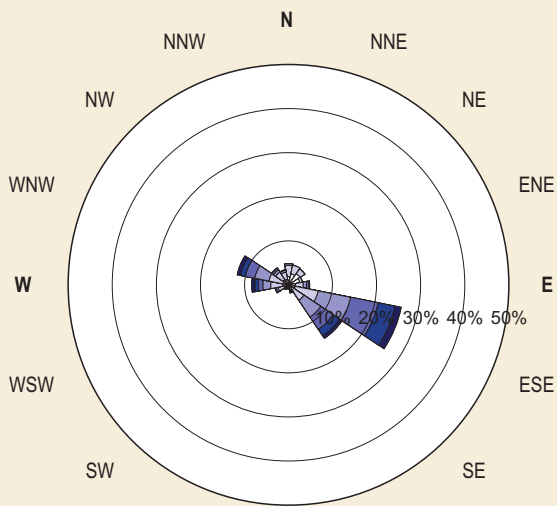
2.2 GEOLOGY

2.2.1 Exploration

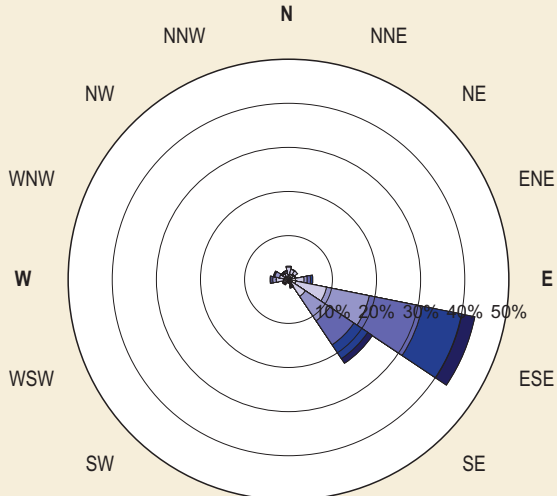
Extensive exploration has been undertaken by Mt Arthur Coal, with numerous programs having been conducted within Mt Arthur Coal's Mining and Exploration leases since 1949. Objectives of these programs have included both shallow and deep regional drilling to assess and quantify the coal resource. The total number of boreholes drilled in the areas held under title by Mt Arthur Coal is 4,719 with a total metreage of over 385,750 m.

Drilling can be divided into three main stages of exploration:

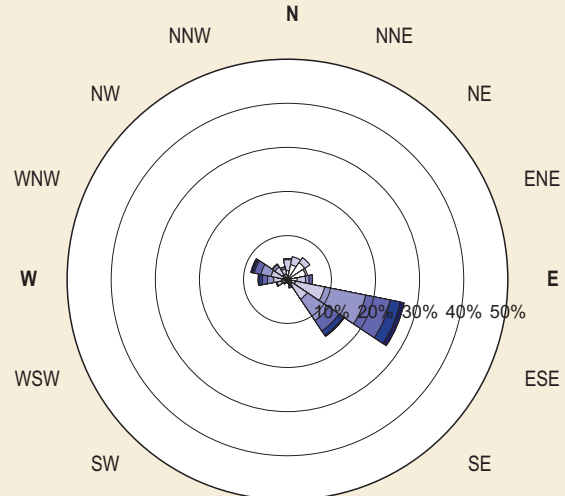
- Historical exploration (1949 to 1982);
- Bayswater Coal Company Joint Venture exploration (1991 to 2000); and
- The Mt Arthur Coal Complex exploration (1998 to June 2009).



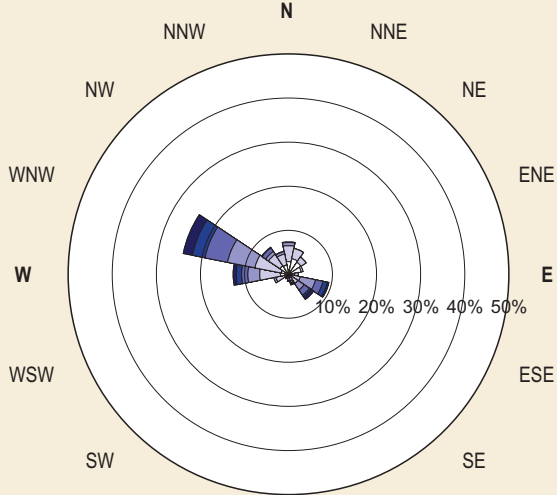
Annual Calms = 1.3%



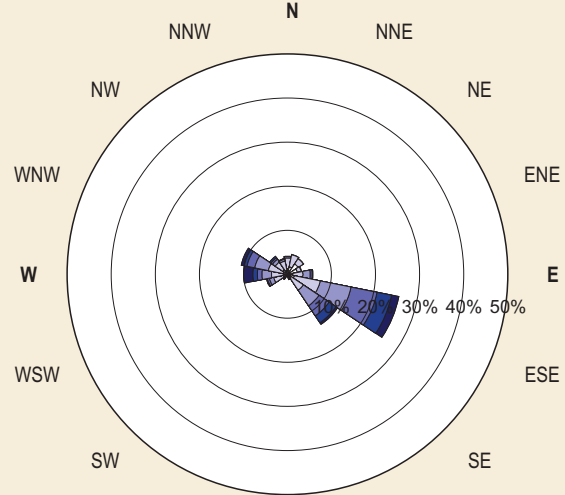
Summer Calms = 1.2%



Autumn Calms = 1.7%



Winter Calms = 1.4%



Spring Calms = 1.1%

Hansen Bailey



MT ARTHUR COAL

Windroses for Macleans Hill

2.2.2 Stratigraphy

The Mt Arthur Coal Complex is situated in the north east of the Sydney Basin in the Upper Hunter Valley Coalfield. Target coal seams are contained within the Wittingham Coal Measures. Open cut mining methods at Mt Arthur Coal allow the maximum recovery of the Wittingham Coal Measures through to the Ramrod Creek coal seam. An indicative stratigraphic column showing the target seams for the Project is presented in **Figure 3**.

The Mt Arthur Coal Complex is located to the west of the Muswellbrook Anticline, with coal seams generally dipping to the west south west toward the Calool Syncline. The EA Boundary encompasses an east west trending graben structure varying in strike length from 750 to 1,000 m with up to 110 m displacement. North of the graben, the seam dip varies from 2° to 10° with an average dip of approximately 8°.

South of the graben, seam dip varies from 2° to 20° with steeper dipping regions occurring in the south east and western areas. Igneous intrusions within the Mt Arthur Coal Complex occur mainly as dykes, which selectively intrude coal seams in localised areas, although dykes have a relatively minor impact on open cut mining. One minor sill intrusion also occurs within the sequence of coal seams in the area.

2.2.3 Reserves and Resource Utilisation

Exploration drilling and feasibility studies undertaken within Mt Arthur Coal's Mining and Exploration leases have indicated that approximately 3.8 Billion tonnes (2009 BHP Billiton Annual Report) of resource remains at the Mt Arthur Coal Complex as at June 2009. The predicted stripping ratio for coal accessible by open cut mining methods averages approximately 1 tonne of ROM coal for every 5 bank cubic m (bcm) of overburden for the Project.

2.3 TOPOGRAPHY AND LAND USE

2.3.1 Topography and Natural Features

The topography surrounding the Mt Arthur Coal Complex is gently undulating to hilly, dominated by Mount Arthur (482 m Australian Height Datum (AHD)), located within the mine operational area, and Mount Ogilvie (468 m AHD), located to the west of the Mt Arthur Coal Complex (see **Figure 1**). The north of the EA Boundary gently slopes up from the alluvial flats of the Hunter River at an elevation of approximately 120 m AHD, rising to approximately 230 m AHD at Macleans Hill and becoming progressively steeper in the vicinity of Mount Arthur and Mount Ogilvie. From Mount Ogilvie, the southern portion of the Mt Arthur Coal Complex slopes down to form part of the Saddlers Creek floodplain.

Generally, rainfall runoff from undisturbed areas flows north west from Mount Ogilvie and Mount Arthur into Quarry Creek and associated tributaries and then into the Hunter River (see **Figure 1**). Rainfall which falls to the south of Mount Ogilvie and Mount Arthur flows into Saddlers Creek before travelling south west and entering the Hunter River approximately 17 km downstream of Denman.

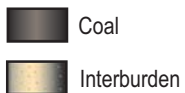
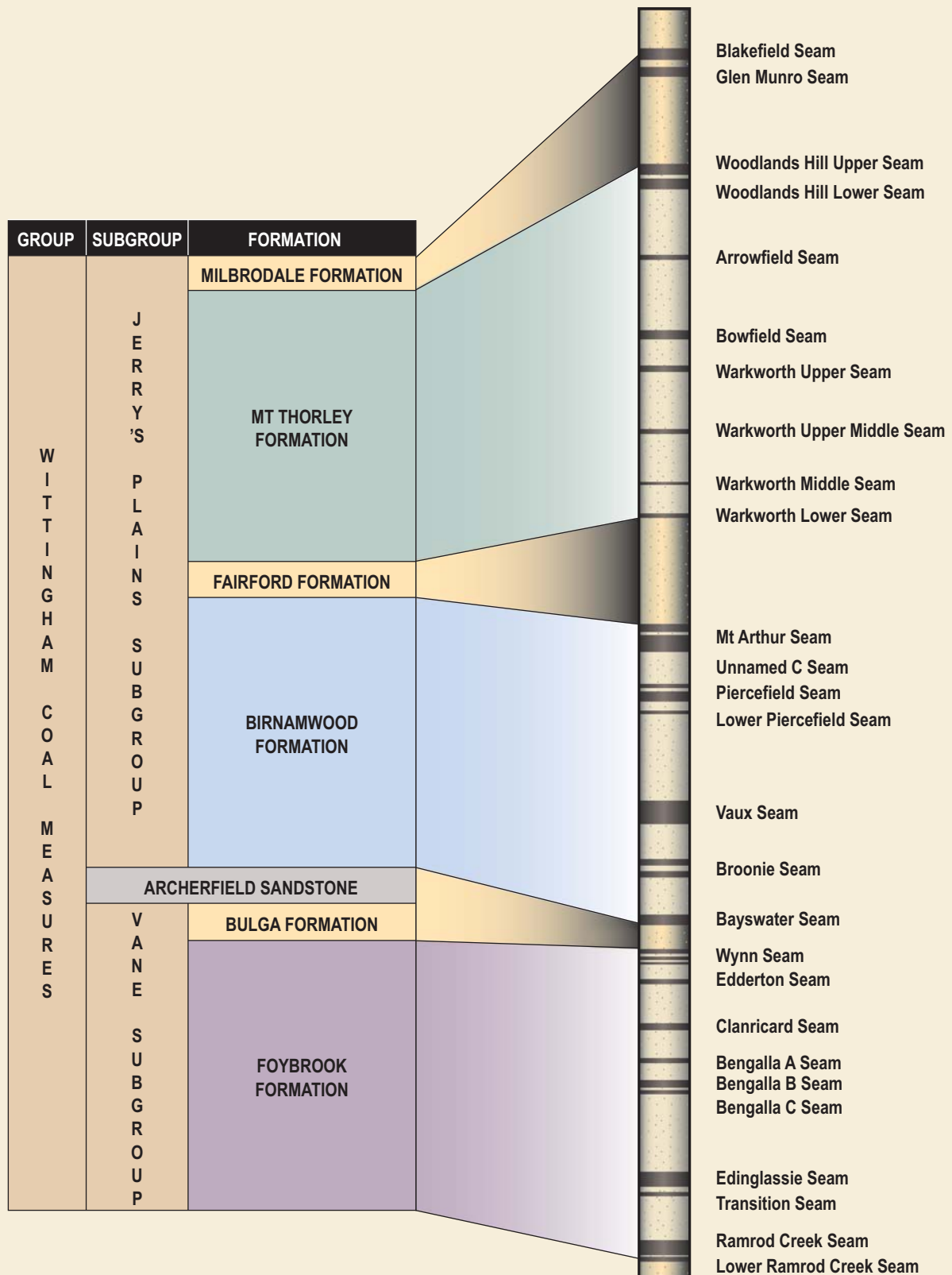
2.3.2 Land Use

The Upper Hunter region has a long history of rural land use for a variety of agricultural and industrial activities, predominantly grazing and coal mining. The current dominant land uses within and adjacent to the EA Boundary include open cut coal mining, power generation and industrial activities, agriculture, rural residential and residential areas. Each is discussed further below in relation to the Project.

Mining, Power Generation and Industrial

Coal mining is a common land use in the area as shown on **Figure 1** with Bengalla Mine located approximately 2 km to the north of the Mt Arthur Coal Complex, separated by the Hunter River alluvial floodplain over which no mining tenement is held.

STRATIGRAPHIC COLUMN



Hansen Bailey



MT ARTHUR COAL

Indicative Stratigraphic Column

Drayton Mine adjoins to the east, whilst the Saddlers Creek Project exploration leases adjoin the Mt Arthur Coal Complex to the south. Macquarie Generation's Bayswater and Liddell Power Stations are located to the south east of the Mt Arthur Coal Complex. Macquarie Generation's buffer lands are located to the south east of the Mt Arthur Coal Complex, between the mining leases and Power Stations. The Muswellbrook Industrial Estate is located on Thomas Mitchell Drive immediately to the east of the Mt Arthur Coal Complex, which houses a variety of businesses predominantly providing supporting services to the mining industry.

Agriculture

The Hunter River is located to the immediate north of the Mt Arthur Coal Complex and plays an important role in the region's agricultural enterprises, meandering south from Glenbawn Dam (east of Scone) to Muswellbrook before heading east towards Newcastle. The Hunter River and its alluvial floodplain support an array of agricultural enterprises including viticulture, grazing, dairying, lucerne hay production, horse studs and olive groves.

The Hunter River alluvium is present in the vicinity of the Mt Arthur Coal Complex and is discussed further in **Section 8.10**.

The Project is located within lands that have been largely disturbed by previous agricultural activities, particularly cultivation and grazing. Agriculture has occurred within the EA Boundary since the Muswellbrook region was first inhabited by European settlers in 1824, creating largely grassland interspersed with small woodland remnants.

Rural and Residential Areas

The township of Muswellbrook is located approximately 5 km to the north east of the Mt Arthur Coal Complex. In addition, there are private freehold lands surrounding the EA Boundary including the Antiene Estate to the east; South Muswellbrook and Racecourse areas to the north; Denman Road to the west; and Roxburgh Road to the north west.

The recently approved subdivision of Ironbark Ridge Estate is located adjacent to South Muswellbrook to the north east of the EA Boundary, as shown and assessed on **Figure 4**. Other recently approved housing developments, such as St Mary's Estate and Eastbrook Links Estate are located over 3.5 km to the north and north east of the EA Boundary respectively and are included as part of the broader South Muswellbrook area.

2.4 LAND OWNERSHIP

Table 3 lists the property ownership surrounding the EA Boundary and indicates if a receiver (private residence) is located on the property. **Table 3** should be read in conjunction with **Figure 4**, which provides an overview of the land ownership types surrounding the EA Boundary. **Figure 4a** and **Figure 4b** present detailed land ownership figures for the northern and southern areas of the EA Boundary respectively. Property IDs for private receivers correlate with the land ownership details in **Table 3**.

The Mt Arthur Coal Complex or adjacent coal mining operations are required to purchase a number of private receivers located in the area surrounding the EA Boundary upon request by the private receiver. These receivers are distinguished in the land ownership figures and **Table 3**. HVEC and its subsidiaries own the majority of land within the EA Boundary, excluding minor areas of Crown land, road reserves and the Drayton Sub-Lease Area. All of the land subject to the Project is owned by HVEC, and subject to existing approved mining tenements as discussed further in **Section 3.6**. Existing approvals facilitating the placement of overburden by Mt Arthur Coal within the Drayton Sub-Lease Area are described further in **Section 3**.

Anglo Coal owns the majority of land to the immediate east and south of the EA Boundary, with land further to the south east owned by Macquarie Generation. The majority of the land owned by Anglo Coal is subject to mining tenements. The Bengalla Joint Venture owns the land on which Bengalla Mine operates and to which its mining tenements apply, to the immediate north of the Mt Arthur Coal Complex.

**Table 3
Land Ownership**

ID	Name	Receiver	ID	Name	Receiver	ID	Name	Receiver
1	MJ Drake		43	DJ Hallett & KL & J Campbell	■	85	PJ & KJ Collins	■
2	The Water Conservation and Irrigation Commission		44	Crail Estates PTY Limited		86	RE & ID Baxter	■
3	The Water Conservation and Irrigation Commission		45	Mt Arthur Coal Owned Land – previously owned by the Council of the Shire of Muswellbrook #		87	RB & LJ Halloran	■
4	The Water Conservation and Irrigation Commission		46	The Council of the Shire of Muswellbrook		88	WJ Reynolds	■
5	The Water Conservation and Irrigation Commission		47	Webber		89	SR Page	■
6	JR Scriven	■	48	F & IR Webber	■	90	BC & SR Page	■
7	F & IR Webber*		49	F & IR Webber	■	91	MF & AV Doherty	■
8	MJ Drake	■	50	Energy Australia		92	CJ & LE Duck	■
9	Engelbrecht*	■	51	Energy Australia		93	RDJ & DA Osborn	■
10	Muswellbrook Race Club Limited ^A	■	52	Freehold Industrial		94	RC & LT Skinner	■
11	JP Drake	■	53	PC & DA & NA Mitchell		95	GHJ & PH De Boer	■
12	DR & CJ Tubb	■	54	Freehold Industrial		96	MJ Bird	■
13	Upper Hunter Developers Pty Limited & NR Turner	■	55	PM & FP Farrell & HG & MG Cope		97	P & K Clifton	■
14	J & DL Robinson	■	56	JT & SE Bancroft	■	98	BD & B Jones	■
15	MC & LJ Dobie	■	57	GJ Mayer	■	99	DW & LM Hunter	■ ■
16	ML & EA Sweeney	■	58	AR & FM Masters	■	100	EJ & MC Sharman	■
17	JR Gleeson & MR Cranfield	■	59	RJD & DA Osborn	■	101	PG Horder	■
18	SM Bredden	■	60	RJD & DA Osborn	■	102	BJ & NH Robertson*	■
19	NJ Rowe		61	JFA Burton	■	103	BJ & NH Robertson*	
20	AC Good	■	62	N Burke & HG Talbot	■	104	Crown	
21	RS & JT Cridland	■	63	G Gillfeather		105	Crown	
22	Englebrecht Racing Stables Pty Limited	■	64	Eastbrook Estate Pty Limited		106	Crown	
23	RH Englebrecht	■	65	Eastbrook Pastoral Pty Limited		107	Mt Arthur Coal Owned Land – previously owned by Crown #	
24	RJ & TT Reid	■	66	JG Abercrombie		108	Crown	
25	GL & IL Andrews	■	67	Crown		109	Crown	
26	RA Byrnes & MA Moller	■	68	BL & JM Bennett		110	RW Moses Pty Limited & Wandewoi Pty Limited* *	
27	TD Barron	■	69	BS & MB Wells	■	111	Arrowfield Wines Pty Limited	
28	MJ McGoldrick	■	70	JA & DR Folpp	■	112	Calogo Bloodstock AG	
29	KB & JA Barnett	■	71	IE & LF Hunt	■	113	Darley Australia Pty Limited	
30	DP Englebrecht	■	72	WR & JM Budden	■	114	Crown	
31	Jabetin Pty Limited	■	73	PJ Hogan	■	115	Hynken Pty Limited	
32	FK & WDG Almond & PW Hume	■	74	F Webber		116	Hynken Pty Limited	
33	SW & KL Barkley	■	75	D & MJ Harris	■	117	Hynken Pty Limited	
34	WJ Hardes	■	76	Merlaust Pty Limited	■	118	NE Ray	
35	C Home		77	Mt Perram	■ ■	119	Crown	
36	C Home	■	78	Yarralong Stud Pty Ltd	■	120	Hynken Pty Limited	
37	The Council of the Municipality of Muswellbrook	■ ■	79	SJ & J Jackson	■ ■	121	JN & JE Wolfgang	
38	Monadelphous Properties Pty Ltd	■	80	EM Casben		122	WRL Wolfgang	
39	JR & JA Buckley		81	CS Jacobsen		123	TL Wolfgang	
40	JR & JA Buckley	■	82	K Newton	■	124	TL Wolfgang	
41	SRP & RF Ray	■	83	K Newton	■	125	TL Wolfgang	
42	DJ Hallett & KJ & K Campbell	■	84	J Jacobsen		126	TL Wolfgang	

ID	Name	Receiver	ID	Name	Receiver	ID	Name	Receiver
127	RL Wolfgang		173	Rosebrook		219	AA & BT Meyer	
128	MH Wolfgang		174	Rosebrook		220	Crown	
129	SA Wolfgang		175	Rosebrook		221	Crown	
130	SA Wolfgang		176	Rosebrook		222	MR & M Peel	
131	SA Wolfgang		177	Rosebrook		223	A Wynne & TW Roots	
132	SA Wolfgang		178	Blakefield		224	GR & MK Walsh	
133	SA Wolfgang		179	PR & M Burgmann		225	MR & M Peel	
134	RL Wolfgang		180	Crown		226	A Wynne & TW Roots	■
135	MH Wolfgang		181	TR & KM Paulsen		227	A Wynne & TW Roots	
136	MH & JN Wolfgang		182	TR & KM Paulsen	■	228	A Wynne & TW Roots	
137	Saddlers Creek Coal Pty Ltd		183	Beringer Blass Wine	■	229	SR & JW Lawson	
138	MH & JN Wolfgang		184	Fosters Wine***	■	230	SR & JW Lawson	
139	MH & JN Wolfgang		185	RW Turner		231	PJ Brown	■
140	MH & JN Wolfgang		186	RW Turner	■	232	JI & PJ Brown	■
141	MH & JN Wolfgang		187	MJ & MJ Duncan	■	233	RM & KF Merrick	■ ■
142	MH & JN Wolfgang		188	Crown		234	JM Thompson	
143	MH & JN Wolfgang		189	RW Jones		235	JM Thompson	■
144	MH & JN Wolfgang		190	DJ Phillips	■	236	JM Thompson	■
145	MH & JN Wolfgang		191	RL Wilks	■	237	RM & KF Merrick	
146	MH & JN Wolfgang		192	HR & BC Grugeon		238	MR Peel	■
147	Wolfgang		193	HR & BC Grugeon		239	PR Ellis	■
148	MH & JN Wolfgang		194	Beringer Blass Wine		240	PSJ Murray	■
149	MH & JN Wolfgang		195	LA & CA MacPherson	■	241	PG & CM Lane	■
150	MH & JN Wolfgang		196	BD Eglinton, SR R& L Fuller & SM & RD Goodchild	■	242	NJ & RY Ellis	■ ■ ■
151	Wolfgang		197	BD Eglinton SR & L Fuller & SM & RD Goodchild	■	243	GT McNeill	■
152	MH & JN Wolfgang		198	MJ & MJ Duncan	■	244	FN & WL Googe	
153	MH & JN Wolfgang		199	Mt Arthur Coal Owned Land – previously owned by Boyle		245	RB & SA Parkinson	
154	MH & JN Wolfgang		200	GR & MK Walsh	■	246	RB & SA Parkinson	
155	MH & JN Wolfgang		201	EJ & CA Denton	■	247	RB & SA Parkinson	
156	Wolfgang		202	Mt Arthur Coal Owned Land – previously owned by Fosters		248	RB & SA Parkinson	
157	G Mediatl		203	MG & LJ Latham	■	249	RB & SA Parkinson	
158	MH & JN Wolfgang		204	MG & LJ Latham	■	250	RR & JM Hamilton	■
159	MH & JN Wolfgang		205	JT Lambkin	■	251	RB & SA Parkinson	
160	MH & JN Wolfgang		206	DJ & JM Wild	■	252	BA & TE Strachan	■
161	MH & JN Wolfgang		207	J & E Zahra	■	253	RB & SA Parkinson	
162	MH & JN Wolfgang		208	J & E Zahra	■	254	DR & AK Hughes	■
163	PM Wolfgang		209	BW & E Rankin	■	255	RB & SA Parkinson	
164	MH & RE Wolfgang		210	BW & E & WJ Rankin	■	256	RB & SA Parkinson	
165	MH & RE Wolfgang		211	BW & E & WJ Rankin	■	257	RB & SA Parkinson	■
166	MH & RE Wolfgang		212	MT Chudyk**	■	258	RB & SA Parkinson	
167	Wolfgang		213	SR & JW Lawson	■ ■ ■	259	FN & WL Googe	■
168	Wolfgang		214	SR & JW Lawson		260	C & LJ Francis	
169	Wolfgang		215	Minister for Public Works		261	RH Keys & RH Reynolds	
170	Wolfgang		216	AA & BT Meyer	■	262	Aliform Pty Limited	
171	RW Laws		217	State Rail Authority of NSW		263	Crown	
172	Rosebrook		218	JDM Markham	■ ■ ■	264	J Moore	■

NB: A coloured square denotes a residence on the property and each colour correlates to the shading used on Figure 4, 4a & 4b.

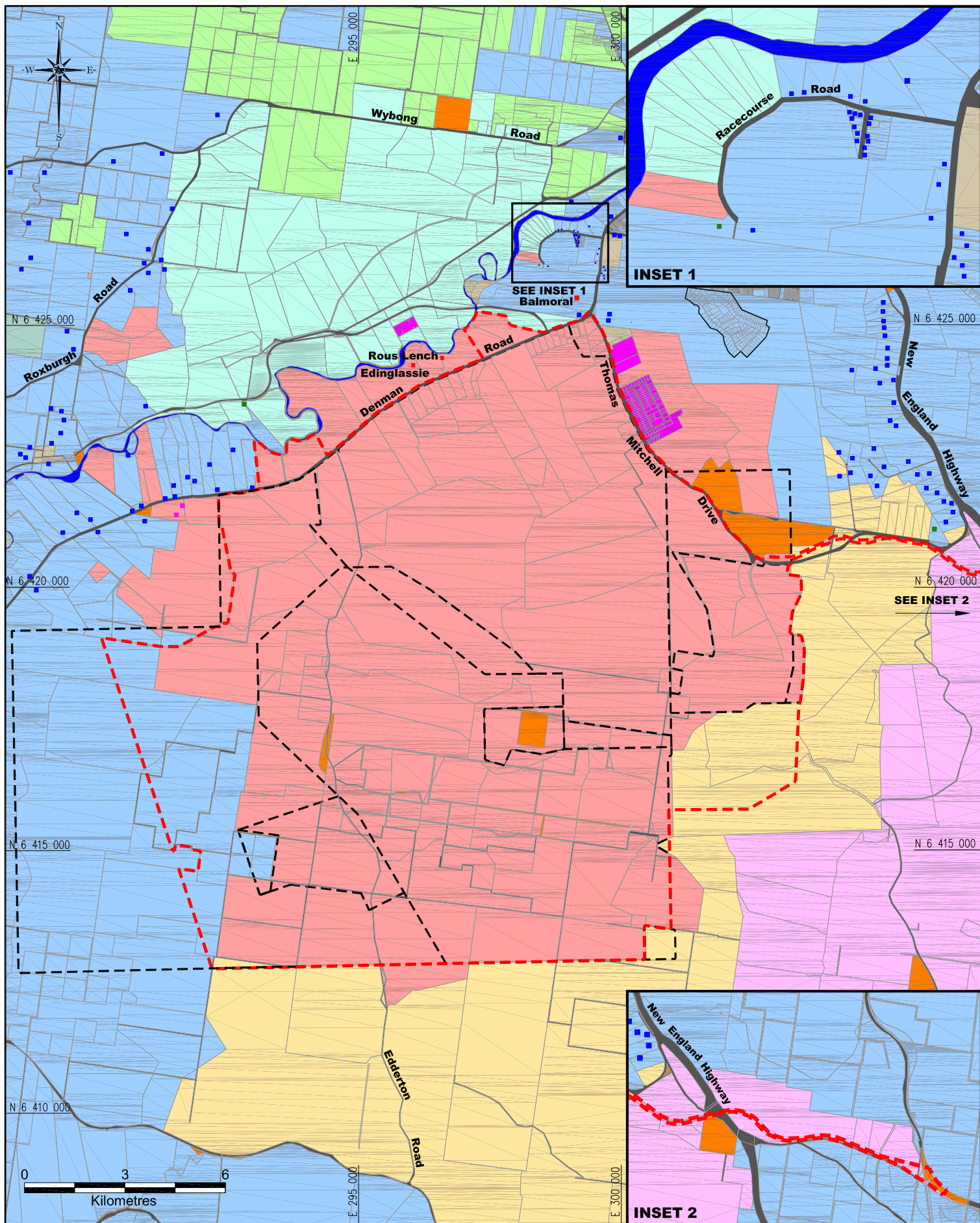
* In Mt Arthur Coal Zone of Affection (ZOA)

** In other mining operation's ZOA.

***Property under contract of sale with Mt Arthur Coal

^ Muswellbrook Race Club is a commercial property.

Land identified in February 2009 DPI land searches which have since been acquired by Mt Arthur Coal.



--- EA Boundary --- Mt Arthur Coal Mining & Exploration Leases Private Freehold Crown Mt Arthur Coal Bengalla Mine Mt Pleasant Mine Drayton Mine Mangoola Mine Utilities / Government Owned Macquarie Generation	 Novacoal Australia Industrial Freehold ■ Private Freehold ■ Receiver Locations ■ Heritage - Listed Properties ■ Private Receivers in Existing ZOA ■ Residence Under Contract
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Hansen Bailey

bhpbilliton

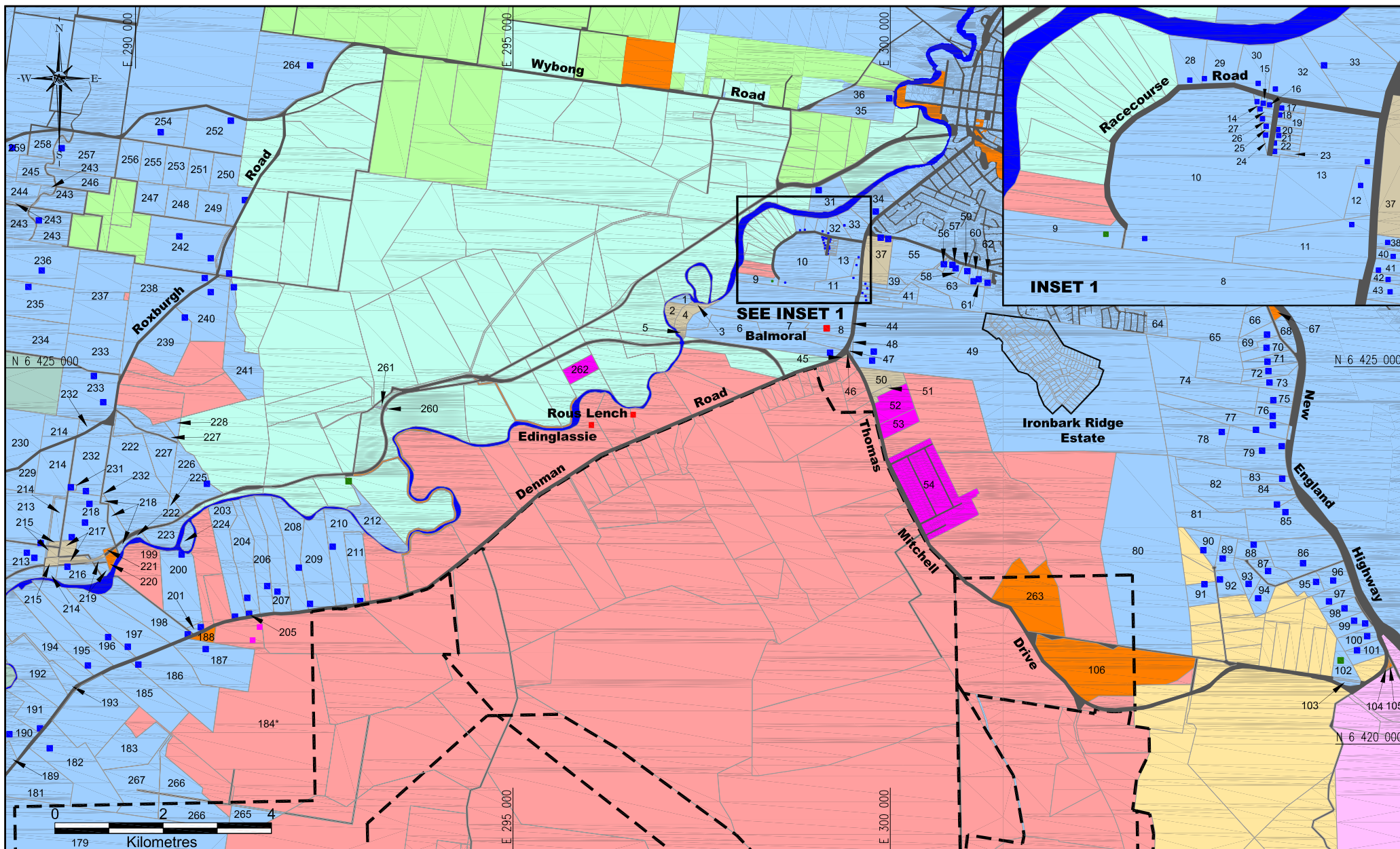
Co-ordinate System: MGA Zone 56
Land Searches: LPI 2009

MT ARTHUR COAL

Land Ownership Overview

Cad File: 03343V.dwg	Date: 21.09.09	Drawn: CP
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Figure
4



- | | |
|---|--|
| <ul style="list-style-type: none"> — Mt Arthur Coal Mining & Exploration Leases 133 Private Freehold 106 Crown Mt Arthur Coal Bengalla Mine Mt Pleasant Mine Drayton Mine Mangoola Mine 50 Industrial Freehold | <ul style="list-style-type: none"> Macquarie Generation Novacoal Australia 37 Utilities / Government Owned Private Freehold Receiver Locations Heritage - Listed Properties Private Receivers in Existing ZOA Residence Under Contract Property Under Contract |
|---|--|

184*

Hansen Bailey



Co-ordinate System: MGA Zone 56
Land Searches: LPI 2009

MT ARTHUR COAL

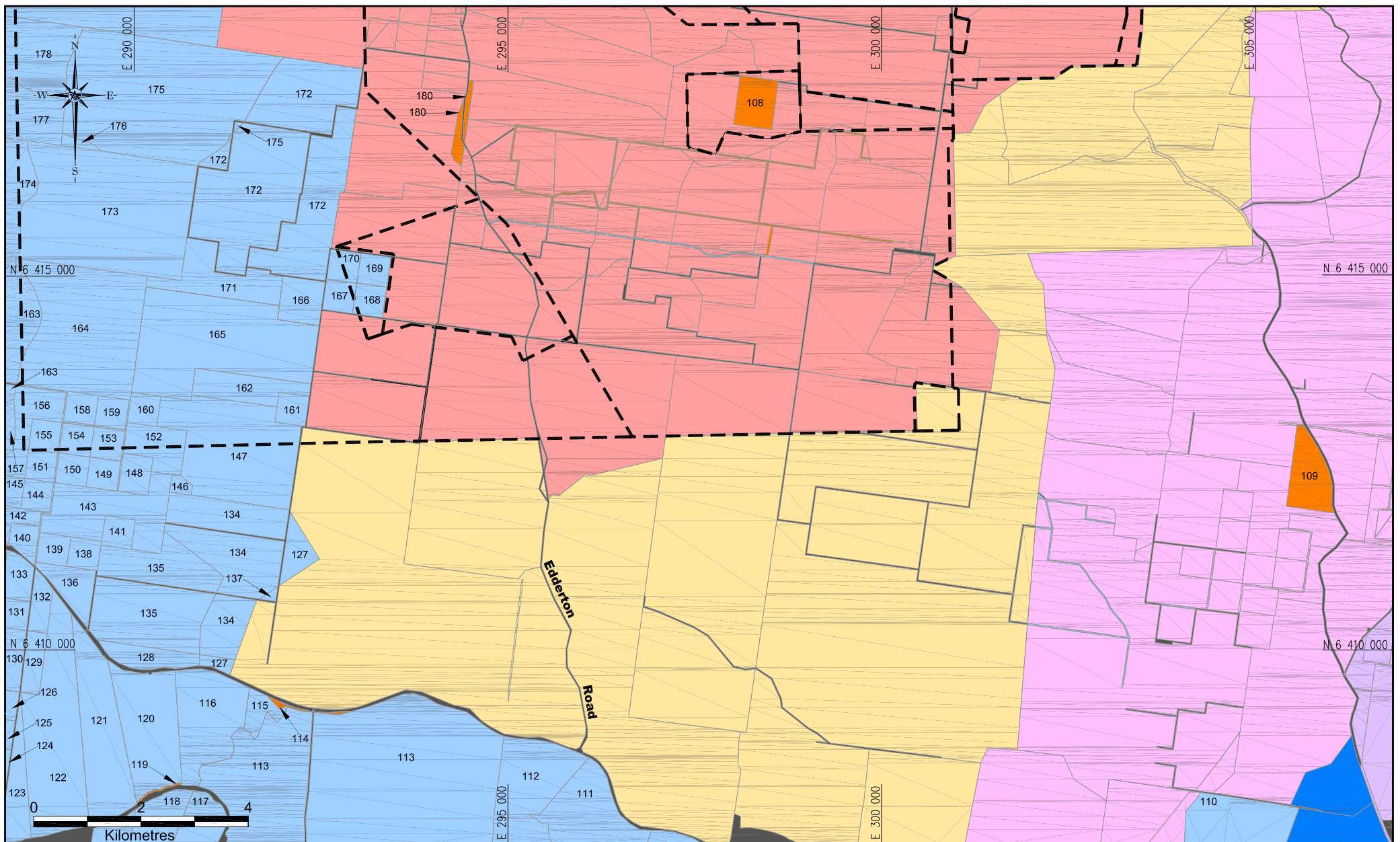
Detailed Land Ownership (North)

Cad File: 033640.dwg

Date: 18.09.09

Drawn: CP

Figure
4a



- | | |
|---|---|
| <ul style="list-style-type: none"> — Mt Arthur Coal Mining & Exploration Leases 133 Private Freehold 106 Crown Mt Arthur Coal Bengalla Mine Mt Pleasant Mine Drayton Mine Mangoola Mine 50 Industrial Freehold | <ul style="list-style-type: none"> Macquarie Generation Novacoal Australia Coal and Allied |
|---|---|

Hansen Bailey



Co-ordinate System: MGA Zone 56
Land Searches: LPI 2009

MT ARTHUR COAL

Detailed Land Ownership (South)

Cad File: 03365E.dwg

Date: 16.06.09

Drawn: CP

Figure
4b

3 APPROVED OPERATIONS

This section includes a detailed description of the approved open cut and underground operations at the Mt Arthur Coal Complex, and a description of the current activities undertaken in relation to mining, infrastructure, coal processing and handling. It also provides a description of the existing environmental monitoring program and a summary of the ISO14001 accredited Environmental Management System (EMS) under which environmental issues at the Mt Arthur Coal Complex are managed. It also provides a discussion on existing archaeological and ecological offset commitments in place.

3.1 BACKGROUND

Mt Arthur Coal currently operates under the following approvals: Bayswater No 3 (including the Bayswater No 2 mining area), Rail Loading Facility, MAN, South Pit Extension, Exploration Adit and the MAU. Each of the approved activities is described briefly below and the proximity of each is illustrated on **Figure 5**.

3.1.1 Bayswater No 2 and Bayswater No 3

Open cut mining occurred in Bayswater No 2 from 1966 to 1998, targeting the Greta Coal Measures. Coal production progressively increased at Bayswater No 2 until September 1994 when Planning Approval 210/93 was granted by the Minister for Planning to construct and operate open cut mining operations at the Bayswater No 3 Mine within mining lease 1358. Planning Approval 210/93 allowed for open cut mining in both the Bayswater No 2 and No 3 mining areas and for ongoing use of the Bayswater Coal Handling and Preparation Plant (CHPP) and other facilities. The consent was granted for a period of 21 years and lapses in 2015.

Mining commenced at Bayswater No 3 in 1995 targeting the Wittingham Coal Measures at rate equivalent to approximately 5 Mtpa ROM coal.

3.1.2 Rail Loading Facility and Loop

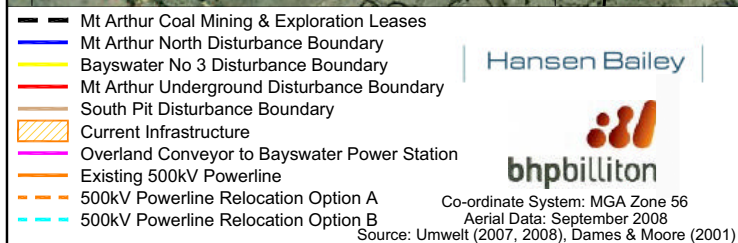
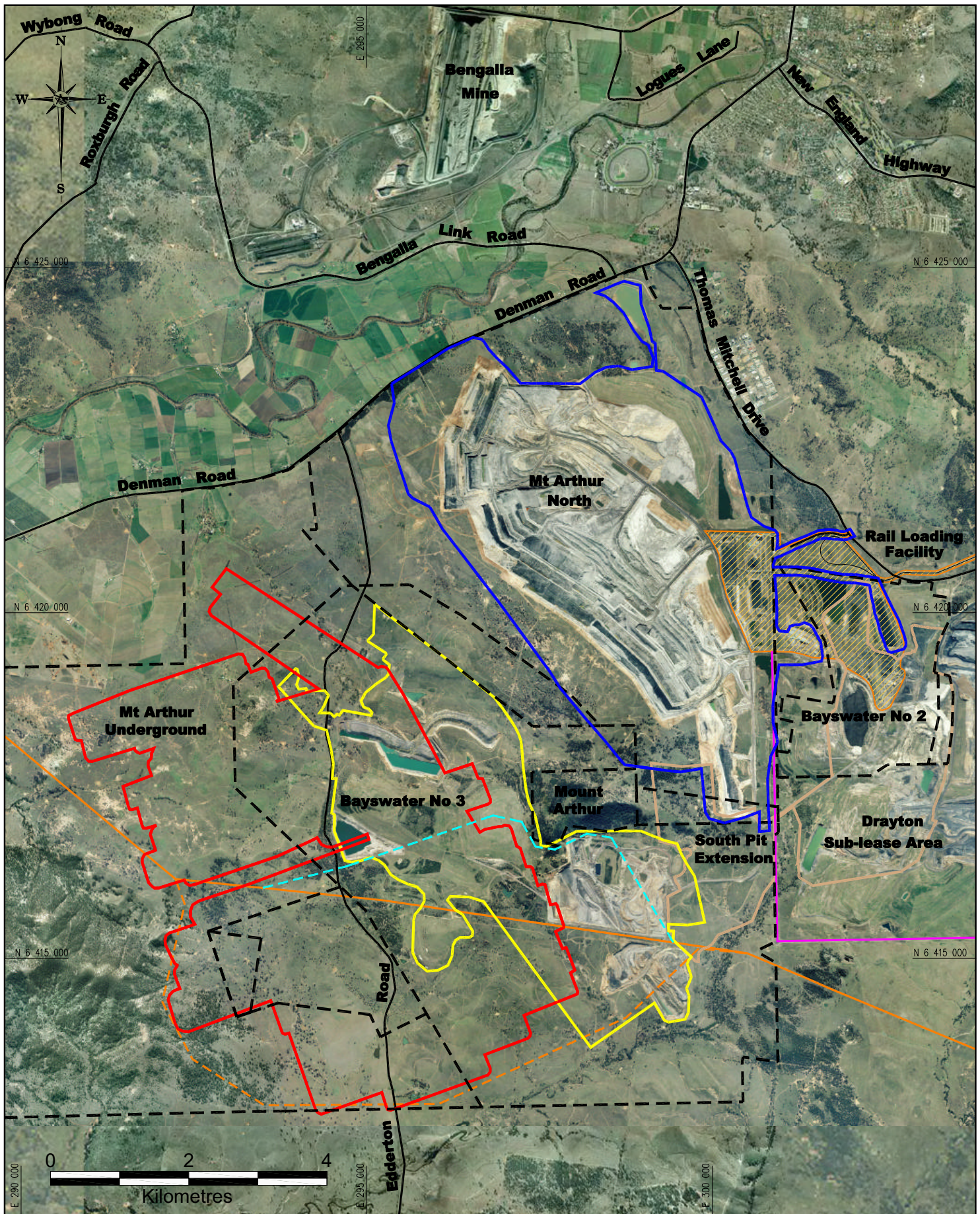
To support the expansion of mining at the Mt Arthur Coal Complex and to facilitate the cessation of coal transport by public road, Planning Approval 105-04-00 was granted by the Minister for Planning in November 2000 for the construction and operation of the Rail Loading Facility and Rail Loop. The approval allowed the proposed rail loop to be connected to the Antiene Rail Spur (east of the adjacent Drayton rail loop) and ultimately the Main Northern Railway Line, thereby allowing export coal to be transported directly to the Port of Newcastle and reducing heavy vehicle traffic along Thomas Mitchell Drive and the New England Highway.

Planning Approval 105-04-00 allowed Mt Arthur Coal to transport up to 13 Mtpa of saleable coal for a period of 25 years, with a maximum of 18 train movements per day (note: each train entering or exiting the Rail Loading Facility is classified as one train movement).

3.1.3 Mount Arthur North

The MAN open cut operation located immediately west of Bayswater No 2 was granted Planning Approval 144-05-2000 by the Minister for Planning in May 2001 to extract up to 15 Mtpa of ROM coal for a period of 21 years until 2022. The approval also facilitated the establishment of new infrastructure facilities including:

- Construction and operation of a new CHPP at MAN (approved to process up to 20 Mtpa), including new coal stockpiles and an overland conveyor to Macquarie Generation's Bayswater Power Station; and
- Administration buildings and offices, maintenance buildings and workshops, bathhouse, car parking facilities and other facilities required to service the Mt Arthur Coal Complex.



Construction at MAN commenced in late 2001 with first coal production in 2002. Coal production from the MAN mining area has been the focus of Mt Arthur Coal's operations since Planning Approval 144-05-2000 was granted.

3.1.4 Exploration Adit

As part of the ongoing work to confirm the underground geology and mining conditions within its mining and exploration leases, Mt Arthur Coal was granted Planning Approval 06_0040 by the Minister for Planning in September 2006 to develop an Exploration Adit for the extraction of a 450,000 tonne bulk sample from the Woodlands Hill seam over two years. Planning Approval 06_0040 enabled coal mining condition testing to facilitate mine and infrastructure planning for MAU. The adit is located at Bayswater No 3 and provides access to underground coal seams from the high wall of existing approved open cut mining areas.

3.1.5 South Pit Extension

In January 2008, Mt Arthur Coal was granted Planning Approval 06_0108 by the Minister for Planning for the extension of mining operations to the south of the approved MAN mining area (the South Pit Extension). Planning Approval 06_0108 provides approval for Mt Arthur Coal to access an additional 25 Mt of coal resources and produce 20 Mtpa of ROM coal from the combined operations of Bayswater No 2, Bayswater No 3, MAN and the South Pit Extension.

Planning Approval 06_0108 enables all coal produced from the South Pit Extension to continue to be processed at the existing MAN surface infrastructure and facilities. The South Pit Extension also facilitated the placement of overburden, tailings and reject in the former Bayswater No 2 mining area and the adjacent Drayton Sub-Lease Area.

As part of the approval, Mt Arthur Coal is responsible for reshaping, constructing drainage and sowing areas affected by emplacement activities conducted by Mt Arthur Coal within the Drayton Sub-Lease Area.

3.1.6 Mt Arthur Underground

Mt Arthur Coal was granted Planning Approval 06_0091 for the MAU in December 2008 and permits underground mining up until 31 December 2030. The MAU facilitates the extraction of up to 8 Mtpa of coal from underground operations. This approval raised the total maximum production limit of the Mt Arthur Coal Complex to 28 Mtpa ROM coal. The MAU approval also facilitated an increase in the capacity and throughput of the MAN CHPP from 20 Mtpa to 28 Mtpa and an expansion of the coal stockpile facilities, including the development of a permanent raw coal stockpile with a capacity of approximately 650,000 tonnes.

The MAU also extended approval for the Rail Loading Facility for the life of the project (i.e. extends the Rail Loading Facility life until 2030) and increased both the tonnage of coal exported by the site to 19 Mtpa and the maximum permissible daily train movements to 24.

The approval also enabled the extension of a passing lane on the Antiene Rail Spur, near the intersection of the Antiene Rail Spur with the Main Northern Railway Line, by approximately 600 m to provide additional train movement capacity as required.

The MAU was designed to be integrated with existing operations and facilities at the Mt Arthur Coal Complex as far as possible, including use of the existing CHPP, Rail Loading Facility, workshops and administration facilities, services and infrastructure (i.e. roads and water management systems and the environmental monitoring and management system).

The construction and use of additional surface infrastructure has also been approved, including new pit top facilities, ROM coal clearance system, relocation of the 500 KV powerline (two options approved, see **Figure 5**) and mining support infrastructure.

The MAU approval also reaffirmed Mt Arthur Coal's approval to realign the southern end of Edderton Road, as outlined in the Bayswater No 3 Environmental Impact Statement (EIS).

3.2 COAL MINING

Open cut mining is conducted via a multi-bench, multi-strip shovel and excavator operation, which provides for the greatest operational flexibility and efficiency in the staged extraction of the coal resource at the Mt Arthur Coal Complex. The open cut mining process includes the clearing of vegetation where necessary, stripping of topsoil, overburden removal, extraction of the exposed coal resource, overburden emplacement and progressive rehabilitation activities. Clearing and topsoil stripping is undertaken in a progressive manner throughout mining operations, minimising the extent of clearing to that required for the advance of each mining strip.

Coal extraction is supported by a fleet of haul trucks which transport the ROM coal to the CHPP for processing. In 2008, coal from the open cut operation was mined from the Woodlands Hill seam to the Ramrod Creek seam of the Wittingham coal measures. Open cut mining methods at the Mt Arthur Coal Complex allows maximum recovery of coal to the Ramrod Creek seam.

Underground coal has been extracted from the Woodlands Hill seam via the approved Exploration Adit. The purpose of the Exploration Adit was to assess underground mining conditions and geology to assist in determining the optimum mine plan for the MAU, which has not yet commenced.

The Exploration Adit was completed in May 2009 and has successfully met its objectives to provide information on underground mining conditions at the Mt Arthur Coal Complex for use in the business planning process. The MAU project will be compared with various open cut expansion options available to the business, prior to making a decision on an integrated development sequence.

Mining activities occur 24 hours per day 7 days per week supported by approximately 990 full time equivalent personnel. Blasting is generally conducted between 9:00 am and 5:00 pm Monday to Saturday.

A total of 14.7 Mt ROM coal was extracted from the Mt Arthur Coal Complex during 2008, which equated to 11.9 Mt of product coal.

3.3 COAL HANDLING AND TRANSPORTATION

Coal handling and processing is undertaken at the centralised CHPP located adjacent to the Mt Arthur Coal product coal loading facilities and connected via overland conveyors.

ROM coal extracted by the approved open cut operations is delivered by truck to either the ROM coal bins or the CHPP raw coal stockpile. Coal from the underground Exploration Adit is either delivered by truck directly to the CHPP or to the underground raw coal stockpile and then transported by truck to the CHPP for processing.

Depending on the ultimate use of the coal, ROM coal can either bypass the Coal Processing Plant (CPP) or be processed via a three stage coal washing and sizing process. Tailings produced from the CHPP are currently disposed of in the tailings emplacement area within the West Cut void at Bayswater No 2, whilst coarse reject is co-disposed within overburden emplacement areas.

The MAU provided approval to upgrade the existing CHPP modules and install an additional coal washing module to enable the processing of the approved 28 Mtpa ROM coal. Following processing, the product coal is transferred via conveyor either to the CHPP product coal stockpile, or directly to the export coal stockpile at the Rail Loading Facility.

Export coal is loaded onto trains at the Rail Loading Facility, which facilitates transportation to the Port of Newcastle via the Antiene Rail Spur and Main Northern Railway Line.

Coal for use in domestic power generation is transported via an overland conveyor directly to Macquarie Generation's Bayswater Power Station as shown on **Figure 5**.

3.4 INFRASTRUCTURE

The approved mining operations at the Mt Arthur Coal Complex are supported by a range of infrastructure, including administration offices, bathhouses, workshops and storage facilities. The main components of the existing infrastructure in place include:

- Administration offices, car parking facilities, stores, bathhouse and workshop facility developed for MAN;
- Project administration facility located adjacent to the CHPP;
- Bayswater No 2 Administration Facility;
- Rail Loading Facility, Rail Loop and conveyor;
- Overland conveyor to Bayswater Power Station (owned and operated by Macquarie Generation);
- Heavy vehicle wash down bays, drive through service and repair bays;
- Bulk oil storages and fuel tanks;
- Power supply and water reticulation systems; and
- Water storages, retention basins and associated water management structures.

3.5 EXISTING OFFSET STRATEGY

Mt Arthur Coal has in place an offset strategy for the management of impacts from approved mining operations, known as the Mt Arthur Coal Biodiversity & Heritage Offset Strategy (the Strategy). The Strategy has been designed to ensure that a sustainable landscape is developed over time and integrated into the regional landscape.

The Strategy comprises areas of existing native remnant vegetation, and future regeneration and rehabilitation areas. These areas are located across the site to ensure connectivity of areas within the EA Boundary and to provide linkages to surrounding native vegetation. The Strategy also includes zones to conserve Aboriginal Archaeology and Cultural Heritage. The Strategy has evolved over time and has integrated and built on previous commitments regarding final land use, maintaining and enhancing habitat values and achieving conservation outcomes.

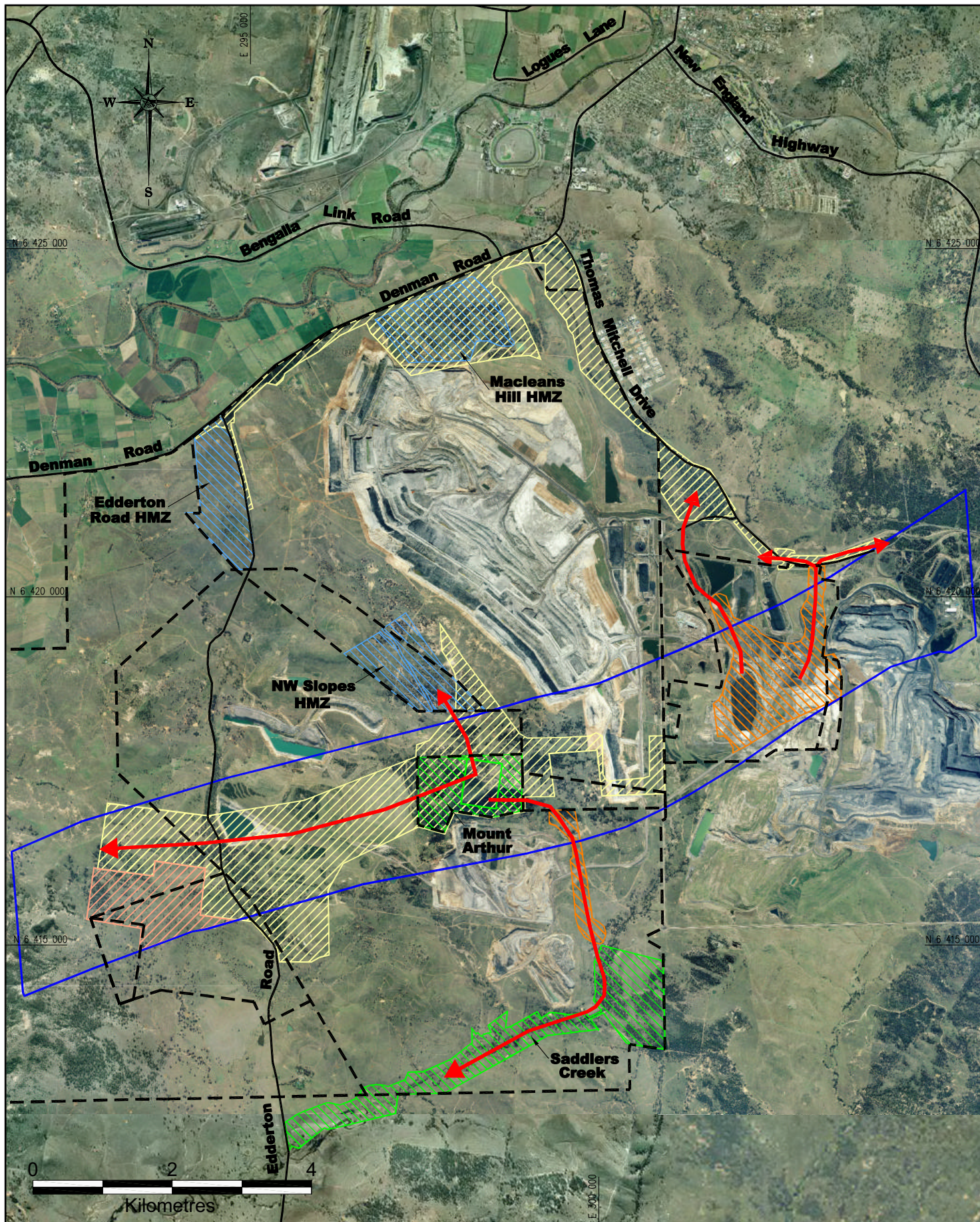
A chronological summary of the development of the Strategy is provided in **Table 4**, with additional detail on key aspects discussed below and illustrated on **Figure 6**.

Proposed Mount Arthur Conservation Area

The Mount Arthur Conservation Area was proposed as part of the MAN Archaeological and Cultural Heritage offset to preserve the Aboriginal cultural heritage values of this area. As part of the South Pit Extension Project EA, a commitment was made to extend the Conservation Agreement to include the protection of Mount Arthur's ecological values.

The Mount Arthur Conservation Area is significant in terms of both Aboriginal cultural heritage and biodiversity.

The Wanaruah Local Aboriginal Land Council, on behalf of local Aboriginal groups, observes that "the area surrounding and including Mount Arthur has great cultural and social significance to the Aboriginal people of the area and was an important cultural and economic transit way for thousands of years. Local Aboriginal groups also observe that Mount Arthur itself was a site used for teaching, was within easy walking distance of several significant sites and ceremonial grounds, and is in close proximity of the song line between the Hunter Valley and the coast".



- Mt Arthur Coal Mining & Exploration Leases
- Local Corridors
- Habitat Management / Improvement Zones (MAN EIS, 2000)
- Regional Habitat Links (Synoptic Plan NSW DMR 1999)
- Edderton Road Revegetation Area (MAU 2007)
- Regeneration Corridors - South Pit Extension
- MAN Heritage Management Zones
- Conservation Areas



Co-ordinate System: MGA Zone 56
Aerial Data: September 2008

Source: Umwelt (2007, 2008) NSW DMR (1999), Dames & Moore (2000)

MT ARTHUR COAL

Existing Biodiversity & Heritage Offset Strategy

Cad File: 03985E.dwg

Date: 24.08.09

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Figure

6

Table 4
Existing Biodiversity and Heritage Offset Strategy

Year	Approval	Management Area	Purpose
2001	Mt Arthur North	Mount Arthur Conservation Area	Aboriginal Archaeology and Cultural Heritage in the long term as specified in Planning Approval 144-05-2000.
		Macleans Hill Heritage Management Zone	Aboriginal Archaeology and Cultural Heritage in the long term as specified in Planning Approval 144-05-2000.
		West of Edderton Road Heritage Management Zone	Aboriginal Archaeology and Cultural Heritage in the long term as specified in Planning Approval 144-05-2000.
		Mt Arthur Northwest Slopes Heritage Management Zone	Aboriginal Archaeology and Cultural Heritage in the long term as specified in Planning Approval 144-05-2000.
		Habitat Management / Improvement Zones	Land Management to promote ecological connectivity in the short term.
2008	South Pit Extension	Mount Arthur Conservation Area	Ecology in the long term as specified in Planning Approval 06_0108.
		Regeneration Corridors and Rehabilitation Area	Ecology Connectivity in the long term as specified in Planning Approval 06_0108.
2008	Mt Arthur Underground	Saddlers Creek Conservation Area	Aboriginal Archaeology and Cultural Heritage and Ecology in the long term as specified in Planning Approval 06_0091.
		Edderton Road Revegetation Area	Management area to provide ecology connectivity as specified in Planning Approval 06_0091.
		Aboriginal Keeping Place and educational resources	Aboriginal Archaeology and Cultural Heritage in the short term.

The Mount Arthur Conservation Area is also significant in terms of biodiversity, as discussed further in **Section 8.6.1**. The area contains Critically Endangered Ecological Communities, habitat for threatened species and its relatively undisturbed forest provides unique habitat features such as rock crevices. The proximity of the Saddlers Creek Conservation Area enhances the value of the Mount Arthur Conservation Area for mobile species that roost in forest and woodland, but forage over creeks and water sources.

The development of a Conservation Agreement is currently underway to preserve the Aboriginal cultural heritage and ecological values of the Mount Arthur Conservation Area in perpetuity.

Saddlers Creek Conservation Area

The Saddlers Creek Conservation Area was initially proposed as part of the South Pit Extension as a Heritage Management and Conservation Area, although this is not a condition of approval or described in the Statement of Commitments. In the MAU EA, the existing Saddlers Creek Conservation Area was extended for ecological purposes. A Conservation Agreement, as required by the MAU Project Approval will be entered to protect this area.

The Saddlers Creek Conservation Area includes the main riparian channel of Saddlers Creek, which houses threatened vegetation communities and species.

The riparian vegetation along the creek also provides habitat for several threatened fauna species and a known population of the threatened listed Tiger Orchid.

The Saddlers Creek Conservation Area is significant in terms of Aboriginal heritage, as water sources such as Saddlers Creek, were common places of activity and recreation, to which local Aboriginal groups hold in great significance.

Heritage Management Zones / Heritage Management and Conservation Areas

Three Heritage Management Zones (HMZs) were preserved as part of the MAN Archaeological and Cultural Heritage offset package (see **Figure 6**).

The MAN EIS proposed the area to the west of Edderton Road as an offset for the impact of the disturbance of Aboriginal artefacts. During the application assessment process two additional areas (Macleans Hill and the Mount Arthur North West Slopes HMZs) were included as offsets and listed as a condition of the development consent.

There is no defined record of the cultural heritage values of the three HMZs in any consent conditions, Commission of Enquiry documentation or the Department of Urban Affairs and Planning (DUAP) Assessment Report. The MAN EIS and the archaeological assessment of that report (Kuskie 1999a) provides only brief assessment of the West of Edderton Road HMZ in terms of significance of Archaeological Terrain Units and very little assessment of heritage values for the areas that became Macleans Hill and Mount Arthur North West Slopes HMZs.

The approved Mt Arthur North Aboriginal Cultural Heritage Management Plan (ACHMP) (Umwelt, 2002) identifies the possibility that these HMZs might be impacted by future mining activities and that there was no long term conservation intended.

Habitat Management Areas (Existing Habitat Management / Improvement Zones)

Habitat Management Areas and Habitat re-instatement areas are a part of the way in which Mt Arthur Coal manages its undisturbed land.

These areas have been a part of the rehabilitation and offset strategies since the MAN EIS was developed (see **Figure 6**). A Habitat Management Area is defined in the MAN EIS as:

“areas created to compensate for the removal of existing open forest and to supplement the areal extent of available habitat. This will be achieved by supplemental plantings within existing fragmented patches of habitat, and revegetation of existing grassland. Habitat management areas will be established in areas which are not proposed to be disturbed in the initial 21 year mine life. The areas may be mined in the future if mining is continued beyond the 21 year mine life. This would require subsequent development consent.”

There have been no commitments made to protect Habitat Management Areas in perpetuity in any EA, planning approval or Statement of Commitment lodged by Mt Arthur Coal.

