Environmental Assessment Statement

Submission of Environmental Assessment (EA)

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

EA Prepared by

Name
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In Respect Of
Coalpac Consolidation Project

Proponent Name
Coalpac Pty Ltd

Proponent Address
Castlereagh Highway
CULLEN BULLEN NSW 2790

Land to be Developed
See **Appendix B** of this EA.

Proposed Development
Development and operation of the Coalpac Consolidation Project and associated activities as outlined in **Section 4** of this EA.

Environmental Assessment
An Environmental Assessment for the Project is attached.

Certification
I certify that I have read and am aware of the terms of the Expert Witness Code of the Land & Environment Court of NSW. I further certify that I have prepared the contents of this 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
March 2012

Executive Summary

Executive Summary

BACKGROUND

Coalpac Pty Ltd (Coalpac) was formed in 1988 and is an Australian owned and operated coal mining company with operations near Cullen Bullen, 25 km northwest of Lithgow in New South Wales. Coalpac (a wholly owned subsidiary of CET Resources) owns and operates the existing Invincible Colliery and Cullen Valley Mine. Each mine operates as an individual entity with separate planning approvals under the *Environmental Planning and Assessment Act 1979*. Coalpac Pty Ltd acquired Invincible Colliery and Cullen Valley Mine in 2006 and 2008, respectively.

In 2011, a total of 1.66 Million tonnes of product coal was extracted from the Illawarra Coal Measures by Coalpac's operations. This coal was supplied to the domestic coal market by truck via road, with the adjacent Mount Piper Power Station receiving a significant component.

Coalpac Pty Ltd now seeks a contemporary Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979* to consolidate and extend the coal mining operations and management of the Invincible Colliery and Cullen Valley Mine sites under a single planning approval (the Project). The Project will allow for the continuation of coal mining operations for a further 21 years largely within Coalpac's current mining authorities and to extract a limited sand deposit.

This Environmental Assessment has been prepared in accordance with the Director-General's Environmental Assessment Requirements and supports an Application to the Minister for Planning and Infrastructure for Project Approval as sought.

EXISTING ENVIRONMENT

Natural Environment

The Project is located in the Western Coalfields of NSW on the western slopes of the Great Dividing Range and is located wholly within the upper catchment area of the Turon River.

The lands within and to the east and north of the Project Boundary are characterised by several steep sandstone escarpments associated with the western edge of the Great Dividing Range.

These landforms topographically divide the site. To the west, the land becomes more undulating as the topography gently slopes towards Cullen Valley.

Land Use

The Project Boundary is predominantly situated on land occupied by the Ben Bullen State Forest, which has historically been utilised for forestry and mining (historic and current operations of Cullen Valley Mine and Invincible Colliery). In addition to the Ben Bullen State Forest, other minor lands within the Project Boundary are utilised for agricultural activities including sheep and cattle grazing, road and rail infrastructure and historical and existing mining operations.

The Castlereagh Highway bisects Cullen Valley Mine and Invincible Colliery extending in a north-south direction through the centre of the Project Boundary, and connects the Great Western Highway to the south and the Golden Highway to the north. The rural township of Cullen Bullen is also located in close proximity to the Project Boundary and includes a range of residential properties, a school, community hall, hotel and a general store.

Land use in the broader region includes a number of other coal mining operations, power generation facilities and industrial activities, as well as National Parks and associated recreational uses, agricultural and forestry activities as well as various agricultural enterprises. The region also supports an array of other minor industries consistent with the rural community setting. None of the Project Boundary falls within the Sydney Water Catchment Boundary.

Land Ownership

The land within and surrounding the Project Boundary is largely managed by Forests NSW for the Ben Bullen State Forest.

In addition to this land, other key land ownership includes private freehold land, Delta Electricity, Coalpac Pty Ltd and other mining companies.

Of the private freehold land located within the Project Boundary, there are five private freehold properties wholly or partially located in the western and central parts of the Project Boundary. Coalpac Pty Ltd is in negotiations with the relevant landholders to purchase these properties should Project Approval be granted.

There are a number of other private freehold landowners that occupy land immediately to the north, west and south of the Project Boundary, including the township of Cullen Bullen.

Climate

The climate of the Project is characterised by a cool-temperate climate, including relatively mild summers and cold winters. Rainfall patterns are summer dominant, with a mean annual rainfall of approximately 860 mm.

Temperature inversions are common in winter months, tending to occur on frosty mornings and on days when fogs are present. Regional temperature records indicate that January temperatures are hottest and July coolest, with a maximum mean average of 25.5°C and 10.4°C respectively.

Resource

Of the named coal seam groups within the Illawarra Coal Measures, seven will be targeted for the Project, including the Katoomba Seam, Middle River Seam, Moolarben Seam, Upper Irondale Seam, Irondale Seam, and the coalesced Lidsdale and Lithgow Seams.

Exploration drilling, feasibility studies and geological modelling of the Project Boundary and mining authorities held by Coalpac Pty Ltd indicate that a marketable reserve of approximately 108 Million Run of Mine tonnes exists.

The predicted stripping ratio for coal accessible by open cut mining methods for the Project averages 6:1 over the 21 year mine life proposed.

The targeted sand extraction of approximately 5 Million bank cubic metres proposed for the Project is located within the Marrangaroo Formation immediately beneath the Lithgow Coal Seam. The Marrangaroo Formation outcrops persistently throughout the Western Coalfield, ranging in thickness from 2 metres to 16 metres.

Approved Coalpac Operations

Coalpac Pty Ltd currently operates Invincible Colliery and Cullen Valley Mine under two separate planning approvals.

Under the existing Project Approval for Invincible Colliery (Project Approval 07_0127 ((as modified)), Coalpac Pty Ltd has approval to operate open cut and highwall mining within the Ben Bullen State Forest, producing up to 1.2 Million tonnes of product coal per annum.

Mining and coal processing operations generally takes place between 7:00 am and 10:00 pm, Monday to Saturday, with haulage of product coal by road. To date, coal has predominantly been extracted by open cut methods. Coal handling and processing at Invincible Colliery is undertaken at two locations: the centralised Coal Crushing and Screening Area; and the Invincible Colliery Coal Handling and Preparation Plant.

Under the existing development consent for Cullen Valley Mine (Development Approval 200-5-2003 ((as modified)), Coalpac Pty Ltd has approval to operate an open cut, underground and highwall mining coal mine within the Ben Bullen State Forest, producing up to 1.0 Million tonnes of product coal per annum.

Mining and coal processing operations are approved to occur 24 hours per day, seven days per week with haulage of product coal by road. Coal handling and processing is undertaken at the Cullen Valley Mine Crushing Plant, with approval under DA 200-5-2003 also held for a Coal Deshaling Plant.

The approved mining operations at Cullen Valley Mine are supported by a range of other infrastructure, including administration offices, bathhouses, workshops and storage facilities. To date, coal has predominantly been extracted by open cut and highwall mining methods, with the previously approved additional underground mine not yet developed.

Both Invincible Colliery and Cullen Valley Mine have an existing Environmental Management System in place, which include a suite of documents and procedures to assist in the management and measurement of environmental performance.

THE PROJECT

To develop a detailed understanding of the Project, Coalpac Pty Ltd has undertaken a range of pre-feasibility studies including the review of various mine planning, infrastructure and operating scenarios. The key objectives of these studies were to minimise environmental and social impacts on the Cullen Bullen township and other nearby receivers and the natural environment, whilst maximising resource recovery and operational efficiencies that could be achieved through the consolidation of Invincible Colliery and Cullen Valley Mine into a single operation.

Extensive changes to the mine plan presented in this Environmental Assessment were undertaken to reduce impacts to Threatened flora species and to minimise noise, air and visual amenity impacts to nearby private neighbours.

The Project generally comprises the following:

- Consolidation and extension of the existing Cullen Valley Mine and Invincible Colliery operations to produce up to a total of 3.5 Million tonnes per annum of product coal, including:
  - The continuation of mining operations at Cullen Valley Mine (the area west of the Castlereagh Highway) via both open cut and highwall mining methods to access an additional resource of approximately 40.1 Mt ROM; and
  - The continuation of mining operations at Invincible Colliery (including an extension north into the East Tyldesley area) via open cut and highwall mining methods to access an additional resource of approximately 68.4 Mt ROM;
- Continuation of coal supply to the local Mt Piper Power Station via a dedicated coal conveyor over the Castlereagh Highway (to be constructed), and emergency supply to Mt Piper Power Station and Wallerawang Power Station (via road), with flexibility for supply to domestic destinations, and Port Kembla (via rail) for export;
- Upgrades to existing Invincible Coal Preparation Plant, administration and other infrastructure;
- Construction and operation of additional offices at Cullen Valley Mine;
- Construction and use of the East Tyldesley Coal Preparation Plant (incorporating the previously approved CDP at Cullen Valley Mine);
- Construction and operation of a bridge and haul road across the Wallerawang - Gwabegar Railway Line to permit access to mine the previously approved Hillcroft resource;
- The extraction of the Marrangaroo Sandstone horizon from immediately below the Lithgow Coal Seam in the northern coal mining area of Cullen Valley Mine. This material will be trucked to an onsite crushing/screening station prior to sale into the Sydney (and surrounds) industrial sand market;
- Construction of a rail siding and associated infrastructure to permit transport of coal and sand products;
- Integration of water management infrastructure on both sites into a single system; and
- Integration of the management of mine rehabilitation and conceptual final landform outcomes for Cullen Valley Mine and Invincible Colliery.

REGULATORY FRAMEWORK

Environmental Planning and Assessment Act 1979

In accordance with Section 75D of the *Environmental Planning and Assessment Act 1979*, the Minister for Planning declared the Project one to which Part 3A applies, as it adheres to *State Environmental Planning Policy (Major Development) 2005* Section 6(2) as development *"for the purpose of mining that is coal mining"*.

A Project Application was accepted by the Director-General of the Department of Planning and Infrastructure in October 2010 and was subsequently allocated Project Application number 10_0178.

The Director-General notified Coalpac Pty Limited of the Environmental Assessment Requirements for the Project under Section 75F of the *Environmental Planning and Assessment Act 1979* on 16 December 2010. Under *State Environmental Planning Policy (Mining Petroleum Production and Extractive Industries) 2007*, mining is permissible with development consent on land where development for the purposes of agriculture may be carried out. Accordingly, development for the purposes of coal mining is permissible on the subject land with Project Approval.

The Project is a 'transitional Part 3A project' as it is a project for which Environmental Assessment Requirements were notified before the repeal of Part 3A.

Other Relevant NSW Legislation

The Project will seek as required, approvals under NSW legislation not exempted by Section 75U of the *Environmental Planning and Assessment Act 1979*.

Relevant Commonwealth Legislation

A Referral under Section 68 of the *Environment Protection and Biodiversity Conservation Act 1999* was lodged with the Minister for Sustainability, Environment, Water, Population and Communities.

The Minister determined the Project a 'Controlled Action' on 24 January 2011 as it is likely to have a significant impact on listed Critically Endangered Ecological Communities under Section 18 including: White Box-Yellow Box-Blakely's Red Gum grassy woodlands and potential habitat for the vulnerable Capertee (Cannon's) Stringybark and the critically endangered Leek Orchid.

The Project was also considered to be likely to have a significant impact on native vegetation which provides potential habitat for two listed Threatened species (the Regent Honeyeater and Swift Parrot) under Section 20 of the *Environment Protection and Biodiversity Conservation Act 1999*.

The Minister will review this Environmental Assessment and confirm whether an 'Approval Decision' can be made under Section 133 of the EPBC Act.

STAKEHOLDER ENGAGEMENT

Stakeholder engagement included consultation with local, State and Federal governments, industry, near neighbours, the local Aboriginal community as well as the wider local community. The engagement process aimed to identify stakeholder issues in relation to the Project in order to ensure that these issues were appropriately assessed and responded to either directly or within this Environmental Assessment.

During the preliminary phase of the Project and the preparation of this Environmental Assessment, approximately 45 near neighbours located in close proximity to the Project Boundary were provided a personal briefing on the Project. This engagement also involved the distribution of three Project Newsletters in October 2010, May 2011 and December 2011 that provided information to the local community on Coalpac Pty Ltd, the Project and the approval's process being followed.

Two community open days attended by 35 stakeholders were also held at the Cullen Bullen Community Hall on 16 and 17 December 2010. These community open days provided an additional forum for the local community to seek information on the Project and for Coalpac Pty Ltd staff to gain feedback from the local community in relation to the Project and existing operations.

Additional focus group surveys were taken from members of the Cullen Bullen community in November 2011 to gain further feedback on the Project.

Coalpac Pty Ltd has made approaches to seek an Agreement (subject to gaining Project Approval) with all private receivers who have been predicted in this Environmental Assessment to be impacted significantly above relevant noise and air quality impact criteria.

A number of briefings and presentations were provided to State and Federal government regulators, Coalpac's domestic coal supply customers, non-government organisations who expressed an interest, as well as to representatives of neighbouring mines and other industry throughout the preparation of this Environmental Assessment.

Consultation with the local Aboriginal community was also conducted in accordance with the *'Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010'* during the preparation of the Archaeological and Cultural Heritage Assessment undertaken for this Environmental Assessment.

All specific issues and concerns that were raised as a result of the stakeholder engagement process undertaken for the Project with near neighbours, the wider community and regulators have been considered in the preparation of this Environmental Assessment.

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 studies for the Project in consideration of the Director-General's Environmental Assessment Requirements and the findings from stakeholder engagement.

Subsidence

Geonet Consulting Group completed an Assessment of Stability and Subsidence for Highwall Mining for the Project in consideration of the highwall mining operations proposed. The assessment was undertaken consistent with the intent detailed in the *'NSW Department of Mineral Resources Subsidence Management Plan 2003'* and *'Department of Trade and Investment, Regional Infrastructure and Services – Mineral Resources – Mineral Resources Mine Safety Operations Guideline, Coal Technical Reference CTR-001'*.

The assessment investigated the potential subsidence and stability impacts associated with the highwall mining component proposed for the Project to enable the extraction of selective coal reserves from the target coal seams.

The Subsidence Study has confirmed that all highwall mining activities will be designed to ensure no impact on sensitive surface features. It was estimated that the maximum subsidence will be in the range 10 mm to 15 mm in areas overlying previous underground mining in the Lithgow Seam. The maximum subsidence in the rock mass unaffected by previous underground mining is predicted to be less than 15 mm.

The Subsidence Study Area modelling identified a potential for local exceptions to the subsidence criterion on the southern point of the western highwall where subsidence may increase around isolated joint zones to 40 mm associated with exposure of unconfined joints in the highwall. These areas of localised subsidence will be controlled by optimising the orientation and profiles of the final open pit highwalls in relation to the major joint sets during the Project design phase to ensure subsidence remains below 20 mm.

Due to its location in such an environmentally sensitive area, the Project highwall mining design recognises that surface subsidence needs to be limited to ensure the stability of the sandstone escarpments (pagodas). Given that the pillar design for the Project was based upon achieving a minimum Factor of Safety of 1.3, under the maximum overburden height in any panel (which is not the case over the full length of the pillars), most of the pillar lengths were found to be over-designed in this regard (that is, having a higher factor of safety).

A peer review of the Geonet Assessment of Stability and Subsidence Highwall was undertaken by Boyd Mining Pty Ltd, with minor issues raised and addressed.

Prior to the commencement of highwall mining for the Project, Coalpac Pty Ltd will prepare a detailed Mining, Rehabilitation and Environmental Management Plan (or contemporary equivalent) for the Project in consultation with relevant regulators. This will specify the design criteria for highwall mining and outline a monitoring and measurement methodology to confirm all design outcomes are achieved.

Slope Stability

A review of the stability of the topographic slope types within the Project Boundary was undertaken by SCT Operations. This review focused on identifying and assessing potential impacts to the sensitive sandstone pagoda and escarpment features within the Project Boundary.

The review determined that, in the absence of adequate controls, vibration from blasting could impact the escarpment and pagoda rock formations.

To ensure no interference with sensitive topographic features, a 100 m monitoring zone is proposed adjacent the sandstone cliffs and pagodas. The distribution of talus and scree slopes within the Project Boundary was also reviewed and was considered to be restricted to the immediate base of most cliffs, with only thin scree deposits noted in previous site inspections.

In addition, Coalpac has committed to a minimum buffer of 50 m from the escarpment and pagoda rock formations within which no open cut mining will take place to further ensure the prevention of mining impacts to these sensitive features.

Air Quality

An air quality impact assessment was completed for the Project by PAEHolmes in accordance with the procedures outlined in the Office of Environment and Heritage *'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW'*. To assess the effect that dust emissions will have on existing air quality, the dispersion model predictions from the four indicative worst case modelled years for the Project (Year 2, Year 8, Year 14 and Year 20) were determined.

There are three private receivers (195, 198 and 199) with whom Coalpac does not have an Agreement, which are predicted to experience air quality levels that exceed the OEH assessment criterion for annual average TSP, PM_{10} annual and depositional dust.

An additional five receivers (216, 258, 325, 327 and 426) with whom Coalpac does not have an Agreement in place are predicted to experience 24 hour PM_{10} levels greater than the relevant criterion for up to 3 days a year.

Private property 201 is also predicted to exceed PM_{10} annual criteria over 25% of vacant land in single, contiguous landownership in Year 2 only.

Existing dust minimisation practices will be enhanced to meet contemporary standards to ensure that the limits predicted in this Environmental Assessment are met for private receivers.

Further, Coalpac Pty Ltd is committed to leading practice dust management for the Project through the implementation of a proactive real-time air quality monitoring and management system.

This will enable any potential short term impacts of the Project to be proactively managed to prevent or minimise dust impacts at sensitive receivers. A revised Air Quality Management Plan will also be developed to allow the ongoing review of operations and the performance of the dust minimisation measures implemented for the Project.

Historical Subsurface Heating

Historical heating has been associated with the abandoned underground workings of the Tyldesley Colliery at the Cullen Valley Mine since the 1970s. The heating was relatively dormant up until the abandoned underground workings were intersected by the open cut excavation in 2003.

In addition to the heating in the old underground workings, there also appear to be small pockets of carbonaceous material that are spontaneously combusting at other locations at Cullen Valley Mine.

Coalpac has a proven track record of implementing successful remediation measures in areas of historic heating. Coalpac Pty Ltd will continue to implement the existing *'Cullen Valley Mine Heating Response Plan'* for the Project to ensure that subsurface heating areas are managed so as to minimise any impact on the local community or rehabilitation, with any modifications required to be made in consultation with Department of Trade and Investment, Regional Infrastructure and Services – Mineral Resources.

Water extraction from the Tyldesley Colliery workings will also continue to be monitored to ensure that the water level remains high enough to limit the potential for spontaneous combustion.

Greenhouse Gas

A component of the air quality impact assessment undertaken by PAEHolmes for the Project included the assessment of greenhouse gas impacts. The main sources of greenhouse gas emissions from the Project have been identified as resulting from electricity consumption, diesel usage, explosives usage, fugitive emissions of carbon dioxide and methane and the transport and end use of the product extracted.

Scope 1, Scope 2 and Scope 3 emissions were considered in the assessment of carbon dioxide, methane, nitrous oxide and relevant synthetic gas emissions relevant to the Project.

Greenhouse gas emissions from the Project (including the mining, transportation and final use of product) are estimated to be 0.0069 Gigatonnes of carbon dioxide equivalent per annum compared to the estimated current global emissions of 3,000 Gigatonnes of carbon dioxide equivalent per annum. The emissions estimated for the Project will not individually have any significant impact on global warming. Applying the principles of Ecologically Sustainable Development, it is considered that there will be no increase or measurable impact on climate change as a result of the Project, since the supply of coal to the Mount Piper Power Station by the Project will be supplied either from this or another project.

Due to the predicted increase in demand for electricity generation within Australia and alternative sources of energy not being financially viable (in the short and medium term), the burning of coal (Scope 3 emissions) at the Mount Piper Power Station will still be required. The supply of coal to the Mt Piper Power Station by the Project would result in a better environmental outcome in regard to greenhouse gas emissions when compared to sourcing coal from more distant operations, where greater transport emissions would be experienced.

Coalpac Pty Ltd is committed to minimising the greenhouse gas emissions of the Project and will implement all reasonable and feasible measures to ensure that operations are efficient in this regard.

Noise

The noise impact assessment for this Environmental Assessment was undertaken by Bridges Acoustics. The noise impact assessment predicted operational, construction, road and rail, sleep disturbance and low frequency noise impacts associated the Project.

Predicted noise levels for the Project were modelled at sensitive receivers for indicative worst case modelled mine plan years for Year 2, Year 8, Year 14 and Year 20. Assessments were undertaken for both prevailing and neutral weather conditions.

Additional modelling scenarios were used to determine the noise impacts associated with construction, the transportation of the coal and sand product, and sleep disturbance noise levels and to ensure that these impacts were assessed against relevant criteria.

Background monitoring was also completed for the Project to confirm appropriate noise assessment criterion. Two intrusive criteria were established across all time periods: Group A, being 35 dBA ($L_{Aeq15\ min}$) (for the majority of receivers); and Group B being 37 dBA ($L_{Aeq15\ min}$) (for those receivers within 500 metres of the Castlereagh Highway).

Predicted noise levels for both Project construction and operational activities include all feasible and reasonable noise management and mitigation measures.

These mitigation strategies were developed during a detailed environmental constraints analysis undertaken for the Project mine plans.

Despite the application of these measures, some private receivers and / or properties are predicted to receive significant exceedance of noise criteria noise levels (10 dBA or higher than background noise levels). Further receivers are predicted to receive moderate noise levels (3 to 5 dBA above the background), whilst others are expected to receive mild noise impacts (up to 2 dBA above the background).

A significant noise impact is predicted at two private residences (residence 195 and 205) where an Agreement with Coalpac is not in place. Of the two, receiver 205 is predicted to exceed the criteria by 0.6 dBA in a single modelled year (Year 2) only. In addition to residential receivers, two properties (173-175 / 178-186, and 198-199) where an Agreement with Coalpac is not yet in place are predicted to experience a significant noise impact from the Project in one or more modelled years over more than 25% of vacant land in contiguous landownership.

An additional 18 private residences (including one located on Crown land) owned by 16 landowners are predicted to receive moderate noise impacts from the Project under a worst-case noise modelling scenario. An additional eight properties are predicted to experience a moderate noise impact from the Project in one or more modelled years and time periods over more than 25% of vacant land in contiguous landownership.

No receivers additional to those predicted to exceed relevant operational noise criteria are predicted to receive cumulative operational, construction, sleep disturbance, road or rail traffic noise levels above relevant criteria.

Detailed and specific noise management and mitigation has been incorporated in the mine plan including: the development of a series of earthen noise mitigation bunds, sound suppression of mobile equipment and selected stationary plant, reduction in northern areas proposed to be mined by open cut methods, developing a conveyor link to Mount Piper Power Station to reduce truck haulage on local roads and constructing Project infrastructure within the footprint of existing Invincible Colliery and Cullen Valley Mine operations.

A number of specific noise management and mitigation measures relating to various 'management zones' surrounding the Project Boundary will be adopted by Coalpac Pty Ltd to ensure noise levels remain consistent with the results predicted.

These include the development and implementation of a leading practice Noise Management Plan and monitoring network for the construction and operation of the Project.

Blasting

A blasting impact assessment for the Project was completed by Bridges Acoustics. The assessment predicted the likely ground vibration and overpressure levels by Project blasting for each of the nearby receivers and sensitive features, for comparison with the relevant criteria.

The Project will require up to 20 blast events per month between 9:00 am to 5:00 pm to prepare overburden for removal and for coal recovery. On occasion, smaller more frequent blasts would be required in areas of the Project in closest proximity to receivers and sensitive heritage structures to ensure predictions are met.

The assessment results indicate that blasting associated with the Project in the absence of any mitigation measures is predicted to produce ground vibration and overpressure levels well below the relevant amenity criteria at the majority of privately owned residences in the absence of noise enhancing weather conditions.

The assessment also considered the impacts of Project blasting in relation to known heritage items and structures. This found that four Aboriginal rock shelter heritage sites and one Non-Indigenous heritage site have the potential to receive ground vibration and overpressure levels above the appropriate vibration criteria in the absence of control measures.

To confirm that the preliminary blasting vibration criteria suggested for the Project by Bridges Acoustics were appropriate for the ongoing management of the Aboriginal heritage rock shelter sites, a geotechnical risk assessment was undertaken by SCT Operations. This assessment reviewed the blast impact criteria proposed and developed a risk-based ranking to assist in the ongoing monitoring and management of each site. As a result of this assessment, one of the Aboriginal heritage rock shelter sites was found to be naturally unstable. A Hazard Management Plan will be prepared for this site.

For the remaining three sites that were found to be in a more stable condition, the implementation of stipulated blast management controls and ongoing geotechnical monitoring will ensure the stability of these sites.

In order to ensure compliance with the relevant criteria for ground vibration and overpressure levels and that the potential for blasting impacts to sensitive features is appropriately managed, Coalpac Pty Ltd will implement an enhanced blast monitoring network for representative locations as part of the Environmental Monitoring Program and work to a combined Blast Management Plan incorporating enhanced management and mitigation measures.

Visual and Lighting

Integral Landscape Architecture and Visual Planning completed an assessment to determine the potential visual and lighting impacts associated with the Project. This assessment was undertaken to identify the character of the surrounding visual landscape and provide management and mitigation measures. To allow the assessment of where potential visual impacts could occur, a Primary Viewing Catchment was developed, where views to the Project were possible, within which views from the eastern, western, northern, southern and central sectors were considered.

From within the Primary Viewing Catchment, representative viewing locations in key positions in the natural and cultural landscape with views towards the Project Boundary were assessed to consider the existing environment Project impacts. This included the development of photomontages and cross sections to represent the Project during Years 2, 8, 14 and 20 of the mine plan to assist in the assessment of visual impacts.

The Northern View Sector is dominated by rural lands with flanking forest areas to the north-east and also includes a number of residences located along Red Springs Road and Reserved Road in close proximity to the Project Boundary. Lands occupied by Baal Bone Colliery and the Gardens of Stone National Park are located further to the north.

Those receivers in close proximity to the Project Boundary that are not screened by intervening topography or vegetation will experience high visual impacts until mitigation bunds at the northern extent of the Project are constructed and rehabilitated in front of areas where active mining will be otherwise visible.

While there is potential for high visual impacts to result for views from some areas of the Gardens of Stone National Park, such impacts would generally be reduced by the obstruction of views from the adjoining forested areas located between key viewing locations and the Project Boundary, the Baal Bone Colliery and viewing distance.

The Eastern View Sector is dominated by forestry land uses within the Ben Bullen State Forest that have low visual sensitivity. There is also limited visibility from this View Sector to operations within the Project Boundary and no private receivers are present. For these reasons, visual impacts on this View Sector are likely to be restricted to recreational users of the forest that have westerly views over existing and Project mining areas from exposed escarpment edges.

The Southern View Sector is dominated by low sensitivity rural land uses. However, it contains several sensitive rural residences and several local roads, including Portland – Cullen Bullen Road and Back Cullen Road. Visual impacts in the Southern View Sector relate to mining areas both to the east and west of the Castlereagh Highway both of which have the potential for high impact levels where active mining operations are visible.

Residences at greater distance from the Project Boundary and a less prominent orientation towards the Project mining areas will experience a moderate to low impact in the first instance during mining operations, and would decrease to low following rehabilitation establishment.

The Western View Sector is dominated by rural lands and contains two rural residences and a section of Red Springs Road that has very limited public use.

There will be a high visual impact experienced by both receivers for a period of up to three years from Project commencement as operations located to the west of the Wallerawang – Gwabegar Rail Line occur in close proximity. These impacts will decline progressively as rehabilitation advances.

The Castlereagh Highway defines the extent of the Central View Sector, which also includes the township of Cullen Bullen. Further to the north of Cullen Bullen and adjacent to the highway, there are a number of individual residences that adjoin or are located within mining areas proposed for the Project, along with the Cullen Bullen General Cemetery.

The highest level of visual impacts associated with the Project will be experienced in the Central View Sector for those residences north of Cullen Bullen township (the township itself is generally screened by existing vegetation and topography). High visual effects created by Project elements would result in high visual impacts being experienced (without mitigation measures in place) in a number of locations in the Central View Sector at various stages of the Project life, including for Cullen Bullen General Cemetery in the last few years of the Project.

The main lighting effects due to the Project will occur as a result of vehicle and train lights and the lighting of active mining areas during night time operations.

There are two sensitive receivers which may potentially be within this zone of influence and experience minor additional lighting effects; however both are screened by topography from direct lighting impacts.

Onsite treatments will be implemented to mitigate visual impacts of the Project including (but not limited to) rapid, rehabilitation of all screening bunds and progressive rehabilitation of overburden emplacement areas. This will reduce the contrast created by views to the Project from surrounding areas.

Offsite treatments will be implemented to mitigate visual impacts of the Project at specific external locations where high visual impacts may be experienced by receivers or at sensitive viewing locations. These will be detailed in the consolidated Rehabilitation and Landscape Management Plan to be developed for the Project.

Due to its potential sensitivity, an additional Visual Management Plan will be developed for the Cullen Bullen General Cemetery in consultation with relevant stakeholders.

Surface Water

A surface water impact assessment has been undertaken for the Project by WRM Water & Environment Pty Ltd. This assessment included a review of the existing catchments, the Project's revised Water Management System, proposed water infrastructure and a water balance for the Project.

The Project occurs entirely outside the Sydney Water Catchment Area. The majority of the Project Boundary is drained by a number of minor unnamed tributaries which flow into Cullen Creek, Dulhuntys Creek or Jews Creek which are located adjacent to the Project Boundary. The main areas of Project disturbance do not intersect any major drainage lines.