Mt Arthur Coal has commenced revegetation of Habitat Management Zones in some areas, focusing on those areas where the potential for future mining is low. Other areas have been included in ecological monitoring programs and maintained rather than actively regenerated. It should be noted that some of the areas shown as Habitat Management Areas / Improvement Zones in both the South Pit Extension and MAU EAs are disturbed areas planned to be rehabilitated with a biodiversity land use. Habitat Management Areas will ultimately form corridors of remnant, regrowth and rehabilitated native vegetation.

Regional Habitat Links

The landscape and revegetation management strategies undertaken at the Mt Arthur Coal Complex have been designed to incorporate the objectives of the Department of Primary Industries (DPI) *'Synoptic Plan for Mine Rehabilitation in the Upper Hunter Valley'* (Synoptic Plan) (Department of Mineral Resources, 1999).

The regional habitat links presented on **Figure 6** are referenced in the Synoptic Plan and will provide linkage between offset areas, rehabilitation areas and offsite vegetation areas. The establishment of ecological corridors enhances the flora and fauna integrity both locally and regionally.

Regenerated Corridors - South Pit Extension Project

As part of the South Pit Extension Project, a commitment was made to revegetate corridors to link the Saddlers Creek riparian corridor to the Mount Arthur Conservation Area (see **Figure 6**). This commitment superseded the commitment to create a Habitat Enhancement Area as required by the Bayswater No 3 EIS. Corridors will be established to provide habitat linkages by planting native species in undisturbed and rehabilitated areas. This area is part of the offset commitments of the South Pit Extension Project, and will be undertaken progressively during the life of the mine and finalised at the end of mine life.

Revegetation Area

The Edderton Road Revegetation Area located to the west of Edderton Road will be revegetated in order to enhance the ecological corridor function in the Synoptic Plan (see **Figure 6**). This area is called the 'Edderton Road Revegetation Area' in the MAU Project Approval and will be gradually revegetated over the life of the Project with the aim of strengthening the ecological corridors found within the Mt Arthur Coal Complex and the coalfields of the Hunter Valley more generally.

Rehabilitation

Rehabilitation at the Mt Arthur Coal Complex is divided into: areas for biodiversity outcomes and areas of pasture (the predominant previous site land use). All rehabilitation strategies aim for a net increase in native vegetated areas at the end of mine life due to rehabilitation targeting native vegetation communities.

Aboriginal Keeping Place and Educational Resources

Further to the designation of the Saddlers Creek Conservation Area to offset impacts from the MAU on Aboriginal cultural heritage, Mt Arthur Coal committed to implementing additional cultural heritage management measures prior to longwall mining as part of the overall Aboriginal cultural heritage offset strategy, including:

- The funding and construction of a Keeping Place within the proposed Saddlers Creek Conservation Area as part of the Aboriginal cultural heritage offset strategy;
- The Keeping Place will have a storage room for artefacts and display centre for teaching / education purposes. The Keeping Place will be staffed for 50 days per annum by appropriately trained Aboriginal community representatives;
- Funding the training of five representatives from the registered stakeholder groups to undertake 'Collections Training' at the Australian Museum for staffing of the proposed Keeping Place;
- Construction of a facility suitable for use by the Aboriginal community when using the area for teaching purposes; and
- Provide training for up to one member of the registered Aboriginal stakeholder groups in relation to site and artefact recording and basic analysis.

3.6 EXISTING REGULATORY APPROVALS

The currently approved mining activities at the Mt Arthur Coal Complex are described in **Section 3.1**. In accordance with the Director-General's EARs, copies of these approvals are included in **Appendix A**.

Mining operations are approved under six separate planning approvals within a number of mining tenements, the status of which are shown in **Table 5** and **Table 6**.

Existing planning approvals which will be surrendered by HVEC following the grant of the new Project Approval at an appropriate time as agreed with DoP, are indicated with an asterisk (*).

HVEC also holds a number of other ancillary environmental licences and approvals to conduct its mining and associated activities which are summarised in **Table 7**.

Applications will be made to vary the above list of ancillary environmental licences and approvals as required to facilitate the Project following the grant of Project Approval, as discussed in **Section 4**.

Table 5
Current Planning Approvals Status

Ref	Planning Approval No	Approval title	Date Granted	Approval Authority	Status
1.	210/93 *	Bayswater No 3 Mine	12/09/94	Department of Planning	Current
2.	105-04-00 *	Construction and operation of the Rail loading Facility and Rail Loop	02/11/00	Department of Planning	Current
3.	114-05-2000 *	Development of Mt Arthur North open cut coal mine and construction and operation of associated surface facilities	01/05/01	Department of Planning	Current
4.	06_0108 *	Mt Arthur Coal Mine South Pit Extension Project	09/01/08	Department of Planning	Current
5.	06_0040	Mt Arthur Coal Exploration Adit	20/09/06	Department of Planning	Current (Expires in 2011)
6.	06_0091	Mt Arthur Underground Project	02/12/08	Department of Planning	Current

** Existing planning approvals to be surrendered following the approval of the Project, as agreed with DoP.*

Table 6
Current Mining Tenements Status

Ref	No	Tenement title	Duration	Authority
1.	CCL 774	Consolidated Coal Lease 774 for Bayswater No 2	03/07/89 – 21/01/28	Department of Primary Industries – Mineral Resources (DPI-MR)
2.	CL 396	Coal Lease 396 for Bayswater No 2	03/05/03 – 03/02/24	DPI-MR
3.	ML 1358	Mining Lease 1358 for Bayswater No 3	21/09/94 – 20/09/15	DPI-MR
4.	ML 1593	Mining Lease 1593 for Bayswater No 3	30/04/07 – 29/04/28	DPI-MR
5.	ML 1487	Mining Lease 1487 for Mt Arthur North	16/06/01 – 12/06/22	DPI-MR
6.	ML 1548	Mining Lease 1548 for Mt Arthur North	31/05/04 – 30/05/25	DPI-MR
7.	A 171	Authorisation 171 for Bayswater No 2	27/10/04 – 25/11/10	DPI-MR
8.	A 437	Authorisation 437 for Bayswater No 3	04/03/91 – 04/03/10	DPI-MR
9.	EL 5965	Exploration Licence 5965 for Bayswater No 3	15/07/02 – 15/07/12	DPI-MR
10.	MPL 263	Mining Purposes Lease 263 for Bayswater No 2	17/10/90 – 17/10/11	DPI-MR

Table 7
Current Other Licences Status

Ref	Approval No	Approval title	Issue Date	Authority
1.	113	Environmental Protection Licence	01/06/00	Department of Environment and Climate Change (DECC)*
2.	11457	Environmental Protection Licence	09/10/01	DECC*
3.	651	General Security Water Access	02/05/08	Department of Water and Energy (DWE)
4.	828	General Security Water Access	02/05/08	DWE
5.	918	General Security Water Access	14/11/07	DWE
6.	919	General Security Water Access	16/06/06	DWE
7.	935	General Security Water Access	24/01/07	DWE
8.	936	General Security Water Access	16/06/06	DWE
9.	937	General Security Water Access	23/01/09	DWE
10.	8416	General Security Water Access	13/12/06	DWE
11.	1012	General Security Water Access	02/05/08	DWE
12.	1041	General Security Water Access	02/05/08	DWE

Ref	Approval No	Approval title	Issue Date	Authority
13.	1082	General Security Water Access	24/08/07	DWE
14	1092	General Security Water Access	16/06/06	DWE
15.	1108	General Security Water Access	02/05/08	DWE
16.	16138	General Security Water Access	28/10/08	DWE
17.	827	High Security Water Access	02/05/08	DWE
18.	917	High Security Water Access	14/02/08	DWE
19.	934	High Security Water Access	16/06/06	DWE
20.	1080	High Security Water Access	16/06/06	DWE
21.	1107	High Security Water Access	02/05/08	DWE
22.	1277	Supplementary Water Access	02/05/08	DWE
23.	1296	Supplementary Water Access	14/11/07	DWE
24.	829	Domestic Stock Water Access	31/03/05	DWE
25.	863	Domestic Stock Water Access	31/03/05	DWE
26.	20BL171995	Groundwater Bore Certificate	05/11/08	DWE
27.	20BL168155	Groundwater Bore Certificate	28/05/07	DWE
28.	20BL170620	Groundwater Bore Certificate	05/12/06	DWE
29.	20BL171156	Groundwater Bore Certificate	13/03/07	DWE
30.	20BL171833	Groundwater Bore Certificate	01/05/08	DWE
31.	20BL169992	Groundwater Bore Certificate	15/12/05	DWE
32.	20BL169989	Groundwater Bore Certificate	14/12/05	DWE
33.	20SL060753	Surface Cutting Licence	17/08/06	DWE
34.	N/A	Section 126 Ministerial Approval under the <i>Coal Mines Regulation Act 1992</i> for Tailings Emplacement Area at Bayswater No 2 Coal Mine (RL 230)	24/02/06	DPI-MR

* Mt Arthur Coal is currently consolidating Environmental Protection Licences 113 and 11457.

3.7 ENVIRONMENTAL MANAGEMENT SYSTEM

Mt Arthur Coal has developed and implemented a comprehensive EMS that provides a framework to facilitate compliance with legal and other requirements (including statutory approvals, BHP Billiton requirements and stakeholder expectations). The EMS is certified against ISO14001, which is the benchmark International Standard for the development, implementation and continual review and improvement of an environmental management system. The EMS incorporates the following:

- Policy;
- Planning;
- Implementation and operation;
- Measurement and evaluation; and
- Continuous review and improvement.

The EMS framework encourages continual improvement in performance at the Mt Arthur Coal Complex and is based upon a suite of procedures and management plans which have been prepared for site activities with a potential to generate environmental impacts.

These plans and procedures are regularly reviewed, communicated to the workforce and audited for compliance and to ensure high levels of environmental performance.

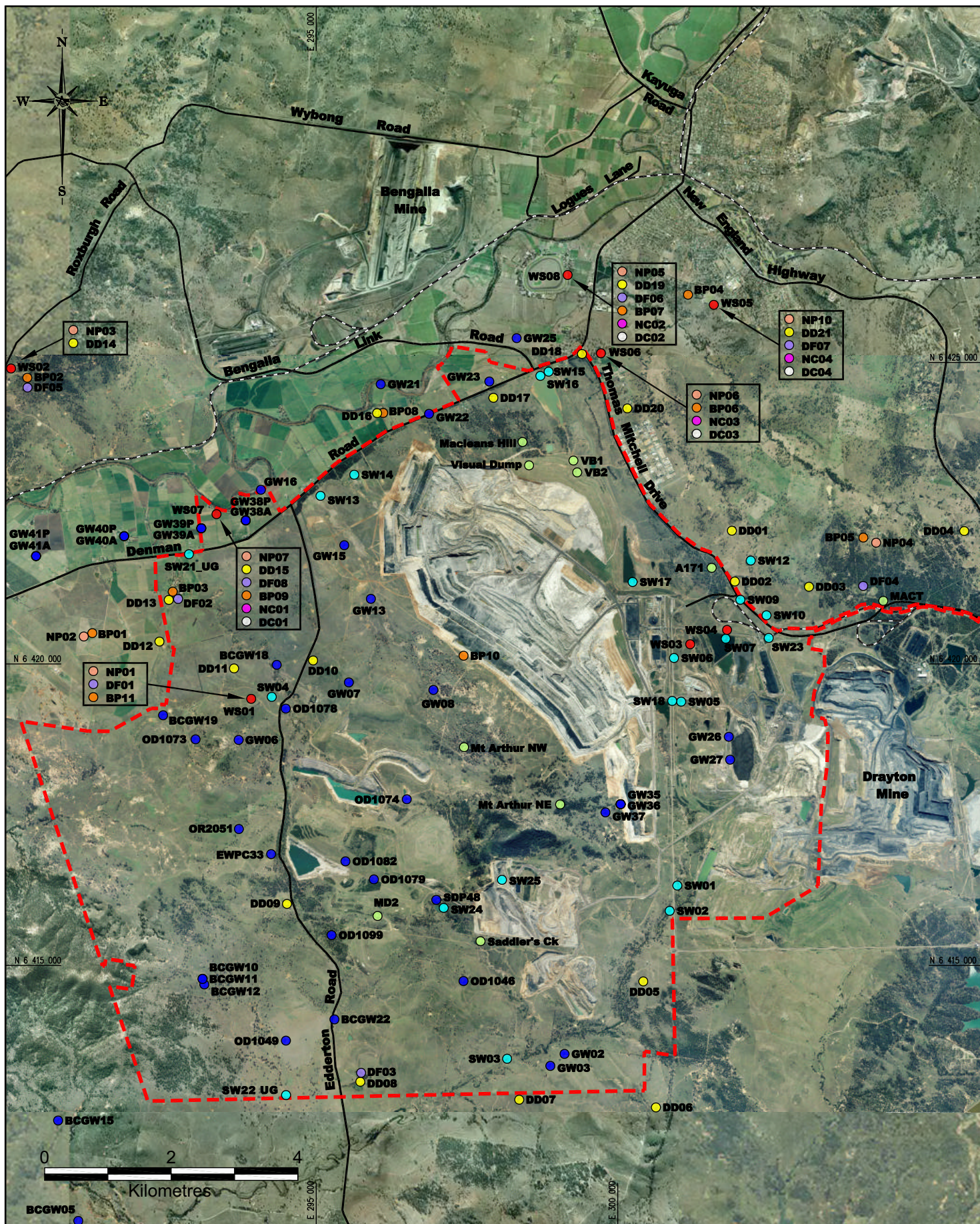
3.8 ENVIRONMENTAL MONITORING SYSTEM

A key component of the EMS is the Mt Arthur Coal Environmental Monitoring Program (EMP). The EMP allows Mt Arthur Coal to effectively manage and measure its environmental performance through a comprehensive monitoring system.

Mt Arthur Coal's existing environmental monitoring system is illustrated on **Figure 7** and includes:

- Eight meteorological stations (including stations on Barn Owls);
- Eight High Volume Air Samplers (HVAS) PM₁₀, four real-time continuous dust monitors, 21 depositional dust gauges;
- Four continuous noise monitors, six quarterly attended noise monitoring locations;
- 44 groundwater monitoring locations; and
- 21 surface water sampling points.

EMP results are published in the Mt Arthur Coal Annual Environmental Management Report (AEMR) and distributed to Government Agencies, employees, the Community Consultative Committee (CCC), the local library and via the Mt Arthur Coal website.



- EA Boundary
- Meteorological Station
- Ground Water Monitoring Site
- Surface Water Monitoring Site
- Flora & Fauna Monitoring Site
- Blast Monitoring Site
- Depositional Dust Monitoring Site
- Real-time Dust Monitoring Site
- HVAS PM10 Monitoring Site
- Periodic Noise Monitoring Site
- Real-time Noise Monitoring Site



Co-ordinate System: MGA Zone 56
Aerial Date: September 2008

MT ARTHUR COAL

Environmental Monitoring System

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Figure
7

4 THE PROJECT

This section includes a detailed description of the Project including: the conceptual mine plan, its staging and interaction with existing Mt Arthur Coal approvals, equipment and manning requirements, a description of upgrades / modifications to infrastructure, waste strategy and construction phases. It also includes a discussion on the need for the Project and a justification of the proposed mine plan.

HVEC seeks Project Approval from the Minister for Planning under Part 3A of the EP&A Act to gain a single, contemporary Planning Approval for its open cut operations and the mining of additional areas within its current mining leases and on the land listed in **Appendix B**. The Project continues all aspects of the Mt Arthur Coal Complex and specifically includes the following:

- Consolidation of all of open cut mining related Planning Approvals into one contemporary Project Approval;
- Extending the mine footprint to uncover additional coal reserves within the current mining leases;
- Increasing the Mt Arthur Coal Complex approved production levels by 8 Mtpa up to 36 Mtpa ROM coal. This will be achieved by;
 - o Increasing open cut coal production by up to 8 Mtpa; and
 - o Having the flexibility to increase either open cut or underground production by an additional 4 Mtpa if the maximum production from either underground or open cut methods is not being met (to a maximum of 36 Mtpa from the Mt Arthur Coal Complex);
- Upgrading the existing Mt Arthur Coal CHPP to process up to 36 Mtpa of ROM coal and allow the development of an ultra-fines coal plant to re-process fines which will facilitate increased resource recovery and reduce water demand;

- Increasing the approved rail haulage capacity, in line with the increased coal production, from 19 Mtpa to 27 Mtpa product coal, with the construction of a second Rail Loading Facility and associated conveyor system;
- Modifications to existing infrastructure (such as workshop and bathhouse), construction of additional ROM coal hoppers and the extension of ROM and product coal stockpiles; and
- A total workforce of approximately 2,600 at peak production, which represents an increase of approximately 1,610 from current staffing levels and an estimated additional 720 positions directly attributable to the Project.

A summary table of key aspects of the Project as compared to approved mining operations at Mt Arthur Coal is shown in **Table 8**.

Key aspects of the Project are described further below.

4.1 CONCEPTUAL MINE PLAN

4.1.1 Mine Layout

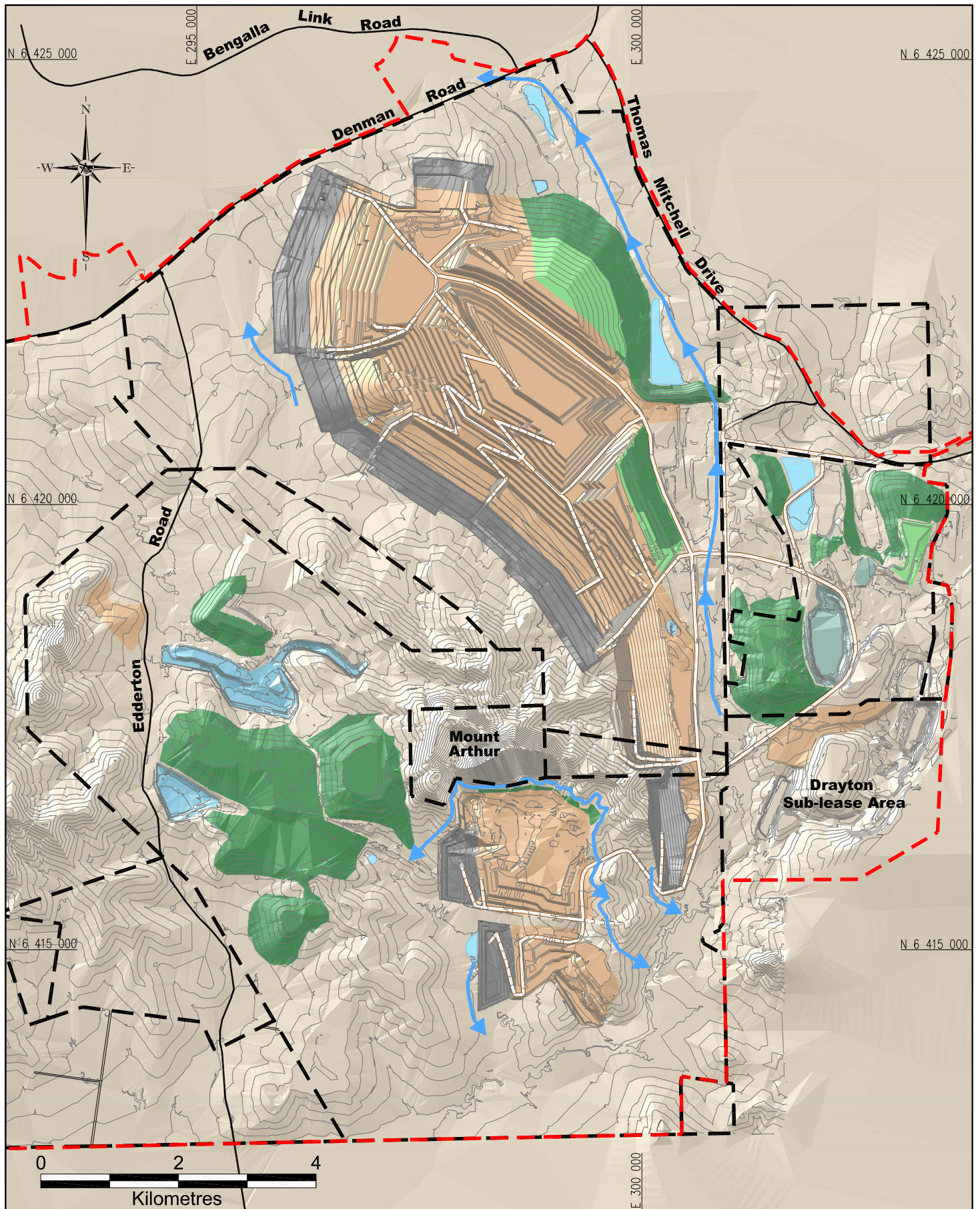
The Project seeks to extend the open cut mining footprint at the Mt Arthur Coal Complex to uncover an additional 100 Mt of thermal coal from within current mining leases. The Project will continue to extract coal resources to the Ramrod Creek coal seam via a shovel and excavator operation until (at least) 2022 (consistent with the MAN Planning Approval). The Project is a logical progression of mining of the available and previously identified coal resource within Mt Arthur Coal's mining leases.

The conceptual mine plan layout for the Project is shown on **Figure 8**, **Figure 9** and **Figure 10** for years 2011, 2016 and 2022 respectively. The modelled mine plan years correspond to years 10, 15 and 21 from the MAN EIS (URS 1997). The years referred to are indicative only and may vary due to actual production achieved.

Table 8
Project Key Components and Comparison with existing Mt Arthur Coal Approvals

Component	The Project	Existing Mt Arthur Coal Approvals
Production	Increasing the Mt Arthur Coal Complex approved production levels by 8 Mtpa up to 36 Mtpa ROM coal. This will be achieved by; - Increasing open cut coal production by up to 8 Mtpa; and - Having the flexibility to increase either open cut or underground production by an additional 4 Mtpa if the maximum production from either underground or open cut methods is not being met (to a maximum of 36 Mtpa from the Mt Arthur Coal Complex).	Maximum production of 28 Mtpa ROM coal from the Mt Arthur Coal complex, comprised of: - Up to 20 Mtpa ROM coal extracted by open cut mining methods; and - Up to 8 Mtpa ROM coal extracted by underground mining methods.
Mining Areas	The additional Mine Extension Areas for the Project in relation to Mt Arthur Coal's existing approved disturbance areas is shown on Figure 11. Open cut mining and disturbance activities will occur within the Mt Arthur Coal Complex Consolidated Disturbance Line, which combines all existing and approved disturbance areas (see Figure 12). Underground mining will remain consistent with the approved mine plan.	Open cut mining and disturbance activities within the operations of Bayswater No 2, Bayswater No 3, MAN and South Pit extension (see Figure 11). Underground mining consistent with the approved mine plan (PA 06_0091).
Overburden Emplacement	Increase in Mt Arthur North overburden emplacement height to an average of RL 360 m (maximum height of RL 375 m AHD to create visual relief on the overburden emplacement area). Development of Bayswater No 3 (Saddlers Pit) overburden emplacement height up to RL250 m AHD (no change to existing approval). Development of Drayton sub-lease emplacement area up to RL 290 m AHD (part of South Pit extension). Development of an out-of-pit overburden emplacement area up to RL 360 m AHD.	Development of the MAN eastern emplacement area (closest to Denman Road) up to RL 245 m AHD and development of the MAN inner emplacement area (towards Mount Arthur) up to RL 300 m AHD. Development of Bayswater No 3 (Saddlers Pit) emplacement area up to RL 250 m AHD. Development of Drayton sub-lease emplacement area up to RL 290 m AHD (part of South Pit extension).
Project Life	Approval for open cut mining including the Bayswater No 3 area is sought until 2022. Approval for underground mining will remain unchanged, consistent with existing approvals.	Open cut mining is approved in the Mt Arthur North, South Pit extension until 2022. Open cut mining in Bayswater No 3 is approved until 2015. Underground mining is approved until 2030.
Coal Processing	Upgrade of the existing Mt Arthur Coal CHPP to process up to 36 Mtpa of ROM coal and allow other flexibilities, as detailed in Section 4.2.	Approved processing rate for the Mt Arthur Coal CHPP of 28 Mtpa ROM coal.

Component	The Project	Existing Mt Arthur Coal Approvals
Coarse Rejects and Tailings Management	Tailings will continue to be disposed of in the tailings emplacement area at Bayswater No 2. Approval to dispose tailings in Drayton sub-lease void will be maintained. The tailings emplacement area will be extended (up to RL 280 m AHD). Coarse reject will continue to be co-disposed within overburden emplacement areas (consistent with existing approval).	Tailings is disposed and dewatered in the tailings emplacement area at Bayswater No 2. Option to dispose tailings in the Drayton sub-lease void is also approved. Coarse reject is co-disposed within the overburden emplacement areas.
Product Coal Transport	Transport of up to 27 Mtpa product coal via the Rail Loading Facility on the existing rail loop along the Antiene Rail Spur and Main Northern Railway Line. Maximum of 24 rail movements per day (no change to existing approval). Use of the existing overland conveyor to Macquarie Generation's Bayswater Power Station, as required.	Transport of up to 19 Mtpa product coal via the Rail Loading Facility on the existing rail loop along the Antiene Rail Spur and Main Northern Railway Line. Maximum of 24 rail movements per day. Use of the existing overland conveyor to Macquarie Generation's Bayswater Power Station for transport of domestic coal, as required.
Employment	Total workforce of approximately 2,600 full-time equivalents employees during peak production. A workforce of approximately 240 full-time equivalent employees will be required during peak construction phases.	Total approved workforce (open cut and underground operations) of 1,138 full-time equivalent employees.
Hours of Operation	All coal operations and associated activities will continue to be undertaken 24 hours per day, seven days a week. Construction onsite may be on a 24 hour, seven day roster consistent with operational requirements. Construction hours for the proposed Edderton Road realignment are 7:00 am to 5:00 pm Monday to Saturday (except in the case of an emergency).	All coal operations and associated activities will be undertaken 24 hours per day, seven days a week.
Offset Strategy	Consolidation of proposed and existing offset commitments into the Mt Arthur Coal Consolidated Offset Strategy (see Figure 26). This includes 849 ha of existing long term offset commitments from previous Planning Approvals and 2,222 ha of new offset commitments proposed for the Project, to create a total Offset Strategy of 3,071 ha to be protected in the long term.	The following are to be protected in the long term (as specified in Planning Approvals) as part of Mt Arthur Coal's existing Biodiversity and Heritage Offset Strategy (presented in Table 4) of 1,257 ha: - Mount Arthur Conservation Area; - Saddlers Creek Conservation Area; - Heritage Management Zones; - Edderton Road revegetation area; - Revegetation corridors; and - Rehabilitation Areas.



- Mt Arthur Coal Mining & Exploration Leases
- EA Boundary
- Active Mining
- Spoil
- Tailings
- Existing Rehabilitation
- Proposed Rehabilitation
- Water Storage
- Drainage
- Haul Roads

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Co-ordinate System: MGA Zone 56

MT ARTHUR COAL

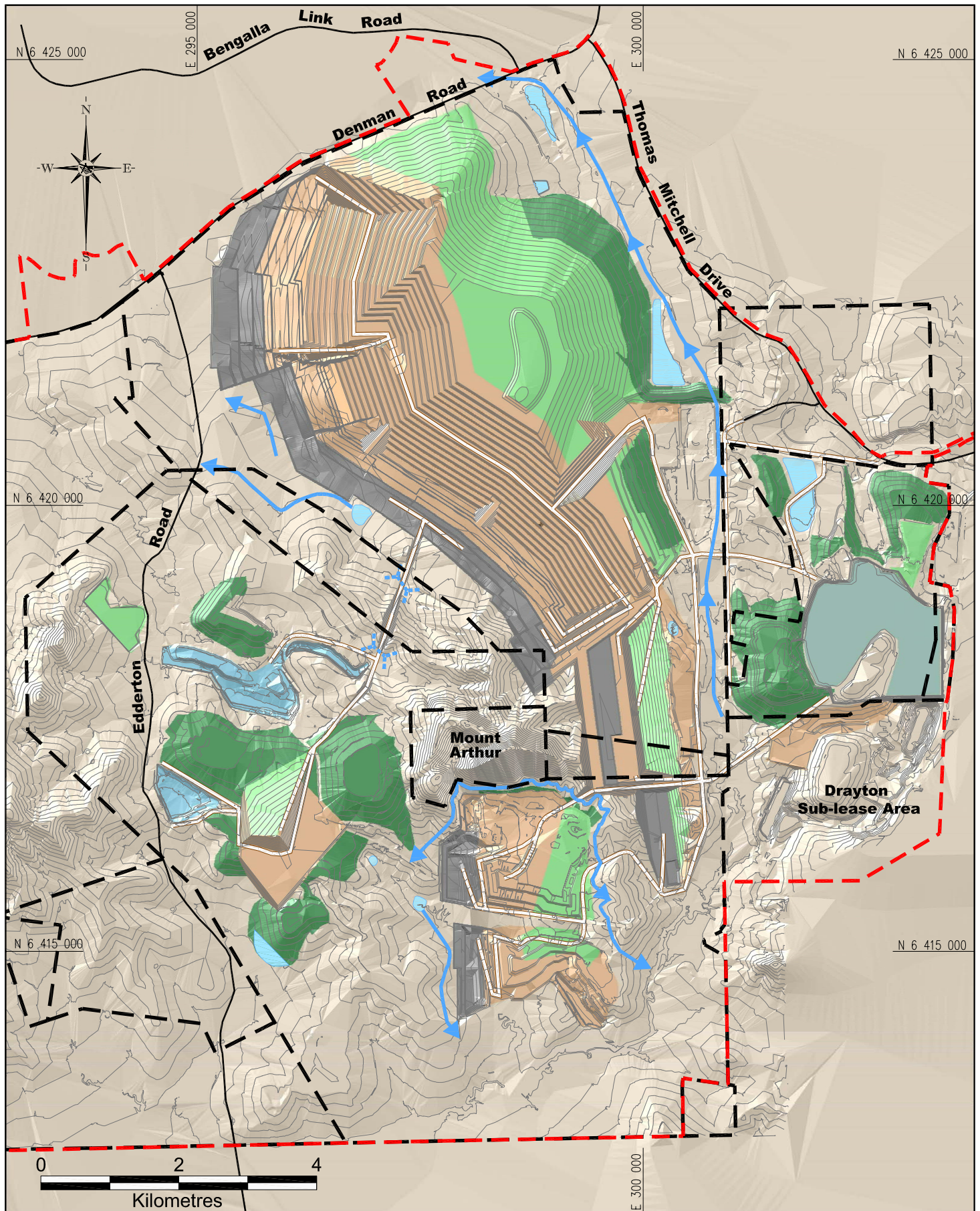
Conceptual 2011 Mine Plan

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Date: 25.08.09

Drawn: JD

Figure
8



- Mt Arthur Coal Mining & Exploration Leases
- EA Boundary
- Active Mining
- Spoil
- Tailings
- Existing Rehabilitation
- Proposed Rehabilitation
- Water Storage
- Drainage
- Haul Roads
- Culvert

Hansen Bailey



Co-ordinate System: MGA Zone 56

MT ARTHUR COAL

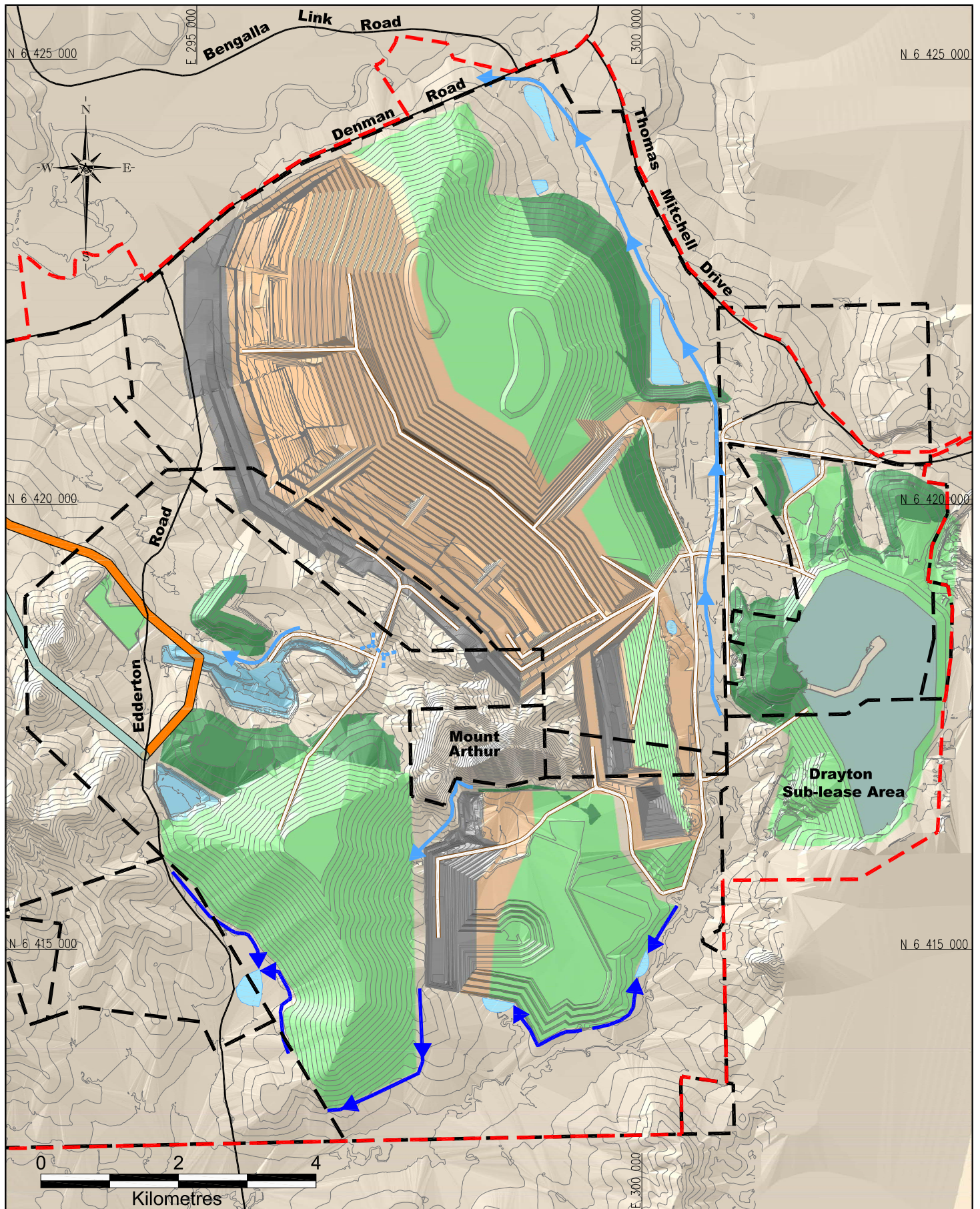
Conceptual 2016 Mine Plan

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Drawn: JD

Figure
9



- Mt Arthur Coal Mining & Exploration Leases
- EA Boundary
- Edderton Road Realignment Option 1
- Edderton Road Realignment Option 2
- Active Mining
- Spoil
- Tailings
- Existing Rehabilitation
- Proposed Rehabilitation
- Water Storage
- Drainage
- Haul Roads
- Culvert
- Collection Drain

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Co-ordinate System: MGA Zone 56

MT ARTHUR COAL

Conceptual 2022 Mine Plan

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Date: 24.08.09

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Figure
10

The additional Mine Extension Areas for the Project in relation to Mt Arthur Coal's existing approved disturbance areas is shown on **Figure 11**.

As indicated in the above figures, mining operations will predominantly continue in the north of the operation and the South Pit extension mining areas, as currently approved. The Project extends coal extraction to the north to Macleans Hill (leaving the eastern flank intact) and further west impacting upon Edderton Road. Coal extraction continues in the Saddler's Pit area (Bayswater No 3), in the southern half of the operation, whilst an out-of-pit overburden emplacement area is to be established in the south west of the operation, above the approved MAU development area. An additional overburden emplacement area may also become available in the already disturbed Macquarie Generation conveyor corridor.

The Belmont Pit mining area to the west of Edderton Road (as approved in the Bayswater No 3 Development Consent) will be maintained to allow access to the Glen Munro Seam as described in the MAU Project Approval.

The existing overburden emplacement area will be increased to an average upper height of approximately RL 360 m, whilst two additional crests up to height of approximately RL 375 m have been incorporated on the overburden emplacement area for visual amenity (see **Figure 8**, **Figure 9** and **Figure 10**).

A levee will be required south of Denman Road after 2011, the exact location of which will be confirmed through consultation with DWE, but will be within the disturbance areas as shown on **Figure 11**.

The Mt Arthur Coal Complex Consolidated Disturbance Boundary is shown on **Figure 12**. This Disturbance Boundary is the extent of all existing approved Open Cut disturbance boundaries at Mt Arthur Coal and the proposed Mine Extension Areas for the Project.

A conceptual final landform design for the Project (upon the completion of mining activities) has been developed in the event that further approvals are not forthcoming to progress open cut mining further to the west. This has been prepared to confirm that if mining was not to be continued beyond 2022 then the orderly closure of the Mt Arthur Coal Complex could be achieved.

A discussion of the post-mining land use and management of the final landform and final voids is provided in **Section 8.15**. The conceptual final landform indicates the presence of two voids – one larger void located in the MAN pit and a smaller void within the Saddlers Pit.

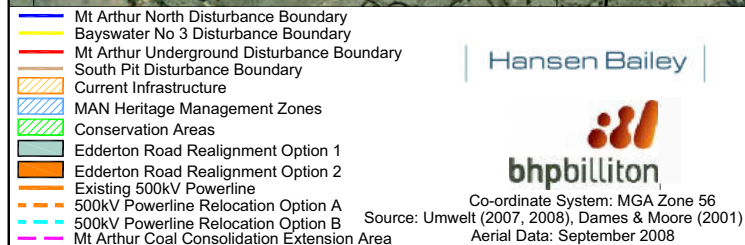
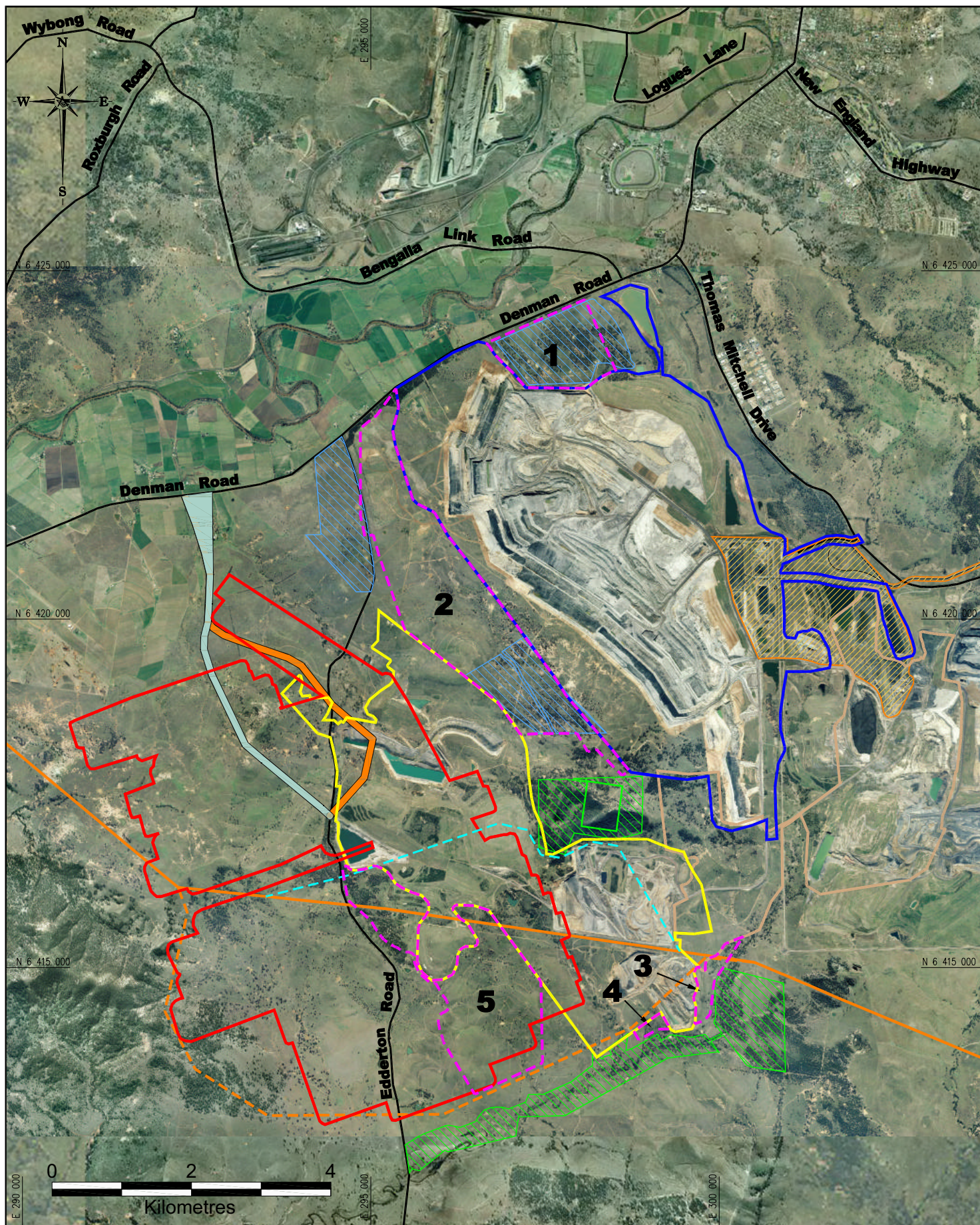
The surface catchment of the final voids will be minimised as far as is practical by the use of diversion drains and contour banks.

4.1.2 Mining Schedule and Method

An indicative open cut ROM coal production schedule for the Project is outlined in **Table 9**. The conceptual open cut mining schedule for the Project involves a gradual increase in ROM production levels until maximum production rates (i.e. 36 Mtpa) are achieved around 2014. The increase in total approved ROM coal production levels from the Mt Arthur Coal Complex will be achieved by:

- Increasing open cut coal production by up to 8 Mtpa; and
- Having a flexibility to increase either open cut or underground production by an additional 4 Mtpa if the maximum production from either open cut or underground methods is not being met (total to not exceed 36 Mtpa).

Mt Arthur Coal will continue to conduct a shovel and excavator operation supported by a truck fleet to transport coal to onsite coal processing and transport facilities. The use of a dragline or other such method to increase productivity and reduce environmental impacts will be utilised if such resources become available.



MT ARTHUR COAL

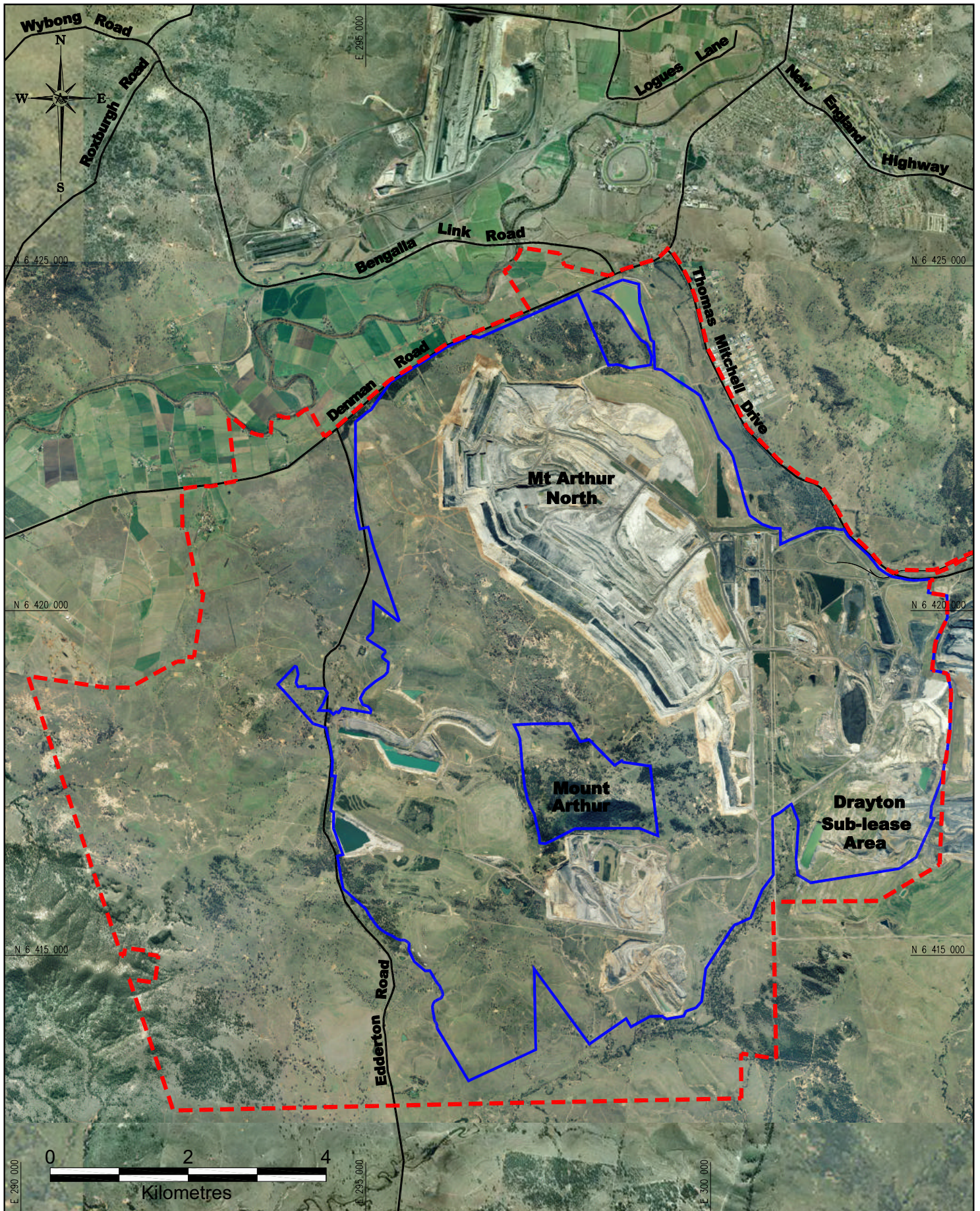
Project Interaction with Approved Operations

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Figure
11



- EA Boundary
- Mt Arthur Coal Consolidated Disturbance Boundary

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Co-ordinate System: MGA Zone 56
Aerial Data: September 2008

MT ARTHUR COAL

Consolidated Open Cut Disturbance Area

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Figure
12

Table 9
Conceptual Materials Schedule (Indicative Only)

Project Year	Total Overburden (Mbcm)	ROM Coal (Mtpa)			Product Coal (Mtpa)	Coarse Reject (Mtpa)	Tailings (Mtpa)
		Open Cut	Underground	Complex Total			
2011	98.4	16.7	8.0	24.7	19.0	4.2	3.5
2016	169.2	32.0	4.0	36.0	27.5	6.2	5.9
2022	143.6	28.0	8.0	36.0	27.5	6.2	5.9

ROM coal produced from the MAU will be transported to the CHPP in a manner consistent with that approval. Minor infrastructure associated with day to day mining operations, including topsoil stockpiles, sediment control and sub-stations will be constructed ahead of mining within the Mt Arthur Coal Consolidation Disturbance Boundary as required.

4.2 INFRASTRUCTURE UPGRADES AND MODIFICATIONS

Existing infrastructure at the Mt Arthur Coal Complex will continue to be utilised for the Project, with some upgrades required to facilitate the increased coal extraction levels sought.

4.2.1 CHPP Upgrades

Coal Processing Plant

The Project will include an upgrade of the existing Mt Arthur Coal CHPP to process up to 36 Mtpa of ROM coal from the open cut and underground mining operations. This will include an ultra-fines coal plant to re-process fines and facilitate increased resource recovery, reduce water demands and reduce waste production.

Additional coal washing modules will be required as part of the Project to meet the planned increase in production and will be located within the existing Infrastructure Area (see **Figure 13**). These modules will provide the ability for product coal to be delivered directly to the export coal stockpile or coal stockpiles via a series of conveyors.

Additional ancillary infrastructure will also be installed as part of the Project. An additional reject facility with approximately 1,500 t capacity will be constructed within the ROM coal area.

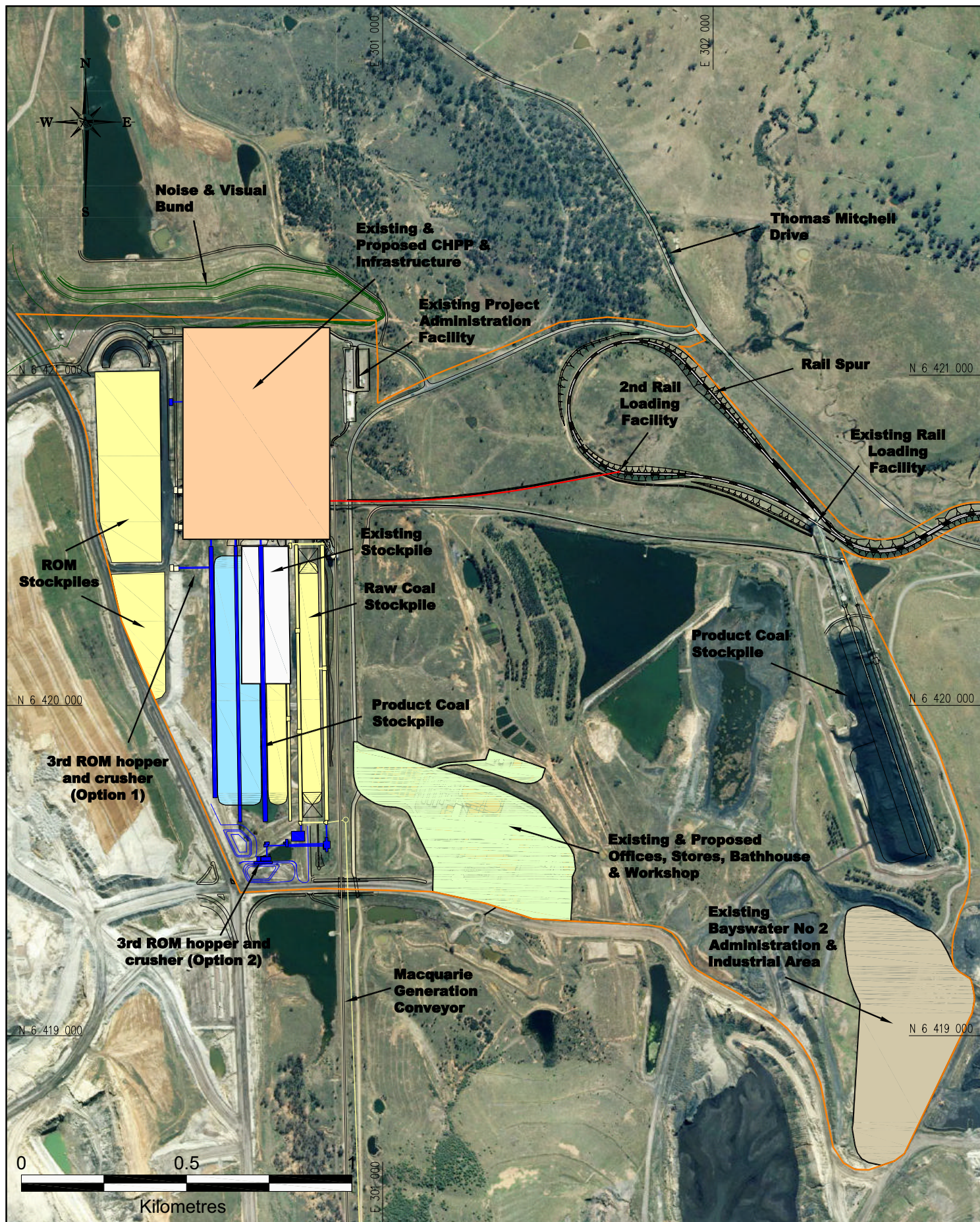
ROM Coal Hopper Facility

Additional ROM coal hopper facilities are proposed to be located near the existing CHPP at the southern end of the stockpiles as indicated on **Figure 13**. The final location of the ROM coal hopper facilities will be subject to detailed engineering designs but is anticipated to be located within the Infrastructure Area.

The two options for the ROM coal hopper facilities are shown on **Figure 13**. The ROM coal hopper facilities will receive ROM coal from both the open cut and underground operations. The ROM coal hopper facilities will be fitted with dust suppression hoods and automatic water sprays (or equivalent dust suppression system) to minimise dust generation.

A feeder will draw ROM coal from the hopper to a primary sizer where the coal will be reduced and conveyed via a transfer station to a secondary sizing station. The ROM coal will then be fed via a dual stream screening station (to remove any reject material) to a tertiary sizing station.

Sized coal will be conveyed to a transfer station from where it can be conveyed to the CHPP modules or placed on the raw coal stockpile.



- Existing Stockpiles
- Existing Bayswater No 2 Administration Area
- Existing & Proposed CHPP
- Existing & Proposed Offices & Workshop Area
- Approved but not yet constructed Infrastructure
- Proposed Infrastructure
- Proposed Stockpile
- Proposed Second Rail Loading Facility & Conveyor
- Indicative Infrastructure Area
- Railway

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Co-ordinate System: MGA Zone 56
Aerial Date: September 2008

MT ARTHUR COAL

Existing & Conceptual Infrastructure Layout

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Date: 01.09.09

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Figure
13

4.2.2 Coal Stockpile Extensions

An extension of the ROM and product coal stockpiles at the Mt Arthur Coal Complex will be required for the Project to store the additional coal throughput. The existing approved footprint of the product stockpiles will be extended west, to provide capacity for two additional stockpiles of approximately 570,000 t capacity for each stockpile. These stockpiles may be fed by a series of conveyors. Additional coal stackers may also be established on the stockpile extensions, while coal reclaim to the CHPP from these stockpiles may be via bucket wheel reclaimers. A general arrangement of the stockpile layout is illustrated in **Figure 13**.

4.2.3 Second Rail Loading Facility

A second Rail Loading Facility is proposed to be installed as part of the Project to accommodate the increased production levels at the Mt Arthur Coal Complex. The second Rail Loading Facility will be established on the existing rail loop at the conceptual location indicated on **Figure 13**. An overland conveyor from the CHPP and stockpiles will feed the second Rail Loading Facility. The Rail Loading Facility and the conveyors will be fully enclosed within a building to minimise dust and noise generation.

4.2.4 Surface Facilities

The Project will also require both the modification of existing surface facilities and the construction of new infrastructure.

These infrastructure modifications and additions will be undertaken by Mt Arthur Coal within the Existing and Proposed Offices and Workshop Area (see **Figure 13**) to minimise any additional surface disturbance and will include:

- Extension of existing car parking areas to facilitate the increased workforce;
- Extension or duplication of the existing bathhouse, workshop and warehousing areas;
- Extension or duplication of the Administration building;
- Heavy vehicle wash-down bays, drive-through service and repair bays;
- Relocation of the site helipad; and
- A new intersection for heavy vehicle entry to the industrial area off the Mt Arthur Coal Access Road.

The following infrastructure modifications will be undertaken within the Indicative Infrastructure Area (see **Figure 13**):

- Bulk oil storages and fuel tanks;
- Modifications to power and water reticulation systems; and
- Water storage and retention basins.

4.3 EQUIPMENT FLEET MODIFICATIONS

The Project will require the operation of a number of items of mobile equipment in addition to the currently approved Mt Arthur Coal Complex fleet to accommodate the increased rate of coal extraction and other ancillary equipment such as lighting plants, pumps, 4WDs, etc. An indicative equipment fleet required for the Project is provided in **Table 10**.

Table 10
Indicative Mobile Equipment List

Equipment	2011	2016	2022
Electric Face Shovels	3	5	4
Excavators	13	18	16
Trucks	71	107	94
Graders	8	11	9
Bulldozers	19	28	24
Rubber Tyre Bulldozers	6	8	7
Watercarts	4	8	7
Drills	6	8	7

4.4 COAL TRANSPORTATION

The Project will require additional rail loading infrastructure to manage the increased export coal production from 19 Mtpa to 27 Mtpa, with the construction of a second Rail Loading Facility and associated conveyor system (discussed in **Section 4.1.1**).

A total of 24 rail movements per day have previously been assessed and approved from the Mt Arthur Coal Complex (as discussed in **Section 3.1**) (note: each train entering and exiting the Rail Loading Facility is classified as two train movements. The Project will not exceed the currently approved rail movements in any one day.

All export product coal will continue to be transported via the Rail Loading Facility located on the existing rail loop along the Antiene Rail Spur and Main Northern Railway Line.

Residents in Antiene (to the east of the New England Highway) have previously raised concern in regard to trains blocking the Antiene Railway Station Road low level crossing in their area. Mt Arthur Coal will continue to work with Anglo Coal, Muswellbrook Shire Council and Macquarie Generation to address the current access situation for receivers in the Antiene area which are affected by trains blocking the Antiene Railway Station Road level crossing.

The existing overland conveyor from the Mt Arthur Coal Complex to Macquarie Generation's Bayswater Power Station will continue to be utilised to transport domestic coal as required.

4.5 HOURS OF OPERATION AND EMPLOYMENT

A total workforce of approximately 2,600 will be required at the Mt Arthur Coal Complex during at peak production, which represents an increase of approximately 1,610 from current staffing levels and an estimated additional 720 positions directly attributable to the Project. Workforce requirements for construction phases of the Project are discussed in **Section 4.9**.

All coal mining operations and associated activities at the Mt Arthur Coal Complex will continue to be undertaken up to 24 hours per day, seven days a week.

4.6 REJECT AND TAILINGS DISPOSAL

As part of mine rehabilitation activities, all tailings produced from the CHPP as a result of the Project will continue to be disposed of in the tailings emplacement area as shown on **Figure 8**, **Figure 9** and **Figure 10**.

Mt Arthur Coal's life of mine tailings storage plan involves the extension of the existing tailings emplacement area which is proposed as part of the Project, up to approximately RL 280m AHD with the construction of a confining embankment initially to the north west. Additional confining embankments will subsequently be constructed to the south and east of the tailings emplacement area as the Project progresses and the tailings emplacement area increases.

As part of mine rehabilitation activities, all coarse reject produced from the CHPP as a result of the Project will continue to be co-disposed within overburden emplacement areas as currently approved, or utilised in the construction of the tailings dams, stockpiles or other infrastructure.

The proposed installation of the ultra-fines plant as part of the CHPP upgrade for the Project (discussed in **Section 4.2.1**) will facilitate the re-processing of fines to further minimise waste and increase water recycling in the plant. Appropriate water management controls will be implemented and maintained for the tailings emplacement area during the life of the Project to ensure runoff is collected and reused within Mt Arthur Coal's water management system.

The proposed coarse reject and tailings disposal strategy provides adequate disposal options and capacity for all coal waste produced throughout the life of the Project whilst contributing to mine rehabilitation outcomes.

4.7 WATER MANAGEMENT

The existing water management system will be progressively augmented as water management requirements change over the Project life. **Figure 8**, **Figure 9** and **Figure 10** illustrate the indicative drainage requirements for the Project and proposed catchment dams to reduce runoff and runoff velocity.

Tailings water will be reclaimed for re-use in the water management system via the Main Dam. Water recovered from the open cut and underground operations will continue to be pumped to mine water storages and will also be used in the CHPP and for dust suppression. During abnormally wet periods leading to an excess of water being generated onsite (when the volume of water being held onsite is in excess of that required to ensure water supply security and there is an increased risk of disruption to mining as a result of excess water being held in open cut pits) water will be transferred to the Environmental Dam with a view to controlled release under the Hunter River Salinity Trading Scheme (HRSTS).

Runoff from haul roads, hardstand and pre-strip areas will either be directed to existing mine water storages (where feasible) or will be captured in sediment retention storages sized to trap silt and other material which easily settle. Water in the sediment dams may be used for dust suppression around the mine. Sediment dams will be generally sized in accordance with the existing Mt Arthur Coal Erosion and Sediment Control Plan and with the *Managing Urban Stormwater Guidelines* (Landcom (2004)).

Runoff from workshop, industrial and vehicle re-fuelling areas, which has the highest potential to contain elevated hydrocarbons, will continue to be captured in downslope dams and recycled within the mine water management system. Treated effluent will continue to be recycled to the Main Dam via the existing wetland.

Runoff from rehabilitated and revegetated areas will continue to be directed to mine water storages or be directed to sediment retention storages prior to being allowed to drain to local drainages. These areas will be allowed to free drain as the landform becomes sustainable.

4.8 EDDERTON ROAD REALIGNMENT

The Project includes the realignment of the northern part of Edderton Road in approximately 2019. The two proposed Edderton Road realignment options are shown on **Figure 11** and include realignment of both a portion of the Edderton Road and relocation of the Denman Road / Edderton Road intersection. The realignment of the northern part of Edderton Road will allow Mt Arthur Coal to reduce the required high wall slopes and maximise the safe recovery of additional coal reserves.

A southern section of Edderton Road has been approved to be realigned as part of the Bayswater No 3 EIS. Although this realignment has not been constructed to date, the MAU approval facilitates the realignment prior to the commencement of mining in the Glen Munro seam (as discussed in **Section 3.1**). The road realignment proposed as part of the Project will be designed to complement the already approved relocation of Edderton Road.

The realignment of Edderton Road will be designed as dual-lane carriage bitumen sealed road with a nominal speed limit of 100 km per hour, thereby resulting in an improved transport route. The proposed realignment of Edderton Road and Denman Road intersection will be undertaken in consultation with the MSC who has maintenance responsibilities for the road and the Roads and Traffic Authority (RTA).

The two potential realignment options proposed for Edderton Road have been developed in consideration of the local topography, economic feasibility, and the provision of environmental buffer zones to provide sufficient flexibility in road design in order to address issues which may potentially arise during the detailed design phase. The relocation of Edderton Road will be designed such that there will remain 24 hour access for emergency services to the Mount Arthur summit.

4.9 CONSTRUCTION PHASE

The Project aims to maximise the use of the Mt Arthur Coal Complex's existing infrastructure where possible. However, construction activities will be required for (at least): upgrading the CHPP, including the installation of additional modules; establishment of a second Rail Loading Facility, construction and / or modification of existing surface facilities, construction of new mine equipment (such as shovels and excavators), and relocation of the northern part of Edderton Road.

The scheduling of construction activities for the Project will be production driven and hence will be staggered over its life. The proposed construction hours for the realignment of Edderton Road are 7.00 am to 5.00 pm Monday to Saturday (except in the case of emergency). Construction onsite, including CHPP and stockpile upgrades, mine equipment builds, and other construction activities as required, may be on a 24 hour, seven day roster consistent with operational rosters. Appropriate noise mitigation will be implemented as required to ensure no breach of noise limits occurs due to construction works. A workforce of approximately 240 employees will be required during the peak construction phase of the Project.

4.10 INTERACTIONS WITH EXISTING APPROVALS AND OPERATIONS

As discussed in **Section 4.1**, the Project is designed to augment the existing approved mining operations at Mt Arthur Coal. The major interactions of the Project with existing, approved operations include:

- Continuation of the same approved mining method (including approved but not yet implemented flexibilities such as the trolley assist described in the MAN EIS and Bayswater No 3 EIS) utilising additional equipment and personnel to achieve an increased rate of production;
- Logical progression of mining areas from approved open cut disturbance areas, through the five new Mine Extension Areas shown on **Figure 11**;

- Interaction with the MAU disturbance area (as the proposed out of pit emplacement area for the Project is located above approved longwall panels);
- Use of the existing infrastructure facilities with additional upgrades and modifications proposed to accommodate the increased production levels sought. Interactions with approved infrastructure will include the upgrade and use of the centralised CHPP facility and associated coal storage and transport systems, road and rail infrastructure, tailings emplacement area, water management systems, workshops, storage and administration facilities, as well as existing noise and visual bunds;
- Utilisation of the existing Rail Loading Facility (Planning Approvals 105-04-00 and 06_0091), with the addition of a second Rail Loading Facility to allow increased export of coal (up to 27 Mtpa) from the Mt Arthur Coal Complex via the Antiene Rail Spur and the Main Northern Railway Line;
- Use of the existing EMS and Water Management System which will be upgraded and enhanced for the Project;
- Consolidation of the Mt Arthur Coal Heritage and Biodiversity Offset Strategy (see **Section 8.6**); and
- Realignment of Edderton Road in accordance with road alignment options presented in both the Bayswater No 3 EIS and MAU EA.