The maximum catchment area draining to the mine Water Management System is approximately 850 hectares during existing operations which represents about 13% of the catchment area of Dulhuntys Creek upstream of the Turon River. The captured catchment area in Cullen and Dulhuntys Creeks reduces substantially by Year 2. A maximum of 165 hectares or 2.5% of the Jews Creek catchment will be captured during Year 8 of mining operations for the Project. The loss of total catchment from the Turon River due to the Project is therefore negligible.

A 21 year water balance was undertaken which aimed to assess the performance of the Site Water Management System under a range of climatic conditions. The water balance modelling was undertaken during the five modelled years (Project Years 2, 8, 14 and 20) dictated that releases of water from the Project are likely to vary.

Based on available water quality data and the proportion of undisturbed catchment area draining to each mine water storage, it is expected that water stored in the mine water dams for the Project will generally meet water quality criteria for release, in the unlikely event that this would be required. As a result the currently approved discharge points and licenses would be retained for this Project.

The modelled inflows and extractions from the extensive abandoned underground workings which underlie the Project indicate that inflows to the underground workings are likely to exceed extractions for all Project years. Extraction of water stored in the underground workings is likely to increase substantially up to approximately Year 8 until the additional mine water storages become fully operational. By Year 20 of the Project, extractions from the abandoned underground workings will be equal to approximately 55% of inflows from Invincible Colliery area pits and surface water flows from existing subsided areas.

The flood assessment undertaken determined that the flooding of the minor tributaries and creek lines draining the Project Boundary is not considered to be of concern to the Project due to the local topography and landscape characteristics.

Coalpac Pty Ltd will mitigate the potential impacts of the Project on surface water resources through the implementation of the development of a revised surface Water Management Plan.

Groundwater

An impact assessment was undertaken for the Project by Australasian Groundwater and Environmental Consultants with the objectives of studying impacts on the groundwater regime and water users and to quantify predicted inflows into the mining areas throughout the life of the Project. The conceptual groundwater model of the Project was developed based on geological and topographical maps of the area, geological information supplied by Coalpac Pty Ltd, and from the results obtained from the previous studies of the groundwater regime in the local area.

A key consideration of the groundwater impact assessment was the history of underground mining in the local area and that there is also a large volume of water (estimated at some 6,245 Megalitres) held within the abandoned underground workings of the Tyldesley Colliery, the Old Invincible Colliery and the Invincible Colliery, a large proportion of which are saturated.

For the Project assessment, it was assumed that the water level within the flooded workings has reached steady state equilibrium where water seepage across the coal seam barrier into the workings of the adjacent Baal Bone Colliery (outflow) is approximately equalled by recharge (inflow).

It is proposed that Coalpac Pty Ltd will continue to utilise the water stored underground within the abandoned workings to augment surface water supplies to meet any water requirements of the Project.

The estimated flows from the Lithgow Coal Seam to the open cut mining areas proposed for the Project were also calculated. It was predicted that these seepage rates will be minor, with an upper seepage limit (per 1,000 metres of coal seam) of 10 Megalitres per annum.

The Project has been designed such that mining of the Lithgow Coal Seam will not intersect the flooded underground workings at that level in the Tyldesley Colliery and that a barrier of solid coal of a specified width will be left in place between the flooded underground mine and the open cut pits.

Based on the Project mine plans, open cut operations will be separated from the flooded Tyldesley Colliery workings by a coal seam barrier in the Lithgow Seam of approximately 50 metres. The assessment indicated that a coal seam barrier of this width will result in a range of seepage from the flooded underground workings from 0.025 cubic metres per day per metre, up to about 0.07 cubic metres per day per metre, over a range of coal seam hydraulic conductivities considered. This means that there will be minor and manageable inflows into the adjacent Project open cut workings.

The rate of groundwater inflow into the highwall mining drives has been assessed in a single 'snap-shot' for the East Tyldesley mining area, that is, a worst case hypothetical situation where all highwall drives have been developed simultaneously. Based on the Project highwall mining layout, the total groundwater inflow for all highwall drives was assessed to be approximately 12 m^3/day, assuming a hydraulic conductivity of about 0.09 m/day.

Assuming a total of 167 highwall mine drives in the area assessed, this series will have a void volume of about 375 Megalitres. The total volume will therefore fill by groundwater seepage from the Lithgow Coal Seam in approximately 86 years which is considered to be minor and manageable.

An analytical method was used to assess the zone of depressurisation in the Marrangaroo Formation and the seepage rate to the sand extraction areas. Steady state groundwater inflow into the sand extraction area is likely to be sourced only from the east, owing to the outcrop of the Marrangaroo Formation in the west. Groundwater inflow to the pit has been determined to range between 0.8 Megalitres per year to about 13 Megalitres per year, depending upon the value of hydraulic conductivity and recharge rate.

The impact of the Project on groundwater levels is expected to be minor and localised, limited mostly to the northern areas of the Project Boundary.

The mining operation will therefore generate a localised zone of depressurisation in the coal seams, but this is not expected to impact on adjacent landholders' bores or the alluvial aquifers in the vicinity of the Project Boundary. The limited extent of these impacts is due to the proximity of old underground workings, the operations of Baal Bone Colliery, the pre-existing shallow hydraulic gradient and the low hydraulic conductivity of the coal seam and sandstone aquifers.

To monitor and assess any impacts to registered bores as a result of the Project, Coalpac Pty Ltd proposes to install three additional monitoring stations on private land in existing groundwater bores. It is anticipated that the volume of water stored within the flooded workings of the Old Invincible Colliery will remain unaffected by the Project. The water stored within the underground workings of the Old Invincible Colliery is likely to continue to be utilised to augment surface water supplies to meet the Project water requirements.

No Groundwater Dependent Ecosystems have been identified within the Project Boundary and there are no known springs within the Project Boundary that are fed by groundwater around which Groundwater Dependent Ecosystems may have developed.

The Coxs River Swamp and Jews Creek Swamp are considered to be the Groundwater Dependent Ecosystems in closest proximity to the Project but are located approximately 2 km and 3.5 km outside the Project Boundary, respectively. Discharges will not occur from the Project to this area and hence the Project will not affect these swamps.

Coalpac Pty Ltd will develop a consolidated Water Management Plan for the Project which will ensure that the groundwater monitoring network is enhanced so that the modelled predictions and assumptions in this Environmental Assessment can be verified and any potential for additional groundwater impacts can be identified and managed.

Geochemistry

A geochemical impact assessment for the Project was completed by RGS Environmental Pty Ltd. This assessment involved a geochemical characterisation process and the assessment of overburden and potential coal reject materials associated with the open cut and highwall mining of the target coal seams for the Project. The assessment also considered the basal Marrangaroo Formation underlying the Lithgow Coal Seam to confirm its suitability for sand extraction.

The majority of overburden materials for the Project are likely to have negligible (< 0.2%) total sulphur content and low to moderate Acid Neutralising Capacity and are therefore are classified as Non Acid Forming barren. One sample from the Marrangaroo Sandstone contained significantly elevated total sulphur content (0.82%) to Maximum Potential Acidity and consequently may have an increased risk of acid generation.

Most potential coal reject materials were found to have negligible total sulphur content (< 0.1%) and are therefore classified as NAF-barren. These materials have a high Factor of Safety with respect to potential acid generation. A small proportion of the potential coal reject materials associated with the Lithgow Seam have a relatively higher total sulphur content and negligible buffering capacity (and hence a low Factor of Safety) and are classified as Potentially Acid Forming - High Capacity.

In contrast, the tailings materials generated from processing the Lithgow Coal Seam at the Invincible Coal Handling and Preparation Plant are Non Acid Forming.

The concentration of total metals in potential coal reject solids is well below the applied guideline criteria for soils and is unlikely to present any environmental issues associated with the rehabilitation and the final closure of the mine. However, Potentially Acid Forming coarse reject materials from the Lithgow Seam may have some potential to generate acidic and more saline runoff and seepage if exposed to oxidising conditions.

The ongoing management of overburden and rejects for the Project will consider the geochemistry of these materials in relation to its potential risk to cause harm to the environment and their suitability for use in construction and revegetation activities.

To manage potential geochemical issues, Coalpac Pty Ltd will implement a number of measures with respect to pre-stripping topsoil from areas to be mined for use in final rehabilitation activities and the placement of overburden within the overburden emplacement areas to limit the risk of surface erosion.

The regular monitoring of surface water and groundwater associated with runoff or seepage from the emplacement areas will be incorporated into the Environmental Monitoring Program.

Aboriginal Heritage

AECOM Australia Pty Limited prepared an Aboriginal Archaeology and Cultural Heritage Impact Assessment for the Project which aimed to assess the nature of the archaeological landscape within the Project Boundary and potential impacts that the proposed mining operations may have on Aboriginal cultural heritage values.

Following a review of relevant background literature and preliminary consultation, a field survey over the Project Boundary was undertaken over 21 days. This involved two AECOM archaeologists and representatives from nine local Aboriginal community groups.

The field component of the assessment divided the Project Boundary into its constituent landform types to ensure that all landforms within the survey areas were sampled.

A total of 15 Aboriginal sites were located within the Project Boundary, including a number that had been recorded by previous assessments in the local area for Cullen Valley Mine and Invincible Colliery. The majority of Aboriginal sites located during the survey were stone artefact sites, with nine artefact scatters and a single isolated find identified. In addition to these, three rock shelter sites were definitively identified, along with two rock shelters that were considered to have some archaeological potential. All rock shelter sites are located outside of the Project Disturbance Boundary.

Of these sites, it is proposed that five open artefact scatters and the isolated find, all of which were assessed to be of low scientific significance, will be subject to a surface collection prior to disturbance. This process will be undertaken in consultation with the local Aboriginal community. The five rock shelter sites (including both the known and potential sites) will be regularly monitored through the life of the Project to ensure the potential for indirect impacts are appropriately managed.

An Aboriginal Archaeology and Cultural Heritage Management Plan will be developed by Coalpac Pty Ltd for the Project, in consultation with Aboriginal stakeholders and the Office of Environmental and Heritage. Coalpac Pty Ltd will also maintain a Keeping Place during the life of the Project for all Aboriginal archaeological material salvaged prior to disturbance, in consultation with the Aboriginal community.

Non-Aboriginal Heritage

AECOM Australia Pty Limited also completed an assessment of Non-Aboriginal Heritage for the Project. The assessment included historical and archival research and searches of the relevant Commonwealth, State and local heritage lists, a review of previous heritage assessments undertaken by Coalpac Pty Ltd and a field survey of the areas within the Project Boundary that had not been previously assessed.

Two sites within the Project Boundary of local heritage significance will be directly impacted by the Project and include an Underground Mine Adit and a Sandstone Assemblage. An additional three sites were identified outside the Project Boundary which have potential for indirect impacts.

Coalpac Pty Ltd will develop a Historic Heritage Management Plan for the Project which shall include a photographic and archival recording of both sites to be directly impacted by the Project. A full archival recording of the Cullen Bullen General Cemetery and Carleon Coach House will be undertaken in consultation with relevant stakeholders prior to blasting within 500 metres of each.

Ecology

Cumberland Ecology Pty Ltd has completed an Ecological Impact Assessment for the Project. This investigated the impacts of the Project on current biodiversity values, including Threatened species, populations and protected ecological communities, as listed under the *Environment Protection and Biodiversity Conservation Act 1999* and Threatened species and communities as listed under the NSW *Threatened Species Conservation Act 1995*.

A background literature review was undertaken by Cumberland Ecology Pty Ltd prior to the commencement of Project field surveys which were undertaken in several stages during 2009, 2010 and 2011 in both the Project Boundary and potential offset properties. No aquatic studies were required to be undertaken as no permanent streams or wetlands exist either immediately adjacent or within the Project Boundary.

Floristic sampling was designed to meet the Department of Sustainability, Environment, Water, Populations and Communities guidelines for the identification of the *Environment Protection and Biodiversity Conservation Act 1999* listed Critically Endangered Ecological Community, the White Box-Yellow Box-Blakely's Red Gum grassy woodlands (Box Gum Woodland), gazetted in 2006.

The Swift Parrot, Regent Honeyeater, Capertee Stringybark, Clandulla Geebung, Leek Orchid, Black Gum, Bathurst Copper Butterfly and Wollemi Mint Bush were also the particular focus of targeted surveys. Project surveys were all undertaken in accordance with the Office of Environment & Heritage *'Threatened Biodiversity Survey and Assessment Guidelines for Development and Activities'*.

The majority of the Project Boundary that has not been modified by previous mining or logging operations contains large expanses of open forest and woodland communities with smaller areas to the west of the Castlereagh Highway supporting cleared grasslands on agricultural land. More than 400 flora species have been recorded within the Project Boundary.

Thirty-five mammal species were identified within or in the vicinity of the Project Boundary of which 15 were listed as Threatened. A total of 112 bird species were identified within the Project Boundary and immediate surrounds. Several listed Threatened birds were either recorded in the locality or are considered to have potential habitat within the Project Boundary.

A total of eight amphibian species were detected in the Project Boundary although none are listed as Threatened. A total of 18 reptile species were recorded in the Project Boundary, including snakes, geckos and skinks. Despite targeted searches, no Threatened reptile species were recorded within the Project Boundary during the survey period.

The areas to be impacted over the life of the Project consist of approximately 958 hectares of which 835 hectares constitutes native forest and woodland. The remaining 123 hectares contains various forms of Low Diversity Native Grassland of low ecological value. Of the area of native vegetation proposed to be cleared for the Project, approximately 16.5 hectares is Box Gum Woodland (a Critically Endangered Ecological Community), 3.28 hectares is habitat for the Threatened Clandulla Geebung and 278 hectares of potential habitat of the Threatened Capertee Stringybark.

The Project mine plan has been modified during the preliminary stages of the Environmental Assessment to avoid disturbance of over 28 hectares of the Box Gum Woodland Critically Endangered Ecological Community and 179 hectares of additional native vegetation. These modifications to the Project mine plan have also avoided disturbance to 8.98 hectares of habitat for the Threatened Clandulla Geebung and 63 hectares of habitat for the Threatened Capertee Stringybark.

Biodiversity Offsets Strategy

Coalpac Pty Ltd has developed a comprehensive Biodiversity Offset Strategy for the Project. This Biodiversity Offset Strategy was developed in response to the predicted impacts of the Project on biodiversity values, particularly those of Threatened ecological communities and habitat for Threatened species and ecological communities listed under both the *Environment Protection and Biodiversity Conservation Act 1999* and the *Threatened Species Conservation Act 1995*.

The proposed Biodiversity Offset Strategy for the Project entails the acquisition of properties for permanent conservation of flora and fauna, including Threatened flora and fauna predicted to be impacted by the Project in addition to the rehabilitation of the Disturbance Boundary.

The Biodiversity Offset Strategy properties will be in addition to the ecological offset landholdings currently managed by Coalpac Pty Ltd under existing approvals for Invincible Colliery and Cullen Valley (which constitute approximately 166 hectares of forest, woodland and grassland communities). These properties will provide habitat for resident fauna and threatened flora species in the long term during and following the implementation of the Project.

To identify potential Project offset, preliminary vegetation mapping was undertaken via field surveys to confirm suitable areas, particularly targeting those containing the Box Gum Woodland and Derived Grassland Critically Endangered Ecological Community and habitat for the Threatened Capertee Stringybark.

Further detailed field surveys were undertaken in 2011 by teams of ecologists to both validate the findings of the preliminary mapping and to assist in completing detailed mapping of vegetation communities on key properties with offset potential.

The proposed Biodiversity Offset Strategy requires the acquisition of land holdings that contain substantial amounts of remnant vegetation, in addition to the land within the Project Boundary that will be rehabilitated.

The land holding areas nominated as offsets for the Project constitute over 1,755 hectares and comprise:

- Hillcroft Offset: A property of 1,097 hectares (of which 989.5 hectares is available for inclusion as an offset) within and immediately to the west of the Project Boundary that will be acquired for conservation. This property is extensively vegetated over the western half, provides suitable habitat for the Capertee Stringybark, Clandulla Geebung and provides a corridor between the Sunny Corner State Forest and the Ben Bullen State Forest.

  The property also provides suitable riparian habitat (including for the Booroolong Frog) along Dulhuntys Creek and Williwa Creek which occur within it, each a tributary of the Turon River;

- Yarran View Offset: A property of 443 hectares to the north of the Project which is located adjacent to the Wollemi National Park and has been acquired for conservation. This property contains both intact native vegetation and Box Gum Woodland and Derived Native Grassland;

- Hillview / Billabong Offset: A property of 83 hectares located west of the Castlereagh Highway adjacent to the Project Boundary west of Invincible Colliery controlled by Coalpac Pty Ltd. This property has Box Gum Woodland and Derived Native Grassland and non-endangered Ecological Community vegetation similar to the Project Boundary; and

- Hyrock Hartley Offset: A property of 240 hectares located to the south east of the Project controlled by Coalpac Pty Ltd. The property contains sandstone vegetation and fauna habitat including escarpment habitats similar to those within the Project Boundary with the Darling Causeway between it and the adjacent Blue Mountains National Park.

During the offset selection process, a large emphasis was placed on sourcing potential offset properties with realistic prospects for long term security.

The properties were chosen for inclusion in the Biodiversity Offset Strategy because they are located outside existing mining tenements and/or in proximity to State Forests (Ben Bullen and Sunny Corner State Forests) or protected conservation areas (Gardens of Stone and Wollemi National Parks, and the proposed Gardens of Stone 2 State Conservation Area.

The establishment, enhancement and maintenance of habitat corridors is proposed as a major feature of the Project Biodiversity Offset Strategy, particularly for areas of remnant vegetation that occur between forests, woodlands and grasslands of high conservation value in order to provide connectivity between these remnant areas.

The location of the offset properties (particularly Hillcroft, Yarran View and Hyrock Hartley) also have the potential to complement the development of further conservation outcomes in the long term following rehabilitation of Project mining areas, including a division of the Gardens of Stone 2 State Conservation Area proposal.

A conservation ratio of 13:1 for the Critically Endangered Ecological Community Box Gum Woodland is incorporated into the Biodiversity Offset Strategy and these properties were also found to provide, or have the potential to provide habitat suitable for a number of threatened flora and fauna species.

The Biodiversity Offsets Strategy will result in significant net benefits to flora and fauna values within the locality and region in the medium to long term, including Box Gum Woodland and extensive habitat for Threatened species that are known to occur in the locality. Management measures proposed for the Project have been developed in accordance with the objectives of the *'Draft Guidelines for Threatened Species Assessment'* with the aim to avoid, mitigate and / or compensate via offsets identified impacts.

A Project Biodiversity Management Plan will be prepared for the approval of relevant authorities.

Management procedures for progressive restoration and the implementation of the Biodiversity Offsets Strategy, along with a flora and fauna monitoring program will be implemented.

The development of linkages between remnant vegetation will be incorporated along with a commitment to re-establish Critically Endangered Ecological Communities (Box Gum Woodland), and key Threatened species of Capertee Stringybark and Clandulla Geebung will also be included in the Biodiversity Management Plan.

This will assist in ensuring that biodiversity values in the region are maintained.

Traffic and Transportation

A Traffic and Transport Impact Assessment was undertaken for the Project by Hyder Consulting Pty Limited.

At the commencement of the Project, the main access to the Project Boundary will continue to be at the existing site access roads in place for Invincible Colliery and Cullen Valley Mine.

For the Project, Coalpac Pty Ltd is proposing a construction program of approximately 15 months for major infrastructure to facilitate the consolidation of both sites and allow for the majority of product coal to be transported via conveyor to the Mount Piper Power Station, reducing the volume of heavy vehicles on public roads required for this activity under existing operations.

Following the construction of bridge and road infrastructure to link Invincible Colliery and Cullen Valley Mine, the primary site access for all Project vehicles will be via the Invincible Colliery site access road.

The construction of the overpass bridge links the two sides of the Project (east and west) and the proposed overland conveyor from the Invincible Coal Preparation Plant to Mount Piper Power Station will significantly reduce the need for the transportation of product coal required by public road. Despite the proposed increase in product coal yield sought for the Project approximately 90% of the total product coal will be transported from the Project Boundary via the overland conveyor to Mount Piper Power Station and the rail siding off the Wallerawang – Gwabegar Rail Line.

When considering the heavy vehicle traffic required for the transportation of the remaining volumes of product coal and sand proposed, the Project represents a reduction in truck movements of approximately 54% in comparison to those generated under existing Coalpac Pty Ltd approvals.

A Road Safety Impact Assessment was undertaken for the Project and considered the potential changes to crash risk on the section of the Castlereagh Highway between Cullen Bullen and the Great Western Highway near Lithgow. The existing road safety deficiencies in the existing road network and the predicted increase in crash risk for the Project were not considered a significant increase above background levels, particularly with the overall reduction in heavy vehicle traffic compared to the level generated by Coalpac Pty Ltd operations.

The proposed rail siding will be constructed off the Wallerawang – Gwabegar Rail Line within the existing footprint of Cullen Valley Mine. It was estimated that the Project will result in approximately 290 one-way train movements per year to Port Kembla.

The transportation of product coal by rail is proposed to occur by two routes, the primary route being via the Illawarra Line, or the secondary route via the Southern Highlands. It is predicted that the two routes considered for the haulage of product coal will not be significantly impacted by Project rail haulage.

Coalpac will develop a Traffic and Transport Management Plan (including limited road haulage) for the Project to manage possible impacts resulting from construction activities and to ensure the traffic network can be managed throughout the life of the Project. This document will include procedures to facilitate the timely construction required for Project infrastructure, management measures to be followed in the haulage of product coal by road and the implementation of procedures to ensure continued road safety.

Bushfire

Lands within and immediately surrounding the Project Boundary are largely occupied by the Ben Bullen State Forest, which is, in turn, connected to a range of other forestry management and conservation areas in the region.

These large areas of forest and woodland vegetation communities in the region area are considered to have a high potential for bushfire risk. The remaining lands adjacent to the Project Boundary are primarily agricultural grazing land, which present a much lower bushfire hazard.

Due to the relatively moderate rainfall and summer temperatures, combined with the potential for the build-up of high fuel loads (leaf drop and tinder) over time, a significant risk of bushfire is anticipated to occur intermittently within and adjacent to the Project Boundary in the Ben Bullen State Forest. On site bushfires and potential bushfire hazards are managed in accordance with the *Rural Fires Act 1999* and regulated by the NSW Rural Fire Service.

Fire controls and emergency systems in place for existing operations are implemented in accordance with the *Coal Mine Health and Safety Act 2002* and the approved management plans.

A Bushfire Management Plan will be developed by Coalpac Pty Ltd for the Project to ensure that potential bushfire risks are continued to be well understood and appropriate management systems and equipment are in place for key areas where bushfire hazards are present to prevent and minimise the potential outbreak of bushfire, control any outbreak of fire that does occur and minimise the risk of bushfires spreading from the Project to adjacent private properties.

Soils and Land Resources

A soils and land capability impact assessment was completed by Ecobiological Pty Ltd for the Project. This impact assessment involved the broad review of existing soil mapping and profiling information and a subsequent field assessment, which included the development of 24 soil test pits at representative locations across the Project Boundary.

Four soil types were identified within the Project Boundary, 70% of which includes Deep Orange Clay Loam. Shallow Brown Clay Loam, Skeletal Sandy Loam and Deep Dark Sandy Loam comprise the remainder.

When considering the topsoil stripping depths appropriate for each soil type and the area of the Project Disturbance Boundary, the estimated total volumes of suitable topdressing materials available is up to 2.3 Million cubic metres, which will be adequate for Project rehabilitation requirements.

The land capability assessment for the project determined that the classification of the majority (90%) of the Project Boundary is Class V, with the remainder Class VIII. The agricultural suitability of the existing environment within the Project Boundary is generally low and follows the same breakdown as for land capability, with most of lands assessed to be Class 4 (the remainder being Class 5).

All areas which are not proposed to be disturbed by mining will retain the same land capability and agricultural suitability class as the pre-mining condition.

In order to reduce the potential for degradation within the Project Boundary and adjoining lands, Coalpac Pty Ltd will develop an internal Soil and Land Capability procedure for the management of its soil resources, in consideration of a range of management and mitigation measures. These include procedures to ensure that topsoil materials are appropriately stripped, stockpiled and handled during the development of final landform and rehabilitation activities.

Preliminary Hazard Analysis

A Preliminary Hazard Analysis was undertaken for the Project with the objective of ensuring that there was an appropriate level of understanding of the hazards and risks that have the potential to occur during the construction and operation of the Project and that the risks identified will be appropriately managed.

State Environmental Planning Policy 33 Guidelines were utilised to determine potential fire, explosion and toxicity hazard.

To ensure that the identified hazards and risks are appropriately managed for the Project, the existing management measures and procedures in place for existing Coalpac operations will continue.

These measures include providing hazard and emergency response training to Coalpac staff and contractors and reviewing the existing management plans for the Cullen Valley Mine explosives storage and explosives precursor storage facilities for the Project.

Waste

Coalpac Pty Ltd will implement a consolidated Waste Management System to manage the disposal, tracking and reporting of all waste materials generated onsite. This system will be reviewed for the Project and enhanced as required to meet both legislative and internal waste management requirements.

This program will continue the process of waste minimisation and segregation in place for existing operations and ensure that appropriate systems for potable and waste water management will be retained and updated as required.

Regular inspections, classification of wastes, monitoring and tracking, and regular waste management handling training will also be undertaken during the life of the Project.

Social

Hansen Bailey completed a Social Impact Assessment for the Project which developed a social profile for the local community (including the townships of Cullen Bullen and Portland) and the wider region (including the Lithgow and Bathurst Local Government Areas) to identify social impacts which may result from the additional 30 employees required for the Project.

The area is generally characterised by an increasing population, ageing population, decreasing number of occupied private dwellings, stable labour force size, relatively high unemployment rate and stable employment industry, with median income levels substantially lower than average NSW income levels (as at 2006). The mining and retail industries and health care service sectors are the largest employment sector.

The local housing market (both for purchases and rentals) appears to be tight in Cullen Bullen and Portland. The local area is serviced by local hospitals in Lithgow and Bathurst which provide emergency services, with more basic care available at Portland.

Other health care services are provided throughout both Lithgow and Bathurst, including general practitioners and facilities for aged care and community health. Primary and secondary education facilities are available in the local area, with tertiary education facilities also available through TAFE facilities in Lithgow and Bathurst and Charles Sturt University in Bathurst.

Education and health services are predicted to have the capacity to meet the demand generated by the additional population, although it should be noted that these two areas were identified by the community as being areas of need.

Coalpac Pty Ltd will employ the following management strategies to mitigate impacts from the Project on the community:

- Continuation of internal community sponsorship and contributions programs, with particular focus on the local community;
- Sourcing additional employees required for the Project from the local area, where possible, including at least one apprentice or trainee per year;
- Continuation of engagement with community stakeholders through a range of measures, including the appointment of a designated Community Liaison Officer for the Project; and
- Voluntary Planning Agreement currently being negotiated with Lithgow City Council under Section 93F *Environmental Planning and Assessment Act 1979* to provide additional contributions to Cullen Bullen and Portland for Project related infrastructure needs.

Economics

An Economic Impact Assessment was undertaken by Gillespie Economics which aimed to determine both the economic efficiency and the economic impacts of the Project.

A benefit cost analysis has confirmed when production costs (acquisition costs for affected land, opportunity cost of land, operating costs, decommissioning costs, etc) and production benefits (revenues from production, residual values of land, etc) are considered, the Project will have net production of $1,519 Million minimum threshold value.

An additional component of this assessment involved the comparison of the mining activities proposed for the Project and the maximum value of other potential land uses within the Project Boundary, being agriculture and forestry (within land held for the Ben Bullen State Forest). In total, the maximum value of these activities over a period of 21 years was found to be $1.4 Million for agriculture and $0.9 Million for forestry.

The net production value of the Project (of up to $1,519 Million) therefore far exceeds any values that could be generated from other potential land uses within the Project Boundary.

Another component of the assessment involved the calculated regional and State economic contributions from the Project in terms of specific economic parameters.

The regional contributions were found to include $219 Million in annual direct and indirect regional output or business turnover, $105 Million in annual direct and indirect regional value added, $30 Million in annual household income and 293 direct and indirect jobs.

For the same categories, contributions to NSW were assessed to be in the order of $275 Million, $133 Million, $48 Million, and 519 jobs, respectively.

Typically, a minimum of 70% of the product coal proposed for the Project will be supplied to Delta Electricity for use at the Mount Piper Power Station, which will in turn provide for over two thirds of the annual coal demand of that facility. Given the current uncertainty over the availability of other coal resources and the availability of other operations in the area to continue supply of product, the Project represents an efficient, secure and low cost option for the ongoing operation of Mount Piper Power Station.

Based on this outcome, the Project is considered desirable and justified from an economic efficiency perspective.

Forestry

A Forestry Assessment was undertaken for the Project by GHD Pty Ltd. This assessment was undertaken with the primary objectives of reviewing the previous values of the forestry resource from within the Ben Bullen State Forest, determining the maximum potential of areas of the forest located within the Project Boundary that could be utilised as a commercial forestry resource, and calculating the potential maximum value of forestry that could be harvested from the resource.

Over the life of the Project, this assessment determined that the Salvage scenario could result in a net forestry value of $0.45 Million, while the Sustainable Yield scenario could provide a net forestry value of $0.25 Million.

The results of the forestry assessment were then used to assist in the preparation of the Economic Impact Assessment for the Project (see above) to allow a comparison of the maximum value of different land use types within the Project Boundary.