4.11 PROJECT NEED

Project Approval is required to maximise the recovery of the additional coal reserves within the Mt Arthur Coal Complex's existing mining leases, whilst at the same time consolidating and streamlining the environmental regulatory approvals platform under which the mine operates.

An additional opportunity to produce saleable coal at an increased production rate will provide Mt Arthur Coal the flexibility and confidence to be able to respond to uncertain and changing economic circumstances while maintaining the effective management of impacts.

It is likely that international economic pressures will continue to influence the demand for steaming coal resulting in the need for producers to be able to respond quickly to any market opportunities which may develop. Paralleling this, technical innovations are causing demands for differing coal quality products. Mt Arthur Coal requires the ability to blend various coal seams from open cut and underground operations which have different coal qualities to meet future market demands.

In addition, coal production rates have to date been constrained by both rail and port capacity limitations. As the bottle-necks in the coal chain are resolved, there is a need for increased flexibility in mine production rates to enable Mt Arthur Coal to respond to market demand within the NSW coal chain capacity.

The Project will facilitate the consolidation of Planning Approvals and associated conditions for the open cut mining operations at the Mt Arthur Coal Complex, incorporating the MAN, Bayswater No 3, Rail Loading Facility and South Pit Extension Planning Approvals into a single, contemporary Project Approval.

The consolidation of Mt Arthur Coal's open cut Planning Approvals will ensure consistent environmental monitoring and management is implemented and achieved across the mining operation and streamline the regulatory framework under which the Mt Arthur Coal Complex operates.

The Project also seeks to consolidate Mt Arthur Coal's Biodiversity and Aboriginal Heritage Offset Strategies to facilitate a more effective management and improved outcome, including greater accessibility to heritage offset areas and more secure biodiversity offsets that are regionally linked to other conservation areas, further increasing value.

Further to the above, the need for the Project is demonstrated by the substantial net economic benefits that it will realise. These include substantial economic benefits to the local community and State and Federal governments including employment for a total workforce of approximately 2,600 employees of which 720 positions are directly attributable to the production of the additional 8 Mtpa of ROM coal from the Mt Arthur Coal Complex.

The recovery of an additional 122 million tonnes of export quality coal from the extensions to mining area sought will also result in a significant increase in royalty payments to the State of NSW and export earnings for Australia.

4.12 PROJECT ALTERNATIVES

Through extensive planning, assessment and operational experience, Mt Arthur Coal has developed a thorough understanding of the environmental and social constraints to mining. Prior to the commencement of detailed mine planning for the Project, several mine plan alternatives were considered in recognition of the principles of Ecologically Sustainable Development (ESD). The preferred mine plan was then developed with these constraints in mind, as discussed below.

4.12.1 Option 1

Option 1 involved a mine plan where the additional coal resource was extracted via underground mining methods. Detailed mine planning and engineering investigations have identified that the proposed coal resource (with maximum recovery of all coal seams) within the Mine Extension Areas shown on **Figure 11** can only feasibly be extracted via open cut mining methods to avoid sterilising some coal seams.

4.12.2 Option 2

Option 2 presented a larger mine plan disturbance footprint, which involved the emplacement of overburden material on the eastern flank of Macleans Hill. There was community concern that Option 2 would result in unacceptable environmental and social impacts. On this basis, Option 2 was rejected on the ESD principle of Intergenerational Equity and the balance of environmental and social impacts.

4.12.3 Option 3

Option 3 involved the pre-stripping of a shallow advanced box cut pit immediately north of Mount Arthur. This option was rejected due to the potential for its increased area of disturbance and associated environmental impacts.

4.12.4 Option 4

Option 4 involved the relocation of the Saddlers Creek grinding grooves to allow for overburden emplacement within the area. Option 4 would have resulted in an impact on the culturally significant grinding grooves in the Saddler's Creek area and was rejected on that basis.

4.12.5 Option 5

Option 5 involved Mine Extension Area 5 remaining disturbed for an extended period of time. This option was rejected in favour of a strategy resulting in progressive and aggressive rehabilitation being achieved, over a shorter duration.

4.12.6 Option 6

Option 6 involved the formation of regular shaped overburden emplacement areas. This option was rejected based on its visual impact, in favour of an option that produced an overburden emplacement area profile that better reflects the surrounding topography and the natural environment.

4.12.7 Option 7

Option 7 is the 'Do Nothing' approach. The 'Do-Nothing' approach in regard to the Project would result in the sterilisation of approximately 122 Mt of ROM coal, the loss of approximately 720 additional employment opportunities, and the significant socio-economic benefits to the State of NSW quantified in **Section 8.11.2** not being realised.

4.12.8 Option 8 - Project Mine Plan

The mine plan as presented in the EA (see **Figure 8**, **Figure 9** and **Figure 10**) has been developed through a series of Pre-Feasibility Studies and Environmental Constraint Analyses.

Mt Arthur Coal completed several detailed Pre-Feasibility Studies for the Project, which included the consideration of numerous mine plan and operational alternatives. The primary objective of the detailed Pre-Feasibility Studies was to minimise environmental and social impacts, whilst maximising resource recovery and operational efficiency.

Project Environmental Constraints Analyses

Five Environmental Constraints Analyses were undertaken over a six month period during the development of the mine plan presented in the PEA for the Project (March 2009). These analyses included detailed assessments of potential air quality, visual and noise and blasting impacts associated with the conceptual mine plan. All recommendations resulting from each Environmental Constraints Analysis were then incorporated by Mt Arthur Coal into further mine plan revisions to minimise environmental and social impacts.

Some of the recommendations which were considered to provide a reduced environmental impact included:

1. Variations to the mine plan sequencing;
2. Variations to the mine plan layout including variations to height of strategic overburden emplacement areas for increased shielding;

3. Variations to mining intensity in sensitive areas (e.g. reducing the amount of shovels or excavators and supporting truck fleets in the northern areas of the operation);
4. Increasing available rehabilitation areas and reducing exposed areas;
5. Modifying the slope of high walls and low walls for safety and the minimisation of disturbance;
6. Modifying the locations of haul roads and increasing haul road shielding;
7. Ensuring quiet equipment is located in any exposed areas;
8. The implementation of best-practice noise and air quality mitigation measures, such as the application of a dust suppressant or road sealing product to all permanent active coal and overburden haul roads; and
9. Investigation into the use of an overburden conveyor spreader system to supplement truck haulage and thus reduce air quality impacts.

All options (with the exception of Option 9) have been incorporated into the mine plan presented in the EA.

Additional Mine Plan Changes

The mine plan presented in the EA has continually evolved from that presented in the PEA to address environmental, economic and social issues. In particular, the mine plan has since been modified by Mt Arthur Coal to address the following:

- The eastern section of Macleans Hill has been removed from the proposed mine plan to minimise potential visual impacts on the community of Muswellbrook and to alleviate community concerns about mining in this area;
- The mine plan landform has been modified to impose visual amenity, including the development of undulating, free-draining overburden emplacement areas and the development of crests on the final landform to minimise visual effects;

- The 2022 mine plan and conceptual final landform was modified for the Saddlers Pit area to ensure the known grinding grooves are not disturbed and remain free-draining post-mining;
- Retraction of the active mining area near Mount Arthur to avoid an identified set of axe grinding grooves;
- Modification of the Out of Pit emplacement area near Edderton Road to avoid known stands of Box Gum Woodland Endangered Ecological Community (EEC); and
- Increase in the buffer alignment of Edderton Road, with the intersection of Denman Road to enable placement of the road to minimise lighting and traffic noise impacts on near neighbours.

The Project as presented in the EA has evolved with a balanced consideration of all potential environmental, social and economic impacts, consistent with the principles of ESD.

Detailed mine planning and engineering investigations have identified that the proposed coal resource (with maximum recovery of all coal seams) within the Mine Extension Areas shown on **Figure 11** can only feasibly be extracted via open cut mining methods to avoid sterilising coal seams. The Project proposes to utilise and enhance existing infrastructure, staying within the Infrastructure Area to minimise land disturbance (**Figure 13**).

5 REGULATORY FRAMEWORK

Mt Arthur Coal currently operates under the Planning Approvals outlined in **Section 3.6**. A single contemporary Project Approval is sought under Part 3A of the EP&A Act to replace the existing Planning Approvals indicated as such in **Table 5** at the appropriate time. Existing approvals for activities outside the scope of the EA, including those relating to underground mining operations will continue to apply.

The Project may also require approvals under additional State and Federal Acts or *State Environmental Planning Policies* (SEPP) not exempted under Part 3A of the EP&A Act. These are discussed in detail below as relevant to the Project. A flowchart showing the Planning Approvals and consultation process applied to the Project is shown in **Figure 14**.

5.1 NSW LEGISLATION

5.1.1 Environmental Planning and Assessment Act 1979

Permissibility of Mining Activities

The Project requires approval under Part 3A of the EP&A Act as it is classified as a Major Project listed in Schedule 1 of *State Environmental Planning Policy Major Developments 2005* (SEPP (Major Development)) (see **Section 5.2.1**). The Minister for Planning will be the consent authority for the Project.

The combined effect of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* and the *Muswellbrook Local Environmental Plan 2009* (Muswellbrook LEP) is that surface mining is permissible on all lands within the EA Boundary. Given this, it is available for the Minister to approve carrying out of the Project as sought.

Requirement for Environmental Assessment

Section 75H of the EP&A Act requires an EA to be prepared in accordance with any guidelines published by the Minister under Section 75F (1) and the Director-General's EARs under Section 75F (2). The Director-General's EARs for the Project were issued on 21 April 2009 and include a comprehensive list of matters to be addressed in the EA. The Director-General's EARs have been addressed in the EA and are reproduced in **Appendix C**.

Development Contributions

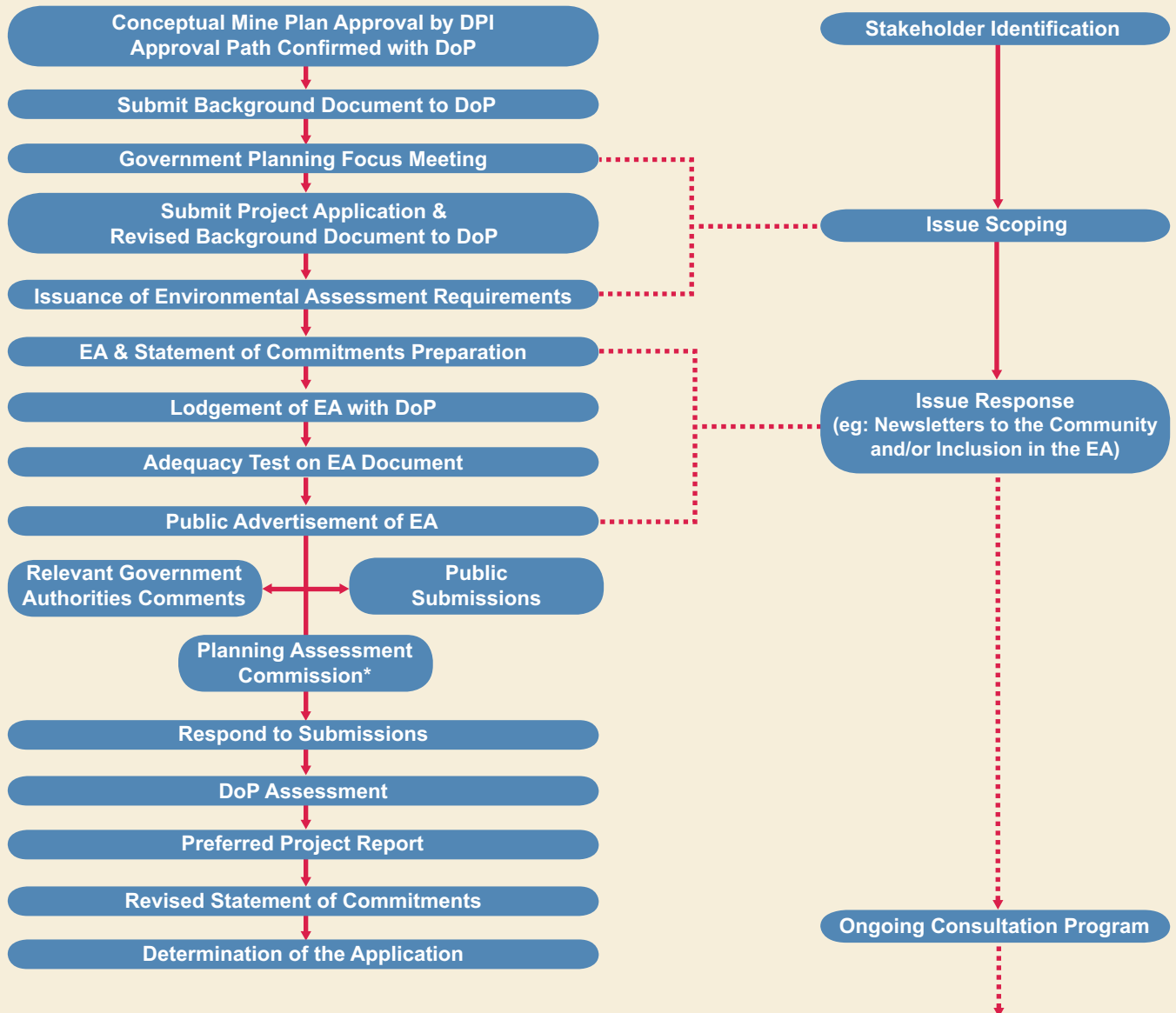
The Minister has the power under Section 94 of the EP&A Act to impose a condition on any Planning Approval requiring a payment to a local council (MSC). The amount is identified as the cost to the local Council of providing additional services for the increased demand on existing services due to the Project.

Section 93F of the EP&A Act enables a Voluntary Planning Agreement (VPA) to be established with the proponent (HVEC) and the local council (MSC). A VPA exclude the power to impose a condition requiring a contribution under Section 94 of the EP&A Act. In such circumstances, the consent authority or the Minister must be a party to the VPA as required by Section 93F (3A) of the EP&A Act.

A VPA is currently being negotiated between HVEC and MSC for the payment of contributions for the Project. The VPA will be made available as a formal agreement for the Minister, MSC and HVEC to enter into as required by Section 93F (3A) of the EP&A Act. If such an agreement is not concluded, HVEC will provide for development contributions linked to the increases in demand for public amenities and services caused by the additional impacts of the Project.

Part 3A (EA Process)

Consultation Process



* Avenue available to the Minister

Hansen Bailey



MT ARTHUR COAL

Planning Approvals & Consultation

Filename: MAC_Diagram14.indd

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Figure
14

Disclosure of Reportable Political Donations and Gifts

Section 147 of the EP&A Act establishes the requirement that reportable political donations and gifts be disclosed when making planning applications or when making submissions on planning applications. The requirement to disclose relates to all development applications or project applications plus any submission made by a person objecting to or supporting a planning application or any development that would be authorised by the granting of the application.

This disclosure requirement applies to all relevant planning applications or submissions made on or after 1 October 2008. In certain circumstances the making of donations or gifts can limit the Minister's ability to determine Project Approval applications.

The proponent has provided a statutory declaration to the DoP confirming that no such reportable donations or gifts have been made during the period, thus making it available to the Minister to determine the Project Application.

5.1.2 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) lists and defines endangered species, key threatening processes, populations and communities and critical habitat within NSW, and provides a framework for their protection. The TSC Act also provides a methodology for the assessment of the effects of development on threatened species.

While the compliance provisions of the TSC Act do not apply to the Project as an application under Section 75U of Part 3A of the EP&A Act, there remains a requirement to consider and assess any impacts on any threatened species located within the EA Boundary.

A comprehensive threatened species impact assessment process was adopted for the Project which is discussed in **Section 8.5**.

5.1.3 National Parks and Wildlife Act 1974

Section 75U of the EP&A Act provides that if the Project is granted Project Approval under Part 3A of the EP&A Act, then a permit under Section 87 or Section 90 of the *National Parks & Wildlife Act 1974* (NP&W Act) is not required for the salvage or destruction of Aboriginal objects. Appropriate significance assessments and management plans consistent with DECC guidelines will however be required.

5.1.4 Water Management Act 2000

The *Water Management Act 2000* (WM Act) regulates access and management of water resources under its licensing and approvals conditions. The *Water Sharing Plan for the Hunter Regulated River Water Source 2003* as established under the WM Act applies to the Mt Arthur Coal Complex. This Water Sharing Plan outlines water sharing rules for the allocation of water from the Hunter River and requires that Water Access Licences are obtained by all water users.

The *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* was gazetted on 24 July 2009. This means that previously held *Water Act 1912* licences are converted to Water Access Licences (WALs) and Water Supply Works and Use Approvals under the WM Act.

Mt Arthur Coal will apply for a WAL as required from the Department of Water and Energy (DWE) for any additional groundwater / surface water extracted as part of the Project.

5.1.5 Water Act 1912

In accordance with Part 5 of the Water Act, Mt Arthur Coal will apply for a licence from DWE for any extraction of water from an aquifer via a bore licence, as required.

5.1.6 Mining Act 1992

The mining of coal in NSW is regulated under the *Mining Act 1992* (Mining Act), administered by the Minister for Primary Industries. Section 5 of the Mining Act requires a relevant lease be granted before conducting any mining and Section 65 (2) of the Mining Act requires that there be 'appropriate development consent' as a prerequisite to the granting of a mining lease.

Mt Arthur Coal holds the appropriate mining authorisations for the Project as shown on **Figure 1** and listed in **Table 6**.

Mt Arthur Coal's Mining Operations Plan (MOP) will be revised to incorporate components of the Project as required.

5.1.7 Coal Mines Health and Safety Act 2002

The *Coal Mines Health and Safety Act 2002* (CMHS Act) came into effect on 23 December 2006 with the enactment of the *Coal Mines Health and Safety Regulations 2006* (CMHSR) repealing the *Coal Mines Regulation Act 1982* and *Coal Mines Regulations 1999*, subject to transitional provisions.

Division 3, Section 100 of the CMHS Act states that Ministerial approval must be held to establish an emplacement area where reject material is to be deposited or placed.

Mt Arthur Coal holds a Section 126 Ministerial approval under the *Coal Mines Regulation Act 1982* for the tailings emplacement area (see **Section 3.6**) for the disposal of rejects and tailings. This approval will continue to apply as required for the Project.

5.1.8 Roads Act 1993

The *Roads Act 1993* (Roads Act) provides for the dedication of classified and unclassified roads and confers certain functions to MSC in relation to the management of roads. Under Section 138 of the Roads Act, consent from MSC is required to erect a structure or carry out work in, on or over a public road.

Section 75V of the EP&A Act provides "an authorisation of the following kind cannot be refused if it is necessary for carrying out of an approved project and is to be substantially consistent with the approval under this part..." The authorisations referenced include an approval under Section 138 of the Roads Act.

An approval under Section 138 of the Roads Act will be sought from MSC prior to the realignment and upgrade of Edderton Road, as discussed in **Section 8.17**.

5.1.9 Protection of the Environment Operations Act 1997

The Protection of the *Environment Operations Act 1997* (POEO Act) provides for the licensing of pollution by the DECC which administers the POEO Act.

HVEC holds EPLs 113 and 11457 in respect to its currently approved operations and is in the process of consolidating these licences. Mt Arthur Coal will seek variations to these licences under the POEO Act to incorporate the relevant components of the Project, as required.

5.1.10 Dams Safety Act 1978

The *Dams Safety Act 1978* (Dams Safety Act) requires the NSW Dams Safety Committee (DSC) to "formulate measures to ensure the safety of dams" and to "maintain a surveillance of prescribed dams". A "prescribed dam" is one listed in Schedule 1 of the Dams Safety Act.

There are two prescribed dams within the EA Boundary - the Main Dam and the Environmental Dam. These water structures will continue to be utilised as mine water storage dams and will not be altered as a result of the Project.

5.2 NSW ENVIRONMENTAL PLANNING INSTRUMENTS

The following sections provide a review of the Environmental Planning Instruments (EPIs) that are relevant to the Project. It must be noted that under Section 75J (3) of the EP&A Act, the Minister for Planning “*may (but is not required to) take into account the provisions of the environmental planning instrument that would not (because of Section 75R) apply to the project, if approved*”.

5.2.1 SEPP (Major Developments) 2005

SEPP (Major Developments) defines certain developments which are classified as Major Developments under Part 3A of the EP&A Act and require determination by the Minister for Planning.

In accordance with Schedule 1 (Group 2) of SEPP (Major Developments) the Project is required to be assessed under Part 3A of the EP&A Act.

5.2.2 SEPP (Mining, Petroleum Production and Extractive Industries) 2007

SEPP (Mining, Petroleum Production and Extractive Industries) (SEPP Mining) was gazetted on 16 February 2007, the objectives which are:

- (a) to provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State, and
- (b) to facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources, and
- (c) to establish appropriate planning controls to encourage ecologically sustainable development through the environmental assessment, and sustainable management, of development of mineral, petroleum and extractive material resources.

Under clause 7 (1) of SEPP (Mining), mining carried out at surface level on any land is permissible with Development Consent where:

- Development for the purpose of agriculture or industry may be carried out; or
- The land is the subject of a Mining Lease immediately prior to commencement of SEPP (Mining).

Facilities for the processing or transportation of minerals are permissible with or without Development Consent on land on which mining may be carried out if the minerals were mined from that land or adjoining land.

The lands upon which the Project is sought are zoned as Zone RU1 and Zone E3 under the Muswellbrook LEP. Particular agricultural activities are permissible with consent in these zones. Secondly, much of this land is the subject of an existing mining lease, thus in accordance with clause 7 of SEPP (Mining), the carrying out of development for the purpose of mining is a use permissible with development consent.

The Project will therefore meet with the objectives of SEPP (Mining).

5.2.3 SEPP 33 – Hazardous and Offensive Development

SEPP 33 – Hazardous & Offensive Development (SEPP 33) applies if a project is for an industrial development and is potentially hazardous or offensive industry. If a Project is considered potentially hazardous industry, a preliminary hazardous analysis must be prepared.

A review of the relevant components of this Project in **Section 8.16** has confirmed that the Project is not considered to be Potentially Hazardous or Offensive. As such, a detailed preliminary hazardous analysis is not required. Further, as SEPP 33 applies only to proposals that are potentially hazardous or offensive and the proposed development does not constitute a potentially hazardous or offensive industry under Clause 3, SEPP 33 does not apply to this Project.

5.2.4 SEPP 44 – Koala Habitat Protection

SEPP 44 - Habitat Koala Protection (SEPP 44) encourages the conservation and management of natural vegetation areas that provide core habitat for koalas, to ensure that there is ongoing protection of koalas and their habitat.

The Ecological Impact Assessment carried out for the Project included the consideration of koala habitat and did not identify the presence of any koalas or core koala habitat within the EA Boundary (see **Section 8.5**).

5.2.5 Muswellbrook Local Environmental Plan 2009

The Project is located primarily on lands classified under the Muswellbrook LEP as Zone RU1 Primary Production. The EA Boundary also contains lands listed under Zone E3 Environmental Management (see **Figure 15**).

The objectives of Zone RU1 aim to encourage continued growth in the Muswellbrook Shire's primary industries and ensure that mining occurs in an environmentally acceptable manner. Mining is permissible in lands of this zoning with consent.

Zone E3 Environmental Management aims to ensure that areas of particular ecological, scientific, cultural or aesthetic values are effectively protected and managed through sustainable land use and development. Mining is not a permissible use in this zoning, however, development for the purpose of agriculture is permissible on land subject to this zoning and accordingly, under clause 7 of the Mining SEPP, surface mining is permissible on these lands.

5.3 COMMONWEALTH LEGISLATION

5.3.1 Environment Protection and Biodiversity Conservation Act 1999

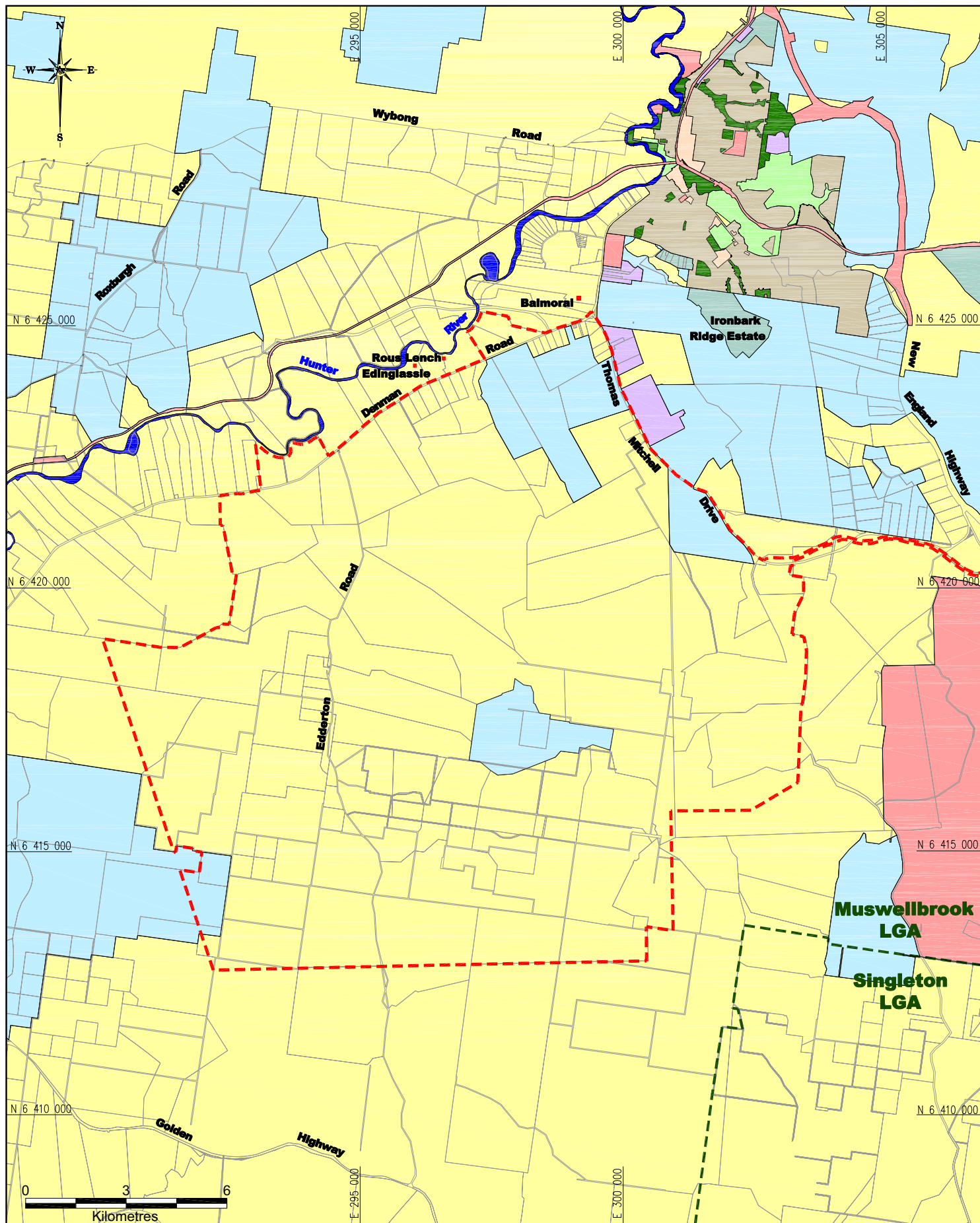
The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a mechanism for national environment protection and biodiversity conservation. Matters of National Environmental Significance (MNES) potentially relevant to the Project include:

- Listed species and communities (e.g. listed threatened species and ecological communities and migratory species);
- Protected areas (e.g. World heritage properties, RAMSAR wetlands of international significance, conservation zones); and
- National, Commonwealth and Indigenous Heritage.

Actions that are likely to have a significant impact on a MNES require approval under the EPBC Act. The following MNES have been deemed relevant to the Project:

- Listed nationally threatened species and ecological communities;
- Listed migratory species; and
- A number of flora and fauna species listed under the EPBC Act being identified in the EA Boundary.

A Referral under the EPBC Act is being drafted for the Mt Arthur Coal Complex (including the MAU) and will be submitted to the Commonwealth Department of Environment, Water, Heritage and the Arts as a separate process to the Part 3A approvals process, due to variations in the definition of the Project under the Referral. A summary of the ecological impact assessment undertaken in accordance with State and Federal requirements is provided in **Section 8.5**.



- EA Boundary
- Zone SP2 - Infrastructure
- Zone E3 - Environmental Management
- Zone R1 - General Residential
- Zone R5 - Large Lot Residential
- Zone B2 - Local Centre
- Zone RU1 - Primary Production
- Zone IN1 - Light Industrial
- Zone RE1 - Public Recreation
- Zone RE2 - Private Recreation
- Zone W1 - Natural Waterways
- Heritage - Listed Properties

Hansen Bailey



Co-ordinate System: MGA Zone 56
Source: Muswellbrook LEP (2009)

MT ARTHUR COAL

Land Zoning

Cad File: 03842D.dwg

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Figure
15

6 STAKEHOLDER ENGAGEMENT

This section of the EA provides a summary of the stakeholder engagement program undertaken for the Project, which included comprehensive engagement with local and State government, industry regulators, near neighbours, the local Aboriginal community and the larger local community. This section provides an overview of the engagement process applied to the Project, its objectives, a description of the various engagement phases, the engagement activities undertaken and findings which have been incorporated in the impact assessments undertaken for the EA as required.

6.1 BACKGROUND

Mt Arthur Coal has a demonstrated history of undertaking best practice stakeholder engagement, with that undertaken for the Project regarded as a continuation of ongoing dialogue with key community and Government stakeholders as part of the mine's logical progression.

Mt Arthur Coal has a strong commitment to undertaking best practice social assessment and stakeholder engagement. On approval of the MAN development, Mt Arthur Coal committed to the employment of a dedicated resource to undertake community relations and stakeholder engagement activities. Mt Arthur Coal's community engagement has been strengthened over time since the approval of MAN with consistent effort and the substantial community engagement in subsequent project approval processes. These processes have each involved extensive engagement with regulators, local landholders and key stakeholders in the Muswellbrook area.

Given the approach adopted as part of the original assessment program and the subsequent commitment by Mt Arthur Coal in maintaining ongoing community relations, the past 10 years have seen effective relationships developed with a range of stakeholders and community members, particularly within the Muswellbrook locality.

The engagement process for the EA was undertaken with the aim of identifying stakeholders' issues regarding the Project and ensuring that these issues were appropriately assessed and responded to by Mt Arthur Coal either directly or in the EA. A detailed Social Impact Assessment (SIA) and Stakeholder Engagement Program was developed by Coakes Consulting to support the EA and is discussed further in **Section 8.12**. A summary of the stakeholder engagement process for the Project is provided in this section.

6.2 STAKEHOLDER IDENTIFICATION

A range of stakeholders were identified for the Project based on existing records held by Mt Arthur Coal and the confirmation of near neighbour contact details through cadastral analysis and the background research into the Muswellbrook area in particular. The key stakeholders relevant to the Project and the engagement methods employed for each are listed below in **Table 11**.

Table 11
Project Stakeholders

Stakeholder	Engagement Method
Community Stakeholders	
Individual Near Neighbours	• Offer of Briefings (99 individual near neighbours) • Face to face briefings (48 individual near neighbours) • Community Information sessions (8 and 9 May 2009) • Project information sheets • Community Matters Newsletter • Local media coverage
Muswellbrook Local Community	• Community Matters Newsletter • Community information sessions • Local media coverage
Aboriginal Community	• Aboriginal Heritage Planning Meeting on 3 February 2009 • Fieldwork on 2 March – 17 March 2009 • Aboriginal Heritage Report Overview on 12 June 2009 • Review of Draft Assessment
Mt Arthur Coal Complex Employees	• State of the Nation Presentations • Community Matters Newsletter • Local media coverage
Mt Arthur Coal CCC	• Project Briefings on 18 February 2009 • Project information sheets • Community Matters Newsletter
Relevant Neighbouring Mines, Industry and Service Providers	• Offer of Briefings • Project information sheets • Face to face meetings
Regulatory Stakeholders	
DEWHA	• Project Briefing on 15 May 2009 • Project information sheets
DoP	• Initial Project Briefing on 7 August 2008 • Planning Focus Meeting (PFM) on 19 February 2009 • Project Update Meeting on 19 March 2009 • Noise assessment meeting with DECC on 15 April 2009 • Project Update Meeting on 10 June 2009 • Project information sheets
MSC Mayor, Councillors, Officers & Environment Committee	• Project briefing on 3 February 2009 • PFM on 19 February 2009 • Project update on 20 April 2009 • Project update on 25 June 2009 • Project information sheets • Community Matters Newsletter
DECC	• PFM on 19 February 2009 • Noise assessment meeting with DoP on 15 April 2009 • Project information sheets

Stakeholder	Engagement Method
DWE	• PFM on 19 February 2009 • Project update and overview of water assessment methodology on 29 April 2009 • Project information sheets
DPI	• Conceptual Mine Plan presentation on 30 January 2009 • PFM on 19 February 2009 • Project information sheets
CMA	• PFM on 19 February 2009 • Project information sheets
RTA	• Offer of briefing • Project information sheets
ARTC	• Offer of briefing • Project information sheets
Relevant State & Commonwealth Members of Parliament	• Project briefing with George Souris, Member for the Upper Hunter on 2 February 2009 • Project briefing with Jodi McKay, Minister for Tourism, Minister for the Hunter, Minister for Science and Medical Research, and Minister Assisting the Minister for Health (Cancer) on 4 March 2009 • Project information sheets

6.3 ISSUE SCOPING

Engagement with community and government stakeholders regarding the Project is outlined below.

6.3.1 Community Engagement

Community engagement was undertaken as part of the SIA for the Project with the following key objectives:

- To identify and document stakeholder / community issues and concerns in relation to the Project;
- To assess the compatibility of the Project with community values and existing land uses;
- To identify the primary and higher order social impacts (direct and indirect) associated with the Project, particularly on those communities within the Shire of Muswellbrook;
- To assess potential workforce impacts associated with the Project on services, facilities and infrastructure provision in the locality;

- To initiate and maintain open communication / engagement with key stakeholders and the community on all aspects of the Project; and
- To proactively respond to and work with key stakeholders, the community and other interested parties to develop appropriate solutions and strategies to minimise negative impacts and enhance the positive impacts associated with the Project.

Community engagement was undertaken with a range of stakeholders including near neighbours and service providers, as summarised below.

Near Neighbour Engagement

During January and February 2009, 50 near neighbours (of the 99 offered briefings) in close proximity to the Project accepted a briefing as part of the SIA program. In addition to personal interviews with residents who live adjacent to the Project, two community information sessions were facilitated to provide information and gain feedback on the Project.

Engagement with Mt Arthur Coal's near neighbours has been further complemented by the distribution of two community project information sheets (as shown in **Appendix D. Table 12** outlines a summary of near neighbours who were engaged with in relation to the Project, their location and method of engagement.

Two Community Information Sessions were held at the Muswellbrook Art Centre on 8 May 2009 between 3:00 pm and 8:00 pm and 9 May 2009 between 8:00 am and 1:00 pm. The Community Information Sessions were advertised in the local papers, including the Muswellbrook Chronicle and Hunter Valley News for the two weeks prior to the sessions. Letters and invites to the Community Information Sessions were also distributed to key stakeholders.

The primary objective of the Community Information Sessions were to provide an accessible means for the local community to obtain information on the Project, understand the potential environmental and social impacts and obtain answers to any questions they may have. The Community Information Sessions were attended by representatives by Coakes Consulting, Hansen Bailey and Mt Arthur Coal to respond to any queries.

Posters on potential environmental and social impacts were presented, with the proposed management and mitigation measures explained. A three-dimensional computer visual animation was also prepared for key locations surrounding the Mt Arthur Coal Complex (such as South Muswellbrook, Racecourse Road and Denman Road) to illustrate the potential visual impacts of the Project.

Service Provider Engagement

During March and April 2009, 72 service providers across the local region (including accommodation, schools, health providers and childcare facilities) were surveyed to identify their capacity to accommodate the additional construction and operational employees as a result of the Project.

Accessibility to general community services is a key issue across the Muswellbrook, Singleton and Upper Hunter communities and therefore it was important to understand how a change in workforce demographics from the Project may impact on service provision.

6.3.2 Regulatory Engagement

Extensive engagement was also undertaken to identify issues that government agencies had in relation to the Project with a summary provided in **Table 11**.

A PFM was held at the Mt Arthur Coal Complex on 19 February 2009, which included a site visit and presentation and discussion of the Project, identified environmental impacts, proposed assessment methodology and preliminary mitigation measures. The PFM was attended by representatives of DoP, DECC, DWE, DPI, CMA, NSW Department of Premier and Cabinet, MSC and the Project team.

6.4 ISSUE RESPONSE

The objective of this stage of stakeholder engagement was to ensure that appropriate responses were provided for all stakeholder issues raised in relation to the Project and that relevant strategies for their management and mitigation were considered in the EA. Where possible, specific issues raised in relation to the Project were addressed with the relevant stakeholders.

6.4.1 Regulatory Feedback

In response to the stakeholder engagement undertaken for the Project and the Major Projects Application, DoP issued Director-General's EARs for the Project on 21 April 2009 which incorporated responses from other regulators. The Director-General's EARs are provided in full in **Appendix C**, while **Table 13** lists each requirement and where it is addressed in the EA.

Table 12
Near Neighbour Engagement

Area	Personal Interview	Project Information Sheets	Total
Denman Road	15	7	22
Roxburgh Road	14	7	21
South Muswellbrook	5	8	13
Racecourse Road	7	16	23
Antiene	5	10	15
Golden Highway	4	1	5
Sheppard Avenue	0	2	2
TOTAL	50	51	101

Table 13
Environmental Assessment Requirements

Issue	Description	EA Section
General Requirements	The Environmental Assessment of the Project must include:	Executive Summary
	An executive summary;	
	A detailed description of	
	Existing and approved mining operations and industrial development in the vicinity of the Mount Arthur mining complex;	2.3 & 2.4
	Historical mining operations at the Mount Arthur mining complex	3.1
	- Existing and approved mining operations and infrastructure on the site, including a copy of all relevant statutory approvals - Existing and / or approved biodiversity and heritage offset areas; and - The existing environmental management regime	3.1, 3.2, 3.3, 3.5, 3.6, 3.7, 3.8 & Appendix A
	- A detailed description of the Project, including the - Need for the Project - Alternatives considered, including justification for the proposed mine plan - Likely staging of the Project - Likely interactions between existing and approved mining operations and the Project - Plans of any proposed building works	4.0
	A risk assessment of the potential environmental impacts of the Project, identifying the key issues for further assessment	7.0
	- A detailed assessment of the key issues specified below, and any other significant issues identified in the risk assessment (see below), which includes - A description of the existing environment, using sufficient baseline data - An assessment of the potential impacts of all stages of the Project on this environment, including any cumulative impacts, taking into consideration any relevant laws, policies, guidelines and plans - A description of the measures that would be implemented to avoid, minimise, and if necessary offset the potential impacts of the Project on this environment, including detailed contingency plans for managing any significant risks to the environment	8.0

Issue	Description	EA Section
	A statement of commitments, outlining the proposed environmental management and monitoring measures	9.0
	A conclusion justifying the Project taking into consideration: the suitability of the site; the economic, social and environmental impacts of the Project as a whole; and whether the Project is consistent with the objects of the <i>Environmental Planning & Assessment Act 1979</i> and	10.0
	A signed statement from the author of the Environmental Assessment, certifying that the information contained within the document is neither false nor misleading.	i
Key Issues	Air quality - including a quantitative assessment of potential air quality impacts of the Project	8.1
	Noise & Blasting - including a quantitative assessment of the potential - Construction, operational and offsite road and rail noise impacts - Blasting impacts of the Project on people, livestock and property (paying particular attention to those properties with heritage significance)	8.2 & 8.3
	Biodiversity - including: - Accurate predictions of the proposed vegetation clearing - A detailed assessment of the potential impacts of the Project on any - Terrestrial and aquatic threatened species, populations, ecological communities or their habitats - Existing or approved offset areas - A revised offset strategy for the mining complex to ensure that the Project will maintain or improve the biodiversity conservation value of the region	8.5 & 8.6
	Heritage - including a detailed assessment of the potential impacts of the Project on the Macleans Hill and Mount Arthur Northwest Slopes Heritage Management Zones	8.7 & 8.8
	Soil & Water - including: - A site water balance for the Project - A detailed assessment of the potential impacts of the Projects, using quantitative modelling on - The quantity and the quality of both surface and ground water resources - Water users, both in the vicinity of and downstream of the Project - The riparian and ecological values of the watercourses both onsite and downstream of the Project - Environmental flows and - Flooding - A detailed description of the proposed water management system onsite	8.9, 8.10, & 8.14
	Transport - including: - Accurate predictions of the road and rail traffic of the Project - A detailed assessment of the potential impacts of this traffic on the capacity, efficiency, and safety of the road and rail networks - A detailed description of the strategy for the proposed relocation of Edderton Road, including conceptual plans for the proposed road works	4.2 & 8.17
	Visual – including: - A detailed assessment of the potential visual impacts of the Project on the amenity of the surrounding area, paying particular attention to the potential impacts of the Project on the residential area of South Muswellbrook and the views of the Project from the surrounding road network	8.4

Issue	Description	EA Section
	o A detailed description of the measures that would be implemented to minimise these impacts, including the proposed landscaping to screen the surface facilities and operations, and the proposed measures to minimise the potential lighting and signage impacts of the Project	
	• Greenhouse Gas - including: - o A quantitative assessment of the potential scope 1, 2 and 3 greenhouse gas emissions of the Project - o A qualitative assessment of the potential impacts of these emissions on the environment - o An assessment of all reasonable and feasible measures that could be implemented onsite to minimise the greenhouse gas emissions of the Project and ensure that it is energy efficient	8.1
	• Waste - including: - o Accurate estimates of the quantity and nature of the potential waste streams of the Project, including tailings and coarse reject - o A detailed description of the measures that would be implemented to minimise the production of waste onsite, and ensure that any waste produced is appropriately handled and disposed of	4.6, 8.13, & 8.16
	• Rehabilitation - including a detailed description of the proposed rehabilitation strategy for the mining complex, having particular regard to - o The key objectives and principles in the Strategic Framework for Mine Closure (ANZMEC / MCA) - o Any relevant strategic land use planning or resource management plans or policies - o The potential for integrating this strategy with any other offset strategies in the region	8.6 & 8.15
	• Social & Economic - including - o An assessment of the potential impacts of the Project on the local and regional community, paying particular attention to the demand it may generate for the provision of additional infrastructure and services - o A detailed assessment of the costs and benefits of the Project as a whole, and whether it would result in a net benefit for the NSW community.	8.11 & 8.12
References	The environmental assessment of the key issues listed above must take into account relevant guidelines, policies, and plans. While not exhaustive, the following attachment contains a list of some of the guidelines, policies, and plans that may be relevant to the environmental assessment of the Project.	12.0
Consultation	During the preparation of the Environmental Assessment, you should consult with the relevant local, State or Commonwealth Government authorities, services providers, community groups or affected landowners. In particular you must consult with the • Department of Environment and Climate Change • Department of Primary Industries • Department of Water and Energy • Roads and Traffic Authority • Muswellbrook Council The consultation process, and the issues raised during the process, must be described in the Environmental Assessment.	6.0

6.4.2 EA Feedback

Following the completion of the initial community and regulatory stakeholder engagement processes all issues raised were addressed by either Mt Arthur Coal or the relevant specialists for inclusion in the impact studies undertaken for the EA. Those stakeholder issues relevant to the current Mt Arthur Coal Complex were included in the ongoing stakeholder engagement program.

Feedback on the issues raised was provided to stakeholders via personal meetings to affected land owners or near neighbours who noted they were interested in follow-up briefings. A project information sheet was distributed to the local community, which provided community engagement feedback and provided contacts to arrange a follow-up briefing as required.

6.4.3 Near Neighbour and Other Stakeholders Feedback

A range of environmental issues of concern were raised by stakeholders during the engagement process. The potential for air quality impacts, noise and blasting impacts, visual amenity issues and cumulative impacts were commonly raised. Other issues raised included employment and economic impacts, water management, rail and road traffic and community contributions.

Table 14 provides a summary of the issues raised by stakeholders and where each is addressed in the EA. The findings of the stakeholder engagement program were also incorporated in the risk assessment discussed further in **Section 7**.

Table 14
Stakeholder Issues

Ref	Issue Raised	Section Addressed in EA
1	<i>Air Quality</i>	8.1
a	Potential dust generation from the Project impacting on health and amenity (tank water, washing and exterior of receivers / vehicles).	
b	Potential increase in dust impacts due to close proximity of the Project to surrounding receivers.	
c	Increased area of disturbed land to provide additional dust source.	
d	The potential for cumulative dust impacts from the Project and other mining operations.	
2	<i>Employment & Community</i>	8.12
a	Increased direct and indirect employment in the Muswellbrook area for the Project.	
b	Cumulative impacts of mining on sense of community and local agricultural industry.	
c	Economic impacts to the Muswellbrook area and provision of services and infrastructure	8.2
3	<i>Noise & Blasting</i>	
a	Additional operational noise for the Project.	
b	Noise generated from additional trains and road traffic along Denman Road as a result of the Project.	
c	The potential for cumulative noise impacts from the Project and other mining operations.	
d	Additional blasts and associated impacts from increased maximum production levels.	
e	The potential for additional blasting to damage nearby receivers.	
f	The potential for cumulative blast impacts from the Project and other mining operations.	

Ref	Issue Raised	Section Addressed in EA
4	<i>Visual Amenity</i>	8.4
a	Increased visual impacts from the Project at nearby receivers.	
b	Increase in visibility of mining operations within semi-rural landscape.	
c	Cumulative impacts on quality of life for nearby residents.	
5	<i>Property Devaluation</i>	8.11 & 8.12
a	Potential devaluation of properties in close proximity to the Project.	
b	The potential for the Project and associated mining activities to damage receivers.	
6	<i>Surface Water</i>	8.9
a	The potential for the Project to impact on regional surface water catchments and water quality.	
b	Potential increase in sediment loads to local surface waters due to increased disturbance areas.	
c	Potential for increased water usage to achieve higher production levels and possible need to withdraw water from the Hunter River.	
d	The potential for impacts to drinking water storages at nearby receivers.	
7	<i>Groundwater</i>	8.10
a	The potential for impacts on local and regional groundwater reserves.	
b	Cumulative impact of neighbouring mines altering regional groundwater resources.	
8	<i>Traffic</i>	8.17
a	Increased traffic volumes for local road and rail network as a result of the Project.	
b	Safety and adequacy of Thomas Mitchell Drive and Denman Road due to additional vehicles accessing the Mt Arthur Coal Complex for the Project.	
9	<i>Final Land Use & Void Management</i>	8.15
a	Stakeholders were interested in potential land use for the area on completion of the Project.	
b	Post-mining rehabilitation options (e.g. returned to natural habitat)	
c	Processes to be followed in the development of final landform and mine closure processes.	
10	<i>Flora & Fauna</i>	8.5
a	Cumulative impact of mining on the local environment and flora and fauna species.	

Source: Coakes Consulting (2009)

6.5 ABORIGINAL COMMUNITY ENGAGEMENT

6.5.1 Introduction

The requirements of the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC, 2005) and *Interim Community Consultation Requirements for Applicants* (DEC, 2004) were applied to ensure that an appropriate level of engagement with the Aboriginal community was undertaken for the Project in relation to Aboriginal Archaeology and Cultural Heritage.

Further detail on the engagement process with Aboriginal community stakeholders is provided in **Section 8.7**.

6.5.2 Notification and Registration

Details of the Project were provided in both the *Hunter Valley News* and the *Muswellbrook Chronicle* in October 2008 seeking registrations of interest. In response to the advertisements, nine Aboriginal stakeholder groups registered an expression of interest in both the Cultural Heritage Assessment and Archaeological survey aspects of the Project.

MSC, NSW Native Title Searches, NSW Department of Aboriginal Affairs – Office of the Registrar, Wanaruah Local Aboriginal Land Council (WLALC) and DECC were all notified by letter on 9 October 2008 informing them of the Project and requesting information regarding the contact details of known Aboriginal stakeholder groups in the locality for engagement.

From the responses received an extensive list was compiled, consisting of the contact details for 34 known Aboriginal stakeholder groups in the Muswellbrook LGA and Hunter Valley Region.

A full list of all known Aboriginal stakeholder groups that were consulted with for the Project is presented in **Table 15**. Two additional groups expressed an interest in the Cultural Heritage and Archaeological assessment following advertisement of the Project and were included in the engagement process.

Table 15
Consulted Aboriginal Stakeholder Groups

Name of Group	Primary Contact
Aboriginal Native Title Consultants (ANTC)	John and Margaret Matthews
Awabakal Descendants Traditional Owners Aboriginal Corporation (ADTOAC)	Shane Frost
Awabakal Traditional Owners Aboriginal Corporation (ATOAC)	Kerrie Brauer and Dene Hawkin
Black Creek Aboriginal Corporation (BCAC)	N/A
Bullen Bullen Consultants (BBC)	Lloyd Matthews
Cacatua Cultural Consultants (CAC)	George Sampson
Culturally Aware (CAw)	Tracey Skene
Gidawaa Walang Cultural Heritage Consultancy (GWCHC)	Annie Hickey
Giwiirr Consultants (GC)	Rodney Matthews
Hunter Valley Aboriginal Corporation (HVAC)	Barry Stair
Hunter Valley Cultural Consultants (HVCC)	Christine Matthews

Name of Group	Primary Contact
Hunter Valley Cultural Surveying (HVCS)	Luke and Pansy Hickey
Hunter Traditional Owners Environmental Management (HTOEM)	Rick and Cara Coles
Hunter Valley Natural & Cultural Resources Management (HVNCRM)	David French
Lower Hunter Wonnarua Council Inc. (LHWC)	Tom Miller
Lower Wonnaruah Tribal Consultancy (LWTC)	Barry Anderson
Mimagen Wajaar (MW)	N/A
Mingga Consultants (MC)	Mick Clifford
Mur-Roo-Ma (MRM)	N/A
Muswellbrook Cultural Consultants (MCC)	Brian Horton
Nur-Run-Gee (NRG)	N/A
St Clair Singleton Aboriginal Corporation (SCSAC)	N/A
Ungooroo Cultural and Community Services (UCCS)	Rhonda Ward
Upper Hunter Heritage Consultants (UHC)	Melissa Matthews
Upper Hunter Wonnarua Council (UHC)	Rhoda Perry
Valley Culture (VC)	Larry Van Vliet
Wanaruah Aboriginal Custodians Corporation (WACC)	Barbara Foot
Wanaruah Local Aboriginal Land Council (WLALC)	Suzie Worth
Wattaka Wonnarua CC Service (WWCCS)	Des Hickey
Wonn1 Contracting (W1C)	Arthur Fletcher
Wonnarua Culture Heritage (WCH)	Gordon Griffith
Wonnarua Nations Aboriginal Corporation (WNAC)	Sandra Miller
Wonnaruah Elders Council (WCE)	Rhoda Perry
Yamuloong Group Initiatives (YGI)	Sean Gordon
Yarrawalk (Y)	Barry McTaggart
Yinarr Cultural Services (YCS)	Kathleen Steward-Kinchela

N/A: Primary contact not provided

6.5.3 Engagement Regarding Survey Strategy and Conservation Values

All groups were invited to participate in the initial Project planning meeting held at the Mt Arthur Coal Complex on 3 February 2009. A total of 14 Aboriginal stakeholder groups were represented at the Project planning meeting. Representatives from Mt Arthur Coal, Hansen Bailey and AECOM (Archaeologist for the Project) were present to discuss the various components of the Project including a background into Mt Arthur Coal's operations, previous archaeological studies and the proposed methodology. Open discussion in regard to the proposed methodology was encouraged at the meeting. In addition Aboriginal groups represented were provided a copy of the methodology to take for their examination and comment.

A letter presenting the proposed survey methodology, requesting comments or acceptance of the proposed methodology and requesting formal expression of interest in field work was sent on 3 February 2009 to the remaining 22 known Aboriginal stakeholder groups listed in **Table 15** not present at the initial planning meeting. As a result of the initial planning meeting, BBC and HTOEM were recognised as additional Aboriginal stakeholder groups and were provided the methodology on 3 February and 12 March respectively and both groups attended the archaeological survey.

6.5.4 Summary of Responses

Correspondence was received from 26 Aboriginal groups accepting the proposed survey methodology and expressing an interest in participating in field survey. All except one response accepted the proposed survey methodology for the Project.

CAC requested that the survey spacing be reduced to 2 m spacing between representatives (the methodology proposed 5 m spacing). After careful consideration, it was determined by AECOM that there would be no net gain to the methodology to reduce the spacing size and as such it remained at 5 m.

6.5.5 Fieldwork

A total of 26 Aboriginal stakeholder groups registered their acceptance of the survey methodology and indicated they would like to participate in the fieldwork component of the Aboriginal Archaeology and Cultural Heritage Assessment.

On 20 February 2009, a letter was sent to all 26 groups providing dates and general information for each individual group's attendance at the field work.

Field work was conducted over a period of 12 working days from the 2 March to 17 March 2009 within three survey areas. Professional archaeologists from AECOM were present to conduct the archaeological survey. Two Aboriginal stakeholder groups which expressed an interest in the field work could not participate due to induction and insurance matters.

All survey areas defined in the methodology were covered with a total of 89 ha of land previously unsurveyed (Mount Arthur and Edderton Road survey areas) and a further 495 ha of potential Offset Area being assessed for its Aboriginal Archaeological and Cultural Heritage significance. Information regarding the attendance of Aboriginal stakeholders who participated in the archaeological survey is presented in **Table 16**.

Table 16
Aboriginal Stakeholder Groups Survey Participants

Field Work	Aboriginal Stakeholder Group	Representative(s)
Group 1 2, 3 & 4 March 2009	Giwiirr Consultants	Michael Matthews
	Hunter Valley Cultural Consultants	Colleen & Barry Stair
	Bullen Bullen Consultants	Lloyd Matthews
	Aboriginal Native Title Consultants	Margaret Matthews
	Upper Hunter Heritage Consultants	John Matthews
	Ungooroo Cultural and Community Services	Rhonda Ward, Jamie-Lee Stair
Group 2 5, 6 & 9 March 2009	Lower Wonnaruah Tribal Consultancy Pty Ltd	Barry Anderson
	Culturally Aware	Justin Matthews
	Hunter Valley Aboriginal Corporation	Katrina Cavanagh
	Hunter Valley Cultural Surveying	Luke Hickey
	Yinarr Cultural Services	Kathleen Steward/Kinchela
Group 3 10, 11 & 12 March 2009	Valley Culture	Elizabeth Howard
	Wonn1 Contracting	Arthur Fletcher & Tony Matthews
	Wonnarua Culture Heritage	Shannon Griffiths
	Cacatua Cultural Consultants	George Sampson
	Mingga Consultants	Mick Clifford
	Lower Hunter Wonnarua Council Inc	Dean Miller
Group 4 13, 16 & 17 March 2009	Yarrawalk	Barry French
	Wattaka Wonnarua CC Service	Des Hickey
	Gidawaa Walang Cultural Heritage Consultancy	Ann Hickey
	Wonnarua Nations Aboriginal Corporation	Maree Waugh
	Upper Hunter Wonnarua Council	Georgina Berry
	Hunter Traditional Owners Environmental Management	Katrina Cavanagh
	Wanaruah Local Aboriginal Land Council	Jade Bauer

6.5.6 Aboriginal Archaeology and Cultural Heritage Report Engagement

A hard copy of the draft Aboriginal Archaeology and Cultural Heritage Assessment was provided to all 26 registered groups on 12 June 2009. A meeting was also held at the Mt Arthur Coal Complex on the same day to present an overview of the report findings, undertake a site inspection, provide a mechanism for questions to be raised and answered and outline the engagement process going forward. Eight Aboriginal stakeholder groups were present for the meeting and site tour, which was also attended by archaeologists from AECOM and representatives from Hansen Bailey and Mt Arthur Coal.

Over 26 follow-up phone calls were made and meeting invites were offered to all registered groups during June and July 2009 in order to seek views on the Project and alternative offset strategy. Three responses on the Project and the proposed management measures were received from the Aboriginal community to the draft report as at 7 July 2009 which were incorporated into the final Archaeology and Cultural Heritage Report described in **Section 8.7**.

6.6 ONGOING STAKEHOLDER ENGAGEMENT

Mt Arthur Coal is committed to continuing its stakeholder engagement program throughout the life of the Project, in accordance with best practice. Ongoing stakeholder engagement will include regular contact with neighbouring land owners, representatives of key local and State regulatory authorities, industry bodies and the Aboriginal community and the release of public information on environmental performance.

Project information sheets will be distributed upon the submission of the EA to provide an update on the EA process and where the EA may be viewed by the public.

Mechanisms employed at Mt Arthur Coal to ensure the effective engagement and communication with the Project stakeholders will include:

- Regular engagement with individual near neighbours;
- The Mt Arthur Coal CCC;
- Company representation on interested environmental and community groups;
- Community newsletter (Community Matters) with distribution to approximately 8,000 homes and businesses;
- Issue specific newsletters, as required;
- Participation at key community events (e.g. Muswellbrook Show); and
- Community surveys.

Also, an AEMR that summarises company activities and performance in the areas of health, safety, environment and community is made available to the public in hard copy and on the BHP Billiton website.

7 RISK ASSESSMENT

A preliminary risk assessment was undertaken as part of the Preliminary EA which accompanied the Major Projects Application to DoP to identify potential environmental issues associated with the Project. The primary purpose of the Risk Assessment process was to prioritise and focus the required environmental assessments for the Project. Each of the environmental issues was addressed to a relevant extent and where appropriate the necessary management and mitigation options were developed.

Following stakeholder engagement and the receipt of the Director-General's EARs, a revision of the preliminary risk assessment was undertaken to incorporate additional requirements. The revised risk assessment is presented in full in **Appendix E**.

The key risks identified for the Project were analysed in accordance with the BHP Billiton Health, Safety, Environment and Community (HSEC) Risk Assessment Matrix (which meets Standards Australia requirements) and is based on probability and potential consequences.

Each potential environmental issue was ranked as either being of extreme, high, moderate or low risk to the environment. Risk rankings identified for each aspect of the Project were further evaluated based on the outcomes of the stakeholder engagement program, as required.

Findings from the revised risk assessment indicated several aspects associated with the Project which, in the absence of controls, potentially posed a high environmental risk, whilst many of the aspects were rated as medium to low risk. No extreme risks were identified (**Table 17**).

Aspects identified throughout the risk assessment process as high, medium and low have each been assessed as part of the EA. Aspects identified as having a higher environmental impact risk formed the primary focus of the EA and were more intensively assessed.

Aspects which have been identified as having a moderate to low risk were also assessed however a lesser scope of works was conducted for these secondary issues, based on their lower risk rating.

Table 17
Environmental Risks

Extreme Risk	High Risk	Moderate Risk	Low Risk
None	Air Quality	Water Management	Spontaneous Combustion
	Visual	Rehabilitation and Final Landform	Waste and Hazardous Materials
	Noise and Blasting	Traffic and Transport	European Heritage
	Ecology and Biodiversity	Social	Soils and Land Use
	Aboriginal Archaeology and Cultural Heritage	Economics	
	Greenhouse gas		

8 IMPACTS, MANAGEMENT AND MITIGATION

This section provides a summary of predicted environmental and social impacts from the Project and discusses management and mitigation measures as appropriate. The issues have been prioritised in accordance with the Director-General's EARs and the risk assessment process in **Section 7**.

8.1 AIR QUALITY AND GREENHOUSE GAS

PAE Holmes has conducted an air quality and greenhouse gas impact assessment for the Project which is presented in full in **Appendix F** and includes:

- Meteorological and climatic conditions and the existing air quality conditions;
- Applicable air quality criteria to be met by the Project;
- Methods used to estimate dust emissions from the Project for future years;
- Predicted dust dispersion patterns due to emissions from the Project and other sources;
- Comparison between the predicted dust concentration and deposition levels with DECC's assessment criteria; and
- Estimation of the greenhouse gas emissions resulting from the Project.

The modelling has been prepared following the procedures outlined in the DECC *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005).

Figure 4a, **Figure 4b** and **Table 3** illustrates land ownership surrounding the Project and allocates each an identification number and indicates whether a receiver is located on the property and should be read in conjunction with this section.

A summary of the assessment is provided below.

8.1.1 Methodology

The assessment used a computer-based dispersion model (ISCMOD) to predict ground-level dust concentrations and deposition levels in the vicinity of the Project. To assess the affect that dust emissions will have on existing air quality, the dispersion model predictions from three indicative worst-case modelled years (2011, 2016 and 2022) have been compared with relevant air quality criteria. The three modelled years represent stages of the Project that have been assessed to have the potential for worst-case air quality impacts on receivers surrounding the EA Boundary.

Meteorological Data

Meteorological data collected at 10-minute intervals from the Macleans Hill meteorological station were incorporated into the air dispersion model for the Project. Hourly average data collected over the period 2007 to 2008 were used to create annual and seasonal windroses which are shown on **Figure 2**. The windroses show that in summer, the wind is predominantly from the east south east, while in winter, the wind is predominantly from the west north west. Autumn and spring months experience a combination of these wind conditions (see **Figure 2**).

Existing Air Quality

Mt Arthur Coal conducts air quality monitoring as shown in **Figure 7** including the measurement of:

- Particulate matters less than 10 microns (PM₁₀) measured every sixth day at eight sites using HVAS;

- Continuous PM₁₀ monitoring at four sites using Tapered Element Oscillating Microbalances (TEOMs) (replacing former GRIMM monitors); and
- Deposited dust at 21 sites.

A detailed review of existing monitoring data was completed for the Project and is provided in **Appendix F**. The review concluded:

- Annual average PM₁₀ concentrations monitored by Mt Arthur Coal are below relevant air quality criteria limits at private receivers;
- There are significant spatial variations in dust deposition over the sites that make up the Mt Arthur Coal air quality monitoring network with annual average levels ranging from 0.8 g/m²/month to 4.3 g/m²/month; and
- There have been occasions when the 24-hour PM₁₀ concentrations were above the air quality criterion of 50 µg/m³ at all sites, with these results generally caused by widespread events such as dust storms or bushfire.

For assessment of the air quality impacts due to the Project, the general approach recommended by DECC is to add dispersion model predictions to existing background levels. The result is then compared with the relevant air quality criteria as provided in **Table 18** and **Table 19**.

As the monitoring data will represent the cumulative effect of all dust sources relevant to the monitoring locations, including the existing Mt Arthur Coal Complex, adding model predictions for the Project to measured background levels will be an overly-conservative approach, as the current background levels already contain the contribution from Mt Arthur Coal's operations.

The approach taken in this assessment has been to develop a spatially-varying grid of background concentrations to add to the predicted impacts due to the Mt Arthur Coal Complex and the nearby mines (Bengalla, Muswellbrook Coal Company and Drayton). A full description of this cumulative air quality assessment methodology is provided in **Appendix F**.

Assessment Criteria

Table 18 and **Table 19** summarise the DECC air quality assessment criteria relevant to the Project. Generally these air quality criteria relate to the total dust burden in the air and not just the dust generated by the Project. Consideration of background levels needs to be made when using these criteria to assess impacts. In addition to health impacts, airborne dust also has the potential to cause nuisance impacts by depositing on surfaces.