Rehabilitation and Final Landform

Revegetation and landform shaping will be undertaken to ensure that lands within the Project Boundary remain generally consistent with the surrounding landscape post-mining and that ecological linkages are enhanced on a local and regional scale. The rehabilitation strategy for the Project will also focus on biodiversity and the establishment of habitat for Threatened species and vegetation communities (predominantly focusing on Box Gum Woodland).

Rehabilitation processes will be undertaken generally in accordance with the *Strategic Framework for Mine Closure* and the *'Mine Rehabilitation'* and *'Mine Closure and Completion'* Handbooks. Preliminary rehabilitation criteria have also been developed for the Project.

A conceptual final landform assuming that mining will not continue beyond the 21 year approval period sought has been developed in consideration of adjacent closing mining operations.

Through the final landform design for the Project, Coalpac Pty Ltd will maximise opportunities for the development of a post-mining landscape that is generally consistent with pre-mining land use and biodiversity values, while also promoting linkages to surrounding offset areas and local State Forest and National Park areas (including Gardens of Stone National Park which is 2.5 kilometres to the north of the Project Boundary).

All disturbed areas for the Project will be shaped prior to rehabilitation establishment to promote this outcome and to ensure that in the long term, the Project Boundary may be used to enhance existing and proposed conservation areas in the wider region.

The conceptual final landform has also been designed such that there will be no final void present at the end of the Project life after Year 21.

Overburden emplacement areas will be progressively rehabilitated over the life of the mine as soon as practical following establishment in accordance with the relevant rehabilitation completion criteria.

A Rehabilitation and Landscape Management Plan will be developed, which will include provision for the monitoring of rehabilitated lands on a regular basis to ensure that rehabilitation objectives and targets are being met and that sustainable revegetation and landform sustainability is achieved in the long term. A Mine Closure Plan (to be prepared within five years of closure) shall be completed in accordance with contemporary regulatory requirements, new technologies and stakeholder expectations.

STATEMENT OF COMMITMENTS

In the preparation of this Environmental Assessment and through the stakeholder engagement process, Coalpac Pty Ltd has identified a range of significant environmental and operational issues which it has committed to managing throughout the life of the Project.

The aim of the Statement of Commitments provided in this Environmental Assessment is to ensure that any potential environmental impacts resulting from the issues identified are appropriately managed and minimised by implementing specific environmental monitoring, response and mitigation strategies.

These ongoing commitments for environmental management are presented in addition to any conditions of Project Approval that may be provided for the Project.

PROJECT JUSTIFICATION

Need for Energy

International and local predictions are that the need for coal as a source of energy for electricity production will increase for some years to come, despite an expectation of an increase in energy from alternate sources. An alternative source has not yet been, or not considered to be for some time to come, developed sufficiently to replace carbon based energy entirely as the source of energy for base load electricity supply.

The expected path forward with regard to energy for the world, is that while there will be development of non-carbon based energy, the political and technological challenges and infrastructure development requirements (when compared to the inevitable increase in demand for electricity) is that there will, for some time, continue to be a need for low cost, good quality, thermal coal for electricity generation, such as would be produced by the Project.

Context

The existing workforce, plant and infrastructure, with some minor additions to the existing Invincible Colliery and Cullen Valley Mines, will support the continuation of operations as proposed by the Project. This will enable the:

- Recovery of coal that can be acceptably mined environmentally and socially;
- Continuation of economic support for Cullen Bullen, Portland, Lithgow and the region by the existing workforce and contracts with Suppliers of goods and services;
- Continued stability for the operation and economic electricity production from the Delta Electricity owned power stations;
- Maximisation of the value of the in-situ coal resource;
- Optimal social and environmental mine closure;
- Optimisation of the return of value from the existing infrastructure and mine development; and
- Mine planning that will facilitate mine closure, appropriate final land forms and uses.

Environmental and Social Concerns

The Project would address some issues that have in the past caused concern in the community by substantially removing coal haulage from the road system by the construction of a conveyor to Mt Piper Power Station, and the construction of a rail siding thus reducing road use, air quality and noise issues.

Additionally, the Project would enable the rationalisation of the existing multiple approvals which would be replaced by a single, contemporary Approval for all operations implementing current environmental and social standards for management plans.

Through the extraction of the remaining recoverable coal resource, the Project will optimise the benefits from environmental and capital costs that have been incurred and ensure an orderly and leading practice closure of the mining operations and rehabilitation of the site.

Product Markets

The Invincible Colliery and Cullen Valley Mine have been long term suppliers to the Delta Electricity owned Wallerawang Power Station and Mt Piper Power Station near Lithgow which together produce approximately 8% of the total generation in the National Electricity Market from some 6.0 Million tonnes per annum of coal. Presently, the two mines provide more than 40% of the coal consumed at Mt Piper Power Station. With the Project, this would increase to a predicted 70% in the future.

The Project therefore plays an important role in the continuation of the supply of the coal to Mt Piper Power Station ensuring continuity of their capacity to meet the demands for reliable and optimally priced steaming coal in the cheapest and least environmentally impacting manner.

Invincible Colliery has been an exporter of coal in the past, and the re-introduction of this practice will significantly assist the Project to provide the profitability and therefore the capital resources required to achieve a high level of resource recovery whilst ensuring 'leading practice' environmental management, life-of-mine mitigation measures, and enhanced bio-diversity outcomes for the Cullen Bullen region. Exporting coal also increases the economic return to the State of NSW, by providing increased royalties.

Coalpac has also long been a supplier of coal to small speciality markets including the Manildra Group Shoalhaven Starches plant at Nowra for its coal fired boilers which require coal with the characteristics of the Invincible Colliery coal.

Continued coal supply will assist Manildra with a range of products, including the supply of ethanol to the NSW petroleum market.

Sand is necessary for building and other markets of metropolitan Sydney. Existing supplies in and nearby Sydney are challenged and new sources of supply are required to meet the demand. The Project's proposed development of its sand resource within the footprint of the proposed open cut mine would allow that market to be partially satisfied with a minimal additional environmental impact.

The Project proposes a source that is close to the Sydney market that minimises the social, economic and environmental costs associated with longer transport distances including financial cost, road and rail use and greenhouse gases. Development of the Project's local sand resource would partly address Sydney's industrial sand demand, which increasingly has to be sourced from further afield.

Land Use

The Project area is predominantly located in the Ben Bullen State Forest, where the Invincible Colliery and Cullen Valley Mine have operated since they began operations over 100 years ago, with the support of the Forests NSW with which Coalpac is engaged in discussions for continued access arrangements for the operation of the Project.

Privately owned parts of the Project Boundary, some of which have been acquired by Coalpac and others of which are subject to current negotiations for purchase, are generally small areas used for hobby farms and recreational uses.

Due to the small farm sizes and relative lack of suitability for intensive agriculture of the privately owned land the agricultural use is of limited economic value with an economic assessment of the value of the agricultural use at $1.4 Million and for forestry of up to $0.47 Million.

Ben Bullen State Forest extends over an area of approximately 6,783 ha. The Project will involve the gradual disturbance and progressive rehabilitation over a 21 year period of 752 ha (11%) of the Ben Bullen State Forest.

There is a proposal for the Ben Bullen State Forest in the vicinity of the Project to be included in the proposal for the Gardens of Stone Stage 2 State Conservation Area. The Gardens of Stone Stage 2 proposal is comprised of six divisions with the Project occurring within the Baal Bone and Long Swamp Division. The proposal has an estimated net economic benefit of $28 Million to $32 Million.

Of the 958 ha proposed to be disturbed by the Project, approximately 528 hectares are located within the Gardens of Stone Stage 2 proposal.

The Gardens of Stone Stage 2 proposal covers approximately 40,000 hectares. The Project's disturbance within the Gardens of Stone Stage 2 proposal therefore represents 1.3% of the total area and 6.8% of the Baal Bone and Long Swamp Division.

The creation of the Gardens of Stone Stage 2 would be able to proceed without the inclusion of the Project Boundary while mining continues, with this land being added when mining and rehabilitation is completed. That is, the Project area will not be necessarily be permanently lost from any Gardens of Stone Stage 2 proposal.

Further to this, Coalpac Pty Ltd propose to support the progressive establishment of Gardens of Stone Stage 2 and to this end; provide a monetary contribution of $0.015 per tonne of coal sold, to Office of Environment & Heritage (or other relevant body) throughout the life of the Project to assist in the development, implementation and management of the Gardens of Stone Stage 2. If required by Office of Environment & Heritage, rehabilitated areas of the Project Disturbance Boundary and biodiversity offset properties may be progressively released into conservation in Gardens of Stone Stage 2.

The Project proposes areas of vegetation offset to be secured in perpetuity. This land could also be included in, and as such, further enhance the Gardens of Stone Stage 2 proposal in addition to the rehabilitation of the Project area by appropriate forward planning. Thus the Project would allow the completion of the recovery of the valuable open cut coal resource within the Gardens of Stone Stage 2 proposal whilst at the same time ultimately enhancing the proposal through the progressive rehabilitation of the disturbance areas and the establishment of complementary biodiversity offset lands.

Project Need

Coalpac is an Australian owned, experienced coal mining company which owns and operates the Invincible Colliery and Cullen Valley Mine. Mines have operated on these leases near Cullen Bullen, west of Lithgow since the late 1800s. The mines have been, and continue to be, an important part of the regional economy and will be required to close when the approved and accessible resources are extracted in 2012, unless the Project is approved.

The Project will assist in achieving the optimal mine closure, rehabilitation and final landform of the existing surface disturbance in accordance with current expectations and the use of leading practice processes which would not be available if the mines were to close in 2012.

The Project is needed to replace the existing multiple and sometimes conflicting approvals comprising the 'approvals platform' for the Cullen Valley Mine and Invincible Colliery with a single, contemporary approval providing for appropriate environmental management.

Project Alternatives

The mine plans evaluated for the Project were considered in the context of the value of the coal remaining in the ground against the sensitivities of the environmental and social context of mining operations involved in its recovery, and the costs of doing and applying the 'objects' of the *Environmental Planning and Assessment Act 1979* Act and the principles of Ecologically Sustainable Development.

Underground mining was considered, but was determined not to be operationally, nor economically feasible. Much of the central and southern extent of the Project is located in areas which have previously been selectively mined by underground methods in the only seam (Lithgow Seam) that is economically recoverable by underground methods due to coal quality and geological conditions.

The Lithgow Seam actually reduces in thickness and quality to the north and west such that it cannot be safely and economically worked underground and was a limit to earlier underground operations in the Tyldesley Colliery. As such, the maximised recovery of coal from these areas is only amenable to open cut and highwall mining.

Closure of the Invincible Colliery and Cullen Valley Mine in 2012 would result in the loss of employment and economic benefits from more than 90 jobs that would be lost, as well as the economic benefits from existing service and supply contracts that which currently contribute to the economy of the Lithgow region and the State. The loss of the economic returns from the remaining resource of more than 108 million tonnes of recoverable in-situ coal and capital would occur, along with some environmental costs which have already been incurred.

With the conclusions that the 'No Project' approach was unacceptable, the Optimal Recovery Mine Plan was critically analysed to identify issues that were then addressed to arrive at a Project that could meet the legal, social, political and environmental expectations of the community and achieve a 'social licence to mine'.

This review and the assessment process involved:

- Reducing the areas of open cut mining which minimised noise and air quality impacts and reduced native vegetation impacts, achieving a reduction in disturbance of 5 hectares of Critically Endangered Ecological Community, 4.5 hectares of habitat for the threatened Clandulla Geebung and 48 hectares of potential habitat for the threatened Capertee Stringybark;
- Replacing a number of potential open cut mining areas with highwall mining, resulting in reduced impacts on surface water flow, visual, noise and air quality impacts and the preservation of 63 hectares of native vegetation (including 23 hectares of Critically Endangered Ecological Community);
- Constructing a rail siding (instead of a rail loop) resulting in a reduction in direct impacts to 15 hectares of native vegetation, all of which is potential habitat for the threatened Capertee Stringybark;
- Lowering the elevation of the East Tyldesley Coal Preparation Plant infrastructure, resulting in a reduction to off-site noise impacts and reductions to offsite visual effects;
- Progressive development of noise bunds resulting in a further reduction of noise impacts on private receivers;
- Construction of a conveyor to Mt Piper Power Station, resulting in a reduction of 202 one-way truck movements per day, enhanced road safety, reduced noise effects; and reduced impact on road surfaces; and
- Reducing the size of the proposed sand mining area, resulting in avoidance of impacts to approximately 4.5 hectares of the Clandulla Geebung threatened species

Bunding, shielding and changes to mine scheduling and operating hours under certain meteorological conditions were also incorporated to further mitigate impacts.

The costs to the Project and to economic benefits to achieve the environmental outcomes described will be the sterilisation of a total of 13.6 Million tonnes of coal and reduction in revenue of $610 Million and revenue in royalties to the New South Wales Government of approximately $50 Million.

The replacement of open cut mining with highwall mining will result in the retention of 63 ha of native vegetation (including 23 hectares of Critically Endangered Ecological Community), significant reduction in visual impacts to Cullen Bullen General Cemetery and on passers-by on the Castlereagh Highway as well as reductions in amenity impacts on receivers north of the Project.

In addition, due to increasing the stand off zone for open cut mining from the sandstone escarpments and pagoda features within the Project Boundary by 50 m, a further 14 Mt of the coal resource would be sterilised. This measure further reduces total Coalpac revenue for the Project by approximately $629.4 Million.

This process resulted in the Project mine plan which recovers 108 Million tonnes of the coal resource over the mine life, leaving 20% of the Optimal Mine Plan resource (or 27.6 Million tonnes) sterilised to ensure that appropriate social and environmental long term goals are achieved. This enables the Project to appropriately address the 'objects' of the *Environmental Planning and Assessment Act 1979*, including the principles of Ecologically Sustainable Development.

Approximately 16% of the total sand resource (1 Million bank cubic metres) will also be sterilised to avoid impacts to ecology.

Various potential mine plans for the Project were carefully considered in the context of the value of the coal remaining in the ground, the value of which is only released by its recovery, against the sensitivities of the environmental and social context of the mining operations involved in its recovery and the costs of doing so in the context of the 'objects' of the *Environmental Planning and Assessment Act 1979* and the 'principles of Ecologically Sustainable Development'.

This Environmental Assessment has assessed the social and environmental impacts of the Project in the context of the 'objects' of the *Environmental Planning and Assessment Act 1979*, which includes the principles of Ecologically Sustainable Development and as required by the Environmental Assessment Requirements.

In consideration of the management and mitigation measures proposed by Coalpac for the Project, it is considered that an appropriate balance has been achieved between the benefits and costs of the Project.

CONCLUSION

This assessment has established that there is a need for the Project from an economic perspective including the continued, and potentially expanded economic support for the local region and the State, and the securing of lowest cost coal for Mt Piper Power Station to seek to assure the ability of TRUenergy to reliably supply appropriately priced electricity to NSW.