Table 18 and **Table 19** show the maximum acceptable increase in dust deposition over the existing dust levels. The criteria for dust fallout levels are set to protect against nuisance impacts and considers cumulative impacts from all dust sources (DEC, 2005).

Table 18
Total Suspended Particulates and PM10 Assessment Criteria

Pollutant	Criteria ($\mu\text{g}/\text{m}^3$)	Averaging Period	Agency
Total Suspended Particulates (TSP)	90	Annual mean	National Health & Medical Research Council
PM ₁₀	50	24-hour maximum*	DECC
	30	Annual mean	DECC long term reporting goal

Source: DEC, 2005

* For coal mining operations in rural areas, this criteria is taken to be non cumulative for assessment purposes, provided the mine operates with best practice dust control measures

Table 19
Dust Deposition Assessment Criteria

Pollutant	Averaging period	Maximum Increase in Deposited Dust Levels ($\text{g}/\text{m}^2/\text{month}$)	Maximum Total Deposited Dust Levels ($\text{g}/\text{m}^2/\text{month}$)
Deposited Dust	Annual mean	2	4

Source: DEC, 2005.

Greenhouse Gas

The procedure specified in *National Greenhouse Accounts (NGA) Factors* (2008) published by the Department of Climate Change (DCC) has been adopted for this assessment which is consistent with internationally applied methods. The procedure nominates the following greenhouse gases:

- Carbon dioxide (CO₂);
- Methane (CH₄);
- Nitrous oxide (N₂O); and
- Synthetic gases (HFCs, SF₆, CF₄, C₂F₆).

Emission factors are standardised and expressed as a carbon dioxide equivalent (CO₂-e) which is calculated by multiplying the individual gas emission factor by its respective Global Warming Potential (GWP).

Dust Modelling

This assessment utilises the most contemporary guidelines for the assessment of air pollution sources using dispersion models (DEC, 2005). The model used for the assessment was a modified version of the US EPA ISCST3 model (ISCMOD). Indicative years 2011, 2016 and 2022 of mining were modelled which represent potential worst-case impacts arising from a range of coal and overburden production rates and mining activities in various locations within the EA Boundary. The operational description for the Project has been used to determine haul road distances and routes, the location of stockpile and pit areas, activity operating hours, truck sizes and other details that are necessary to predict dust emissions for each year.

The years modelled as part of this assessment correspond with years 10, 15 and 20 of the MAN EIS to enable a comparison of impacts from the Project to the currently approved mine.

The model includes the use of a dust suppressant product (or other comparably effective alternatives) on all permanent active coal and overburden haul roads to minimise the generation of dust.

Dust Modelling Criteria

The relevant air quality criteria are those specified in DECC's modelling guidelines and those specified by DoP in recent conditions of consent for open cut coal mines and include:

- 50 $\mu\text{g}/\text{m}^3$ for 24-hour PM_{10} for the Project alone, provided the Project is implementing best practice dust controls, which has been confirmed to be the case at the Mt Arthur Coal Complex (see **Appendix F**). It has been assumed that this applies at the 98.6th percentile (i.e. the criterion is not to be exceeded more than five days per year);
- 30 $\mu\text{g}/\text{m}^3$ for annual average cumulative PM_{10} due to the Project and the effects of other sources;
- 90 $\mu\text{g}/\text{m}^3$ for annual average TSP concentrations due to the Project and the effects of other sources;
- 2 $\text{g}/\text{m}^2/\text{month}$ for annual average deposition (insoluble solids) due to the Project considered alone; and
- 4 $\text{g}/\text{m}^2/\text{month}$ for annual average cumulative deposition (insoluble solids) due to the Project combined with the effects of other sources.

Spontaneous Combustion

Historically, the areas at the Mt Arthur Coal Complex most susceptible to spontaneous combustion have been confined to the Bayswater No 2 and the Drayton Sub-Lease Area where the seams in the Greta Coal measures were mined.

This area is now used for coal beneficiation and stockpiling, rejects emplacement, workshops and deployment facilities. Where final rehabilitation has been completed, no spontaneous combustion is evident.

The Wittingham Coal Measures at Bayswater No 3 and MAN contain lower levels of carbon and sulphur than the Greta Coal Measures resulting in lower propensity to heating. Inert overburden and interburden from these mining areas has and will be used to cap and extinguish spontaneous combustion in the areas where the Greta Coal Measures were historically mined.

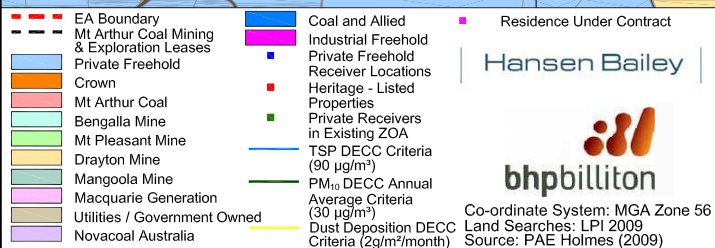
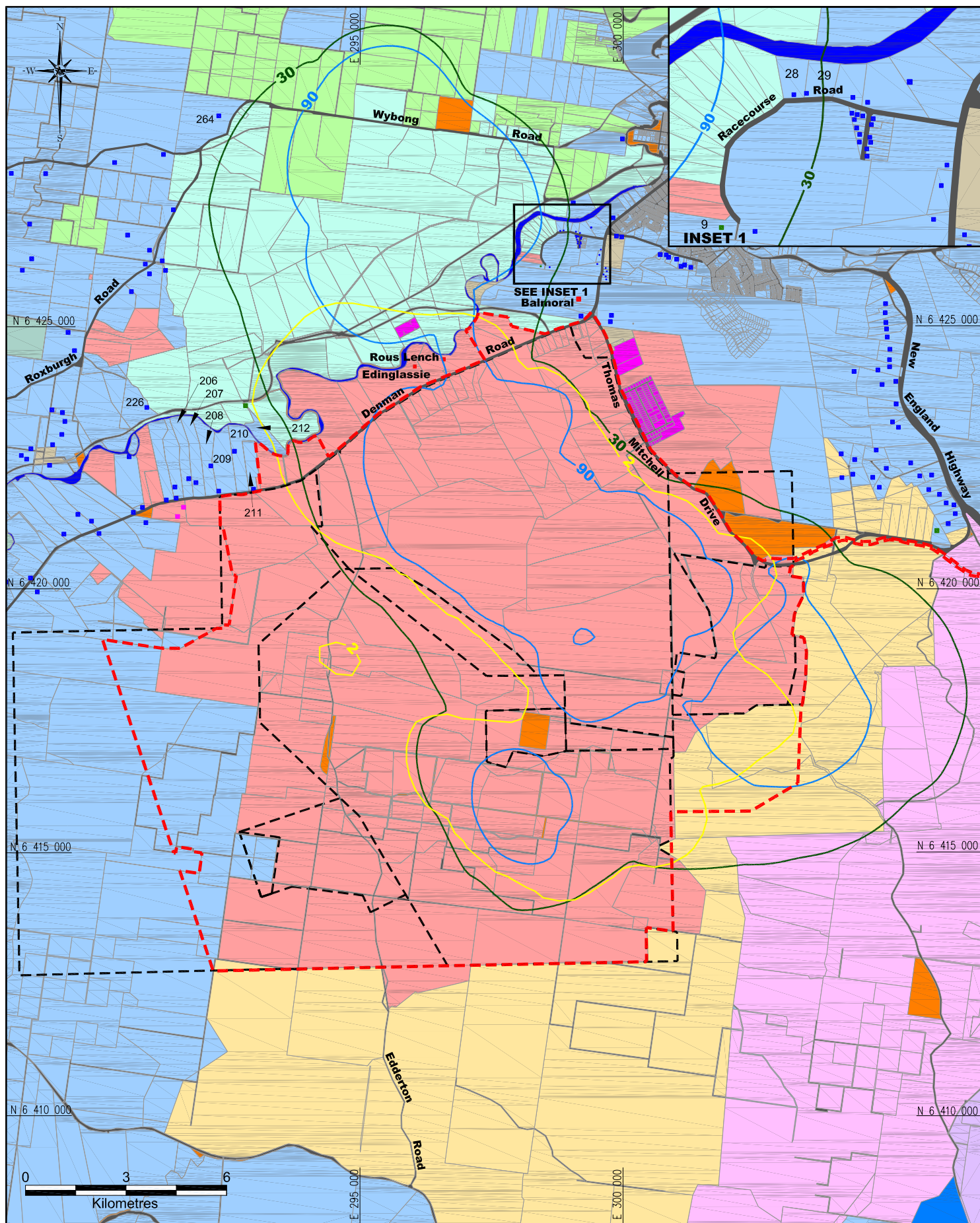
8.1.2 Impact Assessment

Air Quality

Figure 16, **Figure 17** and **Figure 18** illustrate predicted air quality contours for 2011, 2016 and 2022 respectively. These figures show the predicted annual average TSP concentrations, predicted annual average PM_{10} concentrations, and the predicted annual average (insoluble solids) dust deposition rate in relation to private receivers.

The results from the dispersion modelling indicate that the Project considered alone and with other sources is predicted to contribute to exceedances of air quality criteria at a number of private receivers which are summarised in **Table 20**. At all other private receivers, no exceedances of criteria have been predicted.

Table 20 indicates where private properties are already located in an adjacent mining operation's Zone of Affection (ZOA). Further results of detailed air quality impact predictions for all receivers are presented in **Appendix F**.



MT ARTHUR COAL

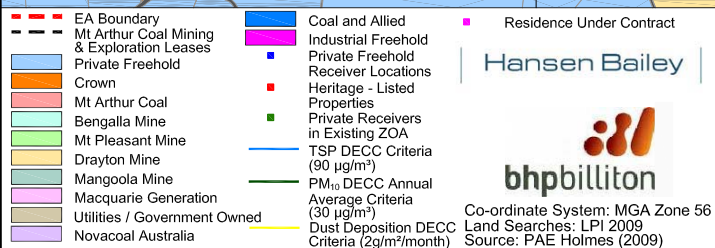
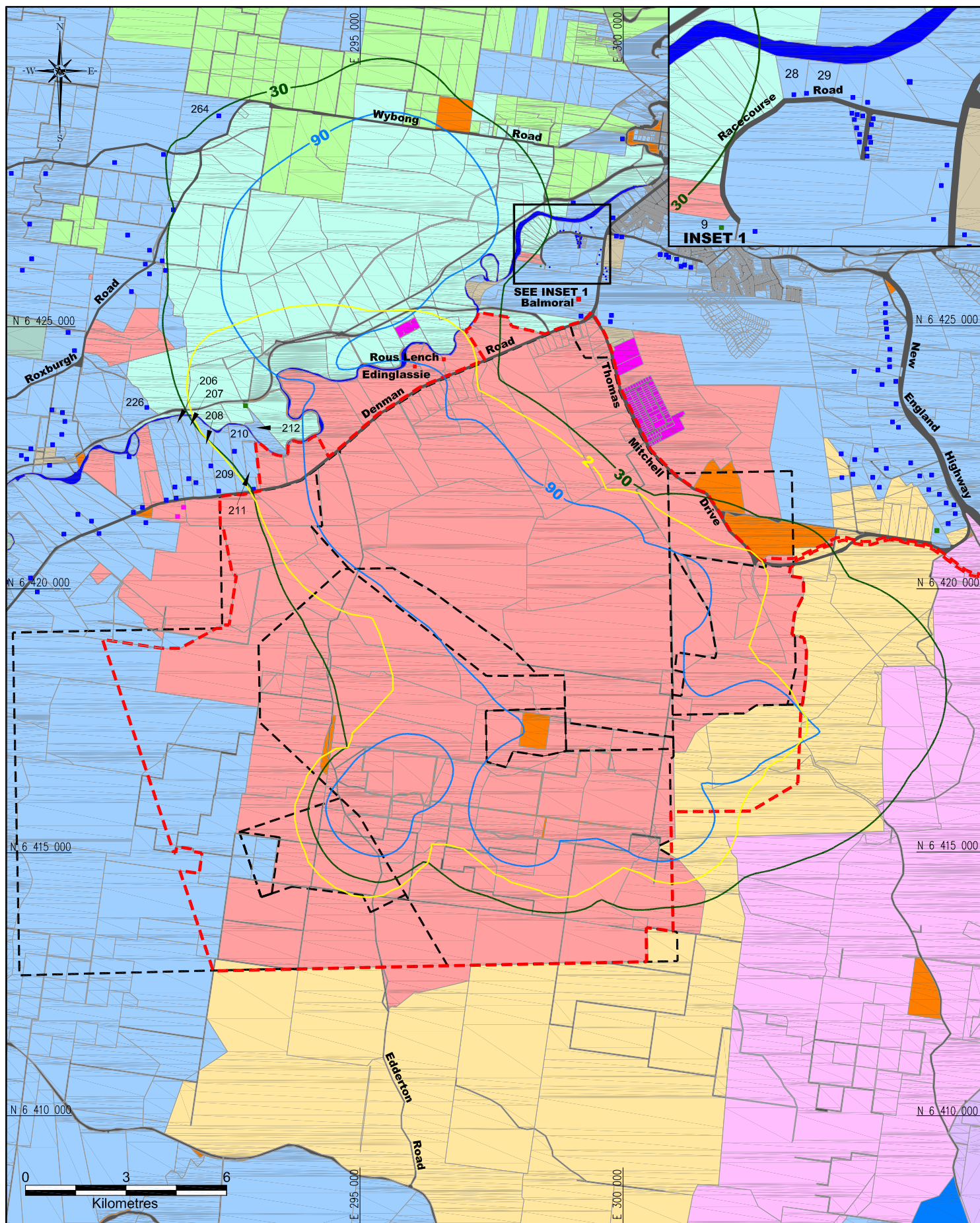
Indicative Air Quality Contours 2011

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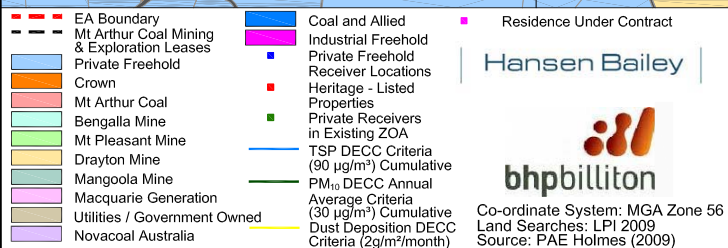
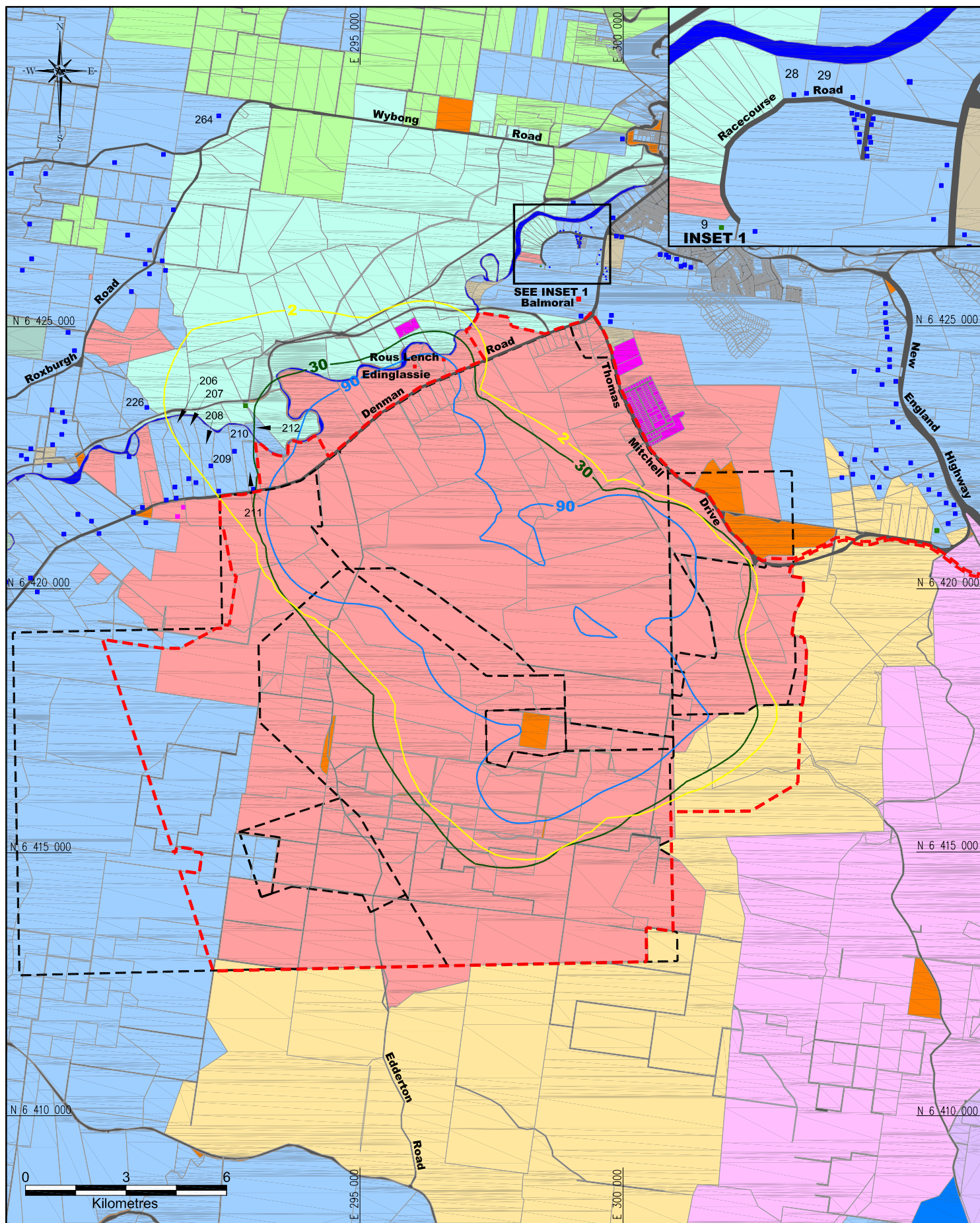
Indicative Air Quality Contours 2016

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MT ARTHUR COAL

Indicative Air Quality Contours 2022

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Figure
18

Table 20
Predicted Air Quality Exceedances at Private Receivers

ID	Receiver	PM ₁₀		TSP	Dust Deposition	
		24 hour	Annual	Annual	Annual	
		Project alone ^(a) (50 µg/m ³)	Project & other sources (30 µg/m ³)	Project & other sources (90 µg/m ³)	Project alone (2 g/m ² /month)	Project & other sources (4 g/m ² /month)
9 ^(b)	Englebrecht	No exceedance	32 µg/m ³ (Year 2011)	No exceedance	No exceedance	No exceedance
28	McGoldrick	No exceedance	31 µg/m ³ (Year 2011)	No exceedance	No exceedance	No exceedance
29	Barnett	No exceedance	31 µg/m ³ (Year 2011)	No exceedance	No exceedance	No exceedance
206	Wild	9 Days above criteria (Year 2022)	No exceedance	No exceedance	No exceedance	No exceedance
207	Zahra	9 Days above criteria (Year 2022)	No exceedance	No exceedance	No exceedance	No exceedance
208	Zahra	8 Days above criteria (Year 2016) 20 Days above criteria (Year 2022)	No exceedance	No exceedance	2.3 g/m ² /month (Year 2022)	No exceedance
209	Rankin	5 Days above criteria (Year 2016) 20 Days above criteria (Year 2022)	No exceedance	No exceedance	2.1 g/m ² /month (Year 2022)	No exceedance
210	Rankin	20 Days above criteria (Year 2016) 38 Days above criteria (Year 2022)	31 µg/m ³ (Year 2016)	No exceedance	2.3 g/m ² /month (Year 2016) 3.2 g/m ² /month (Year 2022)	No exceedance
211	Rankin	25 Days above criteria (Year 2016) 46 Days above criteria (Year 2022)	No exceedance	No exceedance	3.1 g/m ² /month (Year 2022)	No exceedance
212 ^(c)	Chudyk	35 Days above criteria (Year 2016) 52 Days above criteria (Year 2022)	38 µg/m ³ (Year 2016)	No exceedance	3.2 g/m ² /month (Year 2016) 3.9 g/m ² /month (Year 2022)	4.4 g/m ² /month (Year 2022)
226	Wynne/Roots	6 Days above criteria (Year 2022)	No exceedance	No exceedance	No exceedance	No exceedance
264	Moore	No exceedance	31 µg/m ³ (Year 2016)	No exceedance	No exceedance	No exceedance

- a) Only includes receivers where the predicted concentrations exceed the 24-hour average PM₁₀ impact assessment criteria on more than five days.
- b) Receiver 9 is located in the existing Mt Arthur Coal ZOA.
- c) Receiver 212 is located in the Bengalla ZOA.

As shown in **Table 20**, no receivers are predicted to exceed the TSP assessment criterion of 90 ug/m³. Four private receivers (not in an existing ZOA) including receivers 208, 209, 210 and 211, held by two landowners, are predicted to be impacted by dust levels exceeding the annual average 2 g/m²/month deposition level criteria from the Project alone.

Seven private receivers (not in an existing ZOA) including receivers 206, 207, 208, 209, 210, 211 and 226, owned by four landowners, are predicted to exceed the 24-hour average PM₁₀ criterion of 50 ug/m³ on more than five occasions per year. Four receivers (not in an existing ZOA), including receiver 28, 29, 210 and 264 are predicted to be impacted by dust levels above the annual average PM₁₀ criterion of 30 ug/m³ from the Project and other sources.

Four receivers (1 (vacant land), 6, 8 and 241) are also predicted to experience dust levels above the annual average PM₁₀ criterion of 30 ug/m³ from the Project and other sources over 25% of their property at varying times during the life of the Project.

In conclusion, ten private receivers owned by seven landowners (not in an existing ZOA) are anticipated to be impacted by dust levels exceeding the relevant criteria at the residence. Construction activities, including the realignment of Edderton Road were considered in the air quality impact assessment. The assessment found that the construction phase of the Project will have negligible emissions on air quality.

Greenhouse Gas

The main sources of greenhouse gas emissions from the Project have been identified as resulting from electricity consumption, fugitive emissions of CO₂ and CH₄, diesel usage, explosives usage, and the transport and end use of the product coal.

The emissions from these sources have been calculated based on the total extraction rate for each year of the Project and are summarised in **Table 21**. The Project will not significantly affect ambient sulphur dioxide (SO₂) concentrations due to the low sulphur content of Australian diesel and the fact that mining equipment at the Mt Arthur Coal Complex is widely dispersed over the site. Similarly, while NO_x and CO₂ emissions from the Project activities were considered, these were deemed to be too small and too widely dispersed to enable or require a detailed modelling assessment.

When comparing emissions from the Mt Arthur Coal Complex (i.e. from the existing operations at Mt Arthur Coal and the Project) (74 Million tonnes of Carbon Dioxide equivalent per annum) with the estimated current global emissions (3,000 Giga tonnes Carbon Dioxide equivalent per annum), it has been calculated that the average annual emissions of the Mt Arthur Coal Complex from the mining, transport and burning of coal are estimated to be approximately 0.0024% of the current global Carbon Dioxide emissions.

Table 21
Total Greenhouse Gas Emission Predictions from the Mt Arthur Coal Complex

Activity	Emissions (Mt CO ₂ -e)
Diesel and biodiesel usage	6.27
Electricity consumption	2.19
Blasting*	0.12
Fugitive emissions*	15.99
Transport of coal (rail and sea)	11.99
End use of coal	929.00
Total	965.00

* Applies only to the open cut mining operations at Mt Arthur Coal

The emissions estimated to result from the Project will not in themselves have any significant impact on global warming. Applying the principles of ESD, it is considered that there will be no increase or measureable impact on climate change as a result of the Project.

8.1.3 Mitigation and Management

Current dust minimisation practices onsite will be continued and enhanced to ensure that the limits predicted in **Section 8.1.2** above are met at private receivers. Mt Arthur Coal will review the existing Air Quality Management Plan (AQMP) for the site to incorporate the following practical management measures which may be implemented as required to ensure these predictions are met at private receivers:

- A review of the existing air quality monitoring program;
- The use of a dust suppressant product (or other comparably effective alternatives) on all active coal and overburden haul roads where necessary;
- Minimising development of minor haul roads;
- Ripping and revegetating of obsolete haul roads when these are no longer required;
- Clearly delineating all haul road areas to ensure vehicular disturbance is minimised, particularly when these cross overburden emplacement areas; and
- Extending the automatic water spray system to cover the additional coal stockpile areas proposed (or equivalent).

Mt Arthur Coal will continue to monitor greenhouse gas emissions to ensure that these emissions are kept to the minimum practicable level. Through the ongoing review of greenhouse gas emissions and the investigation of practical options for greater energy efficiency, Mt Arthur Coal will attempt to keep the ratio of greenhouse gas emissions per tonne of coal produced as low as possible. This may be achieved through:

- Review of equipment purchases with a view to keeping energy efficiency levels high;
- Ongoing scheduled and preventative maintenance to ensure that diesel and electrically powered plant operate efficiently;
- Review of mining practices to minimise double handling of materials and ensuring that coal and overburden haulage is undertaken using the most efficient routes;
- Ensuring that lighting and heating are only used when required;
- Consideration of the use of alternative fuels (e.g. biodiesel, solar panels and solar hot water systems) where economically and practically feasible; and
- Manage spontaneous combustion to minimise emissions of all gases including greenhouse gases.

Mt Arthur Coal will continue to monitor and manage spontaneous combustion events through the life of the Project in accordance with the Mt Arthur Coal EMS.

8.2 NOISE

A noise and blasting impact assessment for the Project was completed by Wilkinson Murray and is presented in full in **Appendix G**. The assessment includes a consideration of construction and operational mining noise, road noise and rail noise. The noise assessment is summarised below and has been undertaken in accordance with (at least) the following policies and guidelines:

- *NSW Industrial Noise Policy* (INP) (EPA, 2000) for operational and construction mining;
- *Environmental Criteria for Road Traffic Noise* (ECRTN) (EPA, 1999) for road traffic; and
- *Interim Guidelines for the Assessment of Noise from Rail Infrastructure Projects* (DECC, 2007) for rail movements on the Main Northern Railway Line.

Figure 4a, 4b and **Table 3** illustrates land ownership surrounding the Project and allocates each an identification number and indicates whether a receiver is located on the property and should be read in conjunction with this section.

8.2.1 Methodology

Introduction

As described in **Section 4.12**, various constraints analyses were undertaken for the Project which have been incorporated into the noise model.

Predicted noise levels at receivers were calculated using RTA Technology's Environmental Noise Model (ENM) which has been endorsed by DECC for environmental noise assessment. The proposed open cut extension areas and infrastructure modifications have been modelled in accordance with the INP and combined with the existing approved activities to represent the noise generated from the Mt Arthur Coal Complex. Rail noise was incorporated in the model for the privately owned components of the rail, from the existing Rail Loading Facility to the junction with the Main Northern Railway Line. Two Queensland Rail (QR) locomotives with approximately 1,280 m of wagons and one Rail Loading Facility were assumed to be operational at any one time.

The construction noise associated with the relocation of Edderton Road was assessed under the INP as part of the Project.

Background Noise Levels

Mt Arthur Coal engaged Wilkinson Murray to undertake noise surveys as part of the MAN EIS in 1999 and have continued to undertake noise monitoring and modelling since that time. **Section 3.8** provides a summary of the existing monitoring network including noise locations.

During the last 10 years, considerable development has occurred in the area surrounding the Mt Arthur Coal Complex. For this reason, a review of the background operational noise criteria was completed.

This review incorporated: 1) the establishment of receiver zones; 2) a review of previous noise survey results for MAN and MAU; 3) a review of long term noise monitoring (BarnOwl) data; 4) additional monitoring during spring of 2008; and 5) reviewing all monitoring data and results to revise background noise levels where appropriate.

Initially, noise criteria were determined by grouping receivers into zones where monitoring has confirmed that the Rating Background Levels (RBL) and existing industrial noise were determined to be consistent.

Noise levels around the Mt Arthur Coal Complex have been monitored since 1999. Data from three of the permanently installed real-time noise monitors (Racecourse Road, South Muswellbrook and Yammanie) were analysed. These monitors have been operated continuously since their installation between 2001 and 2004 and provide a significant amount of real-time background data.

In addition, monitoring was conducted at four supplementary locations during the spring of 2008. The additional four sites consisted of two sites where a mobile directional real-time monitoring unit was used and two sites where standard noise loggers were used.

The results found that the background noise levels at Racecourse Road and South Muswellbrook have increased since the MAN background noise levels were determined. Each is briefly discussed below.

An analysis of the directional LA_{eq} data from June to August 2008 at Racecourse Road indicates an increased background noise level of 36 dBA at night, of which the majority of noise at this location arrives from the north east, rather than from the direction of either the Mt Arthur Coal Complex or Bengalla mines. The most significant source in the north east direction is Muswellbrook itself, suggesting the increased background noise level is a result of increased urbanisation in the township.

However, it is accepted that the background noise level at Racecourse Road could be influenced by noise from the Mt Arthur Coal Complex and a conservative RBL of 34 dBA at night was adopted.

Background noise levels for South Muswellbrook were not monitored for the MAN EIS and hence the most conservative RBLs under the INP were set in the MAN EIS (30 dBA for daytime, evening and night).

To review this assumption, monitoring was undertaken in South Muswellbrook during October 2008, with the data compared to the long-term data set collected at the nearest South Muswellbrook real-time monitor. A background RBL of 34 dBA at night has been adopted.

Further discussion is provided in this regard in **Appendix G**.

Modelled Assessment Criteria

During preparation of the South Pit Extension EA, a calibration exercise was undertaken which demonstrated that the best correlation with measured noise levels during the worst-case month was with a single meteorological condition of high temperature inversion strength at night (4° per 100 m).

Using this methodology, predicted noise levels have generally been within 2 dBA of measured which is considered best practice and was assumed in the South Pit Extension EA and MAU EA.

Recent calibrations undertaken for the Project again confirmed correlation between predicted and measured noise levels over the winter period confirming the adoption of an inversion strength at night of 4° per 100 m to be appropriate.

Assessment Criteria

Operational Mining Noise

Table 22 shows the intrusive and amenity criteria applicable to the Project for day, evening and night. The intrusive criteria for night time periods have been adopted for this assessment as it is more stringent than the amenity criteria and represents a conservative modelling approach.

The adopted criteria include noise from adjacent existing mining operations and other industry, thus considering cumulative noise impacts.

The 'Amenity Criteria' listed in **Table 22** is the applicable cumulative criteria to be applied to the Project with a night time criteria of 40 dBA $L_{Aeq,9hr}$ assessed further below.

Sleep Disturbance

Sleep disturbance can occur when a short, sharp noise that is clearly audible over the background noise level occurs. The DECC recommends that to protect against sleep disturbance, the $LA_{1-1 \text{ min}}$ noise levels should not exceed the background level by more than 15 dBA at any receiver during the hours of 10:00 pm to 7:00 am or to 8:00 am on Sundays and public holidays. In practice the $LA_{1-1 \text{ min}}$ noise levels can be represented by the maximum noise levels.

Road Traffic Noise

Criteria for the assessment of noise from traffic on public roads are set out in the DECC's ECRTN. In terms of the ECRTN classifications, Denman Road east of Thomas Mitchell Drive and Thomas Mitchell Drive itself are considered "collector" roads taking traffic from west of Muswellbrook to the New England Highway. Denman Road west of Thomas Mitchell Drive is classified as a "local" road. The New England Highway is considered a "freeway or arterial road".

Noise impacts generated by the proposed increase in traffic flows have been considered for the Project. Road traffic noise impacts were assessed utilising the traffic flows estimated in the traffic impact assessment (see **Section 8.17**) and calculating additional noise as a result of the proposed increased in traffic movements from the current measured traffic movements. The criteria under which road traffic noise were assessed are provided in **Table 23**.

Table 22
Receiver Zones & Operational Noise Criteria

Receiver Zone	Location	Previous RBL (Day/Evening/Night dBA)	Assessed RBL (Day/Evening/Night) dBA	Intrusive Criteria (Day/Evening/Night) L _{Aeq,15min} dBA	Amenity Criteria (Night) L _{Aeq,period} dBA
A	Antiene Estate	32 / 35 / 33	32 / 35 / 33	37 / 40 / 38	40
B	Skelletar Stock Route Thomas Mitchell Drive Denman Road	34 / 33 / 32	34 / 33 / 32	39 / 38 / 37	40
C	Racecourse Road	32 / 31 / 30	36 / 35 / 34	41 / 40 / 39	40
D	Denman Road North west Roxburgh Vineyard (north east) Roxburgh Road	32 / 31 / 30	32 / 31 / 30	37 / 36 / 35	40
E	South Muswellbrook (including the South Muswellbrook Development Area)	30 / 30 / 30	34 / 34 / 34	39 / 39 / 39	40
F	Denman Road West Roxburgh Vineyard (west)	32 / 31 / 30	32 / 31 / 30	37 / 36 / 35	40
G	East Antiene	36 / 35 / 34	36 / 35 / 34	41 / 40 / 39	40

Table 23
Road Traffic Noise Criteria

Type of Development	Noise Level Criterion		Where Criteria are already Exceeded
	Day Time	Night Time	
Collector roads	L _{Aeq,1hr} 60dBA	L _{Aeq,1hr} 55dBA	In all cases, the redevelopment should be designed so as not to increase existing noise levels by more than 2dB. Where feasible and reasonable, noise levels from existing roads should be reduced to meet the noise criteria. In many instances this may be achievable only through long term strategies.
Local Roads	L _{Aeq,1hr} 55dBA	L _{Aeq,1hr} 50dBA	
Freeways / Arterial Roads	L _{Aeq,15hr} 60dBA	L _{Aeq,9hr} 55dBA	

Note: Daytime is 7:00 am – 10:00 pm; Night Time is 10:00 pm – 7:00 am.

Rail Transport

The DECC has published trigger noise levels at which an assessment of rail noise impacts should be undertaken which are presented in **Appendix G**. An assessment is not required unless an increase in existing rail noise levels of greater than 2 dBA L_{Aeq} or 3 dBA L_{Amax} is predicted. As no increase in the 24 approved rail movements per day is required as assessed and approved in the MAU, no further assessment of rail traffic on the Main Northern Railway Line is required. Rail transport noise from the Project on Mt Arthur Coal's Rail Loading Facility and loop has been included in the mine operational noise model.

8.2.2 Impact Assessment

Operational Noise

Figure 19, Figure 20 and Figure 21 show predicted received noise levels as night noise contours for the Mt Arthur Coal Complex for 2011, 2016 and 2022 respectively. Receiver zone groupings are also shown in **Figure 19, Figure 20, and Figure 21**. Operational key assumptions utilised for the purposes of modelling and detailed predicted noise levels for all receivers are presented in **Appendix G**.

Predicted noise levels for operational activities and construction of infrastructure modifications include proposed mitigation measures and represent the worst case scenario with all equipment operating under noise enhancing weather conditions. While this situation may occur occasionally, noise levels will generally be lower than the predicted noise levels.

A summary of the predicted modelled noise levels during night conditions for the Project at representative receivers is presented in **Table 24**. Exceedances of the intrusive night noise criteria at receivers under a night time worst case modelling scenario for all operational years modelled are also shown.

Where exceedances of more than 5 dBA above the applicable night time intrusive criteria have been predicted, these values are shown in bold text.

Table 25 provides a summary of predicted maximum intrusive noise levels under prevailing night conditions applicable to each receiver Zone.

As shown in **Table 24**, no exceedances of the intrusive criteria are predicted in Zone C or Zone E. In Zone A, exceedances of up to 4 dBA of the intrusive noise criterion are predicted at three private landholders. In Zone B, exceedances up to 4 dBA are predicted at three private landholders. In Zone D, exceedances of the intrusive criterion of up to 6 dBA are predicted at up to six landholders properties (and an additional receiver within an adjacent mine's ZOA). In Zone F, up to 3 dBA above the intrusive criterion at two private landholders has been predicted.

Where noise from the Project has been predicted to influence private landholders, all Zones (with the exception of Zone G which is influenced predominantly by rail noise) are predominantly influenced by activities associated with mining activities with the following key findings:

- Noise at all private receivers is predicted to comply with the amenity criteria of the INP;
- Noise at some receivers is predicted to exceed the intrusive criterion of the INP;
- Noise at receivers 101 and 102 is predicted to exceed the intrusive criterion by more than 5 dBA (receiver 102 is within the MAU ZOA); and
- Noise at receiver 212 is predicted to exceed the intrusive criterion by more than 5 dBA (this receiver is already within another mine's ZOA).

The cumulative noise assessment undertaken for the Project predicted that for Zone B to Zone F noise levels will continue to remain approximately 4 dBA lower than $L_{Aeq,15min}$ levels and hence no exceedances of the amenity criterion is predicted for any receiver. For Zone A and Zone G the cumulative noise assessment predicted that the night time noise criterion will be exceeded at receiver 102 which is within the MAU ZOA.

Table 24
Predicted Exceedances of Intrusive Noise under Prevailing Night Conditions at Private Receivers

ID	Description	Zone	Intrusive Criteria	Predicted Noise Level L _{Aeq,15min} dBA			Exceedances above Intrusive Criteria		
				2011	2016	2022	2011	2016	2022
6	Scriven	B	37	40	36	36	3	0	0
8	Drake	B	37	39	36	36	2	0	0
37	Council of the Municipality of Muswellbrook *	B	37	37	38	37	0	1	0
49	Webber	B	37	39	36	36	2	0	0
49	Webber	B	37	41	39	39	4	2	2
87	Halloran	A	38	39	39	39	1	1	1
93	Osborn	A	38	39	40	40	1	2	2
94	Skinner	A	38	41	42	41	3	4	3
95	De Boer	G	39	40	40	40	1	1	1
96	Bird	G	39	39	40	39	0	1	0
97	Clifton	G	39	41	42	41	2	3	2
98	Jones	G	39	41	42	41	2	3	2
99	Hunter	G	39	41	41	41	2	2	2
99	Hunter	G	39	42	42	42	3	3	3
100	Sharman	G	39	42	42	42	3	3	3
101	Horder	G	39	45	45	45	6	6	6
102	Robertson ***	G	39	48	48	48	9	9	9
184	Fosters Wine****	D	35	36	38	38	1	3	3
184	Fosters Wine****	D	35	36	37	38	1	2	3
184	Fosters Wine****	F	35	35	37	38	0	2	3
187	Duncan	F	35	35	36	36	0	1	1
204	Latham	D	35	36	36	37	1	1	2
206	Wild	D	35	37	37	37	2	2	2
207	Zahra	D	35	36	37	37	1	2	2
208	Zahra	D	35	37	38	38	2	3	3
209	Rankin	D	35	36	36	36	1	1	1
210	Rankin ^	D	35	39	40	40	4	5	5
211	Rankin	D	35	38	39	39	3	4	4
212	Chudyk **	D	35	39	41	40	4	6	5
226	Roots	D	35	35	38	37	0	3	2

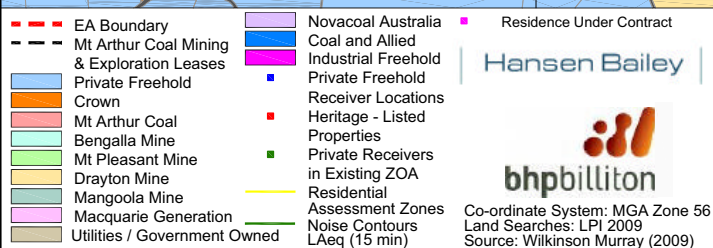
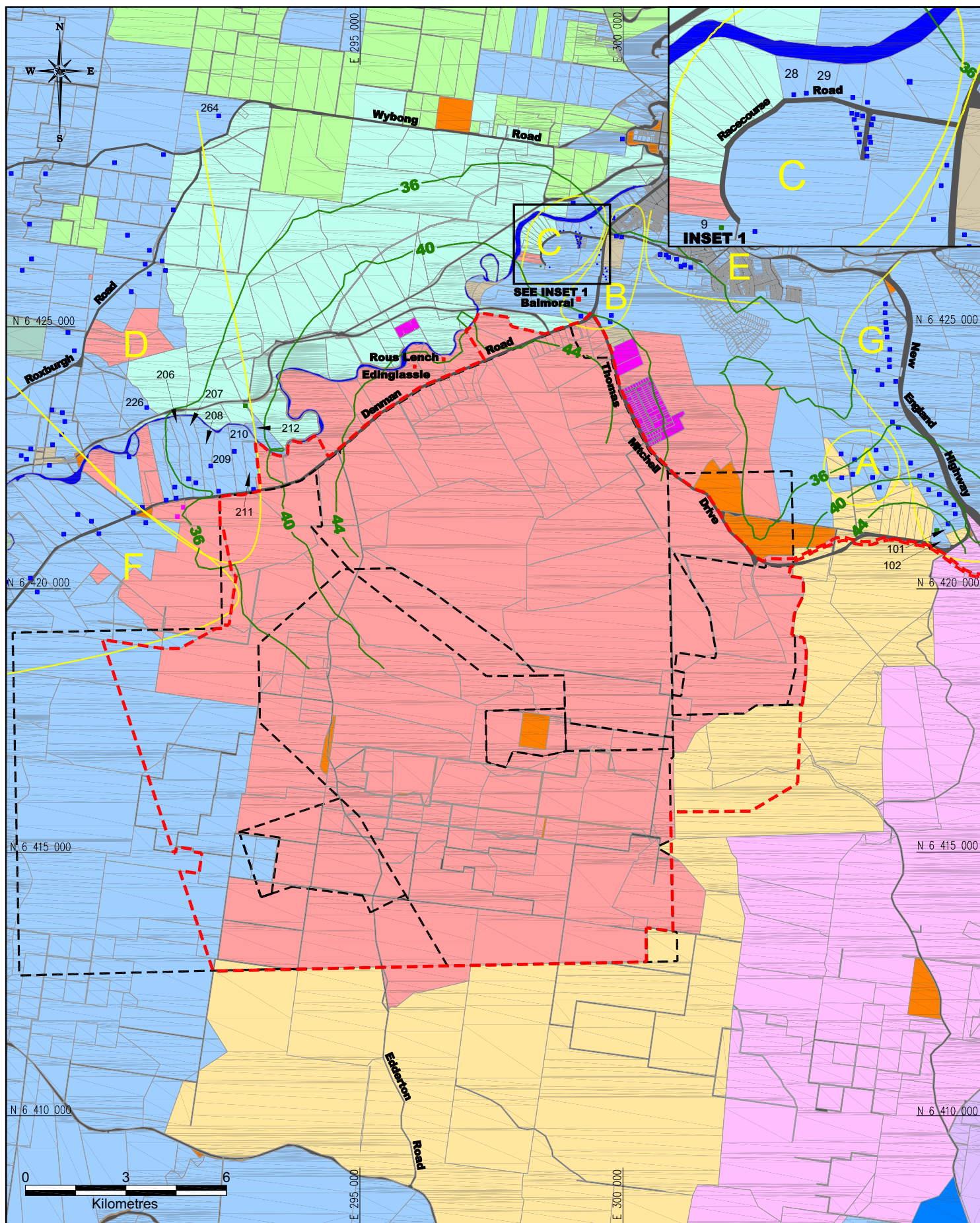
* Commercial or industrial property.

** Subject to acquisition by an adjacent mining operation.

*** Subject to acquisition under the MAU.

****Under contract of sale to Mt Arthur Coal.

^ Indicates where noise exceedances are predicted over greater than 25% of the property (but not at the receiver).



MT ARTHUR COAL

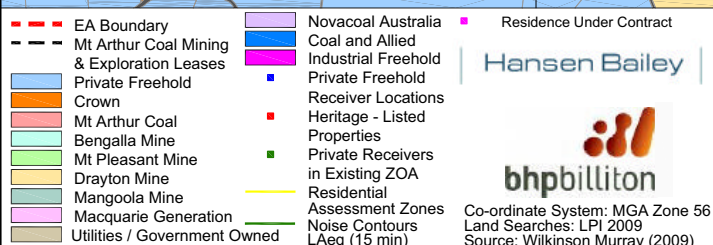
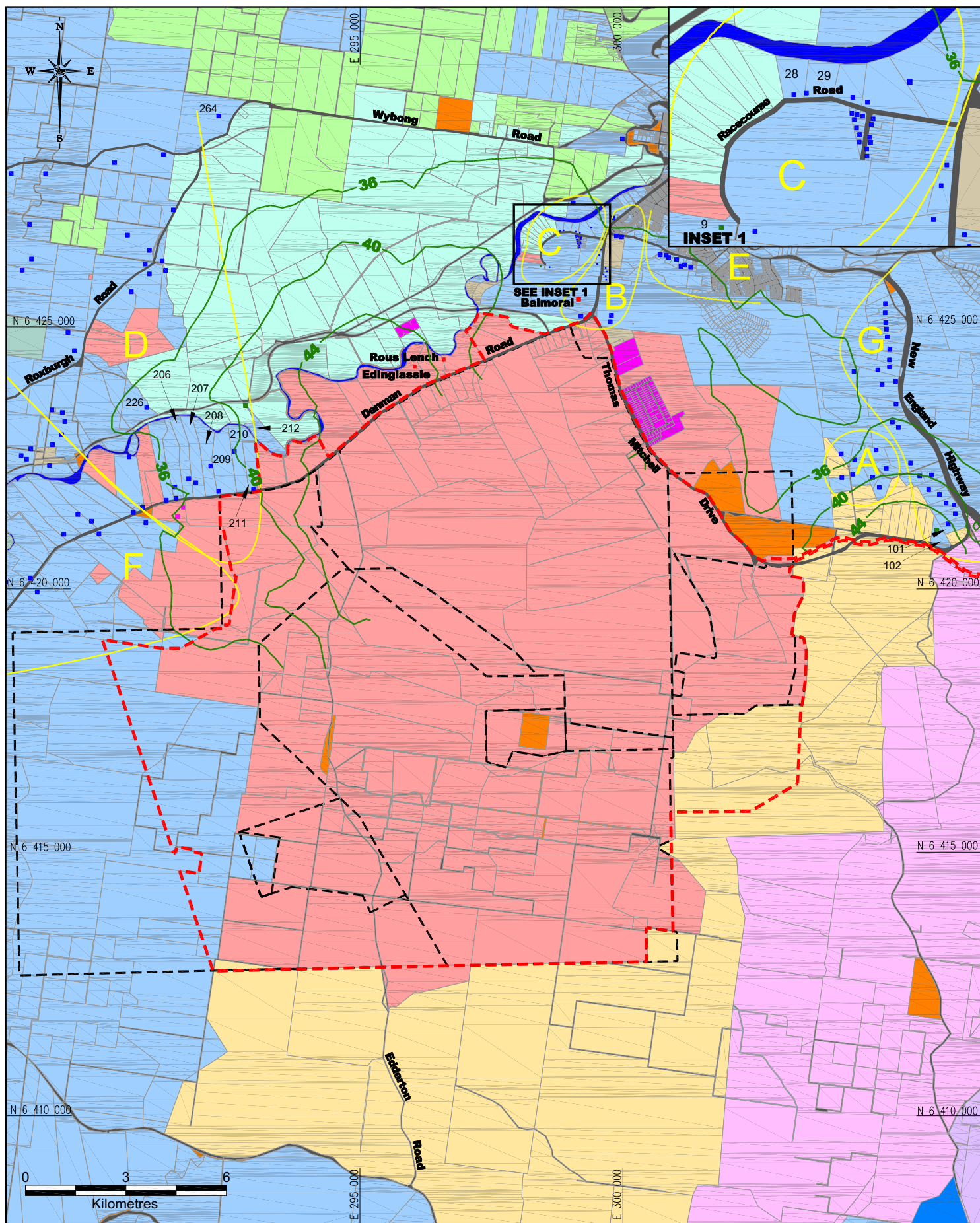
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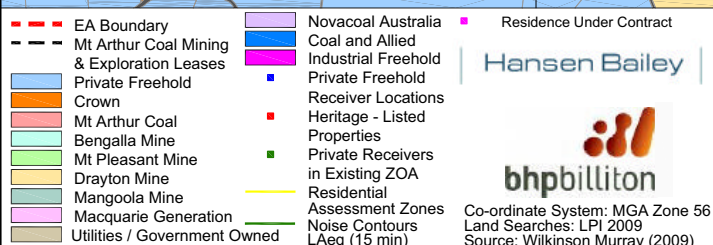
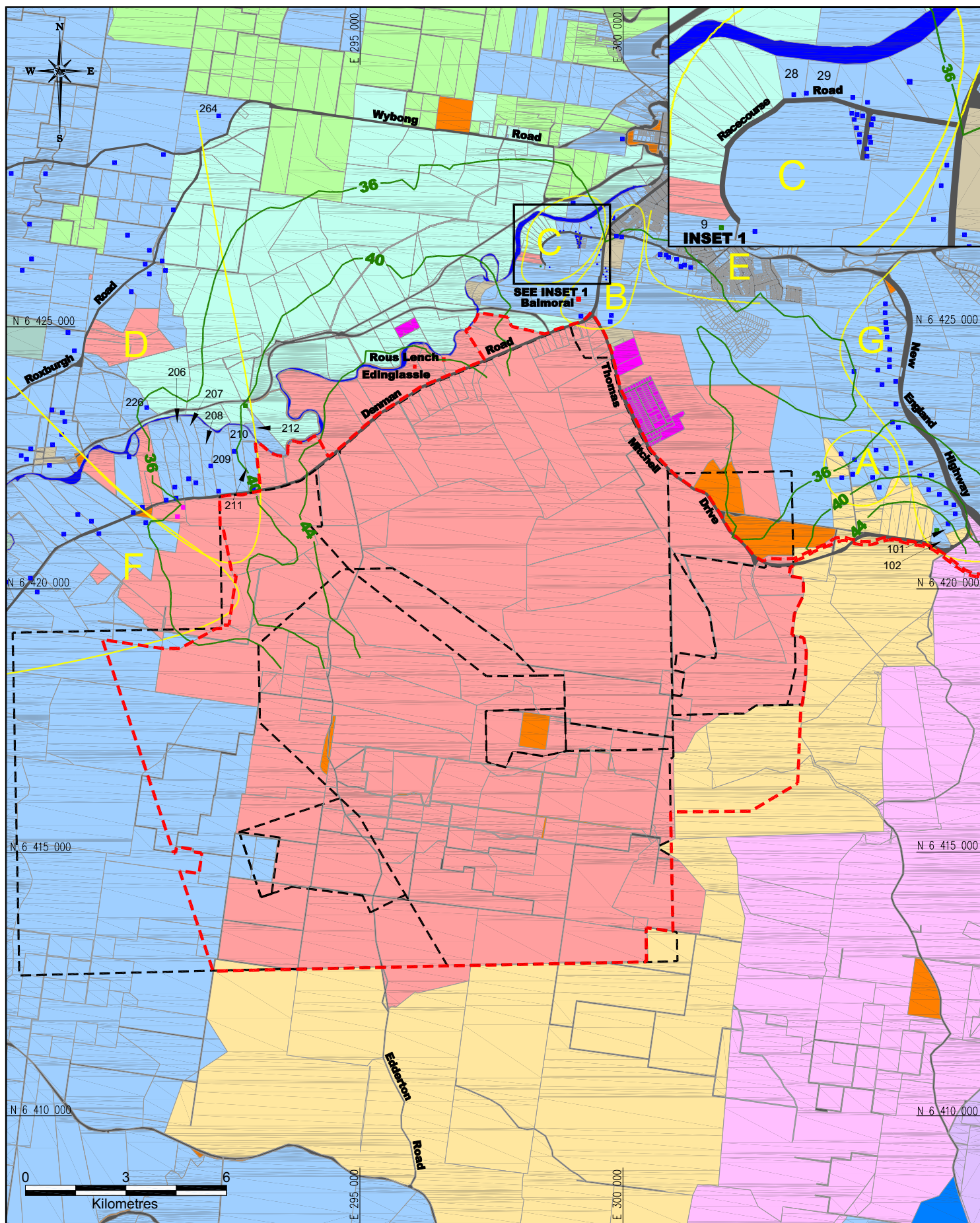
Indicative Noise Contours 2016

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MT ARTHUR COAL

Indicative Noise Contours 2022

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21

Table 25
Receiver Zone Predicted Maximum Intrusive Noise Levels under Prevailing Night Conditions

Receiver Zone	Location	Predicted Maximum Intrusive Night Level (LA _{eq} 15 min (dBA))
A	Antiene Estate	42
B	Skelletar Stock Route Thomas Mitchell Drive Denman Road	41
C	Racecourse Road	35
D	Denman Road North west Roxburgh Vineyard (north east) Roxburgh Road	40
E	South Muswellbrook (including the South Muswellbrook Development Area)	35
F	Denman Road West Roxburgh Vineyard (west)	38
G	East Antiene	42

Edderton Road Realignment Construction

The construction of the Edderton Road realignment is predicted to result in a worst-case 1 dBA exceedance of the daytime criteria at Residence 209 (Rankin). This exceedance is considered negligible and would occur over a short period while construction activities are at the closest point. No exceedances due to construction of the Edderton Road realignment are predicted at any other receivers.

Sleep Disturbance

The potential for sleep disturbance was considered separately for mining operations and for rail infrastructure as part of the assessment. All receivers surrounding the Project were predicted to experience L_{Amax} noise levels below the sleep disturbance criterion from mining operations.

Calculated L_{Amax} levels from rail pass-by noise were predicted to remain within the criterion at all receivers with the exception of receiver 101 and receiver 102 (which is in the MAU ZOA).

All predicted internal maximum noise levels are within the range of levels during the night time period that are unlikely to cause awakening reactions (as defined in the ECRTN).

Road Traffic Noise

Traffic accessing the Mt Arthur Coal Complex generally travels via Thomas Mitchell Road and either the New England Highway to the south or Thomas Mitchell Drive to the north. All these roads support large numbers of industrial traffic.

Approximately 240 employees will be required for the construction period, which are estimated to generate a worst-case weekday traffic volume of 142 light and 10 heavy vehicles per day (each way). Predicted noise levels from the construction traffic have shown an increase in traffic noise by a maximum of 0.6 dBA on Thomas Mitchell Drive east of the Mt Arthur Coal Access Road, which is well within the 2 dBA ECRTN criteria.

Operational activities are proposed to be at peak capacity by 2016 with an increase in employees of approximately 720 personnel. Predicted noise levels as a result of the increased traffic movements as a result of the Project during the operational stage were predicted to increase by approximately 1 dBA, which is considered to be acceptable.

A cumulative traffic noise assessment has been undertaken to determine the cumulative impact of the Project with other approved industrial projects in the area.

Cumulative traffic noise levels predicted showed an increase by a maximum of 1.8 dBA which is below the criterion and therefore considered acceptable.

Rail Noise

Predicted noise impacts from rail infrastructure at receivers in Zones A & G (Antiene) are largely equivalent to that predicted in the MAU assessment. Noise from rail operations are predicted to exceed the intrusive criterion at nine receivers; including two receivers (receiver 101 and receiver 102) which are predicted to experience noise levels greater than 5 dBA above the intrusive criterion (receiver 102 is subject to acquisition upon request by Mt Arthur Coal).

As there will be no increase in the already approved daily train numbers on the rail network (i.e. 24 rail movements per day), there will be no increase in noise levels compared with those previously assessed and approved.

8.2.3 Mitigation and Management

Noise will continue to be managed in accordance with the Mt Arthur Coal EMS, and the Noise Management Plan (including commitments in the MAU EA). These plans will be revised to incorporate the changing requirements of the Project. Ongoing research and development of noise attenuation and mitigation at the Mt Arthur Coal Complex have resulted in noise impacts being minimised since the commencement of mining operations through onsite management activities (including noise monitoring, construction of noise bunds, operational controls and relocation of equipment, routine sound power level testing of mobile equipment, and consideration of noise impacts during mine planning).

Mt Arthur Coal will continue to ensure that the limits predicted in **Table 25** are met at private receivers through the implementation of these onsite management activities and continual improvement.

Mt Arthur Coal will review the existing Noise Management Plan (NMP) for the site to incorporate the following additional practical management measures which may be implemented as required to ensure predictions at private receivers are met:

- Placement of quieter haul trucks on critical (northern) haul routes and relocation of louder equipment to shielded locations during adverse weather conditions; and
- The implementation of white noise reversing alarms.

8.3 BLASTING

A noise and blasting impact assessment for the Project was completed by Wilkinson Murray and is presented in full in **Appendix G**.

The noise and blasting assessment is summarised below and has been undertaken in accordance with the *Guideline to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration* (ANZECC, 1990) and *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (ANZECC, 1990) for blasting.

8.3.1 Methodology

ANZECC recommended blasting criteria as shown in **Table 26** applies to all privately owned receivers or other sensitive receivers as shown on **Figure 4**.

An additional assessment was conducted by Bill Jordan & Associates (see **Appendix H**) to confirm appropriate blasting criteria for the two listed heritage items (Edinglassie and Rous Lench as shown on **Figure 28**) located immediately to the north of the EA Boundary. As these buildings are owned by Mt Arthur Coal, annoyance criteria does not apply. **Table 26** indicates criteria applicable to these two heritage buildings.

Table 26
Blasting Criteria

Location	Criteria	Overpressure (dBL)	Ground Vibration (mm/s)
Privately Owned Receiver*	Less than 5% of total blasts to exceed	115	5
	No blasts to exceed	120	10
Edinglassie & Rous Lench	No blasts to exceed**	133	10

* Criteria may not apply where a written private agreement is in place.

** Further research and future discussion with the NSW Heritage Office may result in a variation to this criterion.

8.3.2 Impact Assessment

Extensive experience in blasting has been gained at the Mt Arthur Coal Complex since the 1960s. Current practice at the Mt Arthur Coal Complex commits to achieving relevant criteria at all potentially-affected locations utilising available technology. This includes the modelling of all blasts to predict impacts ensuring a reasonable level of certainty of impacts.

The assessment defined the extent of areas where modelling predicts an exceedances of criteria, based on worst-case assumptions in relation to mining procedures. Airblast overpressure and ground vibration levels from blasting are related to the “scaled distance” from the blast. Data from over 7,600 records of blasts undertaken at the Mt Arthur Coal Complex was reviewed to derive relationships between scaled distance and overpressure and vibration.

These relationships were designed to predict the 95th percentile value, representing the level which would be exceeded by only 5% of blasts, given the use of current blast practice and the current level of variability in overpressure or vibration for the same scaled distance. These relationships were then utilised to calculate the overpressure and ground vibration at neighbouring receivers from blasts typical of the existing operations and the Project.

The assessment determined that if blasting occurred with a Maximum Instantaneous Charge (MIC) of 1,681 kg over the entire proposed mining area, relevant criteria will be exceeded at a number of sensitive locations.

A predictive equation allowed the assessment of MIC's of 1,681 kg and 812 kg blasts which determined that some areas in the north of the proposed mining area would require blasting to be managed in a different manner to current methods in order to meet the relevant criteria at sensitive receivers. These areas are shown in **Appendix G**. Mt Arthur Coal will conduct full scale blasting within these areas in the future, with trial blasts to be conducted using different blasting technologies to demonstrate compliance with relevant criteria.

Orica Mining Services completed a detailed blasting constraints assessment for the proposed blasting activities for the Project. The assessment confirmed that based on current site law information and blasting practices, Mt Arthur Coal will be able to conform to the existing set vibration limits of 95% of blasts under 5 mm/s.

The assessment also found that Mt Arthur Coal will be able to achieve the proposed vibration limit of 10 mm/s at Edinglassie and Rous-Lench homesteads, however, a change of current blasting practices will be required when blasting reaches a distance of 1 km from these homesteads. A variety of changed blasting practices including varied horizon thickness and number of holes fired in given time frame (i.e. electronic blasting) may be successfully employed at Mt Arthur Coal, within 1 km of these sensitive receivers, in order to meet the blasting limits.

8.3.3 Mitigation and Management

Blasting at the Mt Arthur Coal Complex will continue to be operated in accordance with the Mt Arthur Coal EMS including the Blasting Vibration Management Plan which will be revised to incorporate the Project and the additional mitigation measures proposed. Consistent with current practices at Mt Arthur Coal, consultation will be undertaken with relevant service providers where blasting has the potential to impact transmission lines.

Blasting techniques will be investigated as a part of mine planning and as new technology is available. As a result, it is expected that the blasting in the northern areas will be possible through the application of new technology and different blasting methods at Mt Arthur Coal. The mining of this area will continue to be managed in a way that ensures all relevant criteria are met at private receivers during blasting and that no structural damage results at either the Edinglassie or Rous Lench historic homesteads.

A combination of the following practical management measures will be implemented as required to ensure predictions are met at historic homesteads and at private receivers:

- Vibration-related structural damage criteria as described above in **Table 26** will be applicable to the Edinglassie and Rous Lench Homesteads;
- Operational modifications (e.g. reducing bench heights and the use of electronic detonators to provide accurate timing of charges) will be investigated, and controls implemented to ensure blasting in management zones will not result in exceedances of criteria;
- Continuation of use of Sonic Detection and Ranging (SODAR) or similar effective system to assist in determining appropriate meteorological conditions for a combination of the following practical management measures will be implemented as required to ensure predictions are met at European heritage homesteads and at private receivers; and

- Undertake ongoing investigations to achieve further improvements to current blasting practices, including the application of new technologies, particularly in areas to the north where current blasting practices have the potential to impact on the Edinglassie and Rous Lench historic homesteads and on neighbouring privately owned receivers.

8.4 VISUAL AND LIGHTING

Integral Landscape Architecture and Visual Planning was commissioned to complete a visual and lighting assessment of the potential impacts of the Project.

This assessment was designed and undertaken to identify the character of the visual landscape surrounding the Mt Arthur Coal Complex and provide management and mitigation measures for visual impacts found to be associated with the Project. A summary of this assessment is provided below and included in full in **Appendix I**.

8.4.1 Methodology

Consideration was given to the existing visual environment surrounding the EA Boundary, in the context of current approvals at the Mt Arthur Coal Complex and those sought for the Project. This assessment included the determination of existing landscape settings and how they are seen from various viewing locations. In this way, the existing visual character of the landscape and the visual sensitivity of the various viewing locations assessed for the Project were determined.

The visual effect of the Project was then determined by considering the visual characteristics of its various components in the context of the landscape in which the Mt Arthur Coal Complex is located. An integrated assessment of visual sensitivity and visual effects (and interactions between these two factors) was used to determine overall impacts of the Project and provide direction on the mitigation strategies required. The overall method of visual assessment of the existing landscape and the Project in the context of the surrounding landscape is outlined in **Table 27**.

No additional signage is required for the Project and as such no impacts are predicted.

Representative Viewing Locations

Representative viewing locations within the primary visual catchment were selected to illustrate views of the Project from various external locations (Figure 22). The primary viewing sectors include:

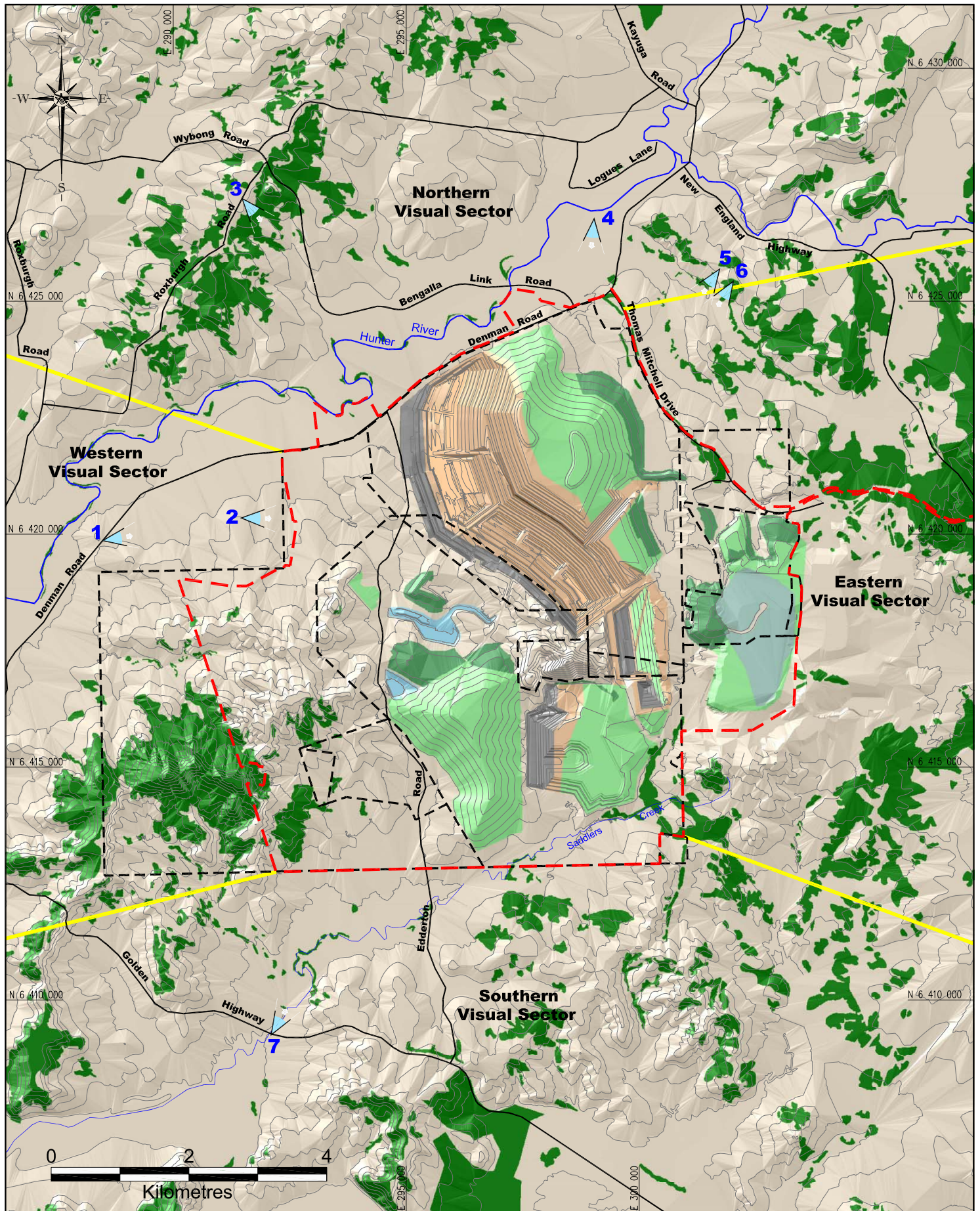
- Western: Location 1 – Denman Road and Location 2 – Roxburgh Vineyard;
- Northern: Location 3 – Roxburgh Road, Location 4 – Racecourse Road, Location 5 – South Muswellbrook and Location 6 – Ironbark Ridge Estate; and
- Southern: Location 7 – Golden Highway (Saddlers Creek).

Assessment location points were selected to illustrate views from various view points around the Mt Arthur Coal Complex. Many locations are the same as were used for the MAN EIS to enable comparisons with the Project. The assessments from these locations have been structured to display typical, worst case views of the Project from these areas.

At each of these locations, a set of photomontages has been completed to illustrate: existing views and those projected during 2011, 2016 and 2022 as representative phases of the Project mine life.

Table 27
Visual Impact Assessment Matrix

Visual Effect					
Visual Sensitivity	High		Moderate	Low	Very Low
	High	High Impact	High Impact	Moderate Impact	Low Impact
	Mod	High Impact	Moderate Impact	Low Impact	Low Impact
	Low	Moderate Impact	Low Impact	Low Impact	Low Impact



- Mt Arthur Coal Mining & Exploration Leases
- EA Boundary
- Active Mining
- Spoil
- Tailings
- Existing Rehabilitation
- Proposed Rehabilitation
- Remnant Vegetation
- Water Storage
- Visual Assessment locations
- Visual Sectors

Hansen Bailey



Source: LPI, 2022 Mine Plan

MT ARTHUR COAL

Visual Assessment Locations

Cad File: 03993D.dwg

Date: 11.08.09

Drawn: CP

Figure
22

Visual Effect

Visual effect is a measure of the level of visual contrast and integration of a development (i.e. the Project) with the existing landscape. Each landscape has certain visual characteristics expressed through the visual elements of form, shape, line, colour and texture. A mining development such as the Project has different visual characteristics that will create contrast with the existing landscape. However, in this case, a range of approved mining operations are part of the existing landscape, so to an extent the visual effects of the Project borrow visual character from these operations, reducing visual effects.

The magnitude of the visual effect of the Project was determined by a balanced consideration of the following:

- The level of contrast and integration of the Project with its surrounding landscape. Project elements as expressed through the visual expression elements (i.e. form, shape, pattern, line and colour with minor consideration in relation to texture) contrast to varying degrees with the surrounding landscape and will also integrate with it to some extent; and
- The proportion of a view from a location that is occupied by the Project.

Visual Sensitivity

Visual sensitivity is a measure of how critically a change to the existing landscape is viewed by people from different land use areas in the vicinity of a development. In this regard, residential, tourist and / or recreation areas generally have a higher visual sensitivity than other land use areas, including industrial, agricultural or transport corridors, as land uses such as residential use the scenic amenity values of the surrounding landscape and may be used as part of a leisure experience and often over extended viewing periods.

Table 27 indicates the levels of visual sensitivity associated with the Project. The visual sensitivity of individual receivers may range from high to low, depending on the following additional factors:

- Screening effects of any intervening topography, buildings or vegetation. Receivers with well screened views of the Project will have a lower visual sensitivity than those with open views;
- Viewing distance from the receiver to visible areas of the Project. The longer the viewing distances, the lower the visual sensitivity; and
- General orientation of receivers to landscape areas affected by the Project. Those receivers with strong visual orientation towards the Project (i.e. those with areas such as living rooms and / or verandas orientated towards it) will have a higher visual sensitivity than those not orientated towards the Project, and which do not make use of the views toward the Project.

For any area to be given a sensitivity score, it must have visibility to the Project. The assessment of visibility for the purpose of scoring visual sensitivity was assessed based on field assessments, the evaluation of topographic and vegetation data and the computer assessment of those two parameters.

Visual Impact

The visual impact of the Project has been determined by considering both visual effect and visual sensitivity, which when considered together determine impact levels. The way in which the visual parameters of visual sensitivity and visual effect are cross referenced and resultant impacts is shown in **Table 27**.

Lighting Impact

The lighting impacts of the Project have been assessed by considering both the proposed mining operations, the relative levels at which the various viewing locations are situated and the presence of any screening features such as topography or vegetation.

Project Mine Planning and Final Landform

The visual assessment of the existing visual environment undertaken for the areas surrounding the EA Boundary was used to enhance the development of the conceptual mine and final landform development plans for the Project. In considering the effects and sensitivities predicted for each primary viewing sector of the Mt Arthur Coal Complex throughout the life of the Project, a conceptual final landform was able to be developed that minimises visual impacts where possible and provides the most acceptable result for surrounding receivers.

As discussed in **Section 4.12.8**, the eastern section of Macleans Hill was removed from the proposed mine plan to minimise potential visual impacts. The mine plan landform has also been modified to improve visual amenity, including the development of undulating, free-draining overburden emplacement areas and the development of crests on the final landform to minimise visual effects.

The development of the conceptual mine plans and final landform for the Project are discussed further in **Sections 4.1 and 8.15** respectively).

8.4.2 Impact Assessment

A review of Project mine plans, aerial photography and the photomontages determined that visual impacts will be created predominantly by the active mining area and overburden emplacement areas. This visual effect is created by the new landform that is progressively introduced and the shapes, lines and colour that are introduced into the landscape by these elements. The visual effect of the overburden emplacement areas is for the greater part of four types, depending on the progression of rehabilitation:

- Overburden that has strong colour and form contrast to the existing landscape, creating a high visual effect;
- Shaped overburden to create the final landform. This, to varying degrees, removes form contrast reducing visual effect towards moderate;
- Land stabilisation with grass planting which restores colour values and reduces contrast with the existing grassland landscape which reduces visual effect to moderate / low; and
- The reintroduction of tree cover to re-establish the patterns of the landscape and assist in reducing the regular form of overburden emplacement areas in the landscape which will reduce the visual effect to low.

In terms of the above, it can be seen that the visual effect on receivers in the northern, eastern and southern sectors will eventually be reduced to low. However, western locations and elevated locations such as Roxburgh Road will retain a high visual effect created by the colour and form contrast of active mining and the overburden emplacement area. To reduce impacts from this type of visual effect, mitigation is typically required at the specific points of viewing.

The western sites which are heavily impacted in this way are limited to a small arc that extends from Roxburgh Vineyard to parts of Denman Road and parts of Roxburgh Road (located in the northern and western sectors, respectively).

Western Sector Sensitivity

The Hunter River Floodplain creates the western view corridor that incorporates lands on the floodplain and adjoining foothills to the west and south of the river. This sector includes Denman, rural receivers at Roxburgh and Denman Roads and sections of the Golden Highway. This sector also includes the tourist destinations of the Roxburgh Vineyard and Pukara Estate Olive Grove.

The following visual sensitivities will be experienced from the viewing locations assessed for this sector:

- Denman Township – Generally low visual sensitivity due to location being approximately 12 km from the Project and a range of localised viewing restrictions;
- Rural receivers – Ranging from low to high, dependent on receiver orientation, intervening topography, distance from the Project and localised viewing restrictions;
- Denman Road – High to medium visual sensitivity due to close proximity to the Project and its location in the primary view zone for road users;
- Roxburgh Road – High sensitivity due to continued open views onto the active faces of the Project overburden emplacement areas; and
- Pukara Estate Olive Grove – High sensitivity due to long views of the Project.

Figure 23a presents an indicative photomontage from the western sector for the Project at Denman Road and Roxburgh Vineyard at year 2022.

Northern Sector Sensitivity

Immediately to the north of the Mt Arthur Coal Complex is the Hunter River Floodplain that is adjoined by the rolling hills of the northern foothills. This sector contains the township of Muswellbrook and Aberdeen as well as rural homesteads in the northern hills. The sector also supports the recently approved Ironbark Ridge Estate development, parts of the New England Highway, the Main Northern Railway Line and Denman Road, as well as significant local roads including Wybong Road.

Key areas in this sector are likely to have the following visual sensitivities:

- Muswellbrook Township – High sensitivity for those receivers that have open views in the direction of the Project, reducing to low for the majority of homes that have no views to the Project;
- Ironbark Ridge Estate – High sensitivity due to continued views of overburden emplacement areas for the Project;
- Aberdeen Township – Low visual sensitivity due to location approximately 15 km from the Project;
- Rural Homesteads – High visual sensitivity for those receivers oriented toward the Project;
- New England Highway – Visual sensitivities from the highway in this sector are low; and
- Denman Road – High sensitivity in this sector due to immediate foreground views available of the Project.

Figure 23b and **Figure 23c** present indicative photomontages from the northern sector as assessed for the Project, located at Racecourse Road, South Muswellbrook, Ironbark Ridge and Roxburgh Road at year 2022.

SITE 1 - DENMAN ROAD



SITE 2 - ROXBURGH VINEYARD



LEGEND

— MAN Approved Year 15 Final Landform

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MT ARTHUR COAL

Western Sector Photomontages (2022)

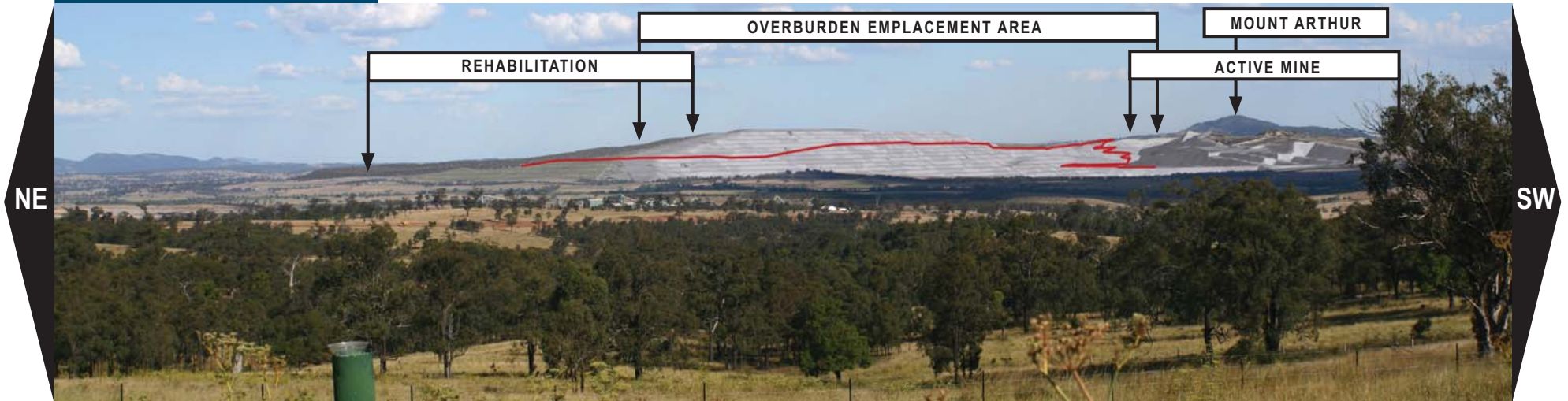
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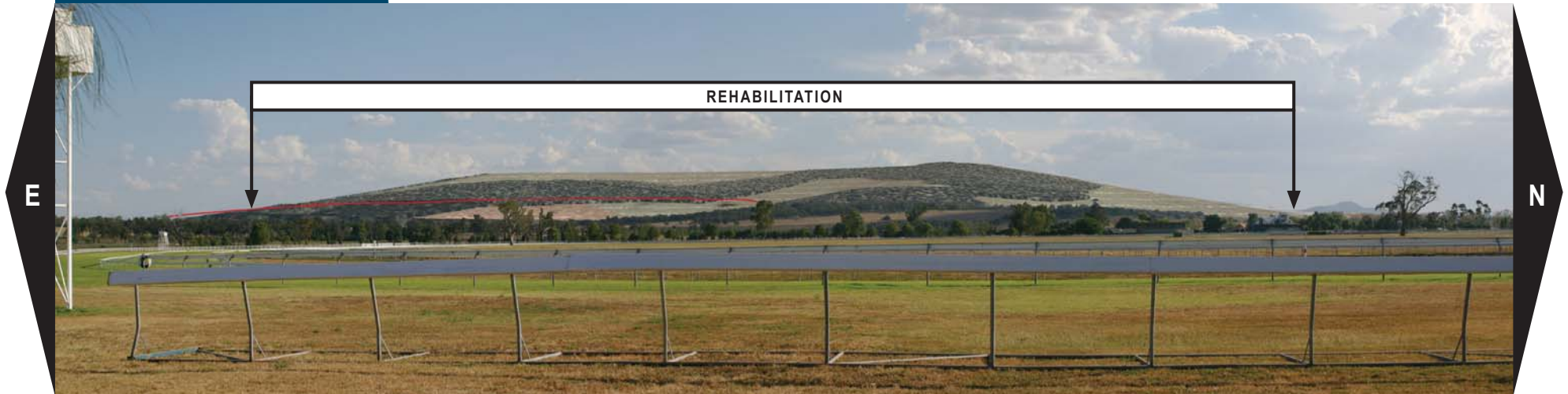
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Figure
23A

SITE 3 - ROXBURGH ROAD



SITE 4 - RACECOURSE ROAD



LEGEND

— MAN Approved Year 15 Final Landform

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MT ARTHUR COAL

Northern Sector Photomontages (2022)

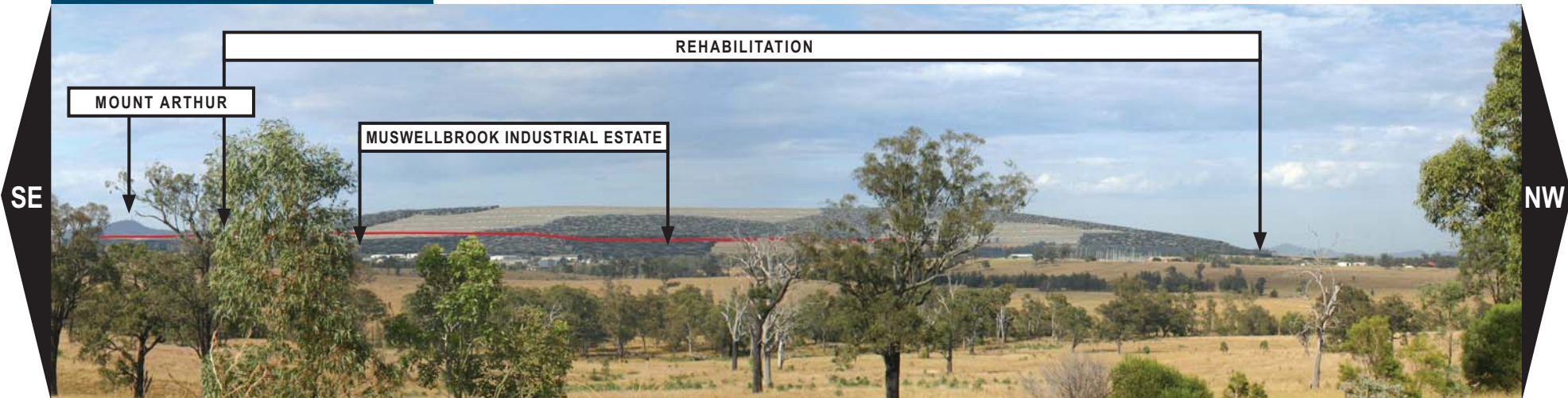
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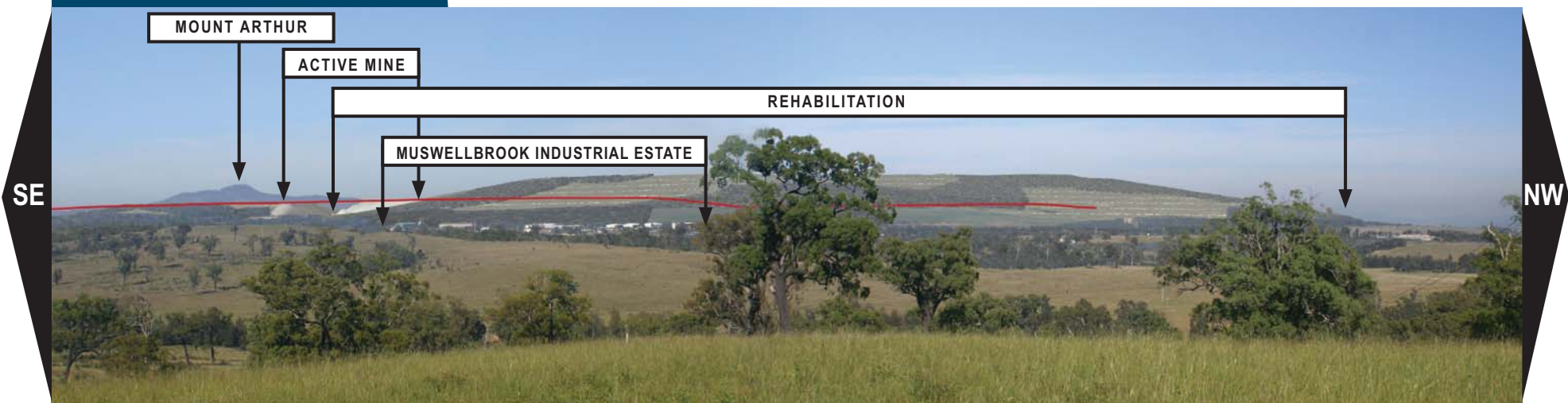
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Figure
23B

SITE 5 - SOUTH MUSWELLBROOK



SITE 6 - IRONBARK RIDGE ESTATE



LEGEND

— MAN Approved Year 15 Final Landform

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MT ARTHUR COAL

Northern Sector Photomontages (2022)

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Figure
23C

Eastern Sector

The eastern sector is dominated by foothills and rural lands. The sector supports part of the Main Northern Railway Line, the New England Highway as well as scattered rural homesteads east of the highway and a small area of rural residential development adjacent to the intersection of the highway and Thomas Mitchell Drive.

Areas that have visual exposure to the Project in this sector are generally located to the west of the New England Highway. To the east of the highway, only distant elevated locations have views to the Project. These areas do not support sensitive receivers and are relatively distant from the Mt Arthur Coal Complex.

The following visual sensitivities are likely to be experienced from the viewing locations assessed for this sector:

- Main Northern Railway Line – Moderate to low sensitivity, with very limited views of the Project;
- New England Highway – Moderate sensitivity due to limited nature of exposure to views of the Project; and
- Rural Residential Areas – Generally low sensitivity due to the lack of view towards the Project. Specific individual rural receivers with views towards the Project in this sector will however, be highly sensitive.

Southern Sector

This sector supports a number of sensitive land uses and includes part of the Golden Highway, Jerrys Plains, horse studs and supporting homesteads, and a winery with a high tourist activity level (Arrowfield Wines).

The following visual sensitivities are likely to be experienced from the viewing locations assessed for this sector:

- Golden Highway – Medium to low sensitivities at the eastern and western extremities of those areas of the highway that have views of the Project;
- Jerrys Plains – Low sensitivity due to a lack of visibility of the Project due to intervening topography;
- Horse Stud Areas – High visual sensitivity for visitor / client viewing areas with views toward the Project, otherwise low or unsighted; and
- Arrowfield Vineyard – Low sensitivity due to lack of visibility of the Project due to intervening topography.

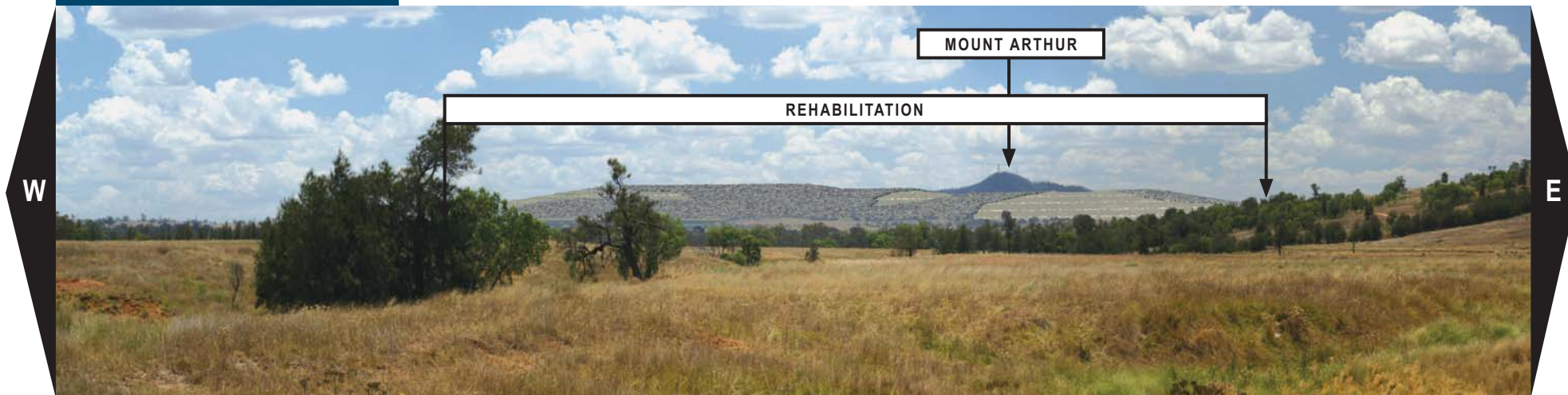
Figure 23d presents an indicative photomontage from the southern sector located on the Golden Highway of the Project at year 2022. As can be seen from this figure, the approved Year 15 final landform from the MAN EIS is currently shielded by existing topography from this viewing location.

Visual Impact Summary

The visual impacts of the Project will vary according to the visual effects created, its visibility and the visual sensitivity of areas from which it is seen. As discussed above, the sensitive viewing locations (receivers) surrounding the Mt Arthur Coal Complex include towns, rural receivers, road networks and tourist locations.

The visual impact assessment undertaken determined that the high levels of impacts to receivers associated with the Project are predominantly created by views of the active mining face and the development of the overburden emplacement areas.

SITE 7 - GOLDEN HIGHWAY



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MT ARTHUR COAL

Southern Sector Photomontages (2022)

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Date: 27.08.09

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Figure
23D

These impacts from the development of the overburden emplacement areas are of three broad types, including: views onto the outer face and active face of the overburden emplacement areas, and loss to distant mountains created by the overburden emplacement areas which are described further below.

View onto Outer Face of Overburden Emplacement Areas

Where views are available onto the outer face of overburden emplacement area, impacts will be dynamic through the life of the Project. Receivers experiencing impacts of this type include eastern viewing locations including Muswellbrook, Aberdeen, the New England Highway, parts of Denman Road and the Main Northern Railway Line, as well as rural receivers in this sector.

Initial impacts of this type may be high, depending on the extent of unconsolidated overburden emplacement areas seen as a percentage of the primary view zone and the view as a whole. This impact will however, be reduced to moderate and low as rehabilitation progresses.

Views onto Active Face of Overburden Emplacement Areas

Where views are available onto the active face of the Project overburden emplacement area, visual effect levels cannot be reduced onsite and any required mitigation measures will therefore need to be established at applicable viewing locations.

The sites that may require such consideration to reduce high visual impact levels are Roxburgh Vineyard, some receivers on Roxburgh Road and parts of Denman Road itself, with possible consideration of areas within the Pukara Estate Olive Grove.

View Loss from Overburden Emplacement Areas

View loss as a result of the Project is due to distant hill features, including Mount Arthur being obscured by the development of the overburden emplacement areas.

These impacts are predicted to be generally experienced by receivers in areas of lower elevation, while elevated areas will generally retain much of their existing views of these features.

As such, the Racecourse Road viewing location and other receivers to the north of the Mt Arthur Coal Complex at similar elevations, including those on Sheppard Avenue, will experience the greatest impact due to the loss of views of distant hill features due to the Project.

Lighting Impact Summary

The level of impacts from lighting is generally dependent on the two types of lighting effects that could be experienced from the Project, being:

- Where the light source is directly visible and will be experienced if there is a direct line of sight between a viewing location and the light source; and
- The general night-glow (diffuse light) that results from light of sufficient strength being reflected into the atmosphere. This type of effect will create a strong local focal point and the effect will vary with distance and atmospheric conditions such as fog, low cloud and / or dust particles which all reflect light.

The only locations that will have direct line of sight to the Mt Arthur Coal Complex lighting are elevated locations such as Roxburgh Road and Roxburgh Vineyard that overlook the screening topography and vegetation. These locations are considerably distant, which will provide mitigation of these effects.

At the Mt Arthur Coal Complex, operational areas and machinery lighting will not be directly visible to most locations due to the screening effect of existing overburden emplacement areas and the adjoining topography and vegetation.

Rather, a diffuse effect of light and its interaction with atmospheric conditions may from time to time create a glow around the EA Boundary. The influence of the surrounding mining operations and associated lighting activities will reduce the visual impact of diffuse light generated by the Project. The diffuse night lighting effect of the Project will be similar to that which is currently experienced and will include the diffuse lighting effects created by Bengalla Mine, Drayton Mine, Muswellbrook township and the existing Mt Arthur Coal Complex operations.

8.4.3 Mitigation and Management

Mitigation and management measures to reduce the visual impacts from the Project include both onsite and offsite treatments and are discussed below.

Onsite Management Measures

Onsite management measures will reduce the visual effect created by the Project overburden emplacement areas through the implementation of management measures on Mt Arthur Coal land. A reduction in contrast and lack of visual integration is created by the form, shape and line of the overburden emplacement areas as well as the colour contrast of the pre rehabilitation overburden within the existing overburden emplacement areas.

In accordance with existing management measures implemented at the Mt Arthur Coal Complex, the main visual treatment to be established for the management of predicted onsite impacts will include the integration of the conceptual mine plans and final landform for the Project with the approved landform designs of Mt Arthur Coal overburden emplacement areas and those for adjacent mining operations. Conceptual mine plans and rehabilitation to be developed for the Project are discussed in **Sections 4.1 and 8.15**, respectively.

Other onsite management measures to be established for the Project may include:

- The integration of tree corridors on the overburden emplacement area as progressive rehabilitation occurs (discussed further in **Section 8.15**);
- The retention of the eastern flank of Macleans Hill to assist in creating landscape diversity at the foot of overburden dumps;
- Establishing visual and ecological planting patterns of native trees to achieve landscape patterns that emulate in part existing mixes of tree and grass cover in a grazing landscape;
- Minimising exposure of work areas to sensitive receivers where possible; and
- Onsite treatment options and management measures will also be incorporated in the Landscape and Rehabilitation Management Plan, to ensure it remains effective throughout the life of the Project.

Offsite Management Measures

Offsite treatments are required where onsite treatments cannot achieve a meaningful reduction in visual effect levels. Landscape treatments will focus on planting schemes to reduce the visibility of the Project for specific receivers but may also involve planting or other works established to create elements that enhance local landscape settings without necessarily removing views to the Project.

Offsite management measures may include (in consultation with private landholders):

- Upon Project Approval, guidelines will be prepared to include: treatment methods for primary and secondary view areas from affected residences; consultation requirements with residents in those key areas of high sensitivity (as discussed in **Section 8.4.2**), and action plans to mitigate visual impacts of the Project (depending on extent of visibility and its sensitivity). This will be detailed in a report to be submitted to DoP.

- Landscape designs and plantings at the locations of affected rural and urban receivers who experience strong orientation toward the Project and are not screened by foreground vegetation, topography or other features;
- Implementation of landscape plans developed in consultation with key stakeholders to ensure appropriate screening of the Project from sites visited by commercial tourists; and
- Assessment of Denman Road to define areas that would benefit from roadside tree planting. Any such plantings would be in keeping with RTA requirements for use of 'frangible' plants within road reserves. Larger tree belts may be planted in adjoining properties with owner consent.

Lighting Mitigation and Management

The visual effect of lighting associated with the Project will be at a similar level to that currently approved and experienced by receivers surrounding the Mt Arthur Coal Complex.

Lighting at the Mt Arthur Coal Complex will continue to be managed to ensure that the minimum level necessary for operational and safety needs is maintained and all lighting shall continue to be implemented in accordance with the EMS. Where possible, lights will be utilised at the lowest effective level and directed away from incoming views. All lighting will be directed to the ground and work areas and avoid being cast skyward or over long distances. Mt Arthur Coal employees will continue to be trained in the management of night time lighting, in accordance with current practice.

Specific light management strategies may include limiting night work, where possible, in areas that are exposed to direct views along Thomas Mitchell Drive and Denman Road and / or orientating direct light away from these viewing locations.

The planting of foreground vegetation on Denman Road may also reduce the potential for direct lighting impacts to receivers at this viewing location.

8.5 ECOLOGY

Cumberland Ecology Pty Ltd completed an ecological assessment for the Project which is included as **Appendix J**. The assessment describes the ecological values within the EA Boundary in consideration of the regional context in which it lies, and assesses the impacts of the Project on flora and fauna, particularly threatened species and communities listed under the TSC Act. The assessment also addresses impacts on MNES as listed under the Commonwealth EPBC Act.

The assessment has been undertaken in accordance with:

- The Draft *Guidelines for Threatened Species Assessment under Part 3A of the EP&A Act*;
- *NSW Groundwater Dependent Ecosystem Policy*;
- *Policy and Guidelines – Aquatic Habitat Management and Fish Conservation*;
- *SEPP No44 – Koala Habitat Protection*; and
- *Guidelines for Development Adjoining DEC Land*.

8.5.1 Methodology

Background

The EA Boundary has been extensively studied since the 1960s for the development of Bayswater No 2 and for subsequent mining extensions and annual monitoring within the Mt Arthur Coal Complex. As a result, survey data exists for 1993, 2000, 2003, 2004, 2005, 2006, 2007 and 2008.

These assessments were comprehensively reviewed for the Project so that the existing information from within and adjacent the EA Boundary could be built upon through investigation and field survey for the Project.

Other existing information on the biodiversity values within the EA Boundary and its surrounds was obtained through the review of the DECC Atlas of NSW Wildlife and DEWHA EPBC Protected Matters Search Tool database resources.

The background review confirmed that extensive fieldwork and scientifically robust surveys have been conducted at Mt Arthur Coal, within a range of habitats and vegetation types, using a variety of flora identification and fauna trapping / detection methods. The existing total fauna survey effort within the EA Boundary (not including field surveys for the Project) is a cumulative result of a series of surveys conducted over a period of nine years to 2009.

During this time, there have been over 6,900 trap nights and over 280 person hours of fauna surveys conducted within the EA Boundary, using detection methods (including Anabat echolocation recordings and active searches) and trapping methods (including hair funnels / tubes, Elliott traps, harp traps and pitfall traps).

Following the review of existing information and survey findings, additional field surveys for flora for the Project were undertaken over a period from spring 2008 to autumn 2009 within the five proposed Mine Extension Areas (as shown on **Figure 24**), in accordance with the DECC *Threatened Biodiversity Survey and Assessment Guidelines for Development and Activities* (2004).

No additional fauna surveys were required for the Project due to the extensive and comprehensive work previously undertaken. The flora field surveys for the Project therefore represent a range of different seasonal and meteorological conditions and included:

- Flora surveys within 400 m² and 1000 m² quadrats (over 25 quadrats);
- Flora surveys entailing random meanders to explore for threatened and regionally significant plant species; and
- Fauna habitat assessments.

The threatened species Schedules of the *Fisheries Management Act 1994* comprise lists of endangered species, populations and ecological communities, vulnerable species, species presumed extinct and key threatening processes.

These Schedules indicate that the Hunter River drainage basin is outside the known distribution of species, populations and ecological communities listed under this legislation. Further, Mine Extension Areas 1-5 are essentially dry with no permanent streams or wetlands. A dry, ephemeral stream is located in the gully of Mine Extension Area 2, and another in the southern portion of Mine Extension Area 5.

However, these were dry at the time of the flora and fauna assessments and they do not support any riparian or aquatic habitats. As such, a detailed aquatic assessment was deemed not to be required for the Project.

Also, no Groundwater Dependant Ecosystems (GDEs) were identified, or anticipated to occur within the Mine Extension Areas.

Flora and Fauna Descriptions

Flora

Previous assessments, supported and enhanced by field surveys conducted for the Project, have identified a number of vegetation communities within the EA Boundary. The status and location of these vegetation communities are shown in **Figure 24** and listed in **Table 28**.

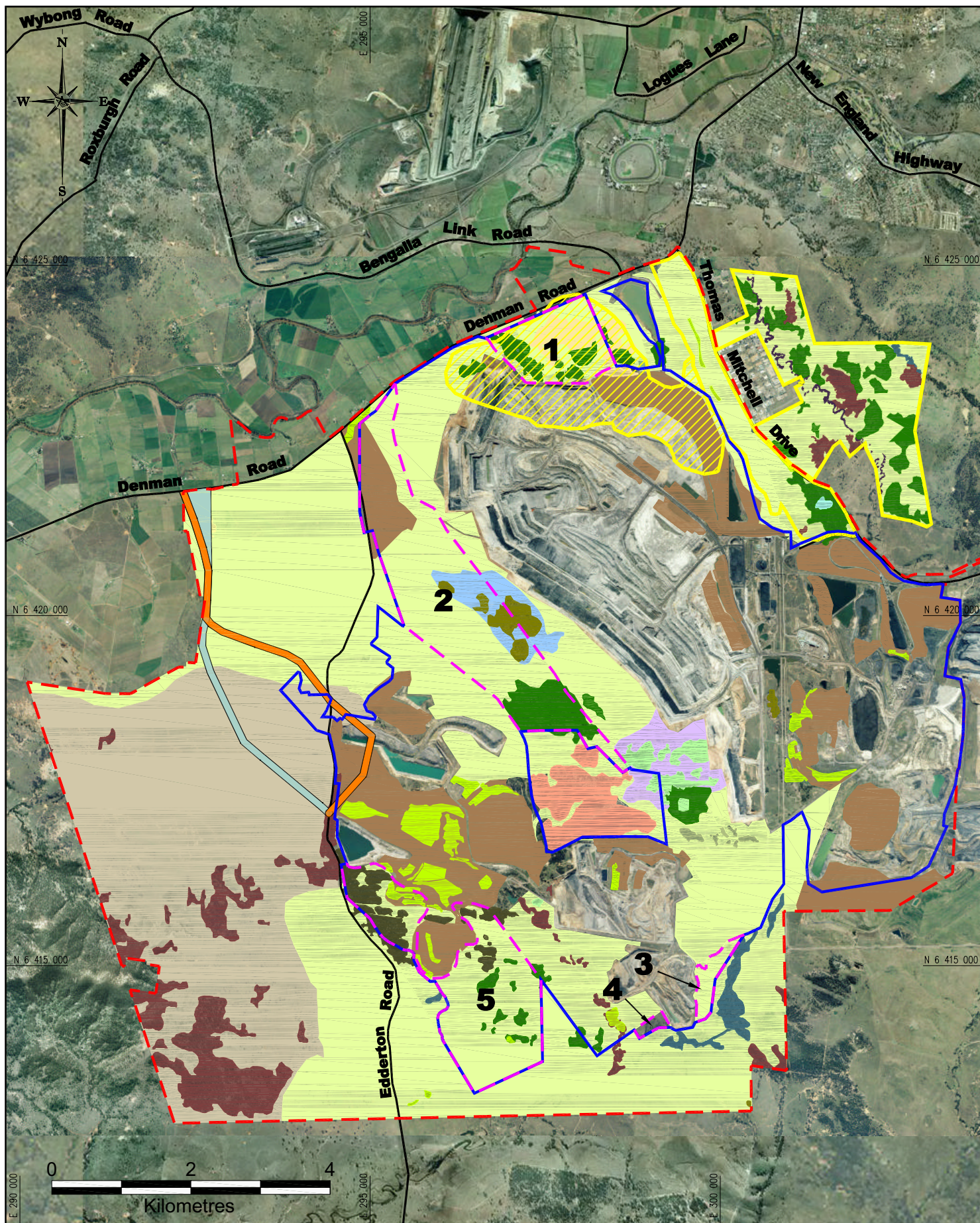
The predominant vegetation element within the EA Boundary is grassland that remains from the clearing of previous woodland and forested communities dominated by a variety of native grass and forb species. This vegetation community also includes the presence of many exotic species as is typical of grazing lands.

Table 28
Vegetation Community Types within the EA Boundary

Vegetation Community Name	TSC Act Status	EPBC Act Status
Forest and Woodland		
Central Hunter Ironbark - Spotted Gum - Grey Box Forest	Nominated	N/A
Mount Arthur Forest Complex	Listed	Listed
Spotted Gum Forest	N/A	N/A
Blakely's Red Gum Woodland	Listed	Listed
Central Hunter Box - Ironbark Woodland	Nominated	N/A
Hunter Floodplain Red Gum Woodland	Listed	Listed
Hunter Floodplain Red Gum Woodland - Weedy Understorey	N/A	N/A
Narrabeen Foothills Slaty Box Woodland	Nominated	N/A
Upper Hunter Hills Exposed - Ironbark Woodland	N/A	N/A
Upper Hunter White Box - Ironbark Grassy Woodland	Listed	N/A
Central Hunter Bullock Forest Regeneration	N/A	N/A
Understorey		
Box-Ironbark Derived Understorey	N/A	N/A
Slaty Box Derived Understorey	N/A	N/A
Spotted Gum Derived Understorey	N/A	N/A
White Box – Ironbark Derived Understorey	Listed	N/A
Other		
Exotic Understorey	N/A	N/A
Planted vegetation	N/A	N/A

Note: Hunter Valley River Oak Forest (as shown on Figure 24) is only found within the Proposed Offset Areas and is discussed further in Section 8.6.

M/A – Not Listed.



MT ARTHUR COAL

Vegetation Communities

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Date: 09.10.09

Drawn: JD

Figure
24

A list of threatened flora species identified as present within the EA Boundary from field surveys or identified as having the potential to occur within the EA Boundary (as indicated from database searches) is provided in **Table 29**. Known occurrences of these species within the EA Boundary are shown on **Figure 25**, where sufficient information has allowed for mapping.

Fauna

A total of 181 fauna species have been recorded within the EA Boundary, including nine amphibian, 108 bird, 44 mammal and 20 reptile species.

This number represents a cumulative result of a series of surveys conducted since 2000. 15 of the fauna species previously identified are listed under environmental legislation.

Of these, 13 species are declared threatened under the TSC Act (and one of these species is also listed under the EPBC Act) and a further two are listed as Migratory under the EPBC Act.

A list of threatened fauna species identified as present within the EA Boundary or identified as having the potential to occur in the EA Boundary (as indicated from database searches) and their respective status is included in **Table 30**.

Known occurrences of these species within the EA Boundary are shown on **Figure 25**, where sufficient information has allowed for mapping.

Non-threatened species that were commonly recorded included feral species European Red Fox (*Vulpes vulpes*) and Rabbit (*Oryctolagus cuniculus*), macropods Eastern Grey Kangaroo (*Macropus giganteus*), Swamp Wallaby (*Wallabia bicolor*), Red-necked Wallaby (*Macropus rufogriseus*) and a suite of bat species.

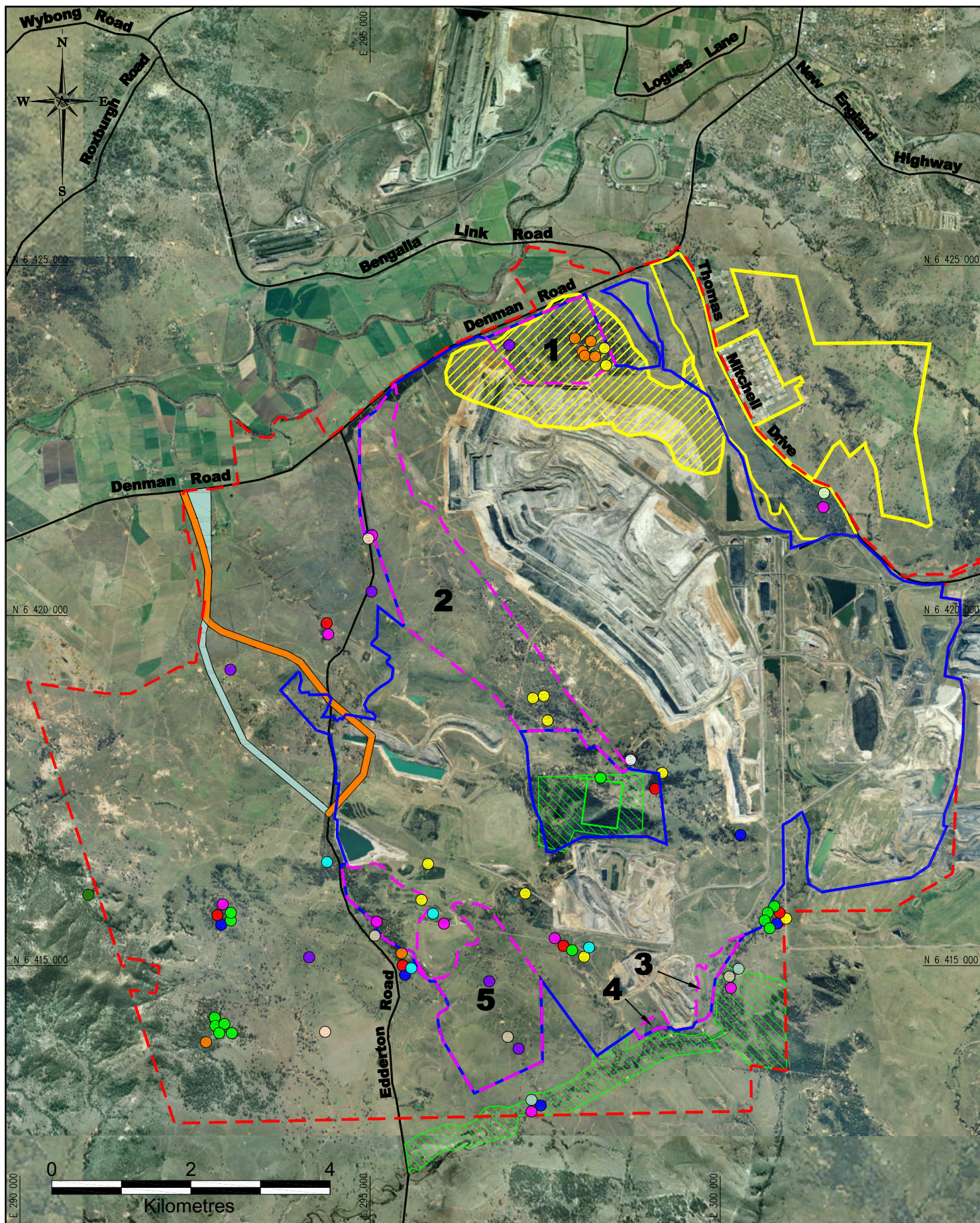
The Common Brushtail Possum (*Trichosurus vulpecula*) and Common Wombat (*Vombatus ursinus*) were also consistently recorded, with the latter species observed around dens along Saddlers Creek and its tributaries.

Table 29
Threatened Flora Species which occur or have the potential to occur within the EA Boundary

Species	EPBC Act Status	TSC Act Status	Recorded within EA Boundary
Weeping Myall (<i>Acacia pendula</i>)	Vulnerable	Endangered	Yes
Tiger Orchid (<i>Cymbidium canaliculatum</i>)	Vulnerable	Endangered	Yes
Painted Diuris (<i>Diuris tricolor</i>)	Vulnerable	Endangered	Yes
Lobed Blue-grass (<i>Bothriochloa biloba</i>)	Vulnerable	Not listed	Yes

Table 30
Threatened Fauna Species which occur or have the potential to occur within the EA Boundary

Species	EPBC Act Status	TSC Act Status	Recorded within EA Boundary
Speckled Warbler (<i>Pyrrholaemus saggitatus</i>)	N/A	Vulnerable	Yes
White-throated Needletail (<i>Hirundapus caudacutus</i>)	Marine - Migratory	N/A	Yes
Brown Treecreeper (eastern subspecies) (<i>Climacteris picumnus victoriae</i>)	N/A	Vulnerable	No - likely to occur as suitable habitat is present
Diamond Firetail (<i>Stagonopleura guttata</i>)	N/A	Vulnerable	Yes
Rainbow Bee-eater (<i>Merops ornatus</i>)	Marine - Migratory	N/A	Yes
Hooded Robin (south eastern form) (<i>Melanodryas cucullata cucullata</i>)	N/A	Vulnerable	Yes
Grey-crowned Babbler (eastern subspecies) (<i>Pomatostomus temporalis temporalis</i>)	N/A	Vulnerable	Yes
Turquoise Parrot (<i>Neophema pulchella</i>)	N/A	Vulnerable	Yes
Masked Owl (<i>Tyto novaehollandiae</i>)	N/A	Vulnerable	No - likely to occur as suitable habitat is present
Spotted-tailed Quoll (<i>Dasyurus maculatus</i>)	Endangered	Vulnerable	No - likely to occur as suitable habitat is present
Yellow-bellied Sheathtail-bat (<i>Saccolaimus flaviventris</i>)	N/A	Vulnerable	Yes
Parma Wallaby (<i>Macropus parma</i>)	N/A	Vulnerable	Predator scat recorded by Dames and Moore (2000). Likely to occur as suitable habitat is present.
Eastern Freetail Bat (<i>Mormopterus norfolkensis</i>)	N/A	Vulnerable	Yes
Squirrel Glider (<i>Petaurus norfolcensis</i>)	N/A	Vulnerable	Yes
Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>)	Vulnerable	Vulnerable	No - likely to occur as suitable habitat is present
Large-Eared Pied Bat (<i>Chalinolobus dwyeri</i>)	Vulnerable	Vulnerable	Yes
Eastern False Pipistrelle (<i>Falsistrellus tasmaniensis</i>)	N/A	Vulnerable	No - likely to occur as suitable habitat is present
Eastern Bent-Wing Bat (<i>Miniopterus schreibersii oceanensis</i>)	N/A	Vulnerable	Yes
Large-Footed Myotis (<i>Myotis macropus</i>)	N/A	Vulnerable	Yes
Greater Broad-Nosed Bat (<i>Scoteanax rueppellii</i>)	N/A	Vulnerable	Yes
Eastern Cave Bat (<i>Vespadelus troughtoni</i>)	N/A	Vulnerable	Yes



- | | |
|--|--|
| <ul style="list-style-type: none"> EA Boundary Mt Arthur Coal Consolidation Extension Areas Mt Arthur Coal Consolidated Disturbance Boundary Proposed Offset Area Proposed Regenerated Woodland Edderton Road Realignment Option 1 Edderton Road Realignment Option 2 Conservation Areas Bothriochloa Biloba Acacia Pendula Cymbidium Canaliculatum | <ul style="list-style-type: none"> Grey-Crowned Babbler Nest Eastern Cave Bat Eastern Freetail Bat Speckled Warbler Squirrel Glider Greater Broad-Nosed Bat Grey-Crowned Babbler Eastern Bent-Wing Bat Large Eared Pied Bat Large-Footed Myotis Diuris Tricolor |
|--|--|
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- Co-ordinate System: MGA Zone 56
 Aerial Data: September 2008

MT ARTHUR COAL

Threatened Flora and Fauna

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Date: 09.10.09

Drawn: JD

Figure
25

8.5.2 Impact Assessment

The Project will extend mining operations within the five Mine Extension Areas as shown on **Figure 24** and described in **Section 4.1**. A summary of the proposed clearing of vegetation communities under the Project is outlined in **Table 31**.

Vegetation Communities

The areas to be impacted over the life of the Project consist of approximately 240 ha of forest and woodland and 750 ha of native understorey.

This includes the proposed clearance of 116 ha of Box Gum Woodland and 700 ha of Box Gum Woodland understorey, which together is listed as the White Box Yellow Box Blakely's Red Gum Woodland EEC under the TSC Act.

No EPBC Act listed communities will be disturbed as a result of the Project, with operations being modified within Mine Extension Area 5 to avoid impacting a known occurrence of Hunter Floodplain Red Gum Woodland, which is listed as a Critically Endangered Ecological Community (CEEC) (see **Figure 24**).

Table 31
Vegetation Disturbance Associated with the Project

Vegetation Community	Status	Total in the EA Boundary (ha)^	Total to be cleared as part of the Project (ha)	Remainder within the EA Boundary (ha)
Forest & Woodland				
Central Hunter Ironbark - Spotted Gum - Grey Box Forest	E ^c	0	0	0
Mt Arthur Forest Complex	E ^{a, b}	132.69	0	132.69
Spotted Gum Forest		4.90	0.90	4.00
Blakely's Red Gum Woodland	E ^{a, b}	2.89	0	2.89
Central Hunter Box - Ironbark Woodland	E ^c	312.45	2.00	310.45
Hunter Floodplain Red Gum Woodland	E ^{a, b}	50.47	0	50.47
Hunter Floodplain Red Gum Woodland - Weedy Understorey		7.04	0.66	6.38
Narrabeen Footslopes Slaty Box Woodland	E ^c	26.44	24.21	2.23
Upper Hunter Hills Exposed - Ironbark Woodland		49.42	38.20	11.22
Upper Hunter White Box - Ironbark Grassy Woodland	E ^b	169.15	116.45	52.70
Central Hunter Bullock Forest Regeneration		72.08	58.14	13.94
<i>Native woodland and forest area subtotal</i>		<i>827.53</i>	<i>240.56</i>	<i>586.52</i>
Understorey				
Box - Ironbark Understorey		1,612.57	6.10	1,606.47
Slaty Box Derived Understorey		43.70	43.70	0
Spotted Gum Derived Understorey		17.25	0	17.25
White Box - Ironbark Understorey	E ^b	2,977.11	699.54	2,277.57
<i>Native grassland Understorey subtotal</i>		<i>4,650.63</i>	<i>749.34</i>	<i>3,901.29</i>
Other				

Vegetation Community	Status	Total in the EA Boundary (ha)^	Total to be cleared as part of the Project (ha)	Remainder within the EA Boundary (ha)
Exotic Grassland		434.37	88.18	346.19
Planted Areas		37.48	0	37.48
TOTAL		5,950.01	1,078.08	4,871.93

Notes: ^ Does not include vegetation that is approved to be cleared under existing Open Cut planning approvals within the Mt Arthur Coal Complex.

E^a = Critically Endangered Ecological Community (EPBC Act).

E^b = Endangered Ecological Community (TSC Act).

E^c = Preliminary Determination under the TSC Act.

In the absence of the mitigation or compensatory management measures discussed below in **Section 8.5.3** and **Section 8.6**, the proposed mining of the five Mine Extension Areas would have a significant impact upon the TSC Act listed White Box Yellow Box Blakely's Red Gum Woodland. Further, the removal of the 240 ha of forest and woodland habitat required for the Project would have the potential to exacerbate the key threatening processes of native vegetation removal and tree hollow loss in a landscape which has already been heavily cleared, increasing the degree of fragmentation of existing patches of habitat.

Threatened Flora

The clearance of vegetation required for the Project will directly remove habitat for a range of threatened fauna species. Three known occurrences of the threatened individual plant species *Bothriochloa biloba* will be impacted by the Project. Extensive areas of grassland will remain with actual and potential habitat for this species and thus, a viable local population is anticipated to exist in the long term.

One occurrence of the threatened orchid Tiger Orchid (*Cymbidium canaliculatum*) was identified within Mine Extension Area 5 (see **Figure 25**). A second occurrence was identified immediately outside Mine Extension Area 5.

As discussed further in **Section 8.5.3**, these individuals will be translocated to the Saddlers Creek Conservation Area, immediately prior to disturbance, where there is a known population.

No significant impact to this species is anticipated as a result of the Project. No other threatened flora species will be impacted by the Project.

Threatened Fauna

In the short term, the Project will increase the degree of fragmentation of treed habitats within the landscape of the Mt Arthur Coal Complex. It will remove foraging and roosting habitat for a number of threatened fauna species that are known to occur or are predicted to occur. It will also result in the removal of tree hollows, which are a wildlife resource and which are used by a number of threatened bats, birds and the Squirrel Glider. Assessments of Significance for those listed threatened species relevant to the Project as listed in **Table 30** have been completed and are included in full in **Appendix J**.

8.5.3 Mitigation and Management

Management measures proposed for the Project have followed the DECC's policy for assessing the ecological impacts of proposed developments, with the aim to avoid, mitigate or offset all identified impacts, as follows:

- *Avoid*: to the extent possible, developments should be designed to avoid or minimise ecological impacts;
- *Mitigate*: where certain impacts are unavoidable through design changes, mitigation measures should be introduced to ameliorate the ecological impacts of the proposed development; and
- *Compensate*: the residual impacts of the Project should be compensated for in some way.

Each of these principles have been applied to the Project and addressed where reasonable and feasible, as discussed below.

Avoid

As discussed in **Section 4.12**, the mine plan for the Project has been specifically designed as far as possible to reduce environmental impacts, including specific impacts on threatened flora and fauna species. In particular, Mine Extension Area 5 has been reduced to avoid known stands of the Hunter Floodplain Red Gum Woodland, which is listed as an EEC under the TSC Act and CEEC under the EPBC Act.

Part of the Macleans Hill area which contains a significant amount of natural forest and woodland has also been excluded from the mine plan presented as part of the Project to minimise environmental impacts.

All other proposed Mine Extension Areas were reviewed to determine if any modifications could be facilitated to preserve ecological function and balance economic considerations.

It was found that the required coal bearing Mine Extension Areas could not be modified further to reduce the ecological impacts of the Project, whilst maintaining its economic feasibility and resulting in a sustainable final landform. However, further mitigation and compensation measures are proposed to offset the impacts of the Project on flora and fauna as described below.

Mitigate

Mt Arthur Coal currently has a range of management strategies in place to limit impacts on native flora and fauna in the EA Boundary.

This includes a strong commitment to progressive rehabilitation and integration of rehabilitation with biodiversity corridors, weed and feral animal control, pre-clearance inspections and annual monitoring.

Specific mitigation measures to be implemented for the Project to ensure the ongoing viability of threatened flora and fauna species and communities within the EA Boundary include:

- Revision and consolidation of the existing Flora and Fauna Management Plans to include the Project and proposed Offset Strategy (see **Section 8.6**);
- Replanting of mine rehabilitation areas with local native plant species in order to provide additional flora and fauna habitats, in the long term;
- Establishing nest boxes where necessary to maintain an effective fauna monitoring program at the Mt Arthur Coal Complex;

- The continuation of flora and fauna monitoring in accordance with the existing Mt Arthur Coal EMS to provide ongoing feedback about the condition of vegetation across the EA Boundary;
- Translocation of individuals of the threatened orchid *Cymbidium canaliculatum* (Tiger Orchid) located in Mine Extension Area 5 to an appropriate Conservation Area; and
- Continue to complete pre-clearance surveys within areas to be cleared and where possible, translocate threatened flora and fauna detected into protected habitat.

With the implementation of these measures, in conjunction to the proposed Offset Areas for the Project and the overall Mt Arthur Coal Complex Offset Strategy (as discussed in **Section 8.6**), it is believed that habitat for threatened flora and fauna of the EA Boundary will remain viable in the long term and at a minimum maintain the biodiversity conservation value of the region.

Compensate

As discussed in **Section 3.5**, Mt Arthur Coal currently has a variety of biodiversity commitments to mitigate and offset the ecological impacts arising from previous mining approvals within the EA Boundary.

Mt Arthur Coal is proposing new Offset Areas for disturbance associated with the Project, which will be integrated in the overall consolidated Mt Arthur Coal Complex Offset Strategy.

The consolidated strategy is discussed further in **Section 8.6** and will assist in streamlining Mt Arthur Coal's biodiversity commitments.

8.6 MT ARTHUR COAL COMPLEX CONSOLIDATED OFFSET STRATEGY

8.6.1 Background

As discussed in **Section 3.5**, Mt Arthur Coal currently has an established Strategy that was developed to mitigate and offset the ecological impacts arising from previous mining approvals within the EA Boundary.

As a key component of the existing Strategy, Mt Arthur Coal has established two Conservation Areas - the Mount Arthur Conservation Area and the Saddlers Creek Conservation Area (**Figure 6**) which total approximately 400 ha. Mt Arthur Coal has previously made the commitment to enter into a Conservation Agreement for both Conservation Areas to protect their significant ecological values.

The offsets contain high quality vegetation including threatened species and are strategically located to provide a corridor for wildlife to move throughout the EA Boundary and access other landscapes in the vicinity.

The Mount Arthur and Saddlers Creek Conservation Areas are of ecological significance for a number of reasons, namely:

- They contain known threatened species records;
- They contain known regionally significant species;
- They contain the known presence of a substantial number of tree hollows;
- They contain extensive remnants of a Box Gum Woodland CEEC (as listed under the EPBC Act);
- The Saddlers Creek Conservation Area contains known examples of the Tiger Orchid (*Cymbidium canaliculatum*) Endangered Population;

- The Saddlers Creek Conservation Area contains a riparian corridor; and
- Both Conservation Areas also contain significant Aboriginal Heritage values.

The Mount Arthur Conservation Area is approximately 105 ha in size and covers the upper and lower slopes of Mount Arthur. The proposed Mount Arthur Conservation Area will protect 74 ha of Mount Arthur Forest Complex, which is Critically Endangered Box Gum Woodland (EPBC Act), 15 ha of Box Gum Woodland Derived Grassland and 9 ha of Spotted Gum Derived Grassland. This Conservation Area contains relatively intact forest and will protect unique habitat features like rock crevices and other rock features. Its proximity to Saddlers Creek enhances its value for mobile threatened species that roost in forest and woodland but forage over creeks and other water sources.

The Saddlers Creek Conservation Area is approximately 295 ha in size, and includes the main channel of Saddlers Creek, running along the southern and south eastern boundaries of the EA Boundary. The vegetation of the proposed Saddlers Creek Conservation Area is dominated by Derived Grassland (approximately 212 ha), Hunter Floodplain Red Gum Woodland Complex (approximately 53 ha) and Central Hunter Box - Ironbark Woodland (approximately 29 ha). There are also areas of aquatic vegetation located along Saddlers Creek. Saddlers Creek riparian vegetation provides known habitat for a number of threatened fauna species and the Tiger Orchid.

8.6.2 Complex Offset Strategy Overview

The Mt Arthur Coal Complex Offset Strategy addresses the Project's impacts by providing additional offset areas and builds upon existing offset commitments on the site (as discussed in **Section 3.5**). The strategy provides a holistic approach to heritage and biodiversity mitigation at Mt Arthur Coal by consolidating existing and proposed offset commitments.

The Mt Arthur Coal Complex Offset Strategy has been specifically developed to integrate the newly proposed offset areas with local and regional corridors, existing Conservation Areas and existing biodiversity conservation commitments at Mt Arthur Coal.

The key long term components of the Mt Arthur Coal Complex Consolidated Offset Strategy are outlined in **Table 32**, identifying where existing offset commitments discussed in **Section 3.5** are included in the overall Mt Arthur Coal Complex Offset Strategy, in addition to the Project commitments.

The Mt Arthur Coal Complex Offset Strategy is illustrated from a regional perspective on **Figure 26**. Existing offset commitments, such as the Edderton Road revegetation area and habitat enhancement corridors are included on **Figure 26** within the Existing and Proposed Woodland Areas. The Synoptic Plan corridors and adjacent conservation commitments at Drayton Mine also illustrate the integrated approach of the Mt Arthur Coal Complex Offset Strategy.

The Mt Arthur Coal Complex Offset Strategy covers the entire Mt Arthur Coal Complex including the lands adjacent to Thomas Mitchell Drive.

The Mt Arthur Coal Complex Offset Strategy will consolidate and supersede the current biodiversity Strategy. The Mt Arthur Coal Complex Offset Strategy has evolved over time and has integrated and built on previous commitments regarding final land use, maintaining and enhancing habitat values and achieving conservation outcomes.

It aims to augment the current strategy to improve and maintain the ecological condition of the landscape within the locality by conserving, improving and creating woodland and forest communities, including habitat for threatened species, such that the net area of such vegetation communities and the condition of habitats increases over time.