To assist further, the 1 Million tonnes per annum proposed for export will assist in meeting the capital costs of the continuation of coal mining at the site and the implementation of the environmental commitments in this Environmental Assessment, whilst allowing Mt Piper Power Station to be provided with cost effective coal.

The Project will provide for the environmental need to ensure the appropriate ultimate closure of Cullen Valley Mine and Invincible Colliery following the recovery of the recoverable in-situ coal resources. It will also enable rehabilitation of currently disturbed mining and facilities areas in a manner to achieve the environmental planning goals for the post mining land use of the area, whether that be for economic, recreational or long term environmental protection purposes.

The Project has been rigorously environmentally assessed in accordance with the 'objects' (including the principles of Ecologically Sustainable Development) and processes required by the Director Generals Requirements concluding that the Project is appropriate for approval under the *Environmental Planning and Assessment Act 1979* and as a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999*.

There are environmental costs that have been identified with certainty and which are capable of being acceptably managed by operational controls, land acquisition and management plans that would be established and adopted as approved by the Director General of Planning and other Government agencies and authorities. Ecological and long term costs have been minimised and will be offset by vegetation and ecological long term offset strategies.

The Project mine plan appropriately represents a material reduction in scale and impact from the plan that would be the Optimal Mine Recovery Plan and justifiably sacrifices a material proportion of the remaining in-situ coal. The Project mine plan meets environmental and social requirements and still results in a mine plan and development for which there is a demonstrated need and from which there are material economic, environmental and social benefits.

The Project will maximise the economic and social value from the remaining coal resource from a mine plan that will appropriately address the environmental and social constraints and the objects of the *Environmental Planning and Assessment Act 1979*, including the principles of ecologically sustainable development. The Project will also provide net benefits of approximately $1,519 Million over its life.

The Project will:

- Maximise the recovery of a coal resource which has been the subject of mining operations for over 100 years;
- Contribute more than 70% of the coal required to maintain efficient operation of the Mt Piper Power Station;
- Contribute to maintaining reliable supply of competitively priced electricity by TRUenergy to NSW;
- Maintain direct employment of up to 120 people and support of contractors;
- Continue and extend financial support to the region and NSW as well as Australia;
- Provide a sand resource to partly address Sydney's increasing demand for industrial sand; and
- Achieve the most efficient economic use of the land.

On the basis of this Environmental Assessment, it is reasonable to conclude that the Project is consistent with the objects of the *Environmental Planning and Assessment Act 1979* and the principles of Ecologically Sustainable Development.

Further, it is also considered that the economic and social benefits of the Project outweigh its social and environmental costs. As such, it is available to the consent authority to approve the Project.

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SECTION 1
Introduction

1 Introduction

1.1 BACKGROUND

Coalpac Pty Ltd (Coalpac) was formed in 1988 and is an Australian owned and operated coal mining company with operations near Cullen Bullen, northwest of Lithgow in New South Wales (NSW).

In November 2006, CET Resources Pty Ltd purchased a controlling interest in Coalpac, with the aim of fully realising the potential of the available coal reserves at Invincible Colliery through innovative mining techniques and increased operational efficiencies. Coalpac then acquired the Cullen Valley Mine in February 2008 and has operated the two mines since that time.

As shown on **Figure 1**, the Cullen Valley Mine and Invincible Colliery operations are located adjacent to the Castlereagh Highway, approximately 25 km north-west of Lithgow in NSW. Both operations are proximate to the township of Cullen Bullen, with Cullen Valley Mine and Invincible Colliery located approximately 1 km to the north-west and south-east, respectively. Coalpac's mining activities occur within the Lithgow City Council (LCC) Local Government Area (LGA).

Coal mining at the Cullen Valley Mine site commenced operations in the late 1800's within the former operational areas of the Tyldesley and Beaumaris Collieries. A range of open cut and underground mining operations have been undertaken since that time at the site which is now occupied by Cullen Valley Mine. The current operations at Cullen Valley Mine were approved in 1997 via Development Consent (DA) 200-5-2003 (as modified in 2004).

Coal mining at Invincible Colliery commenced in 1901 with an underground operation. Open cut mining within the Invincible Colliery has taken place since 1998, including a period where the mine was placed under Care and Maintenance from 2001 to 2006.

The recommencement of mining at the Invincible Colliery was approved under Project Approval (PA) 05_0065, which was surrendered on the granting of PA 07_1027 in December 2008.

Current operations at Invincible Colliery continue to be managed in accordance with PA 07_0127 (as modified).

Coalpac currently has approval to produce up to 2.2 Million tonnes per annum (Mtpa) of product coal by open cut and highwall mining methods for supply to the domestic market. Up to 1.0 Mtpa and 1.2 Mtpa is allowed under the respective approvals for Cullen Valley Mine and Invincible Colliery, respectively.

In 2011, a total of 1.66 Million tonnes (Mt) of product coal was mined from both Cullen Valley Mine and the Invincible Colliery. Coal extraction at Cullen Valley Mine was from the combined Katoomba / Middle River / Moolarben; Upper Irondale; Irondale Seams; and the coalesced Lidsdale / Lithgow Seams within the Illawarra Coal Measures. Coal extraction at Invincible Colliery was from the Irondale Seam and coalesced Lithgow / Lidsdale Seam.

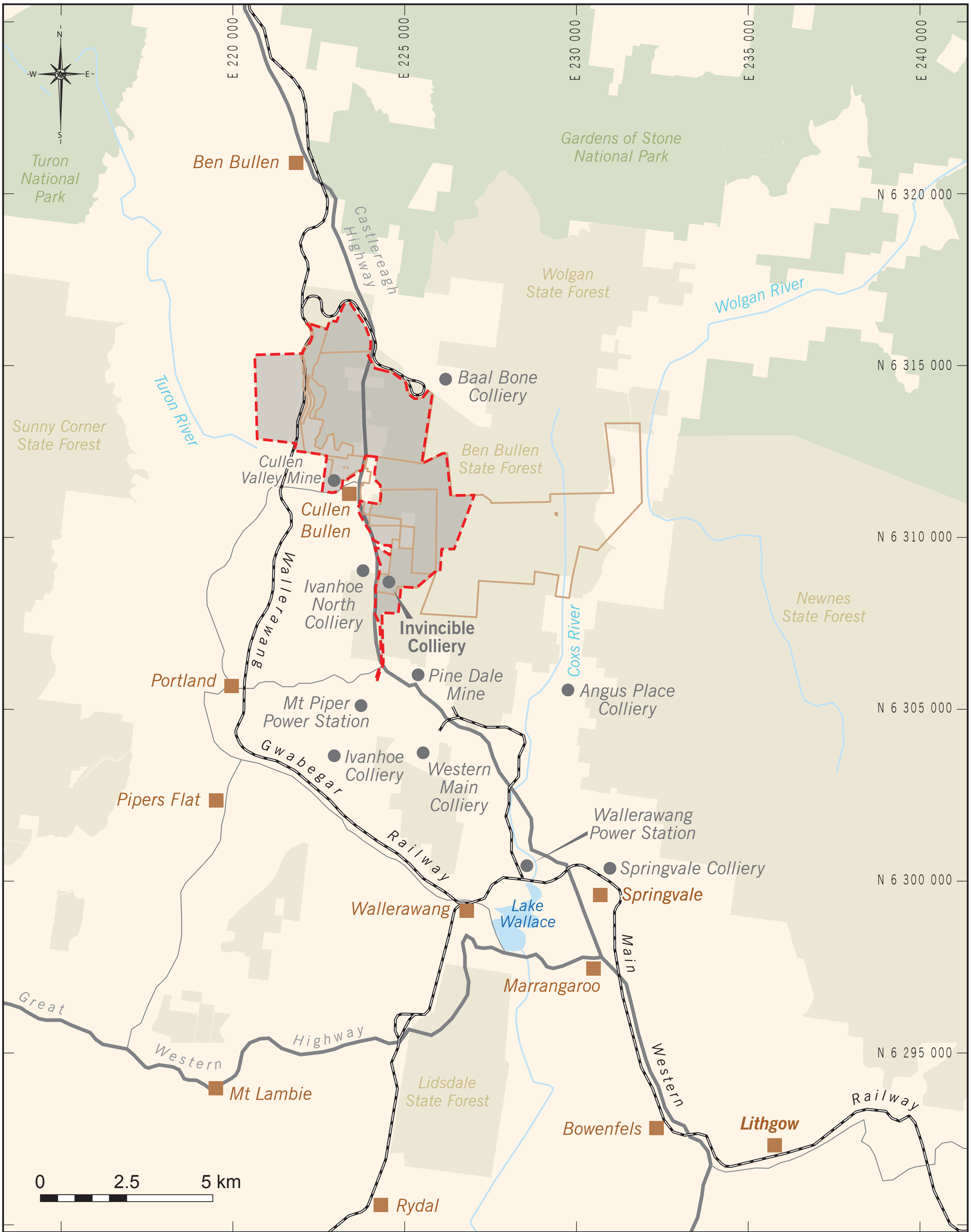
Product coal from both operations is transported by road, primarily to Mount Piper Power Station (MPPS), with smaller volumes provided to other domestic destinations.

1.2 PROPONENT

The Project Proponent is Coalpac (which operates and holds the relevant mining authorities for both the Cullen Valley Mine and Invincible Colliery). The contact details for Coalpac are:

Coalpac Pty Ltd
Cullen Valley Mine and Invincible Colliery
Castlereagh Highway
CULLEN BULLEN NSW 2790

Phone: 02 6359 0600
Fax: 02 6359 0608
http://cetresources.com/operations



Project Boundary

Coalpac Mining Authorities

HansenBailey

Coalpac Pty Ltd

COALPAC CONSOLIDATION PROJECT

Regional Locality

Filename: 0915 F01 General Location.ai	Date: 14.12.11	Drawn: BD	Figure 1

1.3 DOCUMENT PURPOSE

Coalpac seeks a contemporary Project Approval from the Minister for Planning and Infrastructure under Part 3A of the EP&A Act to consolidate the operations and management of the Cullen Valley Mine and Invincible Colliery under a single planning approval (the Project). The Project would allow coal mining operations largely within Coalpac's current mining authorities to continue for a further period of 21 years.

A Major Projects Application (10_0178) and supporting Preliminary Environmental Assessment (PEA) were accepted by the Department of Planning and Infrastructure (DP&I) (formerly Department of Planning) in October 2010 under Section 75E of Part 3A of the EP&A Act. Subsequently, the Director-General's Environmental Assessment Requirements (EARs) were initially issued by DP&I on 16 December 2010.

This Environmental Assessment (EA) has been prepared by Hansen Bailey Environmental Consultants (Hansen Bailey) on behalf of Coalpac to support an application for Project Approval under Section 75E of the EP&A Act. The Project Boundary to which this EA applies is illustrated in **Figure 1**. The schedule of land to which this EA applies (all land located within the Project Boundary) is provided in **Appendix B**.

This EA also supports an application to the Federal Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) to determine whether the Project will have, or is likely to have, a significant impact on a Matter of National Environmental Significance (MNES) which is set out in Part 3 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This EA and associated environmental impact studies include the consideration of all issues raised during the stakeholder engagement process undertaken for the Project. This EA has also been prepared to address the requirements of the Director-General's EARs issued by DP&I by assessing the social, economic and environmental impacts of the Project to enable the Minister for Planning and Infrastructure to determine the Project Approval as sought.

A summary of stakeholder issues raised in relation to the Project and a checklist of each EAR and where these have been incorporated into this EA is presented in **Section 6**.

1.4 DOCUMENT STRUCTURE

This EA consists of five volumes. This volume (Volume 1) encompasses the main EA report prepared by Hansen Bailey and (in relation to the Project) presents a description, summary of associated environmental, social and economic impacts and the mitigation and management measures proposed to be established. It is structured as follows:

- **Section 2** provides relevant information on the existing environmental setting;
- **Section 3** describes the existing mining operations at the Cullen Valley Mine and Invincible Colliery, environmental management system and existing biodiversity and heritage commitments;
- **Section 4** provides a detailed Project description;
- **Section 5** outlines the regulatory framework applicable to the Project;
- **Section 6** details stakeholder engagement undertaken for the Project and discusses issues raised. Specifically, this section lists the EARs and identifies where these matters are addressed in this EA;
- **Section 7** provides a summary of the risk assessment process adopted to rank all identified environmental and social issues to assist in directing the focus of this EA;
- **Section 8** assesses environmental and social issues and impacts predicted for the Project and outlines the management and mitigation measures proposed for each;
- **Section 9** presents Coalpac's Statement of Commitments;
- **Section 10** provides a detailed Project justification;
- **Section 11** lists abbreviations used throughout this EA;
- **Section 12** provides a list of all materials referenced in this EA; and
- **Section 13** presents the study team involved in the compilation of this EA.

Volume 1 also contains the schedule of land to which this EA applies, regulatory correspondence, existing planning approvals, stakeholder engagement materials and the revised environmental risk assessment undertaken during the preparation of this EA.

Volumes 2, 3, 4 and 5 present the remaining technical assessments in full, which support the main volume of this EA.

SECTION 2

Existing Environment

2

Existing Environment

This section provides an overview on the existing climate, geology, topography and land use of the region within and surrounding the Project Boundary. Land ownership as relevant to the Project is also discussed.

2.1 TOPOGRAPHY AND CATCHMENTS

The Project is located on the western slopes of the Great Dividing Range at elevations between 900 m – 940 m Australian Height Datum (AHD), with several steep sandstone escarpments topographically dividing the site. The Project is typified by moderately undulating terrain. West of the Project Boundary, the topography gently slopes towards Cullen Valley to an elevation of approximately 840 m AHD.

The Project commences at the foothills at the western edge of the Great Dividing Range and is located wholly within the upper catchment of the Turon River. The upper Turon River catchment is located approximately 500 m east of the divide from the Coxs River catchment that is created by the steep terrain within the Ben Bullen State Forest associated with the Great Dividing Range (see **Figure 1**). The Turon River flows in a westerly direction before draining into the Macquarie River, approximately 35 km north-east of Orange.

The Project sits relatively high in the landscape with only ephemeral drainage lines present. As a result of the local topography, there are several minor unnamed ephemeral drainage lines present, which intermittently flow through the valleys within the Project Boundary.

These drainage lines flow into the upper catchments of Cullen Creek, Dulhuntys Creek and Jews Creek, which are all tributaries of the Turon River. None of these creeks cross the Project Disturbance Boundary.

Jews Creek drains adjacent to the northern extent of the Project Boundary and includes the Ben Bullen Creek, which drains the existing Baal Bone Colliery. Jews Creek drains into the Turon River some 5 km north-west of the Project. Cullen Creek collects runoff from the ephemeral drainage lines flowing from the existing Invincible Colliery and is situated toward the southern extent of the Project Boundary. Cullen Creek drains towards the west into Dulhuntys Creek, which in turn drains into Williwa Creek, which joins Jews Creek to the north of the Project Boundary.

2.2 LAND USE

The Project Boundary is situated on land largely occupied by the Ben Bullen State Forest and is located on the western slopes of the Great Dividing Range. The Ben Bullen State Forest has historically been utilised for forestry and mining (primarily associated with the existing operations of Cullen Valley Mine and Invincible Colliery). In addition to the Ben Bullen State Forest, the remaining lands within the Project Boundary are utilised for agricultural activities including sheep and cattle grazing, road and rail infrastructure.

The Castlereagh Highway bisects Cullen Valley Mine and Invincible Colliery and extends in a north-south direction through the centre of the Project Boundary, connecting the Great Western Highway in the south and the Golden Highway in the north. The township of Cullen Bullen is also located at the junction of the Castlereagh Highway and the Portland – Cullen Bullen Road, immediately to the south-west of the Cullen Valley Mine and to the north-west of Invincible Colliery. The Wallerawang – Gwabegar Railway line also runs through the western extent of the Project Boundary (see **Figure 1**).

Land use in the broader region comprises other mining operations, power generation and industrial activities, National Parks, a range of agricultural enterprises and other areas of forestry reserve.

Cullen Bullen is a small rural township comprising residential properties, a school, community hall, hotel and a general store. The region also supports an array of other minor industries consistent with the rural community setting.

Coal mining has played an important role in the local economy of Cullen Bullen since 1888 following the establishment of the Cullen Bullen Colliery. In recent years, coal mining has progressed further, with several new mining developments along with the continuation of a number of historical operations.

Each of the key land uses in the region is discussed further below as relevant to the Project.

2.2.1 State Forests, Forestry and National Parks

The majority of the Project Boundary is dominated by remnant vegetation associated with the Ben Bullen State Forest and occurs across a landscape characterised by sandstone escarpments.

The Ben Bullen State Forest has had a long history of disturbances commonly associated with forestry activities, including selective logging and the construction of access trails being undertaken in the forest since the mid 1800s. In addition to forestry operations, disturbance associated with livestock grazing, open cut and underground mining, and recreation activities (including hunting and four wheel driving) have also occurred.

Remnant vegetation within the Ben Bullen State Forest is of relatively good quality, with some exotic species known to occur. Despite active logging activities not recently occurring in the Ben Bullen State Forest, disturbances associated with commercial timber harvesting remain evident, including tree stumps and coppicing trees present in the more accessible areas.

In addition to the Ben Bullen State Forest, there are several other State Forests and National Parks located in the region, including: the Gardens of Stone National Park located approximately 2 km to the north, the Wolgan State Forest located approximately 8 km to the north-east and the Newnes State Forest, located approximately 12 km to the south-east of the Project Boundary as shown on **Figure 1**.

2.2.2 Coal Mining

Coal mining still plays an important role in the local economy and is a common land use, with numerous operations and mining authorities currently held across the region. When the Great Western Railway crossed the Blue Mountains between 1867 and 1869, coal mining became a viable industry for the local area and heralded a regional boom in coal mining and associated industries.

The Cullen Bullen Colliery was the first major coal mining development undertaken at Cullen Bullen. Historic underground operations associated with the Cullen Bullen Colliery have extended from the existing township and into the Project Boundary. One of most significant and long lasting coal mines in the Cullen Bullen area was the Great Western Mine, the site of which was located on land now occupied by the Cullen Valley Mine. Additional detail in relation to the long history of coal mining in the region is described in **Section 8.13**.

Coal mining remains a significant land use in the vicinity of the Project with several other coal mines operating in the region including Ivanhoe North Colliery, Baal Bone Colliery, Pine Dale Mine, Angus Place Colliery, Springvale Colliery, Clarence Colliery and Airly Mine. These operations hold mining authorities over much of the local area and represent a broad range of mining methods, coal production levels and developmental stages as summarised in **Table 1**. The locations of nearby mining operations in relation to Cullen Valley Mine and Invincible Colliery are shown on **Figure 1**.

Table 1 Coal Operations in the Region

Operation & Owner	Location	Mining Method(s)	Approval Status
Ivanhoe North Colliery (Centennial Coal)	Approximately 1 km south-west of the Project Boundary	Open cut with up to 300,000 tonnes per annum (tpa) of Run Of Mine (ROM) coal	19/01/12 – 02/05/12
Baal Bone Colliery (Wallerawang Collieries)	Approximately 0.5 km north-east of the Project Boundary	Underground mining up to 2.8 Mtpa of ROM coal	14/01/11 – 31/12/14
Pine Dale Mine, Yarraboldy Extension (Enhance Place Pty Ltd)	Approximately 5 km south-east of the Project Boundary	Open cut up to 350,000 tpa ROM coal and with a maximum of 800 000 t of ROM coal extracted over the life of the Project	20/02/11 – 31/08/13 (for mining operations)
Angus Place / Springvale Joint Venture (Centennial Coal)	Approximately 6 km south-west of the Project Boundary	Angus Place: Underground up to 3.5 Mtpa of ROM Coal Springvale: Underground up to 3.4 Mtpa of ROM coal	13/09/06 – 18/08/24 27/07/92 – 01/09/25
Airly Mine (Centennial Coal)	Approximately 17 km north of the Project Boundary	Underground mining up to 1.8 Mtpa	21/08/09 – 21/08/14
Clarence Colliery (Centennial Coal)	Approximately 25 km south-east of the Project Boundary	Underground mining up to 3 Mtpa	19/12/05 – 31/12/26

2.2.3 Power Generation

Cullen Bullen (and the greater district) is largely sustained by local coal mines and power stations, and has a long history of economic benefits from mining activities. Coalpac currently has approval to supply product coal from both Cullen Valley Mine and Invincible Colliery to the MPPS, with flexibility in place to supply the Wallerawang Power Station (WPS) on a limited basis.

MPPS and WPS are operated by Delta Electricity and are located approximately 1 km south-west and 6 km south from the Project Boundary respectively, as shown on **Figure 1**. The combined electricity generation from both power stations is up to 2,400 Megawatts, equating to approximately 8% of the total power demand of the National Electricity Market (see correspondence in **Appendix D**).

2.2.4 Recreation

As discussed in **Section 2.2.1**, the area immediately surrounding the Project Boundary consists of a number of National Parks, State Forests and Conservation Areas generally situated along the Great Dividing Range. These areas support an array of associated recreational activities including bushwalking, hunting (in State Forests), trail bike riding and camping, and four wheel drive trails are prevalent throughout the region.

However, in relation to the Ben Bullen State Forest, within which the Project is located, recreation values would also appear to be minimal having no recreation infrastructure (i.e. walking tracks, 4WD tracks, camping areas, etc).

The Greater Blue Mountains World Heritage Area is located approximately 50 km south-west of the Project Boundary and contains spectacular lookouts, mountain bike trails along the cliff-tops and in the valleys, along with over 140 km of walking tracks of all grades in diverse settings (Office of Environment & Heritage (OEH)) formerly Department of Climate Change and Water (DECCW 2011).

In addition, the region also supports a number of other attractions and recreational activities, including numerous museums and galleries displaying the vast history and culture of the area, lookouts, caves, water sports, orienteering, fishing, horse riding and the historic Zig Zag Railway.

The NSW Game Council has declared a number of State Forests suitable for conservation hunting, which permits licensed recreational hunters to assist with the control of introduced species. Forests open for conservation hunting within 10 km of the Project Boundary include Ben Bullen State Forest, covering an area of 6,783 hectares (ha), Newnes State Forest covering 24,794 ha (located approximately 7 km east) and the Sunny Corner State Forest covering 18,857 ha (located approximately 7 km west) as shown on **Figure 1**.

2.2.5 Rural and Residential Areas

The small rural-residential township of Cullen Bullen is located adjacent to the Project Boundary (as shown on **Figure 1**) and consists of approximately 200 residents. The mining and power generation industry sectors in the region provide employment for approximately 23% of the residents (ABS 2010).

The Project Boundary is located approximately 25 km north-west of Lithgow, which has approximately 21,000 residents. Lithgow has historically been an inland mining and industrial centre. However, recent developments have also seen Lithgow recognised as an important heritage centre and the town is now viewed as a desirable rural-residential setting due to its accessibility to the Western Region, while still being located in relatively close proximity to Sydney.

Other small rural villages including Ben Bullen, Portland and Wallerawang are located 7 km north, 8 km south-west and 10 km south of the Project Boundary, respectively.

2.2.6 Local Industry

As outlined above, the common land use in the vicinity of the Project is for coal mining and power generation. There is an array of relatively smaller scale agricultural industries that are also present in the local area. These include a hazelnut venture, horticulture enterprises, sheep and cattle grazing and pastoral improvement operations, which are primarily located to the west of the Project Boundary on more open, undulating lands. In addition, the wider region includes a number of businesses that support the local tourism sector associated with the Blue Mountains World Heritage Area, which receives an estimated 3 million visitors per year (OEH 2011).

2.3 LAND OWNERSHIP

The non-mine land ownership within and surrounding the Project Boundary is listed in **Table 2**. This table allocates each individual lot of land in the area a unique identifying number, and should be read in conjunction with **Figure 2**, which provides an overview of land ownership within and surrounding the Project Boundary.

Additional detail regarding the status of land ownership within Cullen Bullen is illustrated on **Figure 3**. Landholders that hold several contiguous parcels of land are illustrated as a single colour on both **Figure 2** and **Figure 3**. Land ownership surrounding the Project Boundary primarily consists of private freehold, Coalpac (and subsidiary) owned land, land owned by other mining or power generation companies, land held by Forests NSW and land held by the Crown. There are five private residences located primarily within the central and western extent of the Project Boundary.

Table 2 Non-Mine Land Ownership

ID	Name	ID	Name	ID	Name
16	JR Tilley & DG McGrath	88	PR & KA Hall	129	PR & KA Hall
17	Destanag Pty Ltd	89	PR & KA Hall	130	D Barber
40	VA, CA, SL & JA Hantos	91	PR & KA Hall	131	D Barber
41	PR & KA Hall	92	PR & KA Hall	132	D Barber
42	Larkin Pastoral Co Pty Ltd	93	PR & KA Hall	133	PR and KA Hall
43	Destanag Pty Ltd	94	PR & KA Hall	134	PR and KA Hall
44	Destanag Pty Ltd	95	Larkin Pastoral Co Pty Ltd	135	PR and KA Hall
45	Destanag Pty Ltd	96	Larkin Pastoral Co Pty Ltd	136	PR and KA Hall
49	Larkin Pastoral Co Pty Ltd	97	RI & GM Larkin	137	Larkin Pastoral Co Pty Ltd
50	Larkin Pastoral Co Pty Ltd	98	RI & GM Larkin	138	RI & GM Larkin
52	Larkin Pastoral Co Pty Ltd	99	RI & GM Larkin	139	RI & GM Larkin
53	O'Farrell Pastoral Company Pty Ltd	100	RI & GM Larkin	140	RI & GM Larkin
54	O'Farrell Pastoral Company Pty Ltd	101	RI & GM Larkin	141	RI & GM Larkin
55	CJ & MH O'Farrell Pty Ltd	102	RI & GM Larkin	142	PG Desch & KC Farrugia
56	AP & MA Constantinides & DR Gazzard	103	JR & DM Cram	143	DB Speirs
		104	KA Thomas	144	DA & DM Muldoon
58	KA & MJ Kirk	105	A & M Abou-Touma	170	Coalpac (formerly BE Nakhle)
59	KA & MJ Kirk	106	A & M Abou-Touma	173	RK Dickens (Perpetual Lease) *
60	TJ & BN Gilshenan	107	G & M Gebrael	174	RK Dickens *
61	KM Price	108	PJ & CI DI Mauro	175	RK Dickens *
63	RN Harris	109	J, P, GG & CG Piccione	176	GE Orellana
64	PR & KA Hall	110	J Hannouche	178	RK Dickens *
65	PR & KA Hall	111	A & R Salman	179	RK Dickens *
66	PR & KA Hall	112	J Hannouche	180	RK Dickens *
67	PR & KA Hall	113	MB & AM Ringin	181	RK Dickens *
68	Larkin Pastoral Co Pty Ltd	114	PJ & EJ Isaacson	182	RK Dickens *
69	Larkin Pastoral Co Pty Ltd	115	GA & BS Jessep	183	RK Dickens *
70	Larkin Pastoral Co Pty Ltd	116	GA & BS Jessep	184	RK Dickens *
71	Larkin Pastoral Co Pty Ltd	117	P & WE Tilley	185	RK Dickens *
72	AP & MA Constantinides & DR Gazzard	118	GA & BS Jessep	186	RK Dickens *
73	O'Farrell Pastoral Company Pty Ltd	119	LN Goldspink	193	Crown (Cullen Bullen General Cemetery)
74	JC Murray & KL Mcfarlane	120	GA & BS Jessep		
75	JC Murray & KL Mcfarlane	121	GA & BS Jessep	194	JGQ Nominees Pty Ltd **
76	JC Murray & KL Mcfarlane	122	JL Macphee	195	KJ Blackley *
77	JC Murray & KL McFarlane	123	TW & JA Nolan	197	BE & CE Leisemann & IL & KID Follington **
79	RI, AM & GM Larkin	124	DW Macphee		
80	AG Dickson	127	PR & KA Hall	198	DA Tilley *
87	BK Abrahams	128	PR & KA Hall	199	DA Tilley *

ID	Name	ID	Name	ID	Name
200	BE & CE Leisemann & IL & KID Follington *	246	DW & GJ McCann	290	SW Hobby
201	KD & RL Kellam *	247	KO & SL Rochester	291	A & R Inzitari
202	GJ Keightley	248	PB Draper	292	SP Maybury
203	JR Gracey	249	GER Young	293	SP Maybury
204	JR Gracey	250	GER Young	294	A & R Inzitari
205	D Dino & J Seraglio	251	GER Young	295	DR & JA Battersby
206	D Dino & J Seraglio	252	GER Young	296	PF Kendall
209	DJ Ryan	253	M Pasztor	297	BJ Scott
210	FC & K Tilley	254	RW Selmes	298	PF & DM Toner
211	BJ & JM Fitzgerald	255	GE Lane	299	PF Kendall
216	BM Emmott	256	GE Lane	300	S & H Filla
218	G & BA Tilley	257	DJ Tilley	301	CM O'Neill
219	JR Tilley	258	S & H Filla	302	CJ Conroy
220	KL Bunyon	263	M Stone	303	AI Miller & BS Wilson
222	CP Bainy	264	RD & DJ Blackley	304	AI Miller & BS Wilson
223	RJ Whittaker & SR Burrows	267	AW Gleeson & SA Muldoon	305	AI Miller & BS Wilson
224	JR Tilley	268	EA & DM Lane	306	AI Miller & BS Wilson
225	JR Tilley	269	RD Blackley	307	AI Miller & BS Wilson
226	JR Tilley	270	RD Blackley	308	T Bates
227	RG Wright & KL Norris	271	CD & JD McCann	309	ME Stewart
228	AA Woods, EJ Nicholls & LH Field	272	Minister for Education & Training (Cullen Bullen Primary School) ^	310	SJ Bandiera
				311	WG Brown
229	AA Woods, EJ Nicholls & LH Field	273	GJ & TA Hutchison	312	LM McDonald
230	CM & BA Gilbert	274	JL & MB Howden	313	N Viaphay
231	J Fuller	275	JL & MB Howden	314	KR Waters
232	RM Pyne	276	KJ Blackley (Perpetual Lease)	315	KL Godden
233	TE Caddis & RM Pyne	277	RJ Tilley	316	CE & SM Davis
234	S Napoli	278	FS Gilson	317	CE & SM Davis
235	RK & SM Lane	279	N & JA Anderson	318	AW Hall
236	TJ & KO Tilley	280	SR Williams	319	AW Hall
237	MC Crane	281	SJ Brooks	320	AW Hall
238	DP Rochester	282	MW Mercer	321	N Thorne
239	SG Tweedie	283	MW Mercer	322	J & DLA Markowski
240	DW & GJ McCann	284	VN & E Deveigne	323	J & DLA Markowski
241	WF Fitzgerald	285	E Banks	324	P Reddan
242	WF Fitzgerald	286	MB Banks	325	SP & SA Duggan
243	No record held by LPI	287	KD Fripp	327	J Playford
244	No record held by LPI	288	MB Banks	328	RP Harris
245	M Botfield	289	NG Harradine	329	R Bailey