Table 32
Mt Arthur Coal Existing Offset Strategy Comparison to Consolidated Offset Strategy

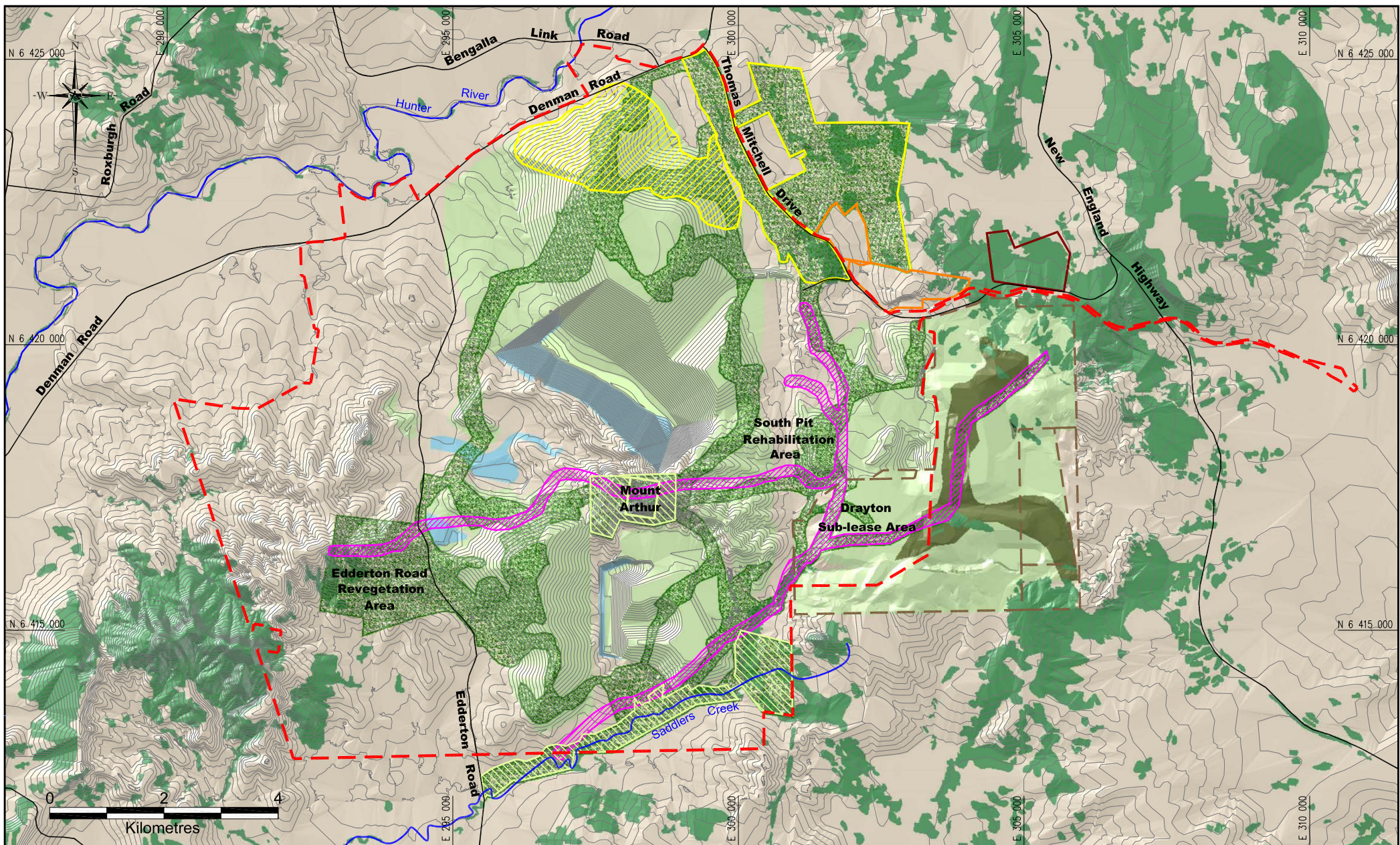
Existing				Proposed	
Commitment Origin	Long term Management Area	Conservation Status	Area (ha)	Area included in Consolidated Offset Strategy (ha)	Difference (ha)
MAN / South Pit Extension	• Mount Arthur Conservation Area	Ecological and Aboriginal Heritage values to be managed in the long term via a Conservation Agreement.	105	105	0
South Pit Extension	• Regeneration Corridors	Designed to connect habitats of Mount Arthur to Saddlers Creek. May be disturbed by mining services throughout mine life, with the area revegetated at completion of mining.	45	45	0
South Pit Extension	• Rehabilitation Areas	Designed to ensure no net loss of woodland/forest through rehabilitation at completion of mining.	250	250*	0
South Pit Extension / MAU	• Saddlers Creek Conservation Area	Ecological (South Pit approval) and Aboriginal Heritage values (MAU approval) to be managed in the long term via a Conservation Agreement.	295	295	0
MAU	• Edderton Road Revegetation Area	To be gradually revegetated over time to enhance ecological corridor function.	154	154	0
The Project	• Thomas Mitchell Drive Offset Area	Ecological and Aboriginal Heritage values to be managed in the long term.	N/A	495	+495
The Project	• Onsite Offset Area	Ecological values to be managed in the long term.	N/A	222	+222
The Project	• Proposed Regenerated Woodland	To be regenerated to woodland and open forest to enhance habitat composition at completion of mining.	N/A	500	+500
The Project	• Proposed Woodland Corridors	Designed to enhance habitat and corridors values at completion of mining.	N/A	1,005	+1,005
TOTAL			849	3,071	+2,222

* These Management Areas as originally proposed will be modified in shape to now fall within the Proposed Woodland Areas as shown on Figure 26.

The Mt Arthur Coal Complex Offset Strategy is discussed further below. In particular:

- **Section 8.6.3** summarises the offsetting principles which have been applied to the Mt Arthur Coal Complex Offset Strategy;
- **Section 8.6.4** discusses the new Proposed Offset Areas to mitigate disturbance impacts of the Project;

- **Section 8.6.5** discusses the integration of the Mt Arthur Coal Complex Offset Strategy with local and regional biodiversity corridors, adjacent conservation areas and initiatives; and
- **Section 8.6.6** provides a summary of the key components of the Mt Arthur Coal Complex Offset Strategy and details how the existing Mount Arthur and Saddlers Creek Conservation Areas will be integrated with new Proposed Offset Areas for the Project.



- | | |
|--|---|
| <ul style="list-style-type: none"> --- EA Boundary --- Drayton Coal Mining & Exploration Leases --- Final Rehabilitation --- Existing & Proposed Woodland Areas --- Remnant Woodland --- Drayton Coal Woodland Areas --- Drayton Wildlife Refuge --- Travelling Stock Reserve --- Water Storage | <ul style="list-style-type: none"> --- Synoptic Corridors --- Proposed Offset Areas --- Proposed Regenerated Woodland --- Conservation Areas |
|--|---|

Hansen Bailey

bhpbilliton

Co-ordinate System: MGA Zone 56
Source: Drayton (2008)

MT ARTHUR COAL

Mt Arthur Coal Complex Consolidated Offset Strategy

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Date: 11.08.09

Drawn: JD

Figure
26

8.6.3 Offsetting Principles

The Mt Arthur Coal Complex Offset Strategy will generally comply with the principles for offsets developed by the Commonwealth and State in that it will:

- Provide a net increase in the area of forest and woodland communities in the locality in the long term;
- Provide a net increase in the area available as habitat for threatened fauna species such as threatened woodland birds, microchiropteran bats and the Squirrel Glider;
- Provide a net increase in the area available as habitat for threatened flora species including *Diurus tricolor*, *Cymbidium canaliculatum*, *Acacia pendula* and *Bothriochloa biloba*;
- Conserve and improve the values of examples of all of the types of woodland and open forest that are to be impacted by the Project;
- Provide a connected system of corridors and habitat patches across the mining lease and linkages to other wildlife reserves and areas of native habitat in the locality; and
- Provide long term protection for Offset Areas.

8.6.4 New Offset Areas for the Project

Introduction

New Offset Areas for the Project will be implemented as part of the overall Mt Arthur Coal Complex Offset Strategy to offset the impacts to biodiversity, with a 2:1 offset ratio for the loss of all native forest and woodland, and a 1:1 offset ratio for native derived grassland proposed to be cleared by the Project.

The native derived grassland areas are artificial grasslands that have been cleared of their original tree and shrub cover for farming. Under ongoing pastoral management, derived grasslands would not regenerate to forest and woodland.

However, under the Mt Arthur Coal Complex Offset Strategy, areas of such grassland to be included as offsets will have tree and shrub cover restored over time and so this will significantly increase the cover of forest and woodland in the long term.

When offsets are combined with forest and woodland regenerated by rehabilitation there will be almost a five fold increase in forest and woodland in the EA Boundary in the long term.

The new Offset Areas proposed for the Project will be provided through the protection and enhancement of 495 ha of land outside the EA boundary and mining lease boundary (known as the Thomas Mitchell Drive Offset Area) and 222 ha of land within the EA boundary (known as the Onsite Offset Area). Both of the Offset Areas are collectively referred to as the Proposed Offset Areas. Further to the Proposed Offset Areas, approximately 500 ha of land that will be returned to native woodland and forest after mining (Proposed Rehabilitated Woodland).

Table 33 presents a summary of the vegetation areas that will be protected within the Proposed Offset Areas, and the areas of woodland that will be created within the Proposed Rehabilitated Woodland Area. **Figure 26** shows the component areas of the overall Mt Arthur Coal Complex Offset Strategy and where they are located.

A key principle of the offset design is to provide “like for like or better” habitat. To this extent, the Thomas Mitchell Drive Offset Area will provide frontage to two permanent creeks that will provide significant wildlife refuges. No permanent creeks exist in the impact areas. Also, the Proposed Offset Areas contain four EEC / significant communities that are not to be impacted by the Project: Hunter Valley River Oak Forest, Hunter Floodplain Red Gum Woodland, Blakely’s Red Gum Woodland and Central Hunter Box-Ironbark Woodland.

The Proposed Offset Areas also provide habitat for a suite of threatened birds and bats that are known to occur in the EA Boundary. Regeneration of woodland and open forest habitat following cessation of cattle grazing will progressively benefit these species.

Thomas Mitchell Drive Offset Area

An offset of approximately 495 ha will be provided on the north eastern edge of the EA Boundary on the eastern side of Thomas Mitchell Drive (see **Figure 26**).

This area contains a suite of endangered ecological communities, including Upper Hunter White Box – Ironbark Woodland and native Derived Grassland. It also has riparian forest along two streams that emanate from areas close to the Drayton Wildlife Reserve and is further linked by a Travelling Stock Reserve that abuts it to the south. The Thomas Mitchell Drive Offset Area therefore is large enough to have merit as a wildlife habitat on its own, and will add to an already substantial block of habitat that has been zoned for conservation.

In its current form, the land has been partially cleared and grazed by cattle. However, it has extensive areas of native grassy understorey that will regenerate well upon reduction or cessation of cattle grazing. It also provides potential habitat for a suite of threatened birds and bats that are known to occur in the EA Boundary. Regeneration of woodland and open forest habitat following reduction or cessation of cattle grazing will progressively benefit these species.

Onsite Offset Area

A further offset of approximately 222 ha will be provided onsite along Thomas Mitchell Drive. It is located on the opposite side of Thomas Mitchell Drive to the offsite Proposed Offset Area and is bounded at its northern and southern extent by Denman Road and the Mt Arthur Coal Access Road (**Figure 26**).

This area contains EEC Upper Hunter White Box – Ironbark Woodland and EEC Derived Grassland. It also contains Blakely's Red Gum Woodland, which is listed as a CEEC under the EPBC Act and Central Hunter Box – Ironbark Woodland, which is nominated for threatened status listing under the TSC Act. Other biodiversity values of the area include a suite of threatened species including birds like the Grey-crowned Babbler and an endangered population of *Diuris tricolour*.

The population of *Diuris tricolour* will continue to be managed through incorporation into the revised Flora and Fauna management program.

In its current form, the land has been partially cleared and grazed by cattle. However, it also has extensive areas of native grassy understorey that will regenerate well upon cessation or reduction of grazing. It also provides potential habitat for a suite of threatened birds and bats that are known to occur in the EA Boundary. Regeneration of woodland and open forest habitat following cessation or reduction of cattle grazing will progressively benefit these species.

Rehabilitation - Proposed Regenerated Woodland

Further to the designation of the Proposed Offset Areas, Mt Arthur Coal will rehabilitate 500 ha of mined area to woodland and open forest using trees, shrubs and native ground covers from the locality in order to offset the predicted loss of Box Gum Woodland understorey from the mining areas.

The proportions of forest and woodland types that will be emulated in rehabilitation are shown in **Table 33**. The rehabilitation area has been designed so that it will provide a large additional area of habitat adjacent to the Offset Areas, and while in the short and medium term the rehabilitation may not provide everything relevant fauna need, it will provide additional hunting and foraging areas for fauna from the Proposed Offset Areas.

Management

The Proposed Offset Areas adequately offsets the loss of biodiversity as a result of the Project, with at least a 2:1 offset ratio for the loss of forest and woodland and a 1:1 offset ratio for the TSC Act listed White Box-Yellow Box Blakely's Red Gum Woodland understorey proposed to be disturbed by the Project.

The Proposed Offset Areas will be conserved in the long term pursuant to a legal mechanism, such as under section 88 of the *Conveyancing Act 1919*, determined in consultation with DoP, and appropriate to the offset commitment.

Table 33
Summary of New Offsets Proposed for the Project

Vegetation Community	Status ^a	Vegetation to be Impacted by the Project (ha)	Remnant Vegetation Within Proposed Offset Areas (ha)	Area to be Rehabilitated in the Proposed Regenerated Woodland Area (ha)	Total Vegetation provided by New Offset Areas (ha)
Native Forest and Woodland					
Central Hunter Ironbark - Spotted Gum - Grey Box Forest	E ^c	0	0	0	0
Hunter Valley River Oak Forest		0	13.81	0	13.81
Mount Arthur Forest Complex	E ^{a, b}	0	0	0	0
Spotted Gum Forest		0.90	0	1.8	1.8
Blakely's Red Gum Woodland	E ^{a, b}	0	2.89	0	2.89
Central Hunter Box - Ironbark Woodland	E ^c	2.00	45.99	0	45.99
Hunter Floodplain Red Gum Woodland	E ^{a, b}	0	3.43	0	3.43
Hunter Floodplain Red Gum Woodland - Weedy Understorey		0.66	0	0	0
Narrabeen Foothills Slaty Box Woodland	E ^c	24.21	0	92.13	92.13
Upper Hunter Hills Exposed - Ironbark Woodland		38.20	0	76.41	76.41
Upper Hunter White Box - Ironbark Grassy Woodland	E ^b	116.45	152.53	299.20	933.79
Central Hunter Bullock Forest Regeneration		58.14	0	30.46	30.46
SUB-TOTAL		240.56	218.65	500.00	1,200.71
Understorey					
Box - Ironbark Derived Understorey		6.1	0	0	0
Slaty Box Derived Understorey		43.7	0	0	0
Spotted Gum Derived Understorey		0	0	0	0
White Box - Ironbark Derived Understorey	E ^b	699.54	482.06	0	0
Total area of native Derived Understorey		749.34	482.06	0.00	0.00
GRAND TOTAL		990.35	700.71	500.00	1,200.71

E^a = Critically Endangered Ecological Community (EPBC Act).

E^b = Endangered Ecological Community (TSC Act).

E^c = Preliminary Determination under the TSC Act.

The Proposed Offset Areas are located within an area where the express intention is that the surface will not be disturbed; however, its creation will not preclude the maintenance of access tracks and fire breaks, the installation of service utilities and any required water management or erosion control works or other such low impact activities. If part of this area is required by MSC in the future for industrial usage or community infrastructure, the amount of area disturbed will be replaced by additional offset area of the same quality of vegetation to that of the land to be disturbed or by increasing the amount of land to be rehabilitated to native woodland or forest.

A new management plan will be prepared to guide the long term management of flora and fauna within the Proposed Offset Areas and ensure the development and implementation of a scientifically based process for the reestablishment of the TSC Act listed White Box-Yellow Box Blakely's Red Gum Woodland understorey and in the longer term overstorey on the mine's rehabilitation areas.

8.6.5 Biodiversity Corridor Linkages and Enhancement

The Mt Arthur Coal Complex Offset Strategy has specifically been developed to integrate with local and regional corridors, adjacent Conservation Areas and existing biodiversity conservation commitments at Mt Arthur Coal. This is illustrated from a regional perspective, with the conceptual final landform if the Project were not to continue beyond 2022 on **Figure 26**. Connectivity of the Proposed Offset Areas, Proposed Woodland areas and the existing Conservation Areas will be provided for in the long term Synoptic Plan corridors and the implementation of the corridors comprising the Existing and Proposed Woodland Areas. The Existing and Proposed Woodland Areas will provide a network of corridors for flora and fauna and in the long term, will enhance the ecological value of the Offset Areas in the region.

Corridors have been specifically designed to facilitate connection with the DPI's Synoptic Plan and Drayton Mine's existing offset strategy (including the Drayton Wildlife Refuge to the north of Thomas Mitchell Drive).

The Proposed Offset Area also abuts a Travelling Stock Reserve which in itself, due to its infrequent use, will have ecological value thus further contributing to the enhancement of the proposed overall offset package. Local corridors affected by the Mine Extension Areas will be adjusted as necessary to maintain their connectivity over the life of the operation. In the adjacent mining lease to the east of Mt Arthur Coal, Drayton Mine is proposing to establish rehabilitation areas that adjoin the proposed Saddlers Creek Conservation Area. The linkages between Mt Arthur Coal and Drayton Mine rehabilitation area will be maximised by rehabilitation planting where beneficial on the Mt Arthur Coal section of Saddlers Creek.

The northern end of Mine Extension Area 5 will encroach into the area currently proposed as a regional corridor for a number of years until rehabilitation is re-established in this area. The corridor function value will increase in this area with the new rehabilitation, as it can be planted with native trees rather than the current grazing grasslands. The previously established Habitat Management / Improvement Zone (management areas) will be extended to the north to serve as a corridor area whilst the out of pit emplacement area is operational. The emplacement area, once rehabilitated, will serve as a component of the regional habitat link.

8.6.6 Overview of the Consolidated Mt Arthur Coal Complex Offset Strategy

The Mt Arthur Coal Complex Offset Strategy has specifically been developed to integrate with local and regional corridors, adjacent Conservation Areas and build upon existing biodiversity conservation commitments at Mt Arthur Coal, which increases the biodiversity values of the Offset Areas that will be protected in the long term. **Table 34** provides a summary of the main vegetation types within the consolidated Mt Arthur Coal Complex Offset Strategy, highlighting that in total 1,592 ha of native forest and woodland and native derived grassland will be conserved at Mt Arthur Coal.

Table 34
Summary of the Mt Arthur Coal Consolidated Offset Strategy

Description	Proposed Offset Areas (ha)	Existing Conservation Areas (ha)	Proposed Regenerated Woodland Area (ha)	Existing and Proposed Woodland Areas (ha)	Total (ha)
TSC Act or EPBC Act listed Forest and Woodland	158.85	126.79	299.2	585	1,169.84
TSC Act or EPBC Act listed Derived Grassland	482.06	29	0	511	1,022.06
Area of other native Forest and Woodland	59.8	226.79	200.8	487.39	974.78
Area of other native derived grassland	0	9.15	0	9.15	18.30
TOTAL	700.71	391.73	500	1,592.54	3,184.98

*Note: Areas referred to are shown on **Figure 26***

Approximately 585 ha of EPBC Act or TSC Act listed woodland, and forest and approximately 511 ha of EPBC Act or TSC Act listed native derived grassland will be conserved as part of the Offset Strategy at the end of the Project. Connectivity of the Proposed Offset Areas and the existing Conservation Areas will be provided for in the long term through the implementation of the corridors comprising the Existing and Proposed Woodland Areas. The Proposed Offset Area also abuts a Travelling Stock Reserve that provides connectivity with the Drayton Wildlife Refuge, thus further contributing to the enhancement of the proposed Mt Arthur Coal Complex Offset Strategy, and other local biodiversity conservation efforts.

8.6.7 Conclusion

In an effort to reduce the potential impacts of the Project, a number of mitigation measures will be implemented, further to the measures explained in **Section 8.5.3**. Foremost amongst the measures will be the designation of two new Proposed Offset Areas of 495 ha and 222 ha to offset Project disturbance impacts, where woodland and open forest communities will be permanently protected and regenerated. The Proposed Offset Areas include Upper Hunter White Box – Ironbark Grassy Woodland, Central Hunter Box – Ironbark Woodland,

Hunter Floodplain Red Gum Woodland, Blakely's Red Gum Woodland, Hunter Valley River Oak Forest; and extensive areas of Native Derived Grassland. Approximately 500 ha of land will also be returned to native woodland and forest after mining to complement the Proposed Offset Areas.

The Proposed Offset Areas are located in close proximity to an existing wildlife reserve established by Drayton Mine to the east and so as vegetation regenerates, the value of it will complement existing wildlife reserves. Proposed Offset Areas will also be connected to existing Conservation Areas through the proposed corridor network.

The existing flora and fauna management program will be revised to guide the long term management of flora and fauna over the entire EA boundary, with emphasis on existing conservative areas, the Proposed Offset Areas and Proposed Regenerated Woodland. The management program will ensure the development and implementation of a scientifically based process for the re-establishment of Box Gum Woodland understorey and in the longer term, overstorey in the Project rehabilitation areas. The management plan will prescribe management of existing vegetation, revegetation of cleared or degraded areas, fire management, weed and feral animal control and management of the habitats of threatened species of flora and fauna.

8.7 ABORIGINAL ARCHAEOLOGY AND CULTURAL HERITAGE

ENSR Australia Pty Ltd (trading as AECOM) has prepared an Aboriginal archaeology and cultural heritage impact assessment which is reproduced in **Appendix K**.

The aim of the Aboriginal Heritage impact assessment was to review and assess the nature of the archaeological landscape of the EA Boundary and assess the potential impacts that the Project may have on Aboriginal cultural heritage. A summary is provided below.

8.7.1 Methodology

The Aboriginal heritage impact assessment aimed to achieve two main functions:

1. To assess the existing archaeological significance of the EA Boundary using desktop survey including the three existing HMZs; and
2. To undertake a field survey of three areas not previously surveyed for Aboriginal archaeology and cultural heritage which included:
 - a) *Edderton Road Survey Area*: an area of 37.3 ha that will form the new corridor for the proposed Edderton Road realignment;
 - b) *Mount Arthur Survey Area*: an area of approximately 86.3 ha immediately north of Mount Arthur. It is the only area within the EA Boundary that was not surveyed under one of the previous major surveys (Bayswater No 3, MAN, MAU and South Pit Extension). This survey area is intended to “complete the picture”; and
 - c) *Offset Survey Area*: an area 495 ha located on the eastern side of Thomas Mitchell Drive, outside the EA Boundary. This area is proposed as a possible alternative to the three existing HMZ.

Desktop Study

The desktop study included:

- A review of previous archaeological reports relevant to the local area to assess the current status of Aboriginal cultural heritage and to provide a basis for developing a predictive model for site location;
- A search of the DECC Aboriginal Heritage Information Management System (AHIMS) Aboriginal sites database for both the EA Boundary as a whole and for the three survey areas individually prior to field survey to locate any additional sites and / or items and validation of known Aboriginal sites in those survey areas; and
- A review of the landscape character and land use history which influences patterning of sites.

The entire EA Boundary area has been subject to some of the most detailed Aboriginal heritage assessments and archaeological salvage projects ever conducted in NSW. The extensive level of Aboriginal archaeological investigation and research conducted to date at the Mt Arthur Coal Complex has provided a comprehensive record of Aboriginal heritage sites across the entire EA Boundary. The following is a chronological list of all surveys and assessments that have been completed at the Mt Arthur Coal Complex:

- Dyll (1980) - Mount Arthur North Coal Lease survey;
- Dyll (1981) - Mount Arthur South Coal Lease survey;
- Koettig and Hughes (1985) – Mount Arthur North and Mount Arthur South coal lease areas;
- Bayswater Archaeological Research Project (1993 – 2005), which was a collaboration with the University of New England, including several reports by Davidson, James and Fife (1993), ERM Resource Planning (1995), Appleton (1995), Fife (1995), Wilson (1995), MacDonald (1996) and MacDonald and Davidson (1998 and 2005);

- Umwelt (Australia) Pty Limited (1997) – Bayswater Coal Project Modifications to CHPP and Transportation systems;
- South East Archaeology (Kuskie (1999)) – MAN EIS Aboriginal Archaeological assessment;
- South East Archaeology (Kuskie (2001)) – MAN Coal Mine: Excavation Permit Application and Research Design;
- Kuskie and Clarke (2004) – Aboriginal archaeological salvage of MAN;
- ERM (2004) – Review of archaeology in the Upper Hunter Valley on behalf of the Upper Hunter Aboriginal Heritage Trust;
- Umwelt (2005) – Surface Collection;
- Umwelt (2006) – South Pit Extension Project;
- Umwelt (2006) – Archaeological Assessment for Downcast Ventilation Shaft and Associated Infrastructure, Proposed Exploration Adit; and
- Umwelt (2007) – Mt Arthur Underground Project, Aboriginal Archaeological Assessment.

All of these previous archaeological studies within the EA Boundary were assessed to determine the current status of Aboriginal cultural heritage and to provide a basis for developing a predictive model for site location.

The desktop study review found that open camp sites consisting of stone artefacts are the most common type of site to be found within the EA Boundary. Three grinding groove sites are also known to be present within the EA Boundary. A search of the AHIMS database shows that a total of 663 Aboriginal sites are currently registered within the EA Boundary.

The Aboriginal stakeholder engagement program was conducted in accordance with the relevant guidelines, as discussed further in **Section 6.5**.

Field Survey

The method used for the field survey included dividing the survey areas into a series of discrete landform based areas, and placing transects within each landform area.

This is in accordance with *Aboriginal Cultural Heritage Standards and Guidelines* (NPWS 1997). To achieve this, the landscape was divided into a series of archaeological terrain units, to ensure that all landforms within the survey areas were sampled. Due to the nature of the terrain, 100% survey coverage was not considered feasible and representative areas within each terrain unit were sampled.

Furthermore, it must be emphasised that the effective coverage achieved is rarely 100% due to the presence of long grass or other vegetation / ground surface cover that inhibits observation of the ground surface and therefore any artefacts lying on the ground.

The approach used a combination of pedestrian and vehicle-based surveys. Pedestrian surveys were conducted in areas of steep, highly eroded and / or heavily vegetated terrain, with archaeologists and Aboriginal fieldworkers walking in line abreast at approximately 5 m intervals.

Elsewhere, two vehicles driving at 20 m intervals in line abreast were used to traverse large areas of open paddock where woodland vegetation was restricted due to dense pasture grass. This allowed the vehicles to traverse backwards and forwards across the paddocks and stop at all exposures and at locations considered to have the highest potential for Aboriginal sites. The field survey was assisted by vehicles in response to concerns raised in the field over the safety of conducting pedestrian survey on several hot days covering large areas where surface ground visibility was non-existent between exposures. This was primarily in response to the Aboriginal community's concerns expressed on Day 1 of the field survey. The Aboriginal stakeholder representatives all agreed to this method in the field. The results of the survey were not prejudiced by this method, as the general pattern of Aboriginal site variability was well established through both pedestrian and vehicle-assisted survey.

The field survey was completed over a 12 day period between 2 and 17 March 2009, with 24 local Aboriginal groups taking part and two AECOM archaeologists present on each day of the field survey. The findings of the field survey are discussed in **Section 8.7.2**.

8.7.2 Impact Assessment

Field Survey

A total of 94 previously unrecorded sites were identified during the field survey (see **Figure 27**), including:

- One site within the Edderton Road Survey Area;
- 26 sites in the Mount Arthur Survey Area; and
- 67 sites within the Offset Survey Area.

94% of the new sites identified were isolated finds and scattered artefacts (89 sites). Two scarred trees and one Potential Archaeological Deposit (PAD) were also identified. The sites were found within a variety of landform contexts, but mostly within close proximity to permanent or ephemeral water sources. These results are largely consistent with results from previous surveys in both the EA Boundary and the wider Upper Hunter Valley region. In addition to the 94 previously unrecorded sites identified, six previously recorded Aboriginal sites within the Offset Survey Area were re-located and site details updated.

Project Impacts

The extension of mining operations proposed as part of the Project will impact a total of 91 additional sites recorded in previous surveys and 11 new sites identified in this survey. This is comprised of:

- Proposed Mine Extension Area 1 – 26 Aboriginal sites (all previously recorded by Kuskie, 1999 for MAN EIS);
- Proposed Mine Extension Area 2 – 66 Aboriginal sites (55 sites previously recorded by Kuskie, 1999 for MAN EIS);
- Proposed Mine Extension Areas 3 & 4 – Two Aboriginal sites (both sites previously recorded by Umwelt, 2008); and
- Proposed Mine Extension Area 5 – Eight Aboriginal sites (all sites previously recorded by Umwelt, 2008).

Three Aboriginal sites (1 newly identified site) will be impacted by the realignment of Edderton Road (if either Option 1 or Option 2 is chosen).

Figure 27 illustrates the registered AHIMS sites and the newly identified sites for the Project. A detailed list of all sites is included in **Appendix K**. Infrastructure modifications sought as part of the Project occur within areas where there has been extensive disturbance to the area and there is unlikely to be any impacts to Aboriginal cultural heritage as a result of these works.

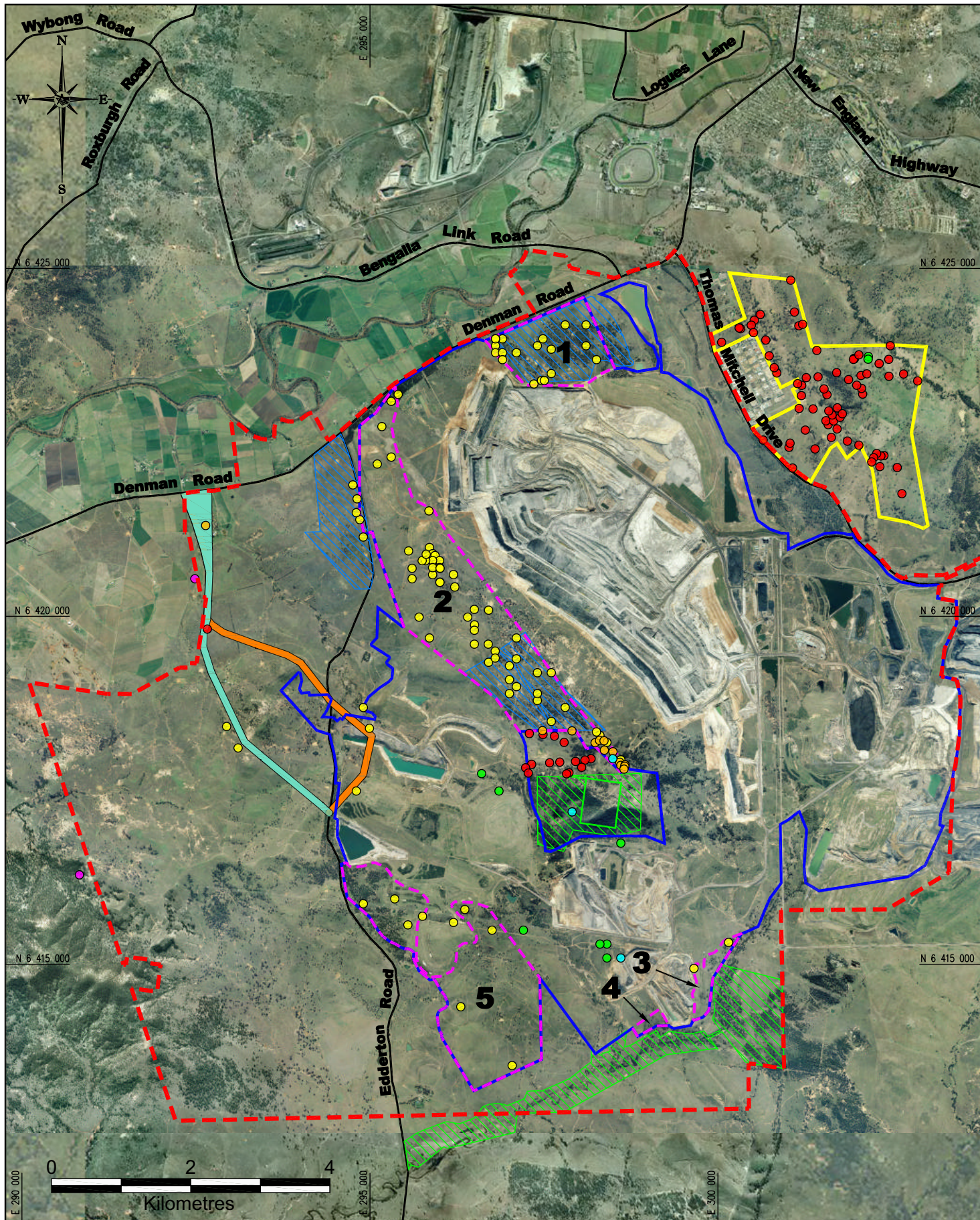
Sites of High Cultural Significance

Seven scarred trees are located in the EA Boundary; however no scarred trees are proposed to be impacted by the Project.

Three grinding groove sites are also located within the EA Boundary. Site 37-2-0110 lies within the proposed Mount Arthur Conservation Area and will be conserved insitu and will not be affected by the Project. Site 37-2-0111 lies at the southern extremity of proposed Mine Extension Area 2 (see **Figure 27**). Mt Arthur Coal has designed the Project mine plan to avoid this site and intends to manage the site in consultation with local Aboriginal representatives as needed.

Site 37-2-0731 (Saddlers Pit grinding grooves) lies within the Bayswater No 3 mining lease and the current management protocol for the site provides for an exclusion zone around the site. The site consists of more than 90 grinding grooves and the site is of high cultural significance as it is an excellent representation of its type with high educational value. The mine plan presented as part of the Project has been specifically redesigned to avoid the site, such that it may remain and be managed insitu.

Engagement with the local Aboriginal community occurred in June 2009 as part of the EA result's feedback process. A site tour of the Saddlers Pit grinding grooves was undertaken to review the site and understand the proposed development of the mine plan, whilst retaining it insitu. Discussion occurred as to the potential viability of relocating the Saddlers Pit grinding groove site.



- EA Boundary
- Mt Arthur Coal Consolidation Extension Area
- Mt Arthur Coal Consolidated Disturbance Boundary
- Proposed Offset Area
- ▨ MAN Heritage Management Zones
- ▨ Edderton Road Realignment Option 1
- ▨ Edderton Road Realignment Option 2
- ▨ Conservation Area
- Previously Identified Sites to Be Impacted
- Newly Identified Sites to Be Impacted
- Newly Identified Sites
- Grinding Groove Sites
- Scarred Trees
- Stone Arrangements

Hansen Bailey

bhpbilliton

Co-ordinate System: MGA Zone 56
 Source: Umwelt (2007, 2008) Dames & Moore (2001)
 Aerial Data: September 2008

MT ARTHUR COAL

Aboriginal Heritage Sites

Cad File: 039911.dwg

Date: 09.10.09

Drawn: JD

Figure
27

Discussions with local Aboriginal groups indicated that the immediate preference is to manage the Saddlers Pit site insitu, to and investigate future management options, including consideration of the potential for its relocation to a more amenable environment remote from existing and proposed future mining operations, and ongoing management insitu.

Three responses on the Project were received from the 26 registered groups consulted. Of these three groups, only one did not expressly agree with the management recommendations for the Project. The remaining 23 registered groups did not respond. Responses from Aboriginal community groups during consultation undertaken for the Project did not identify any additional information on cultural heritage values (see **Section 6.5**).

Heritage Management Zones

As described in **Section 3.5**, three HMZs were established under the MAN development consent in 2001. Analysis of Kuskie's (1999) site distribution maps indicate that a total of 13 Aboriginal sites occur wholly within the three HMZs and another 32 sites occur partially within these areas.

The largest of the HMZ is 139 ha and the three HMZs are discontinuous and do not adjoin other site or regional areas of conservation. Under the approved existing MAN ACHMP, there is no intention to conserve these sites in the long term (Umwelt, 2002). The Project will impact all three HMZs to different extents. To offset the disturbance of these HMZs, an alternative Offset Area is proposed as part of the Project, as discussed in **Section 8.7.3**.

The majority of the Macleans Hill HMZ will be impacted by Mine Extension Area 1 as part of the Project (see **Figure 27**).

All Aboriginal sites within the Macleans Hill HMZ (22 sites with 92 loci) (exception of 2 sites) will be impacted. The Project will also encroach into the West of Edderton Road HMZ for coal extraction and mining-associated disturbance activities.

There are no sites in the West of Edderton Road HMZ (or site loci) that appear to be directly affected by Mine Extension Area 2. However five sites and their site loci are in very close proximity to the extent of the impact area. It is considered that these five sites are at risk of disturbance by mining activities as a result of the Project. The entire Mount Arthur North West Slopes HMZ will be impacted by the proposed Mine Extension Area 2 (i.e. 13 previously recorded sites (with 40 loci) and two new sites identified during this survey to be impacted) and as a result, all sites in this HMZ will be directly impacted by the Project.

An assessment of significance of the HMZs found that they were not originally selected for their heritage values but rather because they were in areas that were not due to be impacted by mining at the time the original MAN Planning Approval was issued. The approved Mt Arthur North ACHMP identifies the possibility that these HMZs might be impacted by future mining activities and that there was no long term conservation intended.

A revised significance assessment of the HMZs based on the more common sites-based approach found that, when significance assessment was conducted on a sites-basis, the Aboriginal sites within the three HMZs were generally of low scientific significance.

8.7.3 Mitigation and Management

Specific management actions and commitments in relation to Aboriginal heritage include:

- Revoking the three existing Mt Arthur Coal HMZs (408 ha) and establishing a larger alternative Conservation Area (495 ha) not located on mining tenements which includes the Offset Survey Area (discussed below);
- The collection of high significance surface sites will be carried out before all sites are to be disturbed by the Project in consultation with the Aboriginal community;

- Implement specific management recommendations for Aboriginal sites not to be impacted by the Project but assessed to have high archaeological and / or cultural heritage significance, including:
 - o Management of DECC site #37-2-0111 (grinding groove site) insitu during the course of this approval;
 - o Ongoing engagement with the local Aboriginal community and DECC to manage potential impacts of surrounding mine emplacement areas on the heritage values of DECC site #37-2-0731 (Saddlers Pit grinding groove site);
 - Advance the creation of the Mount Arthur and Saddlers Creek Conservation Areas, and incorporate management planning for those areas into an ACHMP; and
 - Progress the implementation of the management commitments made in the MAU (previously committed to occur only at commencement of longwall mining), and improve upon where possible as listed below:
 - o Establishment of the proposed Saddlers Creek Conservation Agreement to be conserved in perpetuity for its Aboriginal cultural heritage values. The proposed Conservation Area will be managed in accordance with the requirements of the Conservation Agreement;
 - o Fund and construct a Keeping Place within the Proposed Offset Area (rather than the Saddlers Creek Conservation Area), during the period of this Project. The Keeping Place will store artefacts salvaged as part of the project and will be staffed an average of 50 days per year by appropriately trained Aboriginal community representatives, or as otherwise agreed with Mt Arthur Coal;
 - o Establish within the Proposed Offset Area, a facility suitable for use by the Aboriginal community when using the area for teaching purposes during the period of this project;
 - o Fund the training of five representatives from the registered Aboriginal stakeholder groups to undertake 'Collections Training' at the Australian Museum (or similar training) for staffing of the proposed Keeping Place, during the period of this project;
 - o Offer training for one member of each of the registered Aboriginal stakeholder groups for the project in relation to site recording and artefact recording and basic analysis; and
 - o Establish a Management Committee including at least five representatives of the Aboriginal stakeholder groups to guide the ongoing management of sites within the EA Boundary for the duration of this project.
- The existing ACHMP will be revised for the Project inclusive of the mitigation measures listed above to ensure that it meets the changing requirements of the Project.
- Proposed Archaeological Offset Area**
- The proposed 495 ha Offset Area was surveyed as a possible alternative area to conserve a representative sample of Aboriginal sites on Mt Arthur Coal lands in lieu of the three existing HMZs (see **Figure 27**). A comparative significance assessment of the three HMZs with the Offset Survey Area shows that the Offset Area offers a suitable alternative to the three HMZs due to the following:
- The proposed 495 ha Offset Area represents a net increase in the land set aside for Heritage conservation at Mount Arthur;

- o The Offset Area retains a representative range of Aboriginal site types including sites or site features that are rare in both the local and regional context;
- o The Offset Area retains a contiguous archaeological deposit in the level to gentle drainage depression terrain unit comparable to those found along White's Creek in the original Kuskie (1999) survey;
- o The Offset Area represents a sample of Kuskie and Clarke's (2004) results indicating the spatial patterning of sites along major tributaries of the Hunter River and along ridgelines in closer proximity to the Hunter River;
- The Offset Area retains a representative sample of the terrain units and landform elements that were present in the MAN survey area and are currently present in the HMZs;
- The Offset Area is not within a coal mining tenement and offers a realistic option for future conservation remote from active mining; and
- The Offset Area will be more accessible to members of the Aboriginal community as it is remote from the dangers of active mining.

A significance assessment of the Offset Area found sites of at least comparable, and in some cases much higher, value to those in the three existing HMZs. In particular, the Offset Area contains three sites (two scarred trees and a hatchet head) that are considered to have high scientific significance for their rarity within the region.

As noted above, the Offset Area provides an area of contiguous lands that encompass a similar range of landscape elements currently contained within the three existing HMZs. The Offset Area also provides a contiguous extent of surface archaeological expression associated with Ramrod Creek, indicating contiguous archaeological deposits, particularly within the high creek banks and terraces.

Consequently it is considered that the Offset Area offers a more suitable conservation offset to the three existing HMZs within Mt Arthur Coal's mining leases. The Offset Area will be conserved in the long term pursuant to a legal mechanism, such as under section 88 of the *Conveyancing Act 1919*, determined in consultation with DoP, and appropriate to the offset commitment.

8.8 NON ABORIGINAL HERITAGE

An assessment was undertaken by Archaeology Australia to determine the potential impacts of the Project on Non Aboriginal heritage items identified within the EA Boundary. A summary of this assessment is provided below with the full report presented in **Appendix L**. Additionally, an assessment of blasting on Edinglassie Homestead and Rous-Lench was also undertaken which is summarised in **Section 8.3** and included in full in **Appendix H**.

8.8.1 Methodology

This assessment was undertaken in accordance with the *NSW Heritage Office guidelines for heritage impact studies* (NSW Heritage Office, 2001). The methodology for the assessment consisted of several components to ensure that all relevant Non Aboriginal heritage items that had a potential to be impacted by the Project were assessed. These included:

- Historical and archival research and searches of the relevant Commonwealth and State heritage lists were reviewed to identify known heritage items of significance within 5 km of the EA Boundary that had a potential to be impacted by the Project;
- The review of previous Non Aboriginal heritage assessments of the EA Boundary and surrounding lands; and
- The field survey by vehicle and on foot of the areas not previously the subject of earlier assessments (i.e. Edderton Road Options 1 & 2) to identify and record any Non Aboriginal heritage items.

The lands encompassed by the EA Boundary were initially occupied by Non Aboriginal settlers following a grant of 2,000 acres of land to George Forbes in 1824. A further 4,000 acres were reserved for purchase in 1825. He named the station 'Edinglassie' after the Forbes' ancestral home in Aberdeenshire, Scotland. By 1840, wool growing was the major industry in the area, but there were significant areas under cultivation, particularly wheat. The rainfall in the area proved to be too high for wool production and by the 1890s dairying had become the dominant activity. In the years following 1910, a series of sub-divisions for smaller farming operations resulted in the breaking up of the greater Edinglassie property. Coal mining in the local area commenced in the early 1960s with the establishment of the Bayswater No 2 Mine.

8.8.2 Impact Assessment

The locations of heritage items within and surrounding the EA Boundary are shown in **Figure 28**.

A total of nine sites were identified as having a potential to be impacted by the Project and are shown in **Table 35**.

Of these, six sites were assessed as being within the Mine Extension Areas or Edderton Road realignment Options (one of which was a new site identified by the recent survey) and three items outside of the EA Boundary were assessed as potentially being impacted by blasting activities associated with the Project utilising current practices.

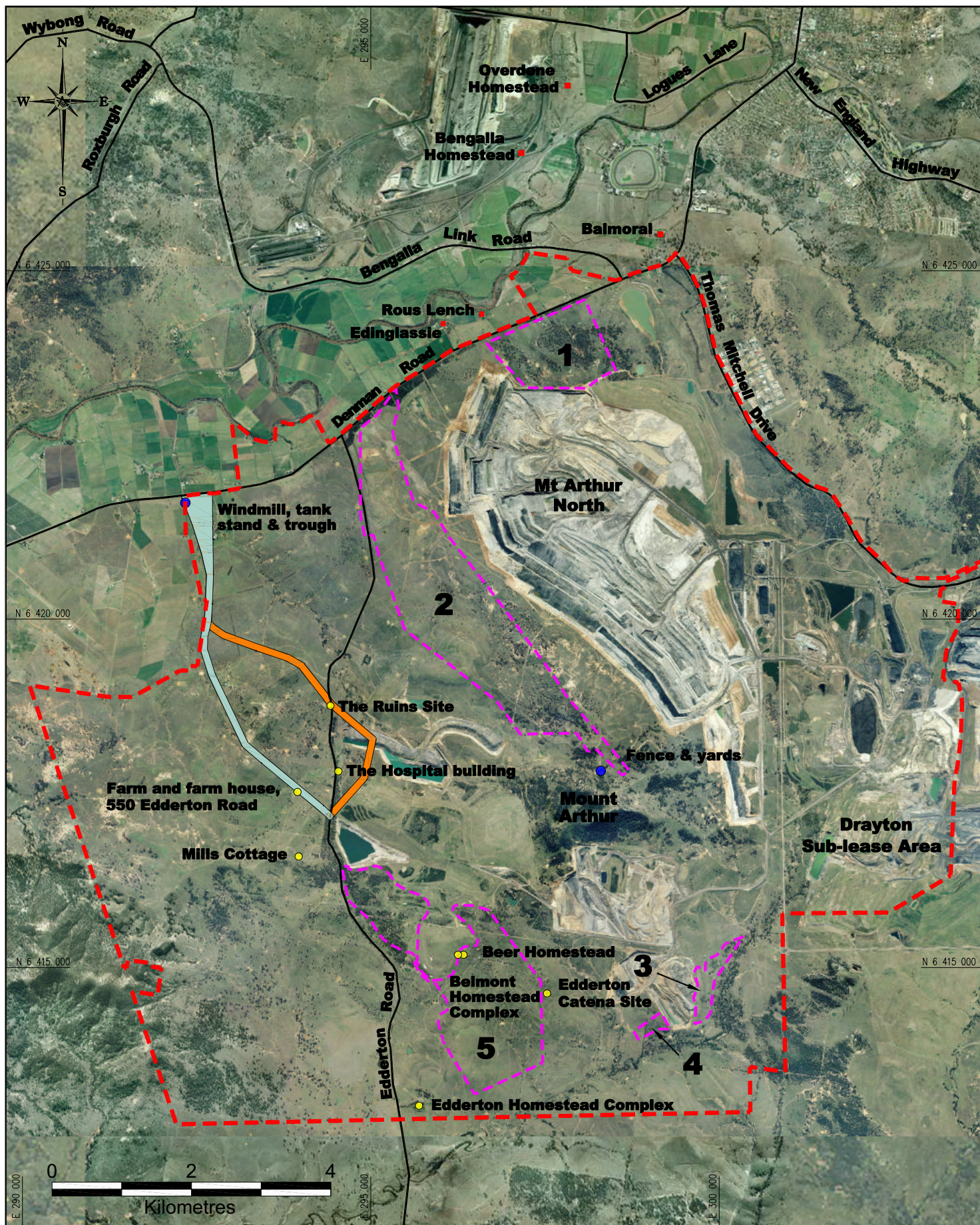
As noted in **Section 8.3**, a vulnerability assessment was undertaken to determine whether a revised blasting criteria could be applied to operations safely to allow the extraction of coal reserves to the north whilst ensuring no impacts to the structural integrity of the Edinglassie or Rous Lench properties (Bill Jordan and Associates, 2009).

Table 35
Non Aboriginal Heritage Sites

Site Name	Significance	Management Action
Fence and Yards Site*	Local – low	Site recorded. No Project impact and as such, no management required.
Windmill, tank stand and trough*	Local – low	Site recorded and will be fenced off to prevent impacts from the Project.
Farm and farmhouse 550 Edderton Road	Local – low	Site recorded and will be fenced off to prevent impacts from the Project.
'Ruins' Site	Local – low	Site recorded and will be fenced off to prevent impacts from the Project.
Beer Homestead – slab hut	Local – moderate	Site to be relocated to prevent destruction by the Project.
Belmont Homestead Complex	Local – moderate	Site to be impacted by the Project and site will be demolished.
Edinglassie (Mt Arthur Coal owned)	Local – high **	Application of a blast design restriction which allows a maximum ground vibration level of 10 mm/s and overpressure level of 133 dBL. Complete structural surveys periodically to assess structural condition and determine mitigation measures, as required.
Rous Lench (Mt Arthur Coal Owned)	Local – high **	Application of a blast design restriction which allows a maximum ground vibration level of 10 mm/s and overpressure level of 133 dBL. Complete structural surveys periodically to assess structural condition and determine mitigation measures.
Balmoral	Local – high	No management measures required for the Project. Blasting at Balmoral is predicted to meet private receiver amenity criteria of maximum ground vibration of 10 mm/s and overpressure of 120dBL as listed in Table 26 .

* Identified by Archaeology Australia (2009).

** Listed on the NSW State Heritage Register.



- EA Boundary
- Mt Arthur Coal Consolidation Extension Area
- Listed Heritage Items
- Newly Identified Historical Sites
- Previously Identified Historical Sites
- Edderton Road Realignment Option 1
- Edderton Road Realignment Option 2



Co-ordinate System: MGA Zone 56
 Source: Umwelt (2007, 2008), Dames & Moore (2001)
 Aerial Data: September 2008

MT ARTHUR COAL

European Heritage

Cad File: 03984E.dwg

Date: 14.08.09

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Figure
28

8.8.3 Mitigation and Management

Both the Belmont Homestead Complex and Beer Homestead slab hut sites are located within Mine Extension Area 5 proposed for the Project.

The Belmont Homestead Complex site has been previously assessed to be of local heritage significance (Umwelt, 2007). The Belmont Homestead Complex has previously been approved to be demolished, subject to the mitigation measures outlined in the MAU EA.

The Belmont Homestead Complex will be impacted by the Project. Consistent with the MAU Planning Approval 06_0091, Mt Arthur Coal will undertake an archival recording of the site prior to any disturbance.

The Beer Homestead slab hut has been previously assessed to be of local heritage significance (Umwelt, 2007). The Beer Homestead slab hut will be relocated as part of the Project. Mt Arthur Coal will undertake an archival recording of the site prior to any relocation.

The Fence and Yards site, Farm and Farmhouse site and 'Ruins' site are each located within the corridors of the realigned Edderton Road. The corridors of the proposed Edderton Road realignment are such that flexibilities in road design have been allowed for and any construction impacts to the heritage items located within the proposed development area can probably be avoided. Each of these sites will therefore be clearly delineated as required to prevent any inadvertent impacts occurring during road construction activities as part of the Project. Further assessment will be undertaken when detailed road design is undertaken if necessary.

As shown in **Figure 28**, the Fence and Yards site will not be impacted by the Project and as such no management measures are required for this site.

Both the Edinglassie and Rous Lench sites may potentially be impacted by blasting for the Project. The existing management plans in place for these sites will therefore be revised in accordance with the blasting vulnerability assessment to ensure that they are sufficient to cover any additional impacts that may result from the Project and the process of ongoing structural review.

The revised heritage management plans for Edinglassie and Rous Lench will include the blasting criteria of 10 mm/s and 133 dBL overpressure as recommended in **Appendix H** by Bill Jordan and Associates (2009) in the absence of further research and consultation with the NSW Heritage Office.

The existing Mt Arthur Coal documents and programs in place for the management of blasting and identified heritage items will be revised to ensure that it meets the changing requirements of the Project.

8.9 SURFACE WATER

A surface water impact assessment has been undertaken for the Project by Gilbert & Associates and is included in full in **Appendix M**. The assessment models potential surface water impacts and includes a site water balance. Local and regional water resources, water users in the vicinity of the Project and the riparian and ecological values of the watercourses in the vicinity of the Project are considered and impacts assessed. A discussion on the management of any water which may report to any potential final voids associated with the Project is also included. A summary of this assessment is provided in the following sections.

8.9.1 Background

Catchment Description

The Project is located to the south of the Hunter River. The topography of the EA Boundary comprises mostly undulating hills, with surface elevations varying from approximately 135 m AHD along Denman Road to the north west and up to 482 m AHD at the topographic peak of Mount Arthur. Surface drainage generally comprises of ephemeral creeks with headwaters within the EA Boundary flowing north (most streams) and to the south west (Saddlers Creek), ultimately draining into the Hunter River. The pre-mining catchment areas of these creeks have been reduced by the previous development of open cut pits at the Mt Arthur Coal Complex.

Flow regulation in the Hunter River is provided by three large water storages – Glenbawn, Glennies Creek and Lostock which are operated by DWE to provide flows for irrigation, environmental flows and other uses, including mining and power generation. Water is extracted from the Hunter River for basic landholder stock and domestic rights, while extraction licences for water utilities, mining and other industry have also been issued under high security and general security entitlements. Mt Arthur Coal's water licences are listed in **Table 7**.

Agricultural properties located immediately north of the EA Boundary contain on-stream dams which are used for irrigation and stock watering on Whites Creek, Fairford Creek and un-named creeks to the north east of the EA Boundary, most of which are owned by Mt Arthur Coal. Two current private extraction entitlements for less than 16 Megalitres (ML)/year of water - each for irrigation, are licensed by DWE on two adjoining properties on Ramrod Creek downstream of the EA Boundary. Water usage downstream of the EA Boundary at Saddlers Creek includes stock watering and irrigation from on-stream dams.

The north western portion of the EA Boundary bordering Denman Road (in the vicinity of Fairford and Whites Creeks) is low-lying with elevations as low as 135 m AHD. The 1955 peak flood level for the Hunter River was recorded at Whites Creek to be at 135.73 m AHD, which was estimated to be the equivalent of a 1 in 100 year average recurrence interval event. This area has the potential for flooding from the Hunter River in extreme flood events.

Existing Water Management System

Mt Arthur Coal's existing water management system is illustrated in **Figure 29**. The water management system prescribes the process relied upon to effectively source, capture, divert, store, monitor, utilise and reticulate water onsite. The water management system is based on adherence to well-established, best water management practices in the Australian mining industry. These principles are:

- Efficient use of water based on the concepts of 'reduce, re-use and recycle';
- Avoiding or minimising contamination of clean water streams and catchments; and
- Protecting downstream water quality for other beneficial uses such as agriculture and industry.

The water management system utilises supplies drawn from clean water imported under licence to the mine from the Hunter River, mine water collected from runoff and groundwater infiltration from the mine site, water sourced under agreement from the neighbouring Drayton Mine, water recycling from the CHPP, treated effluent from MSC municipal waste facility and fresh water from the MSC potable water supply system.

Mt Arthur Coal's existing EPL 11457 permits discharge of excess mine water during periods of high rainfall in accordance with the DECC administered HRSTS. The scheme provides opportunities for controlled releases of water into the Hunter River during periods of high flow to ensure specific salinity targets are not exceeded. Mt Arthur Coal currently holds 25 salinity credits under the HRSTS and is permitted to discharge up to 450 ML per day from its licensed discharge dam (Environmental Dam).

The existing mine water management system has a capacity of approximately 22,000 ML of storage with a total catchment area of approximately 31 km².

Existing Water Quality

Mt Arthur Coal has an extensive environmental monitoring program in place which commenced in 1995. Water quality is monitored at numerous sites, including local creeks and mine water dams within the EA Boundary.

A review of the environmental monitoring data has indicated that local ephemeral creeks exhibit variable water quality associated with periods of rainfall and dry periods. The monitoring data indicates the creeks are generally alkaline in nature and during the dry times can be moderately saline.

Water quality in mine water dams is also variable with the movement of various quality waters across the site. Mine water dams are generally saline in nature which is typical of mine water at other mines in the region.

A full analysis of baseline water quality data from Mt Arthur Coal's water monitoring program is provided in **Appendix M**.

8.9.2 Modelling Methodology

The ability of the existing water management system to achieve its operational objectives was assessed by simulating the dynamic behaviour of the site's water balance over the life of the Project under variable climatic conditions that may be encountered.

A multi year dynamic water balance model was developed for the Project based on a deterministic single year water balance model developed and used onsite since 2007. The model simulates all inflows, outflows, transfers and changes in the storage of water onsite on a daily continuous basis from 2009 to 2022. The key aims of this model are to maintain the supply of water to the CHPP (from the Main Dam) and to the truck fill dam.

For the purposes of this assessment, historical meteorological data from 1889 onwards was reviewed to determine the variable climatic conditions that have been experienced in the region. The water balance model was set up to run for 115 different sequences for each of the 14 years of the mine life, including daily rainfall and evaporation variables to determine the impacts of variable climatic conditions on the mine water balance.

DWEs Hunter River IQQM model was included in the water balance model to ensure that the rules governing the declaration of "off-allocation" conditions in the Hunter River were considered to simulate future variations in water supplies from the Hunter River.

The Australian Water Balance Model (AWBM) (Boughton, 2004) was used to simulate runoff from rainfall on the various catchments within the EA Boundary. The AWBM is a nationally recognised catchment scale water balance model that estimates stream flow from rainfall and evaporation.

Modelling of six different catchment types was undertaken and included:

- Natural Surface / Undisturbed;
- Overburden Emplacements;
- Rehabilitation Areas;
- Hardstand;
- Open Cut / Mine; and
- Tailings.

The CHPP water demand was based on the make-up requirement of 310 L/tonne of ROM coal feed. The model assumes 835 ML/year of treated effluent is available from MSC, rising by a further 150 ML/year by mid 2010.

Groundwater inflows were obtained from predicted inflow rates determined in the previous MAU and the Project groundwater impact assessment (**Section 8.10**). Open cut groundwater inflows were simulated subject to evaporative losses within the open cut. It was assumed that 100 ML/year of the 659 ML/year used in the underground mining operations is recovered.

Further, the model assumes that the Drayton West Pit Void will continue to be available for use as water storage, subject to 1,000 ML of existing water stored in this void being kept in reserve for Drayton Mine.

Table 36 summarises the calculated water demands in the various years of the Project.

8.9.3 Impact Assessment

The potential impacts of the Project on local and regional surface water resources are:

- Changes to flows in local creeks due to extension and subsequent capture and use of drainage from mine area catchments;
- Drawdown of groundwater;
- Potential for export of contaminants (principally sediments and soluble salts) in mine area runoff and accidental spills from containment storages (principally sediments, soluble salts, oils and greases), causing degradation of local and regional water courses; and
- Short term increases in salinity during periods of licensed discharge under the HRSTS.

Table 36
Simulated Project Water Demands (ML/day)

Description	2009	2011	2014	2022
CHPP	3,410	6,710	10,230	10,230
Truckfill	1,346	1,346	1,346	1,346
Industrial Area	45	45	45	45
Export Coal Loader	18	18	18	18
Underground Demand	82	681	681	681

Catchment Changes

The flow regime from the natural drainage system within the EA Boundary will be reduced over time proportionately to the decline in catchment areas as summarised in **Table 37**.

The catchment of the Whites Creek diversion will increase due to the contribution from progressively rehabilitated overburden areas over time. The ability for the engineered diversion to cater for the increased catchment area will be monitored as part of ongoing development of the Site Water Management Plan. Modifications to the design of this structure will be undertaken where required.

Flooding

A review of the topographic information and the 1955 flood level in the Hunter River has been undertaken with regard to the Project mine plans. This has determined that in the areas to the north of the EA Boundary, there is potential for mine areas to be impacted by an extreme flood event in the future.

The land within the vicinity of Whites Creek is the land most vulnerable to flooding impacts given the low elevation in this area (i.e. 135 m AHD) and lower than the 1955 flood event. Topographic data shows that Fairford Creek and other drainage lines within the EA Boundary are not expected to be impacted by flooding from the Hunter River. In the context of local flooding along Denman Road, the catchment area of Whites and Fairford Creeks has been and will continue to be reduced as a result of Project-related open cut development westwards. As a result of catchment area reductions, flows and local flooding in these creeks will likewise be reduced.

Simulated Water Balance

Table 38 provides predicted inflows and outflows for the Project (averaged over the various climatic conditions modelled). The reliability of the water supplies modelled for the various Project water demands and the average source contributions are summarised in **Table 39**.

Table 37
Local Creek Catchment Changes

Parameter	Quarry Creek	Fairford Creek	Whites Creek	Whites Creek Diversion	Unnamed Creeks	Saddlers Creek
Total catchment area prior to mining (km ²)	22.0	10.8	21.5	n/a	4.2	99.0
Current catchment area (km ²)	19.0	10.8	2.2	4.9	5.0	93.7
Catchment at maximum Project development in 2022 (km ²)	18.6	2.7	2.2	6.3	2.8	88.1
Final landform catchment area (km ²)	21.7	5.8	3.2	17.2	3.7	93.5

Note: Total catchments measured to the Hunter River. Derived from 1:25,000 scale Muswellbrook topographic map

Table 38
Average Water Balance

Simulated Indicator	Quantity (ML per annum)		
	Dry Rainfall Sequence (10 th percentile)	Median Rainfall Sequence (50 th percentile)	Wet Rainfall Sequence (90 th percentile)
Average Inflows			
Groundwater Inflows	4,967	6,271	6,992
Catchment Runoff	1,660	1,654	1,649
Hunter River	2,245	1,821	1,325
MSC Effluent Water	971	970	969
Drayton	0	0	0
Tailings Water	1,239	1,239	1,239
Average Outflows			
CHPP	7,161	7,161	7,161
Truckfill	1,566	1,566	1,566
Evaporation	2,083	2,232	2,333
Hunter River under HRSTS	205	267	426
Coal Loader	18	18	18
Industrial Area	44	44	44
Underground	504	504	504

Table 39
Simulated Water Supply Performance

Simulated Performance Indicator	Simulated Value (averaged over all years in all sequences)
Supply Reliability to	
CHPP*	96.6%
Haul road dust suppression	93.8%
Underground	93.3%
Coal loader	92.1%
Industrial Area	92.0%
Supply Source Contribution (% of total)	
Catchment runoff	49.4%
Hunter River licensed extraction	17.8%
Tailings water	12.2%
Groundwater**	13.0%
Muswellbrook treated effluent	7.6%

* Reliability expressed as volume of supply divided by volume of demand.

** Groundwater inflow includes underground mine water return (proportion of water supplied).

As shown above, calculated Project demand averages approximately 12,958 ML/year with the majority of this (approximately 50% on average) able to be sourced from site rainfall runoff, with an average of 17% (2,271 ML) sourced from licensed extraction from the Hunter River.

Model predicted supply reliability assumes that the water supply system will be operated in an unchanged way even if water supplies were drawn down as a result of drought. The model has indicated that a majority of supplies will be obtained from catchment runoff. Extraction from the Hunter River throughout the life of the Project has been predicted to remain well within the current total licensed volume for a majority of the time. However, in extreme drought years water levels will be required above the current extraction limit. In reality under extreme drought conditions, Mt Arthur Coal will be able to investigate and implement other measures.

These include: use the General Security Entitlement (GSE) on the land which it has currently leased back to landholders, conversion of GSE to High Security Entitlement (HSE) or acquire additional Hunter River licences on the open market which are either permanent or temporary transfer. Mt Arthur Coal may also access other sources such as mines, power stations or municipal effluent and stormwater collection systems. The water balance model will continue to be updated and utilised to forecast water supply reliability to assess the need to implement such measures.

The surface water impact assessment has considered the predicted annual releases of water to the Hunter River from the Environmental Dam under the provisions of the HRSTS throughout the life of the Project.

Mt Arthur Coal has not been required to discharge to date in accordance with the HRSTS. The MAU EA confirmed that, even with the additional water make resulting from the underground mining activities; Mt Arthur Coal would continue to operate within the rules of the HRSTS.

This EA has determined that the Project will result in an average decrease of 159 ML per annum of surplus mine water, thus confirming that Mt Arthur Coal will readily be able to continue to operate within the rules of the scheme.

Post Mining Water Management

The final landform design discussed further in **Section 8.15** retains two final voids: the MAN and Saddlers Pit Voids.

Post mining runoff from most rehabilitated and revegetated areas of the Project will be directed to the local drainage network. Surface catchment areas of the final voids will be minimised to protect against external flooding. All areas of the site, with the exception of the final voids and their surrounding catchments will be free draining. The aim of this is to maintain the effective catchment contribution and yield to the Hunter River following the cessation of mining. The total catchment reporting to the MAN and Saddlers final voids is estimated to be approximately 16 km².

Final void water balance models were developed for each of the two voids to predict the long term behaviour of these water bodies. Long term water levels in the final voids are predicted to remain well below the spill levels. These voids are predicted to remain below the surrounding groundwater levels and as such act as sinks until such time as water levels will recover over time with the inflow of groundwater, seepage from the overburden emplacement areas and rainfall. Evaporation will assist in controlling these inflows before they reach steady state, which will not be reached for more than 200 years.

The salinity of the final voids will increase in time, exceeding that of the natural groundwater in the area as a result of net evaporation of void water over time. However with the voids acting as sinks, this will prevent the contamination of the surrounding aquifer with saline void waters.

The final landform includes reconstruction of the channel of Fairford Creek over overburden placed within the north eastern portion of the MAN open cut and a small tributary of Saddlers Creek within overburden placed within the MAN South and Far South open cut pits. Creek reconstruction will be designed and planned to integrate with mining operations.

Creek reconstruction is anticipated to involve controlled placement of overburden within the creek corridors, including a zone of selected overburden placed by paddock dumping methods which will be spread and compacted in lifts using mine plant so as to minimise long term settlement of the overburden. The surface topography of reconstructed creeks will mimic existing topographic and channel form, which will be determined by detailed survey prior to mining. Reconstructed creeks will be revegetated with native species prevalent within the existing creek channels. The reconstructed creek will be established in accordance with best practice standards at the time of construction.

Sediment basins will be established downstream of and possibly at intermediate points within the reformed channels and maintained until vegetation establishment. Temporary stabilisation measures (e.g. rip-rap) may also be required. Reconstructed creek design will include detailed hydrologic modelling of the creek catchments, which include significant areas of rehabilitated overburden and other mine areas, to ensure that the reconstructed channels are stable in a wide range of flows.

8.9.4 Mitigation and Management

Surface water will continue to be managed in accordance with the Mt Arthur Coal EMS and the existing Site Water Management Plan which will be reviewed as needed to ensure that it meets the changing requirements of the Project.

The successful performance of the water management system will involve the utilisation of the water balance model to predict future water demand and supply requirements.

By monitoring and reviewing the operational performance of the water management system, and using the developed water balance model as a tool, it will be possible to assess the adequacy of the credits and licence volume held by Mt Arthur Coal and to purchase additional credits / licences as required. A geomorphological survey will be conducted along those reaches of creeks that will be mined through and which are planned for reinstatement over mine overburden backfill. This data will be required for the ultimate design of creek reconstruction. Design of these structures will be undertaken in consultation with DWE at the relevant time, as required.

Flood bund protection will be installed between Denman Road and the EA Boundary in the areas where topography is less than the 1955 peak flood level in the Hunter River plus 0.5 m freeboard. In order to achieve this minimum level, the height of such a flood bund will therefore be approximately 1.4 m within the former Whites Creek channel, with only a small (less than 0.5m high) bund away from the channel. The installation of this flood bund will alleviate any flood impacts. It is estimated that it will result in a loss of flood storage in a 1955-magnitude flood of approximately 20 ML. In the context of the flood storage of a large river such as the Hunter River, this loss of storage is considered negligible. There is no potential for flooding from the Hunter River to impact on any other drainage line within the EA Boundary as such no other flood bunding will be necessary.

Water from all disturbed areas will continue to be collected in drainage structures and sediment dams and either recycled in the mine water management system or allowed to leave site following settlement of sediment. Sediment dams capturing runoff from areas of pre-strip and rehabilitation will be designed in accordance with the provisions for sediment retention basins in *Managing Urban Stormwater Guidelines* (Landcom (2004)).

A final void management plan will be prepared as part of the closure planning process at Mt Arthur Coal to ensure all management strategies for the voids are documented and known.

8.10 GROUNDWATER

A groundwater impact assessment was undertaken by Australasian Groundwater and Environmental Consultants Pty Ltd (AGE). A full copy of this report is presented in **Appendix N**. The objective of the study was to assess the impact of the Project on the groundwater regime and water users and to determine future inflows to the pit.

8.10.1 Background

In order to adequately assess the potential impacts of a proposal on the groundwater regime, it is important to understand the current conditions of the groundwater system. A brief outline to the existing groundwater system within and surrounding the EA Boundary is provided below.

Existing Groundwater System

The regional groundwater system consists broadly of three aquifer systems and includes:

- An extensive Quaternary alluvial aquifer system associated with the Hunter River and a smaller alluvial system associated with Saddlers Creek;
- A thin veneer of weathered bedrock (regolith) near ground surface; and
- The coal seams of the Permian Wittingham Coal Measures.

The Hunter River alluvium is considered an important groundwater resource being widely used by the agricultural industry, typically for stock watering and irrigation activities. The alluvial aquifer is up to 13 m thick and contains a basal gravel layer that is exploited for irrigation and stock supplies. The basal gravels are overlain by a silt with minor clay layer. The Saddlers Creek alluvium (which is relatively thin) is of similar composition to this silt and clay layer.

The groundwater quality of the alluvial aquifers is variable with the poorest quality water typically in the lower most extents of the basal gravel layer due to discharge from the underlying coal seam aquifers.

The variation in quality in the alluvial aquifers reflects the dominant source of recharge, whether it be from the underlying coal measures resulting in very poor water quality, or recharge from rainfall or the Hunter River itself where fresher water results.

The regolith or shallow hardrock aquifer generally comprises superficial soils and weathered bedrock, is up to approximately 10 m thick and is a temporary groundwater store during sustained wet periods, providing recharge to the underlying coal measures.

Rainfall recharge percolates downwards from the regolith at a reducing rate as increasing confinement and reducing permeability impedes flow. This vertical flow regime is predominantly fracture flow, where pathways depend upon fracture and joint connectivity within the rock strata. Coal seams within the Permian Wittingham Coal Measures are mostly confined aquifers and are not considered representative of a significant aquifer.

While some coal seams may show an elevated hydraulic conductivity, the dominant interburden sections are of very low hydraulic conductivity. Monitoring of groundwater in the Permian Wittingham Coal Measures has shown that they are generally low yielding with the water quality generally poor being brackish to saline and alkaline in nature.

Recharge to the aquifers occurs over the entire area with the rate of recharge over the alluvial deposits and areas of coal seam sub-crops being higher than over the areas of overburden and interburden. The natural groundwater flow in the coal seams discharges to the Hunter River and Saddlers Creek and to the lower reaches of their tributaries such as Whites and Fairford Creeks.

The Project is located to the west of the north to south trending Muswellbrook Anticline where the seams sub-crop. The coal seam sub-crop continues to the north of the Project beneath the Quaternary deposits of the Hunter River. From the sub-crop the Permian Wittingham Coal Measures dip to the west south west towards the Calool Syncline. **Figure 30** below shows the conceptualisation of the geology as used for the groundwater flow modelling.

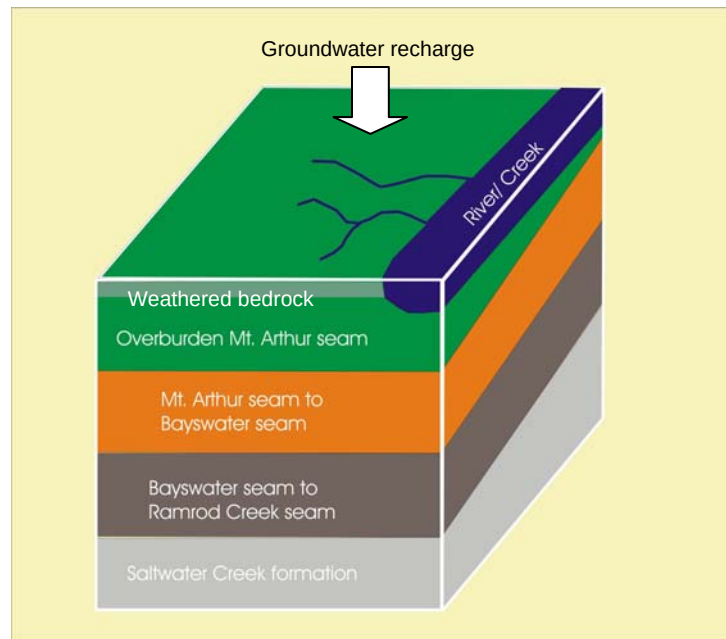


Figure 30 Conceptual Groundwater Model

Existing Groundwater Users

A search of the DWE database of registered bores and wells indicates that there are approximately 32 registered bores within a 5 km radius of the EA Boundary. The registered bores include six licensed for domestic, stock and irrigation supply, six for stock and domestic, and eighteen for stock supplies only. There are only two bores known to be unlicensed.

Of these bores, 20 are located in sandstone, conglomerate, siltstone or coal of the Permian coal measures, and the remaining 12 are reported to be in the alluvium of the Hunter River. There are no registered bores in the alluvium of Saddlers Creek. Of the 20 bores situated within the Permian sequence, 12 of these are on land owned by Mt Arthur Coal.

8.10.2 Modelling Methodology

The assessment was based on a three-dimensional transient, groundwater flow model (FEFLOW) of the area that was developed to provide predictive simulations of the impact of the Project (including MAU) on the groundwater regime. The assessment had the following key objectives:

- Determine the existing groundwater environment and to identify any existing users and GDEs;
- Assess the cumulative impacts that may arise from the Project, together with the existing and approved mines in the region;
- Complete detailed numerical modelling of potential groundwater impacts;
- Interpret data and report on groundwater seepage, drawdown and other impacts on connected groundwater's associated with the Hunter River regulated water source;

- A description of the measures that may be implemented to avoid, minimise, mitigate and offset the impacts of the Project (subject to more effective measures being identified in the future); and
- Determine groundwater management and monitoring protocols to be adopted to meet licensing conditions.

Data necessary for the assessment of the groundwater regime was largely taken from existing reports and Mt Arthur Coal databases with some further field observations undertaken to support this information. Test Pits and drilling was undertaken to better define groundwater occurrence in Whites and Fairford Creeks and in a small tributary of Saddlers Creek. The 3D numerical model was developed using the finite element model developed by AGE (2006) for the South Pit Extension, the finite element model developed by Mackie Environmental Research (2007) for the MAU Project and recent data on coal seams, floor elevations and geological structure.

8.10.3 Impact Assessment

The groundwater impact assessment considered the current conditions of the groundwater system to provide predictions of the impacts that may be caused by future mining activities, which are discussed further below.

Existing Mines and Industry Impacts

Previous mining within the MAN Pit has lead to the cumulative depressurisation of the coal seams and water bearing layers in the interburden in and surrounding the EA Boundary. Depressurisation (that is, the cone of depression or drawdown in the piezometric surface / water table) has previously been predicted to migrate up to 3.25 km from the perimeter of the mined area in the MAN Pit, largely on the southern side of the Hunter River.

The adjacent operations in the Bayswater No 3 Mine (including the Saddlers Pit) and the historical Bayswater No 2 Mine have not been predicted to substantially contribute to the cumulative depressurisation of the coal seam aquifers in the Wittingham Coal Measures around the Mt Arthur Coal Complex. This is due to these operations either mining much shallower seams within the Wittingham Coal Measures or being structurally isolated by the mining of the Greta Coal Measures (which are stratigraphically lower than the Wittingham Coal Measures), respectively. Further, operations at the Drayton Mine to the east of Mt Arthur Coal, extracts coal from the Greta Coal Measures and as such no cumulative impact from these operations is expected.

The operations associated with the MAU Project have been predicted to contribute substantially to the cumulative cone of depression with the MAN Pit during the later years when underground mining of the lower coal seams is planned.

Bengalla Mine, located to the north of the Hunter River extracts the same coal seams as the MAN Pit (albeit only down to Edderton Seam) and is a similar distance from the Hunter River alluvium. As such, there is potential for these operations to cause cumulative impacts on the coal seam aquifers and the Hunter River alluvium.

Predicted Project Impacts on Regional Groundwater System

Extraction of groundwater during mining and mine dewatering will lower the elevation of the groundwater table in the Permian coal seam aquifers around the mine. The development of the cone of depression for the Project will extend from the high wall of the pits as mining progresses to the west and north and gradually becomes deeper in line with the proposed mining operations. Groundwater drawdown contours for the Project are presented in **Appendix N**.

The predicted cone of depression to the south of Hunter River is largely the result of the dewatering in the northern and central parts of the MAN Pit with the yet to be developed MAU Project.

The other mining operations at Mt Arthur Coal are not predicted to substantially contribute to the depressurisation of the Wittingham Coal Measures as they are either mining of much shallower coal seams or are structurally isolated. Within the MAN Pit, the maximum drawdown is predicted to be 120 m at the end of the year 2009. In the future, the cone of depression of the MAN Pit, Bayswater No 3 mine and the MAU Project are predicted to have merged and the existing water flow from the coal seam aquifers to the alluvium of the Hunter River and Saddlers Creek will be affected by the drawdown.

By 2016, it is predicted that the drawdown will reach a maximum of 200 m below the surface and the cone of depression resulting from Mt Arthur Coal is predicted to extend up to 0.5 km from the EA Boundary beneath the Hunter River alluvium on the southern side of the River. Drawdown will also be evident south of Saddlers Creek as a result of depressurisation of strata mined in the Saddlers Pit.

The impact beneath the Hunter River alluvium reaches its peak with Mt Arthur Coal being at maximum production and Bengalla Mine being active north of the river. However, the modelling demonstrates that the cones of depression from the Bengalla Mine and Mt Arthur Coal operations will not join beneath the Hunter River.

Drawdown in 2022 of approximately 290 m within the MAN Pit is predicted to affect the area from the Hunter River alluvials, approximately 0.5 km north of to approximately 1.6 km south of the EA Boundary, south of Saddlers Creek.

Depressurisation is predicted to be limited to the east and west primarily due to the sub-crop in the east and the Mount Ogilvie Fault in the west of the operations.

By 2022, the impact of the Bengalla Mine north of the Hunter River will be significantly reduced with the mine closure in 2017. It should be noted that even if Bengalla Mine extends its operations beyond 2017, the mining activities are likely to continue to the west (i.e. away from the Hunter River) following the dip of the coal seams and as such the hydraulic impact on the Hunter River alluvium from Bengalla Mine will reduce.

Whilst the Permian aquifers (i.e. coal seams) will continue to be depressurised during the Project, it is expected that the shallow bedrock (regolith) aquifers will develop a perched water table in areas where they overlie areas of extensive groundwater depressurisation. Therefore it is assessed that the shallow aquifer system will not be affected to the same degree as that simulated for the coal seam aquifers.

Pit Inflows

Table 40 shows the predicted average groundwater inflows into the various pits at Mt Arthur Coal for years 2009, 2011, 2016, 2019 and 2022.

Table 40
Predicted Average Groundwater Pit Inflows (ML/day)

Project Years	MAN / South Pit	Saddlers Pit	Average Inflows
2009	0.85	0	0.85
2011	1.17	0.15	1.16
2016	2.45	0.15	2.45
2019	2.29	0.15	2.29
2022	2.39	0.15	2.39

The groundwater simulation indicates that from 2009 to 2016 the pit inflow rates rise from 0.85 ML/day to 2.45 ML/day. From 2016 onwards, pit inflows are predicted to reduce due to the growing impact of the underground mine and a general decline of the regional groundwater table. From the peak inflow in 2016 of 2.45 ML/day, the groundwater inflow stabilises in the latter years of mining at approximately 2.29 to 2.39 ML/day.

Groundwater inflows to Saddlers Pit will be insignificant given the dewatering within the MAN Pit, South Pit Extension and the MAU Project and stabilise after 2011 at a relatively constant 0.15 ML/day.

Hunter River, Whites Creek and Saddlers Creek

Hunter River Alluvium

Under natural conditions, the poorer quality groundwater from the Permian coal seam aquifers flows towards the north and discharges into the base of the Hunter River alluvial aquifer. However with mining in the MAN Pit and the depressurisation of the associated Permian coal seam aquifers, the rate of groundwater flow will be reduced and with time locally reversed. This reduction in the rate of flow from the coal seam aquifers to the base of the alluvial aquifer will result in an improvement (although probably undetectable) in the quality of water in the alluvial aquifer.

At present approximately 0.2 ML/day flows from the Permian coal seam aquifers within the EA Boundary towards the Hunter River and discharges into the base of the alluvium. By mid 2011, the groundwater flow from the Permian to the alluvium is predicted to cease. Subsequent to mid 2011, the direction of groundwater flow is predicted to reverse resulting in alluvial water to flow through the base of the alluvium into the Permian coal seam aquifers which will progress towards the MAN Pit.

By year 2016, the groundwater flows from the alluvium towards the MAN Pit is predicted to reach 0.48 ML/day. At the end of mining activities in 2022, the flow rate from the alluvium towards the northern part of the MAN Pit is approximately 0.74 ML/day as shown on **Figure 31**.

The Hunter River alluvial aquifer is predicted to be affected over a length of approximately 6 km, which corresponds to an alluvial area south of the Hunter River of 4.2 km² or approximately 4% of the estimated 105 km² area of Hunter River alluvium between Muswellbrook and the Saddlers Creek confluence.

Approximately 0.176 L/m²/day of groundwater is predicted to be withdrawn from the alluvium which is comparable with the rate of annual groundwater recharge from 64 mm/year of rainfall on the affected alluvium.

This volume of vertical leakage is considered a worst case scenario as the model assumes direct hydraulic connection between the base of alluvium and bedrock (i.e. the model does not account for the likely occurrence of a weathered, clay rich transition zone at the base of alluvium that inhibits leakage).

Predictive modelling has shown that as a result of the depressurisation, leakage will be induced from the alluvium. However the impact on the alluvial aquifers with respect to drawdown of the water table will be negligible as the horizontal permeability of the alluvium is higher than the vertical permeability of the underlying Permian strata. Therefore horizontal flow in the alluvium will mask any drawdown in the alluvium associated with the low rate of vertical leakage to the depressurised coal seams.

At the completion of mining and during the recovery of the final voids (as discussed further below), the predicted groundwater flow direction from the alluvials towards the mining area remains unchanged, but the flow rates are predicted to gradually diminish.

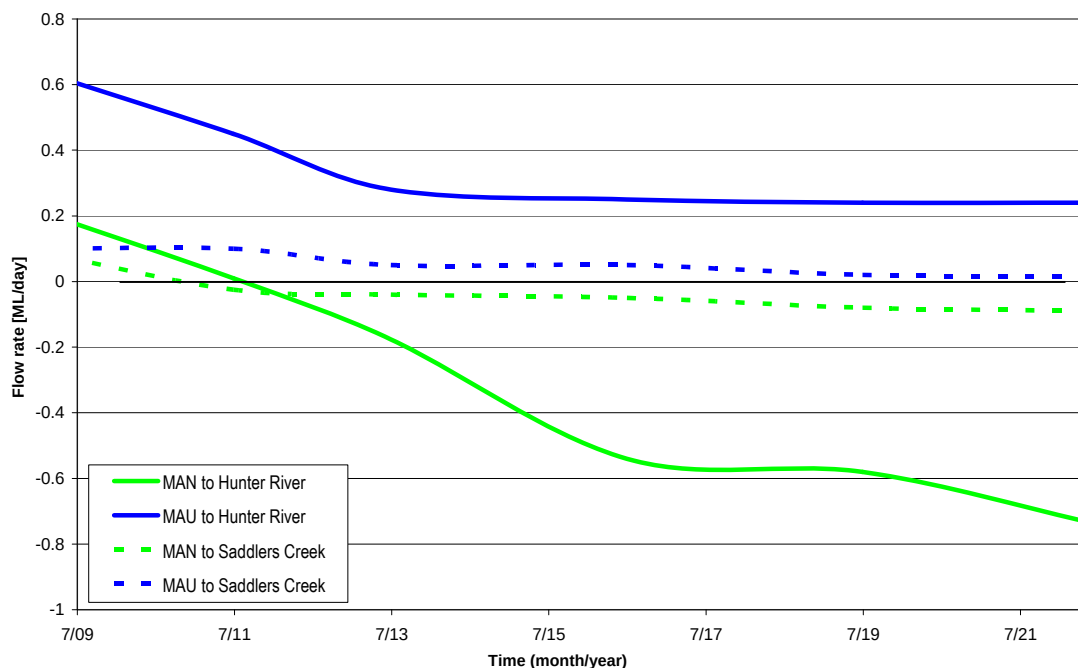


Figure 31
Alluvial Groundwater Seepage Rates to / from Hunter River and Saddlers Creek Alluvium

As explained in **Section 8.10.3**, the water level in the open voids is predicted to recover to a level below the natural groundwater table. As such, the inflow from the Hunter River alluvium to the open void is predicted to continue post mining, with the flow rate diminishing towards a steady-state value of approximately 0.2 ML/day.

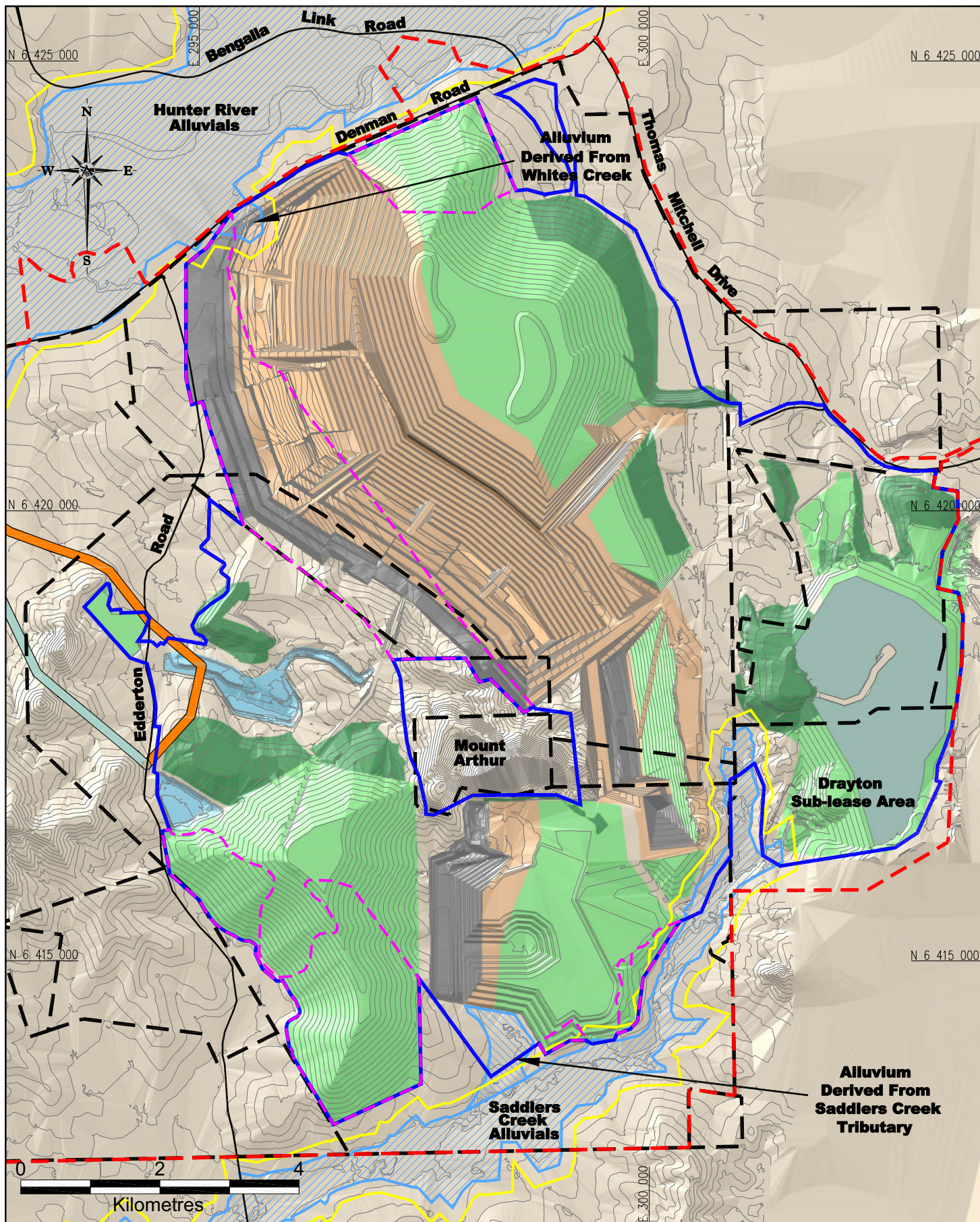
Fairford and Whites Creek Alluvium

In addition to the indirect impacts on the Hunter River alluvium resulting from the depressurisation of the coal seam aquifers, the Project will require mining through and removal of alluvium associated with the remaining sections of Whites Creek and some small tributaries that drain into the Hunter River (as shown on **Figure 32**). It should be noted that the majority of the Whites Creek alluvium was approved to be disturbed by mining activities in the MAN EIS.

The intersection of these alluvial deposits by open cut mining has the potential to result in direct hydraulic connection between the MAN Pit and the Hunter River alluvial aquifer with resultant seepage from these alluvial bodies to the open cut pit.

Field investigations undertaken for the Project as described in more detail in **Appendix N** have confirmed that a narrow band of alluvium exists along Fairford and Whites Creek.

Analysis of the alluvium in these areas demonstrates a stratigraphic sequence that is generally consistent with that of the Hunter River alluvium. This suggests that there is a likelihood of a hydraulic interconnection within the sandy gravel sediments between the alluvium to be intersected and the Hunter River alluvium. However, the sediments in the upper part of the creeks consist predominantly of silty to sandy clays which typically form an aquitard (i.e. area with low permeability) and hence do not readily transmit groundwater. **Section 8.10.4** discusses the various mitigation measures to be implemented in order to ensure there is no hydraulic connection between the Hunter River alluvium and the MAN Pit.



- Mt Arthur Coal Mining & Exploration Leases
- - - EA Boundary
- - - Mt Arthur Coal Consolidation Extension Areas
- - - Mt Arthur Coal Consolidated Disturbance Boundary
- Active Mining
- Spoil
- Tailings
- Proposed Rehabilitation
- Existing Rehabilitation
- Water Storage
- Edderton Road Realignment Option 1
- Edderton Road Realignment Option 2
- Alluvium Extent (MER, 2007)
- 150m Offset Buffer

Hansen Bailey



Co-ordinate System: MGA Zone 56
Source: MER, 2007

MT ARTHUR COAL

Hunter River Alluvials Interaction
(Year 2022)

Cad File: 03986F.dwg

Date: 09.10.09

Drawn: JD

Figure
32

Saddlers Creek Tributary Alluvium

Similar to the impact of mining on the Hunter River alluvium, the Project is predicted to result in the reduction in the rate of the groundwater flow from the Permian coal seam aquifers to the alluvial aquifer of Saddlers Creek. Simulation indicates that up to the year 2011 this modelled reduction will be caused mainly by the advancing cone of depression developing around the MAN Pit and South Pit Extension, which will affect the Saddlers Creek alluvium over a length of around 3 km.

By 2011, the flow direction in the Permian aquifer is predicted to reverse, with flow from the Saddlers Creek alluvium into the coal seam aquifer and progress towards the South Pit Extension, stabilising at a rate of approximately 0.09 ML/day by 2019.

At this time the northern part of the Saddlers Creek alluvium will be hydraulically separated from the underlying Permian aquifer due to the ongoing groundwater drawdown. The creek alluvium however will still receive direct recharge from rainfall and surface runoff and modelling indicates that Saddlers Creek will retain some surface flow.

By 2016 an additional minor impact on Saddlers Creek is caused by dewatering and depressurisation associated with mining in the southern part of Saddlers Pit, leading to a reversal of groundwater flow into the Pit. Predictive modelling indicates that the flow rate from Saddlers Creek towards the Pit will not exceed 0.02 ML/day.

The simulation results indicate that the impact of the MAU may add to the reduction of flow and discharge towards Saddlers Creek along a 6 km long section, directly downstream of the South Pit Extension. The simulated discharge rates to Saddlers Creek alluvium as a result of MAU are reduced from 0.1 ML/day, along this section to 0.01 ML/day in 2022, however groundwater drawdown does not exceed 2 m at Saddlers Creek.

In the lower reaches towards the Hunter River, the Saddlers Creek alluvium will continue to receive groundwater discharge from the coal seams even during peak mining activities within the MAN Pit, South Pit Extension and MAU. This is due to the steep cone of depression (related to low hydraulic conductivity in the Permian sediments) which limits the impact to the immediate surrounds of the open cut and underground mine.

The change of discharge rates between the Permian coal seam aquifers and the alluvial areas along the Hunter River and Saddlers Creek during mine operation is illustrated in **Figure 31**.

The Project also involves mining operations in the Saddlers Pit to consume the alluvial sediments of a small tributary of Saddlers Creek in the southern part of the EA Boundary (see **Figure 32**). It should be noted that the disturbance of Saddlers Creek alluvium and associated impacts as part of the progression of Saddlers Pit was approved as part of the Bayswater No 3 Planning Approval (DA 201/93) in 1993.

Field investigations undertaken for the Project have confirmed that the alluvium in this area is relatively thin. Further, the occurrence of groundwater is sporadic and is associated with lenses of more permeable sand and gravely sand. As such, minimal groundwater impacts are expected to occur.

Impact on Other Groundwater Users

The depressurisation and leakage of the coal seam aquifers as predicted for the Project results in a reduction of the water levels in those existing bores within the radius of the cone of depression. The cone of depressurisation may also result in a reduction in groundwater levels in bores within the overlying alluvials where the natural flow has reversed, with water flowing from the alluvials into the depressurised coal seam aquifers.

Numerical modelling has shown that depressurisation of the upper coal seam aquifers has the potential to impact a number of existing bores located in the various aquifers.

The DWE database indicates that those bores to be impacted by the depressurisation of the coal seam aquifers are located on Mt Arthur Coal land. Additionally, there are no private registered bores on the southern side of the Hunter River within the 4.2 km² of alluvial lands that are located within the predicted cone of depression for the Project.

With respect to GDEs, there are no springs within the topographically elevated land, (the regolith and Permian sub-crop areas supported by groundwater discharge), around which GDEs would develop. Similarly, no GDEs have been identified in the alluvial areas and in any case should they exist it is unlikely that they would be impacted due to the fact that the alluvial areas are of relatively high horizontal permeability and as such less vulnerable to depressurisation from Mt Arthur Coal.

8.10.4 Mitigation and Management

Groundwater will continue to be managed in accordance with the Mt Arthur Coal EMS and the existing Site Water Management Plan which will be reviewed as needed to include findings from this assessment and to ensure that it meets the changing requirements of the Project.

The revision of the Site Water Management Plan will need to incorporate the following, as relevant:

- The progressive replacement of monitoring bores which will be mined out;
- The progressive replacement of monitoring bores which are no longer accessible or unable to be monitored;
- Installation of three paired monitoring bores (i.e. one in the alluvium and the second in the underlying Permian strata) within the Saddlers Creek alluvium to confirm predictions if it is found that these predictions cannot be measured through existing monitoring bores installed for MAU;

- Incorporate a program to monitor the seepage rates associated with the potential leakages from the Hunter River alluvium. This will include the installation of some additional paired bores (i.e. one in the alluvium and the second in the underlying Permian strata) on the Hunter River alluvial areas where impacts were predicted to quantify the leakage from the Hunter River alluvials; and
- Monitoring bores installed to monitor influences with the alluvium will be installed with data loggers to monitor groundwater fluctuations on a daily basis.

During the installation of the additional monitoring bores proposed, permeability tests will be undertaken to obtain further knowledge of the permeability of the overburden material to establish a high degree of confidence of the leakage rates from the alluvial aquifer to the underlying coal seams.

In relation to mining the alluvials associated with Whites Creek, Mt Arthur Coal will continue to monitor hydro-geomorphological conditions and scrutinise for evidence of any groundwater ingress or endwall instability indicators as it progresses the previously approved mining towards the Hunter River alluvials. Mining (other than that already approved in the MAN EIS) will not extend beyond a nominal 150 m buffer zone from the Hunter River Alluvials as shown in **Figure 32** until agreement is reached with DWE regarding the installation of a lower permeability barrier along the point of connections of mining and the alluvium or other appropriate safeguards.

In the unlikely event of water levels in existing landholder bores declining as a consequence of the Project, leading to an adverse impact on water supply, the supply will be substituted by Mt Arthur Coal in consultation with the landholder either by deepening the bore, construction of a new bore or providing comparable water from an external source.

Mt Arthur Coal will obtain all necessary Water Access Licences for the Project from DWE.

8.11 ECONOMICS

An economic assessment was undertaken by Gillespie Economics and is reproduced in **Appendix O**. This assessment reviewed the costs and benefits of the Project as a whole and the net economic benefit for NSW, a summary of which is provided below.

8.11.1 Background

The assessment was primarily concerned with the determination of the following two issues:

- The economic efficiency of the Project (i.e. consideration of economic costs and benefits); and
- The economic impacts of the Project (i.e. the economic stimulus that the Project will provide to the regional and State economy).

8.11.2 Impact Assessment

Benefit Cost Analysis

The Benefit Cost Analysis (BCA) compared the Project to the Base Case (i.e. the continuation of operations at the Mt Arthur Coal Complex until 2022 at approved levels of production up to 20 Mtpa ROM from open cut and up to 8 Mtpa ROM from underground mining). The incremental economic costs and benefits of the Project are summarised in **Table 41**.

Overall, the BCA identified that the net production benefits of the Project were approximately \$2,121 Million.

The Project will have a range of potential external costs, including air quality impacts, noise and blasting impacts, groundwater impacts, some traffic and transport impacts and the costs of ecological and archaeological offsets, which were included in the estimate of capital costs for the Project and have already been included in the above estimate of net production benefits.

The economic costs associated with greenhouse gas generation and ecological impacts were estimated at \$289 Million (assuming a conservatively high greenhouse gas social cost).

The Project therefore represents a quantified net benefit of approximately \$1,832 Million. Some of the external environmental impacts of the Project, however, have not been able to be fully quantified, including: Non Aboriginal cultural heritage impacts; visual impacts and some of the transport and traffic impacts.

The quantified net benefits of the Project of \$1,832 Million can therefore be considered as a minimum threshold value as the economic and social benefits of employment provided by the Project have also not been quantified. This threshold value is the minimum opportunity cost to society of not proceeding with the Project. Interpreted another way, the unquantified environmental impacts of the Project, after mitigation by HVEC, would need to be valued at greater than \$1,832 Million to make the Project questionable from an economic efficiency perspective.

The threshold value therefore represents every household in the region assessed (i.e. the Upper Hunter, Muswellbrook and Singleton Statistical Local Areas as defined by the Australian Bureau of Statistics) as being willing to pay in the order of \$95,900 to avoid any of the residual environmental impacts of the Project, after mitigation by HVEC, to make it questionable from an economic efficiency perspective. The equivalent figure for NSW is \$727 per household.

Table 41
Project Incremental Economic Benefits and Costs

Category	Costs	Benefits
Production	• Opportunity cost of additional land required for open cut extension • Capital costs associated with additional production and ancillary works • Operating costs, including administration, mining, processing and transportation, associated with additional production • Rehabilitation costs associated with additional mine footprint	• Additional sale value of export and domestic coal • Additional residual value of capital and land at the cessation of the Project
Potential Externalities	• Air quality • Greenhouse gases • Noise and Blasting • Ecology • Groundwater • Traffic and transportation • Aboriginal archaeology and cultural heritage • Non Aboriginal heritage • Visual impacts • Surface water and sediment / erosion control	• Economic and social benefits of increased direct employment provided by the Project (an additional workforce of 720 personnel attributable to the Project) • Economic and social flow-on impacts to regional service industries and employment levels • Additional contributions to local, NSW and Commonwealth governments, (royalties, taxes, planning agreements, etc)

Source: Gillespie Economics (2009).

Regional Economic Impact Assessment

Regional economic impact assessment is primarily concerned with the effect of an impacting agent on an economy in terms of a number of specific indicators, such as gross regional output, value-added, income and employment.

The impact study completed for the Project examined the impact of the continued operation of the Mt Arthur Coal Complex and the Project on the surrounding region and NSW as a whole using input-output analysis.

Input-Output Tables were used to estimate the total contributions to the regional and State economy which are shown in **Table 42**.

The regional sectors most impacted by output, value-added and income flow-on effects are likely to be those in the mining services sector, agricultural and mining machinery manufacturing sector, retail trade sector, wholesale trade sector, wholesale mechanical repairs sector, road transport sector and technical services sector.

Table 42
Project State & Regional Economic Contributions

Regional	State
\$635 Million in annual direct and indirect regional output or business turnover \$343 Million in annual direct and indirect regional value added \$79 Million in annual household income 860 direct and indirect jobs	\$948 Million in annual direct and indirect output or business turnover \$496 Million in annual direct and indirect value added \$169 Million in annual household income 1,989 direct and indirect jobs

8.11.3 Mitigation and Management

The cost-benefit analysis indicates the trade-off between net production benefits (incorporating greenhouse gas costs). Minimisation of environmental externalities in the most cost effective manner will assist in maximising the net economic benefits of the Project.

In addition, the cessation of the mining at the Mt Arthur Coal Complex may lead to a range of economic impacts and a reduction in economic activity. It is therefore important for regional authorities and leaders to take every advantage from the stimulation to economic activity and skills and expertise that the Project brings, to strengthen and broaden the region's economic base.

Mitigation measures for specific environmental issues are addressed in other sections of the EA as required.

8.12 SOCIAL IMPACT

Coakes Consulting completed a SIA for the Project which is presented in full in **Appendix P**. This study aimed to predict the future effects of the Project on people, that is their way of life (how they live, work and interact with each other); their culture (norms and traditions); and their community (institutions and structures).

8.12.1 Industry Activities

One of the most significant sources of economic revenue for the Hunter Valley is coal mining. According to the Hunter Valley Research Foundation (2008-2009), the Hunter Coalfield is the largest producing area in NSW.

Workforce data from the 2006 Australian Bureau of Statistics (ABS) Census reports that of the 8,449 people employed in the mining sector in the Hunter region, 81.8% were from the coal mining industry (Hunter Valley Research Foundation, 2008-2009). Specifically, in the Upper Hunter region, most of those employed in coal mining tend to be based within the Muswellbrook and Singleton localities, providing direct jobs for 17% and 14% of the total number of employed residents respectively.

In addition to coal mining, the Hunter region also has a strong agricultural industry with Scone, Singleton and Muswellbrook strongly supported by dairy and beef farming activities, as well as horse breeding, olive production and viticulture. In the Muswellbrook Shire, approximately 6% of the total land area has been classified as prime agricultural land.

Tourism is another sector which is growing in the Hunter region, fuelled in part by the recent expansions within the viticulture industry. Approximately 32% of visitors to the Muswellbrook Shire visit the area specifically for holiday / leisure purposes (four-year annual average leading up to mid-2007).

Most of these visitors tended to reside in hotels / motel accommodation for an average of 1–2 nights (Tourism NSW, 2009). Similar trends were also observed in Singleton, where tourists comprise approximately 38% of the total number of visitors to the town annually. Several temporary accommodation providers, however, have noted a substantial decline in tourist numbers in recent months. Most have attributed this declining trend to the current economic climate (Coakes Consulting, 2009).

8.12.2 Socio-Economic Characteristics

Given workforce trends over time, it has been noted that Mt Arthur Coal's mining employees tend to settle in the townships of Muswellbrook, Singleton and Scone. A comparative analysis of ABS data for these residential localities is provided below.

Muswellbrook, Scone, Singleton, and Denman Suburb Comparisons

The townships of Muswellbrook, Scone, Denman and Singleton display similar demographic patterns across a number of indicators, with differences between the areas relatively small. Scone generally has an ageing population, with higher proportions of the population of retiree age. Muswellbrook is relatively affluent and young with high proportions of the population of young family age. The Singleton combined area demonstrated relatively variable demographics across the four suburbs under consideration (Singleton Balance, Singleton Heights, Darlington, Singleton and Huntview). The Huntview suburb demonstrated significant differences to the other suburbs and was relatively young and affluent with the highest median rents and housing loan repayments. The suburb of Denman is also relatively young with a high proportion of young families.

Muswellbrook LGA Demographic Profile

The Muswellbrook LGA population has grown by 3.3% between the 2001 and 2006 Census periods, most likely indicative of an increase in coal mining activities in the area.

It was during this time period that several proposed mining developments were approved, including the MAN development proposal, which was approved in 2000 and commenced operating during 2002.

ABS Census data suggests that the Muswellbrook LGA has recently undergone significant economic and infrastructure growth. The population increase over the 2001 – 2006 Census periods is complemented by growth in key industrial sectors such as Education and Training, as well as Mining, which increased its employment rates by 3.2% from 2001 – 2006. This growth in the mining sector is significant given that the mining sector has been the primary employer in the Muswellbrook LGA over the last decade, employing up to 17% of Muswellbrook's total workforce.

In addition, the population of the Muswellbrook LGA recorded significantly higher income levels relative to that of the Hunter Statistical Division during the 2006 Census, with income levels increasing by a substantially greater proportion between the Census periods of 2001 – 2006 relative to the period of 1996 – 2001. Taken together, these trends are further reflective of a town undergoing strong economic growth, largely due to the expansion of the mining industry.

The 2006 Census also reports that the Muswellbrook LGA has had substantially high occupancy rates for housing in recent years, with the total number of occupied dwellings increasing by 4.7% from 2001 – 2006. The MSC Strategic plans outline the MSC's development initiatives aimed at improving provision of housing infrastructure to not only accommodate its growing population, but to also serve as a key attraction for a skilled workforce to take up permanent residency in the Muswellbrook region.

8.12.3 Workforce Impacts

Population changes associated with large scale developments are likely to result in a range of social impacts such as changes to the capacity of local community infrastructure and services to cope with a growing population.

These social impacts not only affect individuals, but also families and broader communities.

Estimated workforce numbers and residential trends provided by Mt Arthur Coal have allowed the modelling of impacts which are likely to result from an influx of construction and operations employees into the area as a result of the Project. Outcomes of the population impact analyses are interpreted in light of whether existing service and community infrastructure has the capacity to accommodate the projected population changes at the various Project phases as discussed below.

Construction Phase

The construction phase workforce for the Project is estimated to peak at approximately 240 workers at any one time. The construction workforce is expected to be at its peak in around 2014. Previous studies have found that in rural or remote locations, given the specialised nature of construction, an approximate benchmark of 20% of a construction workforce tends to be recruited locally.

This assessment assumes that 80% of the construction workforce (192) will be sourced from outside the region, with a further 48 construction personnel sourced locally.

Given the temporary nature of construction, it is assumed that the construction workforce will not be accompanied by their families and that most of the onsite workers are likely to be residing in temporary accommodation in proximity to the operation within the locality. It is assumed that the construction workforce will reside in similar localities as Mt Arthur Coal's current workforce. More than half of Mt Arthur Coal's workforce currently resides in the towns of Muswellbrook, Singleton and Scone; with a smaller proportion in Aberdeen and other towns in the region.

To assess potential pressures on temporary accommodation, a survey of temporary accommodation availability and capacity was undertaken with 31 accommodation providers across the Muswellbrook, Singleton and Scone localities.

These included hotels, motels, caravan parks, as well as onsite cabin facilities. Outcomes of the temporary accommodation service provider survey have revealed that a sufficient amount of spare bed capacity exists to accommodate the potential influx of a peak 192 construction workforce.

Operational Phase

The Project when combined with existing Mt Arthur Coal open cut operations and the MAU will employ a workforce of approximately 2,600 at peak production which represents an increase of 1,610 personnel. Of these approximately 720 personnel are directly attributable to the Project.

The impact assessment considered both the potential workforce influx directly attributable to the Project and the potential peak workforce influx resulting from Mt Arthur Coal's overall growth activities across its combined operations. This analysis of peak workforce influx across the context of Mt Arthur Coal's overall production activities affords a more comprehensive understanding of population change impacts associated with the anticipated peak total of new personnel additions.

The SIA assessed maximum and minimum additional personnel cases. The maximum influx case is based on Australia-wide industry research and assumes that 20% of Mt Arthur Coal's additional personnel will be sourced locally while 80% will be sourced from outside the region. Conversely, the minimum influx case is based on Mt Arthur Coal's historical employment of 80% of employees being sourced locally while 20% are sourced from outside the region.

Table 43 outlines the predicted number of new personnel which are likely to reside in the towns of Muswellbrook, Singleton, Scone and Aberdeen as well as other surrounding townships.

Table 43
Town of Receiver Estimations of Operational Workforce

Town	Residential Distribution	Scenario A	Scenario B
Muswellbrook	37%	53	119
Singleton	27%	39	87
Scone	11%	16	35
Aberdeen	7%	10	23
Other towns (in region)	18%	26	58
Total	100%	144	322

Source: Coakes Consulting (2009)

Note: * Residential distribution is based on the location of receiver for Mt Arthur Coal's current workforce (2008) as detailed in the company's Project update to the Muswellbrook MSC.

Given that Mt Arthur Coal intends to continue its local recruitment policy, it is probable that 80% of the new operational workforce for the Project will be recruited locally and only 20% recruited from outside the region. Therefore, the current assessment has shown the following:

- Scenario A – Project-Specific workforce influx (minimum influx case scenario): Assumes influx of 144 new personnel into the region (20% of 720 proposed new personnel additions to the current workforce); and
- Scenario B – Peak workforce influx, Mt Arthur Coal Complex Overall (Minimum influx case scenario - Peak workforce influx resulting from Mt Arthur Coal's overall growth activities across its operations combined): Assumes influx of 322 new personnel into the region (20% of 1,610 proposed new personnel additions to the current workforce).

These figures reflect anticipated peak workforce additions associated with overall growth activities across Mt Arthur Coal's combined underground and open cut operations, which is unlikely to enter the region concurrently, but with a gradual operational ramp-up of workforce more likely to occur over a period of time.

8.12.4 Regional Family Level Impacts

It is assumed that the operational workforce relocating to the area for the Project will be accompanied by their families. Therefore, family level impact analysis was undertaken to provide a more detailed understanding of the extent of impacts that may result from the influx of an operational workforce into the locality.

The predicted family impact was based according to the likely preferred residential locations of Mt Arthur Coal's new production personnel. Population impacts are likely to be experienced in Muswellbrook, with the Project-specific workforce influx (Scenario A) likely to result in a potential influx of 186 new community members into Muswellbrook.

In Scenario A, where 186 personnel are assumed to be sourced from outside the region, the family level impacts will be greatest in Muswellbrook and Singleton. In Muswellbrook, the number of primary school aged children (5 – 12 years) is expected to increase by a maximum of approximately 27 children and the younger workforce age group (25 – 34 years) in Muswellbrook is expected to grow by an additional 28 persons. In Singleton, the number of primary school aged children is likely to increase by 21 and the younger workforce age population is projected to grow by an additional 22 persons.

Using Scenario B which is the “minimum influx case scenario” of population change and family level impacts, significant population growth across the various townships will occur, particularly in Muswellbrook and Singleton (119 and 304 population additions, respectively). In both these towns, the primary school aged population is anticipated to increase by 60 children (Muswellbrook) and 47 children (Singleton), respectively. Similarly, the workforce age population in both Muswellbrook and Singleton has also been projected to increase with the older workforce age bracket 35 – 44 years projected to undergo the most significant growth (63 additional persons in Muswellbrook, and a further 49 in Singleton).

While the minimum influx case scenario suggests a significant resident influx into the region, it is again noteworthy that these figures reflect peak workforce additions associated with overall growth activities across the combined underground and open cut operations at the Mt Arthur Coal Complex. Therefore, this peak workforce, with their respective family members, is unlikely to be entering the region concurrently. Rather, the population change is more likely to occur gradually over a period of time, with new production personnel phased in across Mt Arthur Coal’s production activities over a number of years. This gradual phasing of new personnel into the region is likely to afford local communities and service providers the opportunity to adjust and improve current capacities in managing the changing demands of the growing population.

8.12.5 Local Services Impacts

Health Services

A service provider survey was undertaken for the Project of public hospitals in the Upper Hunter Region. The Muswellbrook District Hospital declined to take part in the current survey; therefore data from MAU social assessment was used.

The service provider survey found that hospitals in Muswellbrook, Denman and Scone are unlikely to be able to accommodate any further population growth in the area, unless more beds and staffing resources are provided. The Singleton Hospital, however, can increase the number of beds in-house if necessary.

Most of the GP services surveyed for the assessment indicated an ability to accommodate a further increase in population. However, most of these services also agreed that there was a need for further GPs to assist in servicing the growing population demands and unless more doctors were encouraged to work in the region, the area’s GP services would not cope with any further long term projected growth in population.

Dental practices which took part in the survey expressed confidence in their abilities to handle any potential population growth in the area. However, further growth in the region’s population may result in increased waiting times for patients under the Government’s Medicare scheme.

Education

Under minimum influx case projections, Scenario A shows the number of primary school-aged children in Muswellbrook is projected to increase by 27 children, with a further 21 in Singleton. In contrast, Scenario B suggests a projected peak increase of 60 primary school children in Muswellbrook and a further 47 in Singleton. The potential increase in high school-aged children is not as significant as that for the primary group. It is anticipated that, under minimum influx case projections, Muswellbrook would experience an increase of 18 new students under Scenario A, and an additional 12 in Singleton; while under Scenario B, the projected peak increase of new high school students in Muswellbrook is estimated to be 40, and in Singleton 27.

The survey found that although some schools noted limited spare capacity to accommodate new students, the majority would have the capacity to handle an increase in local population through installation of demountables or development of further extensions to existing facilities.

Therefore, it is likely that education services in the region would be able to cope with the current anticipated population change and influx of new residents.

Childcare

The service provider survey found that most of the childcare services in the region were already running either at, or very close to, capacity. Further, most of the childcare services reported challenges in resourcing existing facilities, due largely to an overall shortage of childcare staff as well as limited funding for specialised programs to cater to those children in need.

The impact assessment has revealed a minimum potential increase under Scenario A of 18 young dependent children (0 – 4 years) in Muswellbrook, and an increase of 12 in Singleton. Under Scenario B, a minimum potential increase of 41 new dependent aged children in Muswellbrook is estimated, alongside a further 27 in Singleton.

In addition to these dependent aged children, the number of school aged children (5 – 12 years) who might also be in need of childcare services (i.e. before and after school care, vacation care) is also likely to undergo considerable growth in coming years. Therefore, there is likely to be strains to existing childcare services should there be an increase in demand for these services.

Residential Housing and Accommodation

The Hunter region (and in particular Muswellbrook) has undergone substantial growth in recent years due largely to the expanding Hunter coal industry. According to the Housing Industry Association, Muswellbrook is fast becoming a “booming real estate scene”, with MSC undertaking several initiatives to not only accommodate its growing industry workforce population, but also initiating large scale residential development projects as an incentive to attract other skilled professionals into the area.

Given current initiatives in further housing development in the region, there is likely to be sufficient accommodation to house Mt Arthur Coal's projected number of new production personnel.

Further, given current plans for a gradual ramp-up of staff over a period of time, local councils will be able to progressively phase in new housing and residential development applications over the coming years.

8.12.6 Cumulative Population Impact

Assessment

Other developments in the region have the potential to add pressure on community infrastructure, services and housing with the key potential cumulative operation in the area being the Mangoola Coal Mine which has a peak construction workforce of 350 likely to occur in the year 2011. Given that construction for the Project is not expected to commence until 2012, it is unlikely that there will be any cumulative construction workforce impacts imposed on the region, particularly on key service sectors such as the temporary accommodation sector.

Mt Arthur Coal anticipates that its projected peak total of 1,610 new production personnel will be fully phased in by 2016, bringing its peak production workforce to approximately 2,600 across its operations. For Mangoola Mine, information provided by Xstrata has suggested that the peak operational phase will see a workforce influx of 300 production personnel in the year 2019. Therefore from the year 2019, both the Project and Mangoola Mine's peak production phases are likely to coincide. At this point, Muswellbrook is estimated to have 565 new residents associated with these phases of the Project and Mangoola Mine. This in turn means there will be an estimated 1,977 new community members during the period where both Projects' peak production phases coincide.

In summary, the potential cumulative impacts of the Project and Mangoola Mine on the Muswellbrook LGA include:

- Potential strains on health services in the Muswellbrook LGA;
- Potential constraints on existing and long term residential land availability, unless effective planning processes are in place to assist the MSC in progressively phasing in new residential land applications in accordance with the influx of new production personnel for the Project;
- The variety of different primary schools in Muswellbrook, including large capacity intakes and flexibility for some of these schools (e.g. Muswellbrook Public School has a current spare capacity of 270 and a flexible capacity of 700) suggests that there is likely to be sufficient capacity in existing primary education services to accommodate the minimum influx case addition of 71 primary school-aged children;
- Current capacity of the Muswellbrook High School (840 / Flexible) and the St Joseph's High School (650 / Flexible) suggests sufficient capacity to accommodate a minimum influx of an additional 47 secondary school aged students into the Muswellbrook LGA; and
- Potential strains on existing childcare services across the Muswellbrook LGA, given that most current childcare services are already running at, or close to, capacity and are therefore unlikely to be able to accommodate an additional 48 young children (0 – 4 years) in the Shire.

Summary

The figures provided above are population predictions only, based on a maximum influx case scenario where both the Project and Mangoola Mine peak production workforces are assumed to coincide.

To ensure accuracy of prediction, the current cumulative impact assessment for Mt Arthur Coal's growth activities across its operations in coming years will need to be revised as additional information regarding Project approvals / closures in the Muswellbrook LGA becomes available.

While the SIA has projected a substantial cumulative influx of peak production personnel and their respective family members into the Muswellbrook LGA during the period when both the Project and Mangoola Mine's peak operational phases have been assumed to coincide; it is important to note the time lag between the commencements of peak production phases.

While Mt Arthur Coal's peak production phase is likely to be fully phased in around 2014 following construction of the Project, Mangoola Mine's peak production workforce is unlikely to be fully phased in until 2019. Therefore, this time lag is likely to afford key service providers in the Muswellbrook LGA with the opportunity to work constructively with the respective companies in effectively planning for the anticipated and progressive population growth in coming years.

8.12.7 Mitigation and Management

Mt Arthur Coal has been operating since the 1960's and has a well developed community investment program in place. Mt Arthur Coal is currently in discussions with Muswellbrook Shire Council in relation to the establishment of a VPA under the EP&A Act in relation the Project.

Mt Arthur Coal has a robust program of community engagement mechanisms in place, and will continue to provide further information on issues of interest to the community.

8.13 WASTE

Mt Arthur Coal has an existing comprehensive Waste Management System (WMS) which was developed to consolidate the disposal, tracking and reporting of all waste generated onsite. The WMS is designed to meet both legislative and BHP Billiton requirements. It is further discussed below.

8.13.1 Waste Management System

Mt Arthur Coal's WMS utilises an approved, independent waste contractor working within the provisions of the POEO Act to monitor, remove, track and report wastes. Complementing this, the waste segregation component of the WMS ensures each waste stream is segregated in the appropriate receptacles for recycling, reuse and / or disposal.

Mt Arthur Coal has documented procedures for the minimisation, storage, transport, disposal, tracking and reporting of waste generated onsite. A spill response procedure is also in place that describes the measures to be followed in the event of a spill incident.

To ensure the WMS is working effectively and appropriately for the changing needs of the operation, regular inspections and monitoring is conducted by appropriately qualified personnel.

Any spills that occur within collection areas are contained within bunds and managed by Mt Arthur Coal's pollution control systems, whilst regular inspections of the WMS ensure compliance with regulatory requirements.

Maintenance Workshop Waste

The Mt Arthur Coal Complex has a bioremediation area designed to monitor and manage the amount and quality of hydrocarbon contaminated materials generated onsite. The bioremediation area consists of a clay lined pad and leachate collection sump and is fully contained by a graded perimeter drain. Contaminated materials are placed on the prepared area in defined windrows where it is subject to initial testing and classification.

Waste greases and bulk waste oil are held in tanks in a bunded area before removal from site by a licensed contractor and recycled or disposed of at a licensed facility. Scrap metals will be collected and removed from site by a licensed scrap metal merchant for recycling.

Other solid wastes such as cardboard, paper, plastic containers (where suitable) and timber is placed in recycling bins for treatment at an appropriate recycling centre. Other general waste is placed in general waste bins for licensed transport and disposal to the Muswellbrook Shire Landfill.

Batteries and light vehicle tyres are kept separate from other wastes in safe storage areas, and then removed from site by licensed contractors. Waste tyres from mining equipment are buried within the overburden emplacement area.

General Waste

Waste suitable for recycling is placed in designated recyclable waste bins, which can receive combined recyclable wastes and includes paper, cardboard, glass, recyclable plastics, wooden pallets and aluminium and steel cans. Recyclable wastes are then transported to an appropriate recycling centre for separation and recovery.

A licensed locally operated waste recovery company collects other general waste for disposal to landfill.

Sewage Treatment

The Mt Arthur Coal Complex has an onsite wastewater treatment facility used to treat effluent collected from the staff amenities. Sludge is then removed and trucked offsite by a licensed contractor to appropriate waste handling facilities.

Effluent and sludge from septic pump-out systems installed at Bayswater No 3, and in-pit crib areas are collected by licensed contractors and treated offsite at licensed facilities.

Additional sewage and wastewater from the CHPP and industrial area is treated in a package treatment plant before being pumped to the existing constructed wetland for treatment before passing to the Main Water Dam with the treated effluent re-used as a mine water supply.

8.13.2 Impact Assessment

General Waste

The current WMS and sewage treatment plant facilities will continue to be utilised for the Project and upgraded where necessary to cater for the additional workforce proposed by the Project. In particular, as part of infrastructure upgrades the Sewage Treatment Plant will be upgraded or duplicated.

8.13.3 Mitigation and Management

The WMS will continue to be utilised for the Project, in accordance with the EMS. Training will continue in the minimisation of waste streams, reuse and recycling options and management strategies for each major waste stream relevant to key work areas.

Irrigation of treated wastewater will continue to be monitored in accordance with the EPL and the *Environmental Guideline for the Utilisation of Treated Effluent* (DEC, 1995).

8.14 SOILS AND LAND RESOURCES

GSS Environmental (GSSE) completed a soils and land use assessment for the Project which is reproduced in **Appendix Q**. A summary is provided below.

8.14.1 Methodology

The assessment objectives were to:

- Classify and determine the soil types of the study area (Mine Extension Areas 1 - 5 and proposed Edderton Road realignment options);
- Assess the suitability of the current topsoil material for future rehabilitation; and
- Identify pre and post mining agricultural suitability and land capability.

The assessment incorporated a desktop review of the extensive previous soil and land capability assessments, which was complemented by additional fieldwork during March 2009.

A description of soils, pre-mining land capability and agricultural suitability is provided below.

8.14.2 Impact Assessment

Soils

Topdressing Suitability

The soils within the EA Boundary were assessed to determine their suitability as topdressing media for the post mining landscape of the area. Topdressing suitability for each soil class is discussed below;

- **Soil Class 1** – is not suitable as topdressing material due to its excessive sand and gravel content. It is of relatively minor occurrence, being confined to associations with soil classes 3 and 4, typically along ridge crests;
- **Soil Class 2** – is generally not considered to be suitable as a topdressing material due to its apedal nature, generally sandy texture and poor water holding capacity. It should only be considered as an alternative source of topdressing material if other sources are found to be insufficient;
- **Soil Class 3** – varies in suitability from gravelly or stony loamy sand to sandy loam surface texture and is only marginally suitable as a topdressing material;
- **Soil Class 4** – is marginal as a topdressing material due to its shallow, sandy-textured nature; and
- **Soil Class 5** – the red duplex soils are mostly suitable as a topdressing material by combining the thin loamy A and upper portion of the B horizons and can be stripped to a depth of 0.30 m.

A zone of deeper depositional soils (Classes 3 & 5) adjoins Denman Road. This area can be stripped to a depth of between 0.80 m and 1.20 m.

Topdressing Availability

Topdressing material stripping depths within the study area are shown in **Appendix Q**. Individual volumes of available topdressing material for each recommended stripping depth are provided in **Table 44**. Some 1,220 ha of disturbed area may require rehabilitation (including Edderton Road realignment options). Allowing for a 10% handling loss, approximately 2,167,650 m³ of suitable topdressing material is available within the area to be disturbed. Therefore, topdressing may be placed on the post-mining landform at a theoretical average depth of 0.18 m. This depth is consistent with what has been used previously at the Mt Arthur Coal Complex (ranging from 0 – 300 mm), where the placement of topdressing material to a depth of 0.1 m has been found to be adequate for healthy pasture establishment on rehabilitated spoil material.

The depth of re-spread topdressing material is not critical for tree establishment.

Erosion Potential

Many of the soil types within the EA Boundary include soil horizons which exhibit a slight to high potential for dispersion and consequently are likely to be subject to sheet, rill and gully erosion if left exposed and unprotected during mining operations. If the topsoil of these soil units is disturbed or removed and the subsoils are exposed, the potential for erosion may be increased. Disturbance occurring within the vicinity of a drainage line could impact on downstream water quality through an increase in sediment loads. These soils will be managed to ensure that the subsoils are not exposed without suitable controls being implemented.

Potential Acid Generating Material

The potential for acid generation from regolith material (topsoil and subsoil) within the EA Boundary is low. Acid Sulphate Soils which are the main cause of acid generation within the soil mantle, are commonly found less than 5 m above sea level, particularly in low-lying coastal areas.

There has been little history of acid generation from regolith material in the Muswellbrook area (which is located approximately 130 km from the coast).

Land Capability

The pre-mining and post-mining rural land capability classifications of the Mine Extension Areas (in accordance with Department of Natural Resources mapping) are shown in **Appendix Q**. The percentage area of each class prior to and following mining is indicatively shown in **Table 45**.

Class VI land will dominate the site after cessation of mining with some 49% of the extraction area returned. There will be no Class I land in the rehabilitated landform although Class II land will increase from 3% to 9%, to mitigate the loss of Class I land. The Class III land percentage will remain unchanged and Class IV land will remain similar (with 6% pre-mining and 7% post mining). Approximately 13% of the area will be returned to Class VIII land due to the creation of a final void.

Agricultural Suitability

The pre-mining and post-mining agricultural suitability classification of the Mine Extension Areas is shown in **Appendix Q** with the percentage area of each class (before and after mining) is shown in **Table 46**.

Class 4 land will dominate the site after cessation of mining with some 55% of the extraction area returned to Class 4 land. This represents a similar pre-mining percentage of Class 4 land. Class 1 land will increase from 2% (pre-mining) to 9% (post mining) to further mitigate the loss of Class I land capability. Whilst the Class 2 land percentage remains similar to pre-mining, Class 3 land is reduced from a pre-mining percentage of 19% to 7% after mining. The area of Class 5 land remains the same.

Table 44
Indicative Topsoil Availability

Stripping Depth (m)	Area (ha)**	Volume (m ³)*
0.15	63	94,500
0.10-0.30 *	1,018	2,036,000
0.15 -0.30 *	139	278,000
Total	1,220	2,408,500
Total (Less 10% Handling Loss)	1,220	2,167,650

* Assumes average stripping depth of 0.20 m

** Includes disturbance associated with Edderton Road alignments

Table 45
Rural Land Capability Classification of the Mine Extension Areas

Land Class	Pre-mining (%)	Post-mining (%)
Class I	3	Nil
Class II	3	9
Class III	16	16
Class IV	6	7
Class V	64	6
Class VI	8	49
Class VIII	Nil	13
Total	100	100

Table 46
Agricultural Suitability Classification of the Mine Extension Areas

Land Class	Pre-mining (%)	Post-mining (%)
Class 1	2	9
Class 2	17	16
Class 3	19	7
Class 4	47	55
Class 5	15	13
Total	100	100

8.14.3 Mitigation and Management

In order to reduce the potential for degradation at the Mt Arthur Coal Complex and adjoining lands, the following strategies will be implemented during mine rehabilitation to achieve the desired post mining land capability and agricultural suitability outcome:

- Materials will be stripped to indicated levels in a moist condition and placed directly onto reshaped areas where practical;
- Where topsoil must be stockpiled, efforts will be made to reduce compaction with as coarsely textured a condition as possible; will be a maximum of 3 m in height and if stored for greater than 12 months seeded and fertilised and treated for weeds prior to respreading at around 0.1 m in depth;
- An inventory of designated areas and available soil will be maintained to ensure adequate topsoil materials are available for planned rehabilitation activities;
- Thorough seedbed preparation will be undertaken to ensure optimum establishment and growth of vegetation with all topsoiled areas lightly contour ripped (after topsoil spreading) to create a “key” between the soil and the spoil. Ripping will be undertaken on the contour and the tynes lifted for approximately 2 m every 200 m to reduce the potential for channelised erosion, preferably when soil is moist. The respread topsoil surface will be scarified prior to, or during seeding, to reduce run-off and increase infiltration via tilling with a fine-tynd plough or disc harrow;

- Regrading will be undertaken where required to produce slope angles, lengths and shapes that are compatible with the proposed land use and not prone to an unacceptable rate of erosion. This will be done in integration with drainage structures and dams capable of conveying runoff from the newly created catchments whilst minimising the risk of erosion and sedimentation (including contour furrows or contour banks at intervals down the slope, contour ripping across the grade, and graded banks where required); and
- Engineered waterways, spillways and sediment control dams (using erosion blankets, ground-cover vegetation and / or rip rap) will also be implemented to capture sediment laden runoff prior to offsite release and designed and located so as to safely convey the maximum anticipated discharge.

8.15 REHABILITATION AND FINAL LANDFORM

8.15.1 Rehabilitation Objectives

Mt Arthur Coal has extensive experience in achieving successful mine rehabilitation, with rehabilitation works being completed for various mining areas onsite over the last 45 years. Mt Arthur Coal has also undertaken a number of rehabilitation research projects to provide further information for the successful planning and management of rehabilitation, including studies on topsoil management and for the establishment of native trees and grasses.

Mt Arthur Coal's key rehabilitation objective is to ensure that processes are undertaken generally in accordance with the *Strategic Framework for Mine Closure* (ANZMEC MCA), and the Synoptic Plan including:

- Achieving a land capability following the cessation of mining that is comparable to pre-mining land capability and considers stakeholders interests;

- Allowing for sustainable post mining land use(s) to occur;
- Establishing a clear set of indicators to be met;
- Increasing areas of native vegetation and available fauna habitat; and
- Improving linkages between existing areas of remnant vegetation; and
- Increasing the average percentage of native woodland to improve habitat value (i.e. at least 30% of rehabilitation areas will be returned to native woodland).

Relevant Planning Instruments

The land use objectives for lands in the Muswellbrook LEP for the areas zoned as RU1 - Primary Production (which make up the majority of the EA Boundary as discussed in **Section 5.2.5**) include:

“...To ensure that development for the purpose of extractive industries, underground mines (other than surface works associated with underground mines) or open cut mines (other than open cut mines from the surface of the flood plain), will not:

- (a) Destroy or impair the agricultural production potential of the land or, in the case of underground mine, unreasonably restrict or otherwise affect any other developments on the surface, or
- (b) Detrimentally affect in any way the quantity, flow and quality of water in either subterranean or surface water systems;
- (c) Visually intrude into its surroundings, except by way of suitable screening...”

The conceptual final landform shown in **Figure 33** and the proposed ecological offsets strategy as discussed in **Section 8.6** provides consideration of all of the above objectives and the land use objectives of the Muswellbrook LEP.

8.15.2 Rehabilitation Techniques and Criteria

The following broad criteria will continue to be applied to all rehabilitation practices at the Mt Arthur Coal Complex, including:

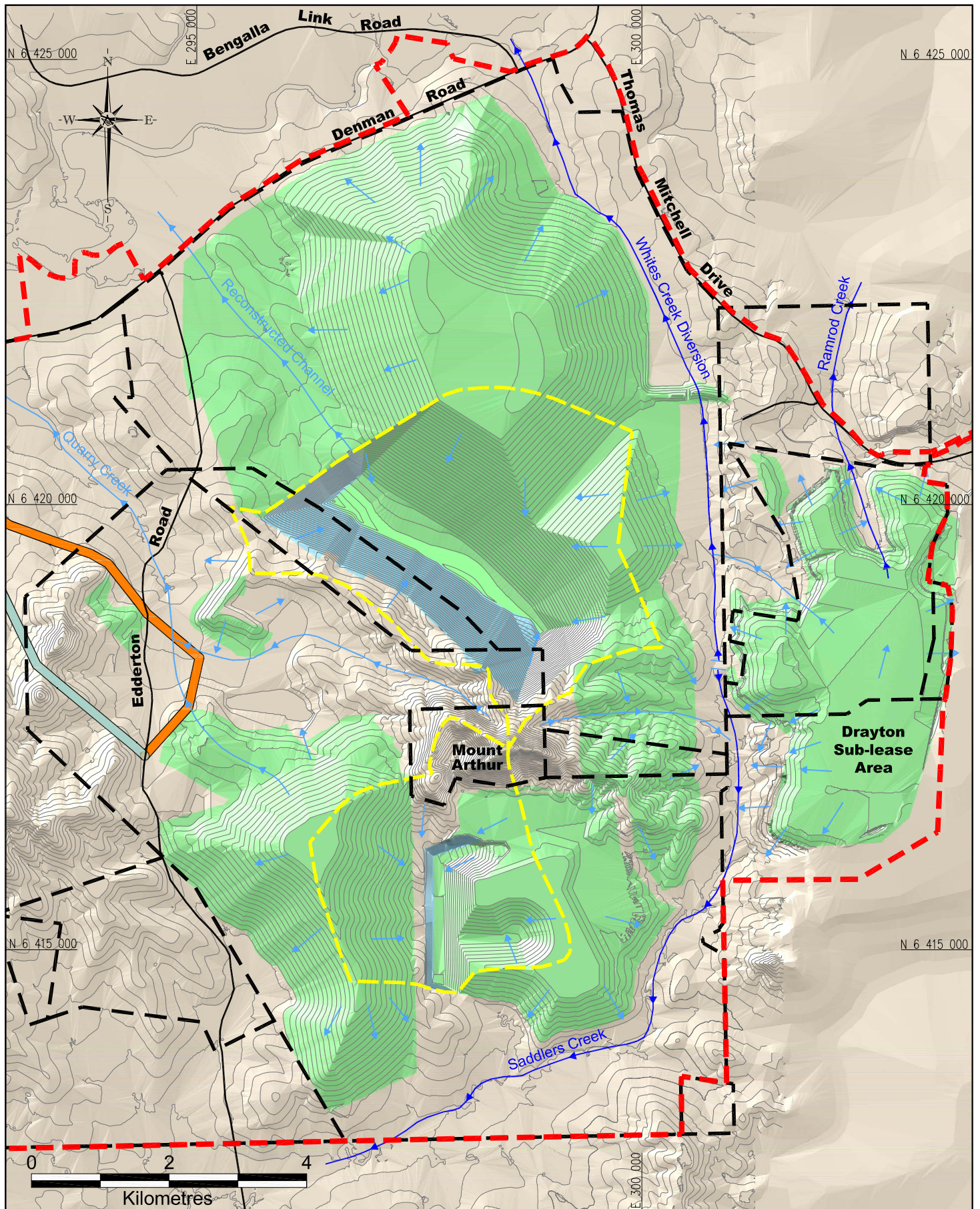
- Revegetation will be conducted following the reshaping, topsoiling and ripping of disturbed areas. Native species endemic to the local area will be used wherever possible;
- As noted in **Section 8.15.1**, the overall aim of the rehabilitation program is to return the post mining landscape to its pre-mining overall level of land capability. Additionally, it is proposed to increase the average percentage of forest to improve the habitat value and to provide shade and shelter for stock;
- Generally, the flatter longer slopes of the reshaped areas will be sown to pasture while the steeper sections and those which adjoin treed areas and watercourses will be planted or sown to grasses, trees and shrubs. Initial pasture and cover crop sowings will temporarily stabilise steep slopes prior to tree plantings and sowings; and
- Native grass species typical of the local area will be used in pastoral grassland establishment. Improved pastures and occasional forage crops will also be considered on areas of Class IV land.

Rehabilitation monitoring results will be used to assist in the continual improvement and refinement of the rehabilitation techniques applied at Mt Arthur Coal. Rehabilitation monitoring is discussed further in **Section 8.15.4**.

8.15.3 Final Landform

It is anticipated that mining at the Mt Arthur Coal Complex will continue to the west beyond 2022 pending further Planning Approvals to be sought in the future.

In the unlikely event that mining does cease at the Mt Arthur Coal Complex in 2022, the following strategy will be implemented to ensure the minimisation of mine void areas and the creation of an acceptable post mining landform.



- Mt Arthur Coal Mining & Exploration Leases
- - - EA Boundary
- - - Void Catchment Boundary
- Water Storage
- Edderton Road Realignment Option 1
- Edderton Road Realignment Option 2
- Final Rehabilitation
- Surface Water Flow Direction
- Undisturbed Creek

Hansen Bailey



Co-ordinate System: MGA Zone 56

MT ARTHUR COAL

Conceptual Final Landform

Cad File: 03999E.dwg

Date: 26.08.09

Drawn: CS

Figure
33

Where possible, rehabilitation planning at Mt Arthur Coal will attempt to maximise opportunities for a diverse post-mining landscape and land-use. It is presently proposed that the final land uses of the rehabilitated site will include pastoral, commercial forestry, recreation and/or wildlife habitat opportunities.

The conceptual location of proposed woodland and forest communities on rehabilitated lands is consistent with the DPI's Synoptic Plan.

Void Use and Management

Two voids will remain within the EA Boundary - the MAN Void and the Saddlers Pit Void. Both final voids will be utilised for water storage, with their locations and respective catchment boundaries (a combined area of approximately 16 km²) within the conceptual final landform shown in **Figure 33**. The proposed use of the two voids is related to the preferred land use and landform design options for the Project and the effective management of these features was a key consideration in the development of the conceptual final landform as described below.

Surface water from all areas that are not designed for free drainage to surrounding catchments will report to either of the two final voids. A discussion of the post-mining management of surface water and final void areas is presented in **Appendix M**.

Conceptual Final Landform

If mining were to cease in 2022, the final landform and rehabilitation proposed following the conclusion of active mining operations will be established by progressive backfilling operations in the final years of operation generally as illustrated in **Figure 33**.

The conceptual final landform design for the Project under this scenario has been developed to maximise consistency with the surrounding landscapes and ensure long term sustainability and stability, with a maximum design height of approximately 375 m AHD and slopes generally less than 10 degrees (and up to a maximum slope of 18 degrees).

In accordance with Mt Arthur Coal's objectives for mine rehabilitation, the final landform will be designed to promote visual characteristics that are consistent with the surrounding environment and to result in a class of land capability that is comparable to that of the pre-mining landscape.

The management measures to be utilised in the development of the final landform would be detailed in the relevant documents of the Mt Arthur Coal EMS, which will be revised as required for the Project.

The drainage pattern of the final landform will be designed to integrate with the surrounding catchments and will include permanent channel diversions, drains and contour banks, as conceptually shown in **Figure 33**. These works will involve the reconstruction of a channel in the north west of the EA Boundary to Denman Road. In addition, the rehabilitation of the tailings storage dam located in the Bayswater No 2 and Drayton Sub-lease Areas will be integrated with other rehabilitation in the Drayton Sub-Lease Area to form a separate elevated final landform to the east of Whites Creek.

All surface infrastructure at the Mt Arthur Coal Complex that will not be required after the completion of mining operations shall be removed from the site.

Specific details of the final landform will be refined as the Project progresses and detailed in the MOP to the approval of DPI.

The conceptual final landform provides an integrated landscape that is consistent with the Synoptic Plan and aims to link existing vegetation communities within and surrounding the EA Boundary with rehabilitation areas to provide corridors for the movement of fauna. The corridors proposed are consistent with, and will further complement both the Synoptic Plan and the final landforms of surrounding mining operations, which were considered in the conceptual design process (see **Figure 33**).

The integrated rehabilitation planning approach utilised for the Project will therefore result in significant benefits, including:

- The maximum extraction of the available coal resources within the Mine Extension Areas proposed for the Project;
- The continued availability of the Drayton Sub-Lease Area for tailings and overburden emplacement resulting in a more sustainable final landform;
- The management of spontaneous combustion within the Drayton Sub-Lease Area;
- Integration and implementation of the principles of the Strategic Framework for Mine Closure and the Synoptic Plan in the conceptual final landform;
- Integration with adjacent mine rehabilitation and offset areas such as the Drayton Wildlife Refuge Area (see **Figure 26**); and
- A net increase in the area of native woodland reinstated as part of rehabilitation and corridor enhancement.

8.15.4 Mitigation and Management

Rehabilitated areas will continue to be managed in accordance with the methods that are currently in place at the Mt Arthur Coal Complex under the EMS and have been used successfully to date. A summary of these techniques that will continue to be utilised and developed further for the Project are provided below.

Progressive Rehabilitation

The rehabilitation of land disturbance associated with the Mine Extension Areas will continue to occur progressively as an integral component of the mining operations at the Mt Arthur Coal Complex. The rehabilitation of the site will continue to be undertaken generally in accordance with the Mt Arthur Coal EMS and its associated management documents, which will be revised for the Project, as appropriate.

As discussed in **Section 4.1** and as generally displayed on **Figure 8**, **Figure 9** and **Figure 10** rehabilitation will be scheduled to occur progressively throughout the life of the Project, as soon as is practical following the completion of mining disturbance. This process is in accordance with the DPI requirements for Rehabilitation Completion Criteria.

Detailed mining and rehabilitation schedules will be prepared for the MOP and AEMR which will be submitted to DPI over the life of the Project. Progressive rehabilitation minimises the areas of disturbed land, and will also assist in minimising the visual impact of the Project and the potential for wind blown dust and erosion.

Revegetation

The revegetation strategy at the Mt Arthur Coal Complex has been developed as a result of previous rehabilitation experience, the outcomes of rehabilitation trials undertaken and in accordance with industry practice and regulatory advice. Revegetation will occur, where practical, as soon as possible after reshaping and drainage activities have been completed.

The timing of the grass and tree seeding works will be undertaken during the preferred autumn or spring periods, where possible, to promote vegetation establishment and to minimise the potential for erosion and visual impacts.

Mt Arthur Coal will continue to complete the revegetation of rehabilitation areas using specific seed mixes for pastoral and reforested areas, which contain native species and have proven successful in previous use. To promote effective links between site rehabilitation, remnant vegetation and ecological offset areas, Mt Arthur Coal will continue to develop a series of woodland corridors across the site, in accordance with the principles presented in the Synoptic Plan (see **Figure 26**).

Further to this, it is proposed for the translocation of topsoil and vegetative material to assist in the recreation of 500 ha of Box Gum Woodland understorey. The seed bank existing in the soil will be supplemented with purchased native seed and spread over the designated understorey and woodland areas.

Rehabilitation Monitoring

In accordance with existing site procedures, rehabilitation areas will be monitored on a regular basis to ensure that rehabilitation objectives are being met and that sustainable revegetation and long term landform sustainability is achieved. Rehabilitation monitoring will include regular inspections of rehabilitated areas to assess:

- Structural stability;
- The effectiveness of erosion and sediment control measures;
- Revegetation success and the establishment of Box Gum understorey and fauna habitat; and
- The effectiveness of weed and pest management measures.

Maintenance works in rehabilitation areas will be completed as required to address any issues of concern identified during monitoring. Maintenance activities may include a range of responses, including: supplementary seeding of vegetated areas, weed and pest control, the application of fertiliser, de-silting or repairing drainage structures and sedimentation dams and the infill and re-grading of any eroded areas.

Mt Arthur Coal will continue to undertake rehabilitation maintenance works across the Complex, as required. Mt Arthur Coal will also undertake rehabilitation works within the Drayton Sub-Lease Area on areas affected by Mt Arthur Coal's activities (for a maximum period of three years from the expiry of the sub-lease).

The results of rehabilitation and landform monitoring and the effectiveness of any maintenance activities required for the Project will be assessed and utilised in the continual refinement of rehabilitation techniques and reported against in the Mt Arthur Coal AEMR.

8.16 HAZARD ANALYSIS

8.16.1 Introduction

A relevant level of assessment has been undertaken to determine any potential hazards associated with the Project. This assessment was undertaken in accordance with *SEPP 33 – Hazardous and Offensive Development Application Guidelines* (DUAP, 1994) (SEPP 33 Guidelines), and the *Hazardous Industry Planning Advisory Paper No 6 – Guidelines for Hazard Analysis* (Planning NSW, 1997).

8.16.2 Background

Mt Arthur Coal primarily manages hazardous materials onsite in accordance with the site EMS and Mine Safety Management Plan (MSMP), relevant standards and legislation. All chemicals used, or proposed to be used onsite are verified for their safety and potential environmental effects by the safety department and the environmental department.

Hazardous material storage facilities are currently located onsite at the industrial area, CHPP and explosives plant. These facilities will continue to be used and upgraded for the Project.

A database is utilised by Mt Arthur Coal to assist in the recording and management of chemicals. This chemical management system contains a Material Safety Data Sheet (MSDS) for all chemicals used onsite.

8.16.3 Impact Assessment

Previous assessments undertaken for the Mt Arthur Coal operations, including the Mt Arthur North EIS (URS, 1999) and the MAU EA (Umwelt, 2008) have confirmed that no aspect of the operations is considered to be hazardous or offensive under the relevant guidelines.

The Project will require the transport and storage of additional diesel, materials for explosives (including initiating products, detonators and emulsion explosives), and some other goods which may be considered to be potentially hazardous.

The current capacity of diesel storages will need to be increased to facilitate the proposed increase in production levels for the Project. The increase in storage capacities will be designed in accordance with the relevant Australian Standards and to comply with the various regulatory requirements. No flammable liquids will be stored in the vicinity of these diesel storages. As such in accordance with the SEPP 33 Guidelines this component is not considered to be potentially hazardous. The transport of diesel to the site will continue to be undertaken by licensed contractors which will comply with the relevant OH&S standards and procedures.

Mt Arthur Coal will continue to utilise a variety of explosive products (including initiating products, detonators, and emulsion explosives) for blasting activities to facilitate open cut coal mining. These commonly used forms of explosives have successfully been managed in accordance with existing OH&S procedures and legislative requirements.

Mt Arthur Coal currently has a fully bunded onsite explosives magazine (managed by site personnel) for the storage of detonators and other materials. An independent, licensed contractor is currently utilised to supply emulsion explosives and other initiating products to the site on an as required basis.

A review of the relevant components of the Project has confirmed that the Project is not considered to be Potentially Hazardous or Offensive. As such, a detailed preliminary hazardous analysis is not required. Further, as SEPP 33 applies only to proposals that are potentially hazardous or offensive, and the proposed development does not constitute a potentially hazardous or offensive industry under Clause 3, SEPP 33 does not apply to this development.

8.16.4 Mitigation and Management

All hazardous materials associated with the Project will continue to be transported by a licensed contractor in accordance with the relevant Australian Standard and legislation.

Mt Arthur Coal will continue to utilise its EMS and OH&S procedures to manage the hazards and risks associated with the Project. In particular, the relevant procedures and management plans are regularly reviewed and updated to include any changes that have the potential to result in hazards.

Mt Arthur Coal will continue to ensure all carriers of dangerous goods are licensed and ensure that relevant procedures are followed when travelling to and from the site.

8.17 TRAFFIC AND TRANSPORT

A Traffic Impact Assessment has been undertaken for the Project by Hansen Bailey in accordance with the RTA's *Guide to Traffic Generating Developments* (2002). A summary of the report is provided below and the full report is presented in **Appendix R**.

The regional transport network in the vicinity of the Project is shown on **Figure 1**. The main vehicular road access to the Project is via the Mt Arthur Coal Access Road which runs west off Thomas Mitchell Drive, however there are a number of alternative accesses used to access other areas of the site.

Thomas Mitchell Drive connects to the New England Highway (in the east) and Denman Road (in the west) and is a moderately trafficked road carrying predominantly industrial, mining and rural related traffic.

8.17.1 Methodology

The Traffic Impact Assessment for the Project included an assessment of the following:

- The existing road network;
- Baseline road traffic volumes in 2008;
- Existing road accident statistics;
- Predicted future background traffic volumes;
- Predicted increases in road traffic volumes due to construction and operation of the Project;

- Predicted impacts of traffic volumes and the level of service on the road network;
- Predicted impact on relevant intersections;
- Predicted impacts of temporary road closures due to blasting;
- Predicted impacts of the proposed realignment of Edderton Road; and
- Existing and proposed rail movements associated with haulage of additional coal produced by the Project.

As part of this assessment, traffic counts were undertaken at a number of locations on the surrounding road network in 2008. The recorded volumes were used to calculate baseline traffic volumes on the road network in future years (2011, 2014 and 2019).

Future road traffic volumes were then predicted by using these baseline volumes and adding traffic volumes predicted to be generated by proposed developments in the area, which have been approved but not yet constructed, and an allowance for annual growth, in accordance with RTA guidelines.

As discussed in **Section 4.9**, the Project's construction phase is estimated to employ a maximum construction workforce of 240 fulltime equivalent employees around 2011. The Project will progressively commence operations from 2012 and the Mt Arthur Coal Complex is predicted to reach maximum coal production of 36 Mtpa ROM by 2014.

On this basis the critical years for assessment of the Project's traffic-generation impacts are 2011 and 2014, when the additional traffic volumes generated by construction and operations respectively will be highest compared with background traffic volumes on the surrounding road network.

2019 has also been assessed, based on the same project-generated traffic as 2014 plus higher background traffic volumes.

This provides a more relevant indication of long term volumes and intersection performance, in accordance with RTA assessment requirements.

Cumulative Impacts

Approved and proposed projects which were considered in this assessment of cumulative impacts included additional Mt Arthur Coal open cut operations (up to 20 Mtpa ROM coal production), the MAU, Bengalla Mine, Drayton Extension and the Mangoola Mine.

The predicted background traffic volumes for the surrounding road network in 2011, 2014 and 2019 are summarised in **Table 47**.

8.17.2 Impact Assessment

Road Traffic Volumes

Traffic volumes recorded on the Mt Arthur Coal Access Road during the 2008 traffic count were used in the prediction of traffic volumes which may be generated by the Project.

The Mt Arthur Coal Access Road will continue to be the principal access point to the Project.

However it is noted that other points of access will be used for minor purposes (such as drilling, land management) and plant establishment or relocation. Full coal production and the maximum additional operational workforce of 720 employees is currently planned to be reached by 2014. The highest traffic volumes due to the Project, relative to background traffic volumes, will occur at this time. The additional daily traffic volumes predicted to be generated by the Project alone in 2011 and 2014 are shown in **Table 48**.

The total predicted road traffic volumes, including the Project in Years 2011 and 2014 and other traffic-generating developments, have been predicted and are summarised in **Table 49**. This table also includes the percentage increase in total traffic compared with the background case without the Project.

Table 47
Predicted Background Traffic Volumes

Road	Location	Direction	Daily Traffic		
			2011	2014	2019
Mt Arthur Coal Access Road	Thomas Mitchell Drive intersection	Eastbound	1,464	1,464	1,464
		Westbound	1,480	1,480	1,480
Thomas Mitchell Drive	West of Mt Arthur Coal Access Road	Eastbound	2,825	2,969	3,228
		Westbound	2,765	2,905	3,158
	East of Mt Arthur Coal Access Road	Eastbound	1,699	1,781	1,929
		Westbound	1,726	1,809	1,959
Denman Road	North of Thomas Mitchell Drive	Northbound	4,208	4,427	4,823
		Southbound	4,213	4,433	4,829
	South of Thomas Mitchell Drive	Northbound	2,355	2,483	2,713
		Southbound	2,371	2,501	2,733
New England Highway	Southern boundary of Muswellbrook	Northbound	6,103	6,140	6,201
		Southbound	6,286	6,324	6,387
	Ravensworth	Northbound	6,313	6,189	5,987
		Southbound	6,239	6,116	5,916

Note: Table includes approved Mt Arthur Coal projects & other traffic-generating developments.

Table 48
Predicted Project Only Generated Traffic Volumes

Road	Location	Direction	Daily Traffic	
			2011	2014
Mt Arthur Coal Access Road	Thomas Mitchell Drive intersection	Eastbound	153	468
		Westbound	153	468
Thomas Mitchell Drive	West of Mt Arthur Coal Access Road	Eastbound	100	304
		Westbound	100	304
	East of Mt Arthur Coal Access Road	Eastbound	53	164
		Westbound	53	164
Denman Road	North of Thomas Mitchell Drive	Northbound	89	273
		Southbound	89	273
	South of Thomas Mitchell Drive	Northbound	11	31
		Southbound	11	31
New England Highway	Southern boundary of Muswellbrook	Northbound	0	0
		Southbound	0	0
	Ravensworth	Northbound	53	164
		Southbound	53	164

Note: Table includes Project predictions & other traffic-generating developments.

Table 49
Predicted Total Road Traffic Volumes

Road	Location	Direction	2011		2014	
			Daily Traffic	% change	Daily Traffic	% change
Mt Arthur Coal Access Road	Thomas Mitchell Drive intersection	Eastbound	1,616	10.4 %	1,932	32.0 %
		Westbound	1,632	10.3 %	1,948	31.0 %
Thomas Mitchell Drive	West of Mt Arthur Coal Access Road	Eastbound	2,925	3.5 %	3,273	10.3 %
		Westbound	2,865	3.6 %	3,209	10.5 %
	East of Mt Arthur Coal Access Road	Eastbound	1,751	3.1 %	1,945	9.2 %
		Westbound	1,778	3.0 %	1,973	9.1 %
Denman Road	North of Thomas Mitchell Drive	Northbound	4,297	2.1 %	4,700	6.2 %
		Southbound	4,302	2.1 %	4,706	6.2 %
	South of Thomas Mitchell Drive	Northbound	2,366	0.4 %	2,514	1.2 %
		Southbound	2,382	0.4 %	2,532	1.2 %
New England Highway	Southern boundary of Muswellbrook	Northbound	6,103	0.0 %	6,140	0.0 %
		Southbound	6,286	0.0 %	6,324	0.0 %
	Ravensworth	Northbound	6,365	0.8 %	6,353	2.6 %
		Southbound	6,291	0.9 %	6,280	2.7 %

In 2011 the greatest impact of the Project will be on Thomas Mitchell Drive, between Denman Road and the Mt Arthur Coal Access Road, where future traffic volumes have been predicted to increase by up to a maximum of 3.6% with the Project. In 2014 the greatest impact of the Project will also be on Thomas Mitchell Drive, where the future traffic volumes have been predicted to increase by up to a maximum of 10.5% and 9.1% north and south of the Mt Arthur Coal Access Road intersection, respectively.

Level of Service

The Level of Service (LOS) is defined in the Austroads (1988) *Guide to Traffic Engineering Practice* as 'a qualitative measure of the operational conditions within a traffic stream as perceived by motorists and passengers'. The LOS categories describe the conditions in terms of factors including speed and travel time, freedom to manoeuvre, traffic interruptions, comfort, convenience and safety. There are six levels of service ranging from A to F.

Level A represents the best operating condition of free traffic flow, virtually unaffected by the presence of other vehicles, while Level F represents the worst operating condition with forced or break-down traffic flow.

The predicted total daily traffic volumes and LOS on the surrounding road network in 2011, for the two scenarios without the Project (background) and with the Project, are summarised in **Table 50**. The current LOS experienced by road users is likely to be very similar to the 2011 without the project scenario. This shows that the predicted increase in traffic volumes on the adjacent road network during construction of the Project will not cause any change to the LOS experienced by road users. The predicted total daily traffic volumes and LOS on the surrounding road network in 2014, for the two scenarios without the Project (background) and with the Project are summarised in **Table 51**.

Table 51 shows that the predicted increase in traffic volumes on the adjacent road network during the operation of the Project will not cause any change to the LOS experienced by road users, with the exception of Thomas Mitchell Drive between the Mt Arthur Coal Access Road and Denman Road, where the LOS will change from D to E with the Project. This is the year in which the operational impacts will be greatest.

Table 50
Predicted 2011 Levels of Service

Road	Location	Without Project		With Project		Change in LOS
		AWT	LOS	AWT	LOS	
Thomas Mitchell Drive	West of Mt Arthur Coal Access Rd	5,590	D	5,790	D	No change
	East of Mt Arthur Coal Access Rd	3,425	C	3,529	C	No change
Denman Road	North of Thomas Mitchell Drive	8,421	D	8,599	D	No change
	South of Thomas Mitchell Drive	4,726	B	4,748	B	No change
New England Highway	Southern boundary of Muswellbrook	12,389	D	12,389	D	No change
	Ravensworth	12,552	D	12,656	D	No change

(AWT = average weekday traffic representing the combined traffic volumes in both directions)

Table 51
Predicted 2014 Levels of Service

Road	Location	Without Project		With Project		Change in LOS
		AWT	LOS	AWT	LOS	
Thomas Mitchell Drive	West of Mt Arthur Coal Access Rd	5,874	D	6,482	E	D to E
	East of Mt Arthur Coal Access Rd	3,590	C	3,918	C	No change
Denman Road	North of Thomas Mitchell Drive	8,860	D	9,406	D	No change
	South of Thomas Mitchell Drive	4,984	B	5,046	B	No change
New England Highway	Southern boundary of Muswellbrook	12,464	D	12,464	D	No change
	Ravensworth	12,305	D	12,633	D	No change

(AWT = average weekday traffic and represents the combined traffic volumes in both directions).

Intersection Performance

An investigation of the following key intersections which may be impacted by Project-generated traffic was undertaken as part of this assessment:

- Denman Road / Thomas Mitchell Drive intersection;
- New England Highway / Thomas Mitchell Drive intersection; and
- Thomas Mitchell Drive / Mt Arthur Coal Access Road intersection.

The predicted future weekday traffic volumes (background plus the Project) were broken down into morning (AM) and afternoon (PM) peak hour traffic movements at these intersections, based on existing turning movement distributions, so that further simulation of the intersection could be undertaken. The SIDRA simulation model was then used to determine the LOS for each turning movement and for each intersection as a whole in 2011 and 2019. Detailed results are provided in **Appendix R**.

The LOS at an intersection is based on the average delay per vehicle and can be applied to both an individual movement and a full intersection with LOS ranked from A to F.

The delay times corresponding to the various LOS categories are summarised in **Table 52**. The results of the SIDRA analysis for the Denman Road / Thomas Mitchell Drive intersection indicate that the critical turning movement is a right turn movement from Thomas Mitchell Drive to Denman Road. The average delay periods and 95th percentile queue lengths for this critical movement indicate that the existing intersection configuration will perform with a 'satisfactory' LOS in 2011 both with and without the Project.

However by 2019, the LOS of the intersection is predicted to be on the threshold of 'satisfactory' and 'near capacity' without the Project, and is predicted to be 'unsatisfactory' with the Project.

The results of the SIDRA analysis for the New England Highway / Thomas Mitchell Drive intersection indicate that the critical turning movement is a right turn movement from Thomas Mitchell Drive to the New England Highway. The average delay periods and 95th percentile queue lengths for the critical movement, without and with the Project, in 2011 and 2019 (**Appendix R**) indicate that the existing configuration for the New England Highway / Thomas Mitchell Drive Intersection will perform on the threshold of 'satisfactory' and 'near capacity' in 2011, even without the proposed Project.

Table 52
Intersection Level of Service Performance Categories

Level of Service	Average Delay per vehicle (seconds)	Description
A	Delay less than 14.5	Good
B	Delay between 14.5 and 28.5	Acceptable
C	Delay between 28.5 and 42.5	Satisfactory
D	Delay between 42.5 and 56.5	Near capacity
E	Delay between 56.5 and 70.5	At capacity
F	Delay greater than 70.5	Unsatisfactory

Source: RTA Guidelines for Traffic Generating Developments (2002).

However, the LOS of the New England Highway / Thomas Mitchell Drive intersection is predicted to be 'unsatisfactory' with the Project in 2011. Without upgrade, the intersection would be performing 'unsatisfactory' by 2019 with or without the Project.

The results of the SIDRA analysis for the Thomas Mitchell Drive / Mt Arthur Coal Access Road intersection indicate that the critical turning movement is a right turn movement from the Mt Arthur Coal Access Road to Thomas Mitchell Drive.

The average delay periods and 95th percentile queue lengths for this critical movement indicate that the existing intersection configuration will perform well in 2011 and 2019, with and without the Project (**Appendix R**).

Road Safety

A review of road accident statistics for the surrounding road network indicates that there are no recurring traffic accident trends in the vicinity of the Project.

Blasting

From 2009 onward, blasting operations associated with existing approved Mt Arthur Coal open cut operations will include blasting within 500 m of Denman Road.

This will subsequently require temporary closure of parts of Denman Road between the Thomas Mitchell Drive and Edderton Road intersections. Road closures are likely to occur approximately three times per week for periods of several weeks at a time, up to a maximum of 120 closures per year. Mt Arthur Coal has existing approval for such closures and proposes to continue to undertake temporary closure of Edderton Road when blasting operations require blasting within 500 m of Edderton Road.

The potential impacts which may result from temporary closures of roads during blasting include the following:

- Disruption to road traffic flows between Muswellbrook and Denman, and the Golden Highway;
- Longer local trip durations for through traffic;
- Impacts on emergency services; and
- Temporary access restrictions to local properties along the sections of Denman Road and Edderton Road that are temporarily closed.

Proposed Edderton Road Realignment

The traffic volumes on Edderton Road are not predicted to be impacted by the Project as only a small amount of Project-generated traffic will travel to and from the Mt Arthur Coal Complex on Denman Road south of the Thomas Mitchell Drive intersection and the portion of this traffic which may use Edderton Road is expected to be negligible.

The Project includes realignment of the northern part of Edderton Road in approximately 2019. The two proposed Edderton Road realignment options are shown on **Figure 11** and include realignment of both a portion of Edderton Road and relocation of the Denman Road / Edderton Road intersection.

The two potential realignment options proposed for Edderton Road have been developed with consideration of the local topography, economic feasibility, and the provision of buffer zones, to provide sufficient flexibility in road design in order to address issues which may potentially arise during the detailed design phase.

The increase in road length and the calculated change in travel times for vehicles using Edderton Road have been assessed for both realignment options and are summarised in **Table 53**.

Rail Transport

All coal produced by the Project will be railed to the Port of Newcastle using the existing rail network (with the exception of coal conveyed to Macquarie Generation via conveyor). No coal will be hauled on public roads except in the case of an emergency.

The Project includes construction and operation of a second Rail Loading Facility and associated conveyor system, and an increase in the approved railed product coal volume from 19 Mtpa to 27 Mtpa. Assuming 7,000 tonnes capacity trains (based on average 2008 rail volumes) the maximum number of trains to be loaded per year at peak production will be approximately 3,860 trains, corresponding to a daily average of 22 rail movements. This compares with 2,700 trains per year and a daily average of 15 rail movements required for the current approval of 19 Mtpa.

As discussed in **Section 4.4**, there will be no increase in the maximum approved number of daily rail movements to and from the Mt Arthur Coal Complex associated with the Project, from the currently approved level of 24 rail movements per day. However, the proposed increase in total coal haulage for the Project will result in an increase in the number of days per year when rail movements approach 24 rail movements per day.

Table 53
Edderton Road Realignment Options Travel Times & Distances

Realignment Component	Option 1	Option 2
Length of realignment	5.4 km	6.2 km
Average travel speed on realignment	90 km/hr	70 km/hr
Travel time from Denman Road to end of realigned section*	3.6 minutes	5.3 minutes
Increase in travel time when travelling on Edderton Road * (toward Golden Highway) from Muswellbrook direction	1.3 minutes	3.0 minutes
Decrease in travel time when travelling on Edderton Road * (toward Golden Highway) from Denman direction	1.7 minutes	No change

* Based on the average speed of alignment as stated above.

Antiene Railway Station Road is an unsealed road coming off Hebden Road and crosses the Antiene Rail Spur at a level crossing near where the rail spur joins the Main Northern Railway Line. As identified in the MAU Environmental Assessment (Umwelt, 2008), trains travelling on the rail spur occasionally restrict access across this level crossing whilst waiting for the signal to proceed onto the Main Northern Railway Line.

The Project has the potential to increase the frequency in which trains will block access across the level crossing. Consistent with the MAU EA, Mt Arthur Coal is committed to resolving this access situation for receivers in the Antiene area east of the New England Highway, in conjunction with other relevant parties.

Discussions with MSC and other relevant parties are ongoing in relation to determining a feasible solution for this issue.

8.17.3 Mitigation and Management

Roads and Intersections

The SIDRA analysis of the existing Denman Road / Thomas Mitchell Drive and New England Highway / Thomas Mitchell Drive intersections undertaken as part of this assessment indicates that both intersections will be operating 'at capacity' / 'unsatisfactory' by 2019 with the additional traffic predicted to be generated by the Project.

It is noted that without the Project, the New England Highway / Thomas Mitchell Drive intersection would be operating as 'unsatisfactory'.

Additional SIDRA analyses assessing both of these intersections indicated that the LOS of both these intersections will improve significantly, if upgraded.

Mt Arthur Coal will consult with the MSC and RTA regarding a relevant contribution proportionate to usage for upgrade works for both intersections.

No upgrade of the Thomas Mitchell Drive / Mt Arthur Coal Access Road intersection is required as a result of the Project.

Blasting

All blasting is undertaken in accordance with Mt Arthur Coal's existing Blast Management Plan, which prescribes the system for monitoring, assessment, impact mitigation and reporting of blasting activities.

Road closures will be undertaken in accordance with the Mt Arthur Coal Denman Road Closure Management Plan which has been prepared in consultation with the RTA, MSC and DoP.

This plan will be revised to include Edderton Road closures. It is envisaged that closures of Denman and Edderton Roads will occur for a period of approximately 15 minutes and generally only on weekdays between 9:00 am and 3:00 pm.

The Denman Road Closure Management Plan forms part of the Mt Arthur Coal EMS and provides a framework to coordinate safe and efficient closures of roads impacted by blasting by:

- Ensuring the safety and protection of potentially affected persons and property;
- Minimising road closure periods;
- Minimising potential impacts on road users, local residents and businesses;
- Notifying relevant stakeholders in advance of temporary road closures; and
- Ensuring that emergency service activities are not restricted by road closures.

Proposed Edderton Road Realignment

The detailed design of the proposed Edderton Road realignment, and subsequent relocation and reconstruction of the Denman Road / Edderton Road intersection will be completed in consultation with the RTA and MSC. All design and construction work associated with the realignment will be undertaken in accordance with applicable design guidelines and standards.

Other Management Measures

The following traffic management measures will continue to be implemented:

- Consultation with the MSC, RTA and other local authorities as necessary prior to the movement of oversize loads on public roads;
- Continued encouragement of car-pooling amongst the mine workforce; and
- Continued implementation of all reasonable and feasible measures to minimise blockage of the Antiene Railway Station Road at the Antiene Spur line level crossing.

9 STATEMENT OF COMMITMENTS

In addition to conditions of Project Approval, Mt Arthur Coal commits to the operational controls outlined in **Section 4.1** and **Section 8** of the EA for all activities associated with the Project.

This Statement of Commitments (SoC) summarises the major aspects of the Project as described throughout the EA and summarises the key proposed management and mitigation measures.

The aim of this SoC is to ensure that any potential environmental impacts resulting from the Project are minimised and managed by implementing relevant environmental management and monitoring strategies.

Table 54
Statement of Commitments

Ref	Commitment	Section
Mining Operations		
1.	Upon the receipt of Project Approval, an application will be made to DoP to surrender all relevant existing Development Consents related to open cut mining at the appropriate time as agreed with HVEC and DoP.	4.0
Environmental Management & Monitoring		
2.	Mt Arthur Coal 's Environmental Monitoring Programs for air quality, water quality, noise and blasting will be reviewed and updated as required, in consultation with relevant regulators for approval by DoP.	8.0
3.	Management Plans will be revised and / or prepared in consultation with relevant regulators for approval by DoP for the following areas: • Water Management; • Flora & Fauna; • Rehabilitation & Landscape (including Void Management); and • Aboriginal Archaeology & Cultural Heritage.	8.0
Air Quality		
4.	In addition to the best practice management measures currently in place, Mt Arthur Coal will apply a road sealant or dust suppressant product on all active coal and overburden haul roads and / or utilise other such technologies and initiatives as required to ensure that the air quality outcomes described in the EA are achieved.	8.1.3
5.	Mt Arthur Coal will undertake regular reviews and monitoring of greenhouse gas emissions and energy efficiency initiatives to ensure that greenhouse gas emissions per tonne of product coal are kept to the minimum practicable level.	8.1.3
Noise & Blasting		
6.	Mt Arthur Coal will implement the necessary noise control and management measures to ensure that the modelled noise levels at private receivers as listed in Table 25 are not exceeded.	8.2.3
7.	Mt Arthur Coal will manage its blasting practices such that the Edinglassie and Rous Lench historic company owned homesteads will not incur blast vibration levels above 10 mm/sec and blast overpressure levels above 133 dBA in the absence of further research and consultation with NSW Heritage. Recommended DECC guidelines, existing at the time of approval; will be met at all privately owned receivers in the absence of a written agreement facilitating higher levels.	8.3.3
Water Resources		
8.	Mt Arthur Coal will continue to monitor hydro-geomorphological conditions and scrutinise for evidence of any groundwater ingress or endwall instability indicators as it progresses the previously approved mining towards the Hunter River Alluvials. Mining (other than that already approved in the MAN EIS) will not extend beyond a nominal 150 m buffer zone from the Hunter River Alluvials until agreement is reached with DWE regarding the installation of a lower permeability barrier along the point of connections of mining and the alluvium or other appropriate safeguards.	8.10.4

Ref	Commitment	Section
9.	Mt Arthur Coal will undertake a census of privately owned groundwater bores to ascertain their current usage and provide a baseline against which to compare any future impacts. In the event of interruption to water supply resulting from the Project, an alternative water supply will be provided, until such interruption ceases.	8.10.4
Traffic		
10.	Mt Arthur Coal will contribute to the upgrading of the intersections at either end of Thomas Mitchell Drive, commensurate with the impacts of the Project (when impacts are anticipated) and as agreed between MSC, RTA and Mt Arthur Coal.	8.17.3
11.	The Proponent will contribute to MSC \$400,000 per annum for four years (totalling a maximum contribution of \$1,600,000) to the upgrading of Thomas Mitchell Drive and an additional annual contribution of \$64,000 for the life of the consent (a maximum of 21 years). The annual contribution is to be increased by the rate of CPI (as published by the Australian Bureau of Statistics) at the end of each year in respect of the following years payment. Contributions will be payable from the physical commencement of construction works to upgrade Thomas Mitchell Drive.	8.17.3
12.	Mt Arthur Coal will liaise with Anglo Coal, MSC, Macquarie Generation and the ARTC to address legal and appropriate access for properties along Antiene Railway Station Road.	8.17.3
Ecology		
13.	To offset impacts on fauna & flora from the Project, Mt Arthur Coal will establish an additional 495 ha Offset Area to the east of the mine site and 222 ha Offset Area within the EA Boundary. These areas, along with existing offset areas, will be proactively managed to enhance its ecological values as detailed in Section 8.6 .	8.6
14.	The mine rehabilitation program will focus on the re-establishment of 500 ha White Box Yellow Box Blakely's Red Gum Woodland.	8.6
Visual		
15.	Mt Arthur Coal will progressively rehabilitate the mining and overburden emplacement areas.	8.4.3
16.	Upon Project Approval, guidelines will be prepared to include: treatment methods for primary and secondary view areas from affected residences; consultation requirements with residents in those key areas of high sensitivity, and action plans to mitigate visual impacts of the Project (depending on extent of visibility and its sensitivity). This will be detailed in a report to be submitted to DoP.	8.4.3
Aboriginal Archaeology & Cultural Heritage		
17.	All of the Aboriginal heritage management initiatives described in the MAU EA as listed in Section 8.7.3 will be implemented as part of the Project.	8.7.3
18.	To offset the disturbance of previously established Heritage Management Zones, a 495 ha Offset Area to the east of the mine site will be managed to ensure the protection of Aboriginal objects and the enhancement of Aboriginal cultural heritage.	8.7.3
19.	The salvage and the protection of any remaining Aboriginal objects within the EA Boundary will continue to be managed in accordance with a revised Aboriginal Archaeology & Cultural Heritage Management Plan in consultation with the local Aboriginal community and DECC.	8.7.3
Non-Aboriginal Heritage		
20.	Mt Arthur Coal will undertake archival recordings of the Belmont Homestead Complex and Beer Homestead slab hut prior to any disturbance or relocation of these sites.	8.8.3
Community		
21.	Within 12 months of this approval, unless otherwise agreed by the Director-General, the Proponent shall use its best endeavours to enter into a planning agreement with Council in accordance with Division 6 of Part 4 of the EP&A Act, that provides for a contribution to Council for the purpose of community enhancement to address the social amenity and community infrastructure requirements arising from the additional impacts caused by the Project and the Mt Arthur Coal Mine Underground Project, as approved in the development approval, No 06_0091 and granted on 2 December 2008.	8.12.7

Ref	Commitment	Section
	The entering into of this planning agreement will meet the requirements included in the development approval for the Mt Arthur Coal Mine – Underground Project (development approval No. 06_0091), and in particular will satisfy condition 14 in schedule 2 of the approval for the Mt Arthur Coal Mine – Underground Project (development approval No. 06_0091).	
Reporting		
22.	Mt Arthur Coal will prepare a consolidated AEMR (which summarises monitoring results and reviews performance) for the Mt Arthur Coal Complex and distribute it to the relevant regulatory departments.	8.0

10 PROJECT JUSTIFICATION

This section includes a conclusion justifying the Project taking into consideration: the suitability of the site; the economic, social and environmental impacts of the Project as a whole; and confirms the Project is consistent with the objectives of the EP&A Act.

Further to the Project Need described in **Section 4.11**, the Project will provide Mt Arthur Coal the opportunity to accelerate its mine rehabilitation program and implement an integrated offset strategy that will ensure the orderly progression of open cut coal mining whilst most effectively rehabilitating the mine site and enhancing the largely disturbed natural environment within the EA Boundary.

10.1 SITE SUITABILITY

The Mt Arthur Coal Complex is an existing open cut coal mining operation which has successfully operated for over 45 years under a variety of Planning Approvals within several mining leases. Mt Arthur Coal's current mining tenements provide the largest remaining open cut coal resource in the Muswellbrook LGA.

The Project represents the continuation of previously anticipated mining to ensure the methodical and complete extraction of all economically viable open cut coal reserves within the currently held mining leases as the mine progresses further to the west.

The Project is a natural progression of the intended land use which will initially utilise the existing employee resource, infrastructure and equipment fleet in operation at the mine prior to its supplementation. Whilst allowing current mining operations to progress in an orderly manner, the Project will provide the mine the flexibility to increase its coal production rate in response to both domestic and international energy demand trends.

Due to the ongoing commitment to best practice environmental management, the progression of mining will not greatly extend Mt Arthur Coal's current environmental footprint despite the proposed increase in the scale of operations. Further, the fact that the open cut mining area has largely been previously developed and shielded, and that foundation elements of required infrastructure are in place, results in a substantial amount of developmental impact having been previously incurred thus lessening the impact of the natural progression of the mine.

The EA Boundary abuts two other coal mining project areas and is immediately opposite a third to the north of the Hunter River. The Mt Arthur Coal Complex is adjacent to the Bayswater Power Station, the NSW Government's largest supplier of energy to the eastern seaboard power grid and the largest consumer of NSW thermal coal resource. A comprehensive cumulative impact assessment in all relevant disciplines has confirmed that the Project operating with other approved developments will not result in any significant additional environmental impacts.

In consideration of the above, it can be concluded that the EA Boundary is suited to the Project as proposed.

10.2 ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS

The EA has assessed all of the economic, social and environmental impacts associated with the Project by applying the following principles:

- The application of a methodical risk assessment process throughout the Project planning, design and assessment process;
- The consideration of ESD principles and best practice environmental and social standards in the development of project specific mitigation and management measures;
- Undertaking comprehensive stakeholder consultation and addressing issues raised where possible; and

- Optimising social and economic benefits associated with the Project.

As highlighted throughout the EA, all environmental impacts have been assessed on a worst-case scenario, assuming the Project will reach the proposed maximum production rate of 36 Mtpa of ROM coal of which 32 Mtpa is assumed to be mined by open cut methods.

The conceptual mine plan presented for the Project has been specifically designed to support the economic productivity of the Project within the constraints of the mine site, whilst complying with all relevant environmental criteria presented in the EA. As such the Project will deliver significant socio-economic benefits to both the Hunter Region and State of NSW through the generation of additional employment, export revenue, taxes and royalties.

Specifically, the Project will result in economic benefits to the State economy of the following approximate values:

- \$948 Million in annual direct and indirect output or business turnover;
- \$496 Million in annual direct and indirect value added;
- \$169 Million in annual household income; and
- 1,989 direct and indirect jobs.

These very significant economic benefits to the State of NSW will be foregone if the Project does not proceed.

Beyond the above a VPA is being negotiated with MSC which will provide funds to address the increased impacts on local community infrastructure associated with the Project. If such an agreement is not concluded, Mt Arthur Coal will provide for development contributions linked to the increases in demand for public amenities and services caused by the additional impacts of the Project.

The EA encompasses detailed assessments of all identified environmental and social issues associated with the Project, as discussed in **Section 8**.

The application of a stringent, contemporary environmental assessment has not identified any significant adverse economic, social or environmental impacts associated with the Project.

It is proposed that Mt Arthur Coal will continue to manage and minimise its impacts through its risk based ISO 14001 certified EMS which is regularly updated and will undergo detailed review following Project determination.

The Project involves the extension of mining operations at the Mt Arthur Coal Complex through a mine plan which has been specifically designed to minimise adverse economic, social and environmental impacts, optimise final landform and provide suitable offsets. In particular, the proposed mine plan will ensure that the eastern flank of Macleans Hill will remain to assist in reducing impacts from mining operations to receptors to the east and north of the Mt Arthur Coal Complex.

Mt Arthur Coal has previously established two Conservation Areas which are intended to be gazetted as Conservation Areas under the NP&W Act.

To further offset the ecological and Aboriginal archaeological heritage impacts of the progression of mining, Mt Arthur Coal is proposing to establish an additional 495 ha Conservation Area to the east of the Project, which contains various threatened fauna and flora species and Aboriginal heritage sites. It is envisaged that this Offset Area, due to its accessibility will accommodate teaching and research and will be an ideal location for the proposed Aboriginal Cultural Heritage Keeping Place which is to be established by Mt Arthur Coal.

Further to this, Mt Arthur Coal is proposing to establish an additional 222 ha Offset Area within the Environmental Assessment Boundary for ecological offsets. Approximately 500 ha of land will also be returned to native woodland and forest after mining.

Due to the substantive positive economic and social impacts associated with the Project and the nature of the environmental impacts resulting from the Project (in consideration of the mitigative measures proposed) it can be concluded that the Project is well justified on socio-economic and environmental grounds.

10.3 CONSISTENCY WITH THE OBJECTIVES OF THE EP&A ACT

Section 5 of Part 1 of the EP&A Act describes its objectives which are reproduced below followed by comment on their consideration as part of the assessment:

"To encourage 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."

The Project will facilitate the ongoing orderly and logical extraction of a non renewable thermal coal resource within Mt Arthur Coal's mining leases, the benefits of which will promote social and economic welfare.

"To encourage the promotion and co-ordination of the orderly and economic use and development of land."

The Project will result in the logical progression of existing mining development in an area previously identified for this purpose by the NSW Government.

"To encourage the protection, provision and co-ordination of communication and utility services."

The Project should not disrupt communication or utility services.

"To encourage the provision of land for public purposes."

The Project will result in the establishment of a 495 ha heritage Offset Area and 717 ha biodiversity Offset Area (including the 495 ha heritage offset area).

"To encourage the provision and co-ordination of community services and facilities."

The Project includes a commitment to MSC to enter into a VPA for the provision and coordination of community services and facilities or otherwise provide development contributions.

"To encourage 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."

The Project will result in the implementation of an Offsets Strategy specifically designed to protect and conserve native animals and plants.

"To encourage ecologically sustainable development."

The Project and its assessment appropriately address ESD principles as discussed in **Section 4**.

Impacts of the Project have been identified with certainty and measures to address them incorporated into the Project, thus addressing the Precautionary Principle.

The maximised recovery of the insitu coal resource and the optimisation of final rehabilitation and landform of the past and proposed mining area address the principles of Intergenerational Equity and Improved Valuation.

The principle of Conservation of Biological Diversity and Ecological Integrity is addressed by the Project in the commitment to implement the previously agreed Mt Arthur Coal Conservation Areas and the other elements of the proposed Offset Strategy.

“To encourage the provision and maintenance of affordable housing.”

As stated above the Project includes a commitment to MSC to enter into a VPA for the provision and coordination of community services and facilities. Further to this, at a State level, the economic benefits that will flow from the Project to the NSW Government will assist in ensuring the provision and maintenance of affordable housing.

“To promote the sharing of the responsibility for environmental planning between the different levels of government in the State.”

The consultation required during the preparation and assessment of an EA under Part 3A of the EP&A Act demonstrates that environmental planning is shared between the different levels of government in NSW. The preparation of the EA has followed this due process and seized every opportunity for stakeholder engagement over the Project with all levels of Government as described in **Section 6**.

“To provide increased opportunity for public involvement and participation in environmental planning and assessment.”

Section 6 of the EA describes the stakeholder engagement process relied upon during the preparation of the EA. This process was exhaustive and hence fulfils this objective of the Act.

It can be concluded by an analysis of the comments following each stated objective of the EP&A Act that each has been comprehensively met during the preparation of the EA.

In conclusion, the Project encompasses the logical and systematic progression of the exploitation of the State Government's most valuable non-renewable open cut coal resource in the Muswellbrook LGA. The mine plan put forward considers and balances the maximisation of coal recovery with the minimisation of environmental impacts as described in **Section 4.12**. Where impacts have been identified these have been proposed to be mitigated with best practice environmental management initiatives.

11 ABBREVIATIONS

Abbreviation	Description
ACHMP	Aboriginal Cultural Heritage Management Plan
ABS	Australian Bureau of Statistics
ADTOAC	Awabakal Descendants Traditional Owners Aboriginal Corporation
AECOM	ENSR Australia Pty Ltd trading as AECOM
AEMR	Annual Environmental Management Report
AGE	Australasian Groundwater and Environmental Consultants Pty Ltd
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
ANTC	Aboriginal Native Title Consultants
ANZECC	Australian and New Zealand Environment Conservation Council
AQMP	Air Quality Management Plan
ATOAC	Awabakal Traditional Owners Aboriginal Corporation
AWBM	Australian Water Balance Model
AWT	Average weekly traffic
BBC	Bullen Bullen Consultants
BCA	Benefit Cost Analysis
BCAC	Black Creek Aboriginal Corporation
bcm	bank cubic metres
BoM	Bureau of Meteorology
CAC	Cacatua Cultural Consultants
CCC	Community Consultative Committee
CCL	Consolidated Coal Lease
CEEC	Critically Endangered Ecological Community
CH ₄	Methane
CHPP	Coal Handling Preparation Plant
CL	Coal Lease
CMHS Act	Coal Mines Health and Safety Act 2002
CO ₂	Carbon dioxide
CO _{2e}	Carbon dioxide equivalent
dBA	The peak sound pressure level, expressed as decibels (dB) and scales on the 'A-weighted' scale, which attempts to closely approximate the frequency response of the human ear
Dams Safety Act	Dams Safety Act 1978
DCC	NSW Department of Climate Change now DECC
DECC Guidelines	Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (2005)
DECC	NSW Department of Environment and Climate Change (formerly Department of Environment and Conservation)
DEWHA	Commonwealth Department of Environment, Water, Heritage and the Arts
DoP	NSW Department of Planning (Incorporates former DIPNR, Planning NSW and DUAP)

Abbreviation	Description
DPI	NSW Department of Primary Industries (Incorporates the former Department of Mineral Resources, Department of Fisheries, and Department of Agriculture)
DSC	Dams Safety Committee
DUAP	Department of Urban Affairs and Planning
DWE	NSW Department of Water and Energy (Incorporates former DNR)
EA	Environmental Assessment
EARs	Environmental Assessment Requirements
EEC	Endangered Ecological Community
ECRTN	Environmental Criteria for Road Traffic Noise 1999
EIS	Environmental Impact Statement
EMP	Environmental Monitoring Program
EMS	Environmental Management System
ENM	Environmental Noise Model
ESD	Ecologically Sustainable Development
EPA	NSW Environmental Protection Authority (incorporated in DECC)
EP&A Act	Environmental Planning and Assessment Act 1979
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth)
EPI	Environmental Planning Instrument
EPL	Environmental Protection Licence
INP	NSW Industrial Noise Policy 2000
GC	Giwiirr Consultants
GDE	Groundwater Dependent Ecosystem
GSSE	GSS Environmental
GWCHC	Gidawaa Walang Cultural Heritage Consultancy
GWP	Global Warming Potential
ha	Hectare
HMZ	Heritage Management Zones
HRSTS	Hunter River Salinity Trading Scheme
HTOEM	Hunter Traditional Owners Environmental Management
HVAC	Hunter Valley Aboriginal Corporation
HVAS	High Volume Air Sampler
HVCC	Hunter Valley Cultural Consultants
HVCS	Hunter Valley Cultural Surveying
HVEC	Hunter Valley Energy Coal
HVNCRM	Hunter Valley Natural & Cultural Resources Management
ISO	International Standards Organisation
LA ₁	The noise level exceeded for 1% of the time
LA ₁₀	A noise level exceeded for 10% of the time
LA ₉₀	Commonly referred to as the background noise, this is the level exceeded 90% of the time
LA _{eq}	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period
LEP	Local Environment Plan

Abbreviation	Description
LGA	Local Government Area
LHWC	Lower Hunter Wonnarua Council Inc.
LOS	Level of Service
LWTC	Lower Wonnarua Tribal Consultancy
m	Metre
MAN	Mount Arthur North Coal Mine
MAU	Mt Arthur Underground
MC	Mingga Consultants
MCC	Muswellbrook Cultural Consultants
MCRG	Muswellbrook Community Reference Group
Mining Act	Mining Act 1992 (NSW)
ML	Megalitres
ML/day	Megalitres per day
ML/year	Megalitres per year
mm	Millimetre
MNES	Matter of National Environmental Significance
MOP	Mining Operations Plan
MRM	Mur-Roo-Ma
MSC	Muswellbrook Shire Council
MSDS	Material Safety Data Sheet
Mt	Million tonnes
Mtpa	Million tonnes per annum
mm/s	Millimetres per second
Muswellbrook LEP	Muswellbrook Local Environmental Plan 2009
MW	Mimagen Wajaar
N ₂ O	Nitrous oxide
NGA	National Greenhouse Accounts
NMP	Noise Management Plan
NPW Act	National Parks and Wildlife Act 1974
NRG	Nur-Run-Gee
PEA	Preliminary Environmental Assessment
PFM	Planning Focus Meeting
Planning Approval	Development consent or Project Approval document
POEO Act	Protection of the Environment Operations Act 1997
PM ₁₀	Particulate Matter <10 microns
RBL	Rating Background Level
Receiver	Private property adjacent the EA Boundary containing a receiver
Roads Act	Roads Act 1993
ROM	Run of Mine
RTA	NSW Roads and Traffic Authority
SCMP	Spontaneous Combustion Management Plan
SCSAC	St Clair Singleton Aboriginal Corporation

Abbreviation	Description
SEPP	State Environmental Planning Policy
SEPP 33	Hazardous and Offensive Development
SEPP 44	Habitat Koala Protection
SIA	Social Impact Assessment
SO ₂	Sulphur dioxide
SoC	Statement of Commitments
SODAR	Sonic Detection and Ranging
Synoptic Plan	Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of New South Wales (1999)
TEOMs	Tapered Element Oscillating Microbalances
TSC Act	Threatened Species Conservation Act 1995
TSP	Total Suspended Particulates.
UCCS	Ungooroo Cultural and Community Services
UHC	Upper Hunter Heritage Consultants
UWCC	Upper Hunter Wonnarua Council
VC	Valley Culture
VPA	Voluntary Planning Agreement
W1C	Wonn1 Contracting
WACC	Wanaruah Aboriginal Custodians Corporation
Water Act	Water Act 1912
Water Sharing Plan	Hunter Regulated River Water Source
WEC	Wonnaruah Elders Council
WCH	Wonnarua Culture Heritage
WLALC	Wanaruah Local Aboriginal Land Council
WM Act	Water Management Act 2000
WMS	Waste Management System
WNAC	Wonnarua Nations Aboriginal Corporation
WWCCS	Wattaka Wonnarua CC Service
Y	Yarrowalk
YGI	Yamuloong Group Initiatives
YCS	Yinarr Cultural Services

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13 STUDY TEAM

Section	EA Component / Role	Team Member and Company	
Project Management			
	Environment & External Affairs Manager	Sarah Withell	Mt Arthur Coal
	Environmental Superintendent	Julie McNaughton	
EA Management			
	Project Director	James Bailey	Hansen Bailey
	Project Manager	Dianne Munro	
	Project Coordinator	Melissa Walker	
Stakeholder Engagement			
	Environment & External Affairs Manager	Sarah Withell	Mt Arthur Coal
	Environmental Superintendent	Julie McNaughton	
	Consultant	Dee Bourbon	Coakes Consulting
EA Sections			
	Executive Summary	Dianne Munro	Hansen Bailey
1.0	Background	Jason Martin	Hansen Bailey
2.0	Existing Environment	Jason Martin	Hansen Bailey
3.0	Approved Operations	Melissa Walker	Hansen Bailey
4.0	The Project	Melissa Walker	Hansen Bailey
5.0	Regulatory Framework	James Bailey	Hansen Bailey
6.0	Stakeholder Consultation	Dorian Walsh	Hansen Bailey
7.0	Risk Assessment	Melissa Walker	Hansen Bailey
8.0	Impacts, Management & Mitigation	Dianne Munro, Melissa Walker, Dorian Walsh, Jason Martin, Nathan Cooper	Hansen Bailey
9.0	Statement of Commitments	James Bailey	Hansen Bailey
10.0	Project Justification	James Bailey	Hansen Bailey
11.0	Abbreviations	Jason Martin	Hansen Bailey
12.0	References	Dorian Walsh	Hansen Bailey
13.0	EA Study Team		
Appendices			
Appendix A	Summary of Mt Arthur Coal Planning Approvals		
Appendix B	Schedule of Land to Which the EA Applies		
Appendix C	Regulatory Correspondence		
Appendix D	Stakeholder Consultation		
Appendix E	Environmental Risk Assessment	Melissa Walker	Hansen Bailey
Appendix F	Air Quality Impact Assessment	Judith Cox	PAE Holmes

Section	EA Component / Role	Team Member and Company	
Appendix G	Noise and Blasting Impact Assessment	George Jennar	Wilkinson Murray
Appendix H	Blast Vibration Vulnerability Assessment	Bill Jordan	Bill Jordan & Associates
Appendix I	Visual Impact Assessment	John van Pelt	Integral Landscape Architecture and Visual Planning
Appendix J	Ecological Assessment	David Robertson	Cumberland Ecology
Appendix K	Aboriginal Archaeology and Cultural Heritage Assessment	Neville Baker	ENSR AECOM
Appendix L	Non Aboriginal Heritage Assessment	Chris Carter	Archaeology Australia
Appendix M	Surface Water Assessment	Tony Marszalek	Gilbert & Associates
Appendix N	Groundwater Impact Assessment	Errol Brieze	Australasian Groundwater and Environmental Consultants
Appendix O	Economic Assessment	Robert Gillespie	Gillespie Economics
Appendix P	Social Impact Assessment	Dee Bourbon	Coakes Consulting
Appendix Q	Soil Survey and Land Resource Assessment	Rod Masters	GSS Environmental
Appendix R	Traffic and Transport Impact Assessment	Juliet Bates	Hansen Bailey
Legal Advice provided by Minter Ellison			
Drafting and Graphics Design by Pegasus Technical Pty Limited and Greenpond TSG			