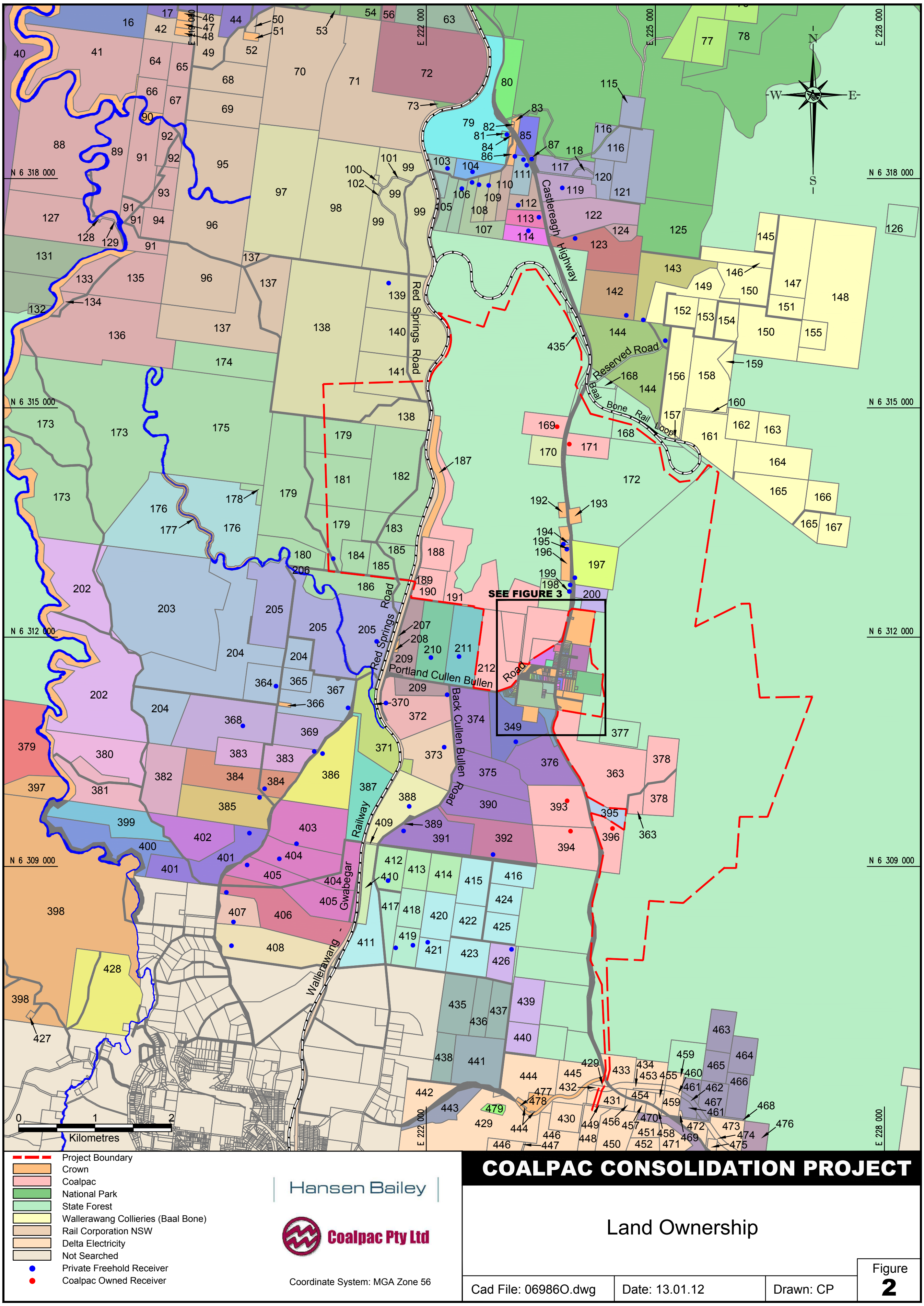
ID	Name	ID	Name	ID	Name
330	DJ Annesley	368	RA Fuller	406	P W Griffiths
331	GJ & VC Walsh	369	RA Fuller	407	TJ & SM Griffiths
332	BN Rochester	370	JA, SE Byron & DC Hutton	408	RH Griffiths
333	RP Doyle	371	MA & JL Taylor	409	VA McFadden
334	P Warner & YA Harris	372	RE Gilmore	410	PJ & SL McFadden
335	P Warner & YA Harris	373	WF Fitzgerald	411	SJ & DS Taylor
336	P Warner & YA Harris	374	MG Bulkeley	412	V & F Fava, C Rositano, F Tedesco & E Todorello
337	P Warner & YA Harris	375	MG Bulkeley		
338	GJ Williams	376	MG Bulkeley	413	V & F Fava, C Rositano, F Tedesco & E Todorello
339	GJ Williams	379	VL Chadwick		
340	GJ Williams	380	LJ Wallwork	414	V & F Fava, C Rositano, F Tedesco & E Todorello
341	GJ Williams	381	SG & DR Bolzan	415	SJ & DS Taylor
342	GJ Williams	382	DA & KL Mitchell	416	SJ & DS Taylor
343	AG & RL Williams	383	BS Bretherton & B Chandwick	417	AP & KA Brown
344	RT & VE Dobson	384	A Tabone	418	AP & KA Brown
345	DK & K Northey	385	Ceedive Pty Ltd	419	AP & KA Brown
346	GJ & VC Walsh	386	TJ Griffiths	420	SJ & DS Taylor
347	DJ Annesley	387	JR Embleton & KJ Kelly	421	SJ & DS Taylor
348	RE Gilmore & MG & PJ Bulkeley	388	VA McFadden	422	SJ & DS Taylor
349	RM Crane	390	MG Bulkeley	423	SJ & DS Taylor
350	Tanwind Pty Ltd	391	MG Bulkeley	424	SJ & DS Taylor
352	RS Speirs	392	IG Palmer	425	SJ & DS Taylor
353	JM Ellis	393	JGQ Nominees Pty Ltd **	426	JWJ & SM Taylor
354	E Fabits	394	JGQ Nominees Pty Ltd **	427	J Menchin
355	MS Ivey	397	J Menchin	428	KJ Taylor
356	DC & KT Claydon & JD Garrett	398	J Menchin	435	GW & JL & TJ & JA Clark
357	ST & CP Wilson	399	PJ & TM McFadden	436	GW & JL & TJ & JA Clark
358	RJ Duncan	400	D Hart	437	GW & JL & TJ & JA Clark
361	RR Cole	401	KG & DA Neaves	438	GW & JL & TJ & JA Clark
362	RE Gilmore & MG & PJ Bulkeley	402	KJ & DK Shaw	439	JWJ & SM Taylor
364	JR Gracey	403	BR & E Brown	440	JWJ & SM Taylor
365	JR Gracey	404	BR & E Brown	441	GW & JL Clark
367	JR Gracey	405	BR & E Brown	443	Lithgow District Car Club Inc. ^

All ID numbers not represented in the above table are outside the frame of **Figure 2**, or are mining, industrial commercial or vacant crown land.

* Agreement being negotiated with landholder

** Agreement in place with landholder

^ No residence, or a commercial or public building



Castlereagh Highway
Red Springs Road
Reserved Road
Baal Bone Rail Loop
Portland Cullen Bullen Road
Back Cullen Bullen Road
Railway
Gwabegar
Wallerawang
SEE FIGURE 3
N 6 318 000
N 6 315 000
N 6 312 000
N 6 309 000
E 219 000
E 222 000
E 225 000
E 228 000
N
S
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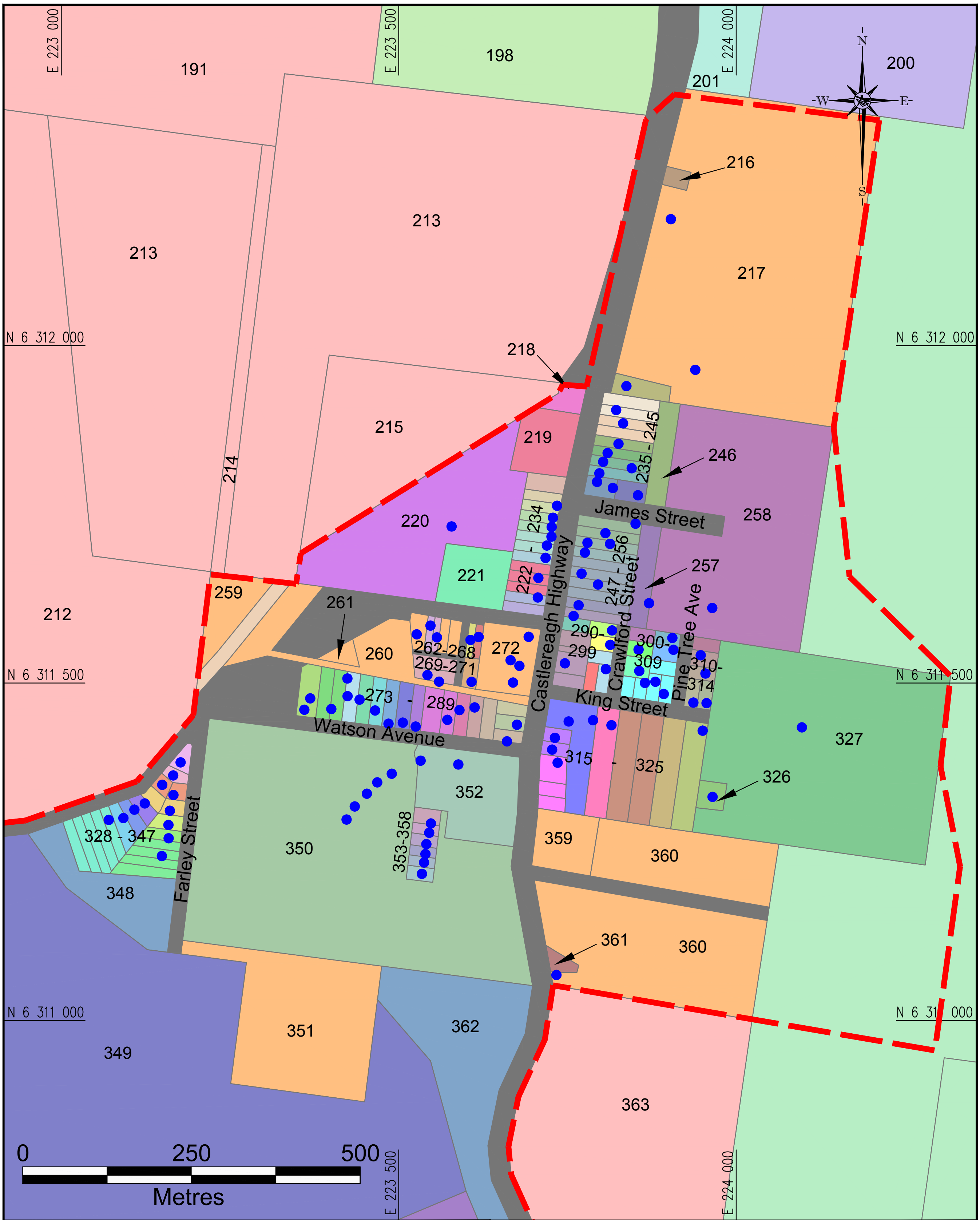
W
0
1
2
Kilometres
Project Boundary
Crown
Coalpac
National Park
State Forest
Wallerawang Collieries (Baal Bone)
Rail Corporation NSW
Delta Electricity
Not Searched
Private Freehold Receiver
Coalpac Owned Receiver
Hansen Bailey
Coalpac Pty Ltd
Coordinate System: MGA Zone 56
COALPAC CONSOLIDATION PROJECT
Land Ownership
Cad File: 06986O.dwg
Date: 13.01.12
Drawn: CP
Figure
2



Project Boundary
Crown
Coalpac
Rail Corporation NSW
Not Searched
Private Freehold Receiver

Hansen Bailey

Coalpac Pty Ltd

Coordinate System: MGA Zone 56

COALPAC CONSOLIDATION PROJECT

Land Ownership - Cullen Bullen

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2.4 CLIMATE

The climate of the region is defined by its latitude, inland location, and the steep ridge and valley escarpments typical of the western slopes of the Great Dividing Range. The climate is generally cool-temperate, characterised by relatively mild summers and cold winters. Rainfall patterns are summer dominant.

Fog and frost are common in the cooler months, although a range of factors including the ridge and valley topography, altitude, aspect and exposure result in some localised temperature variations within the region.

Temperature inversions are common in winter months, tending to occur on frosty mornings and on days when fogs are present.

Data from a range of meteorological monitoring stations in the region were reviewed during the preparation of this EA, in addition to the two existing meteorological stations operated by Coalpac for the Cullen Valley Mine and Invincible Colliery. The Bureau of Meteorology (BoM) also operates a number of monitoring stations in the area, which have also been utilised during the preparation of this EA to review regional climatic conditions.

A description of the regional monitoring locations and records of the BoM used to examine long term background climatic conditions for the Project is provided in **Table 3**.

Table 4 provides a summary of the long term climatic conditions in the vicinity of the Project Boundary, with each of the key parameters discussed further below.

2.4.1 Temperature and Humidity

Temperature records from the Lithgow (Birdwood Street) BoM station indicate that January reaches the hottest temperatures with a maximum mean average of 25.5°C. July records the coolest month with maximum monthly mean temperatures of 10.4°C and minimum of 0.7°C.

Humidity levels exhibit seasonal variability throughout the year, with mean morning (9:00 am) humidity levels ranging from 60% - 82% and mean afternoon (3:00 pm) humidity levels ranging from 50% - 66%. Late spring and early summer are generally drier than the rest of the year.

2.4.2 Rainfall

The Western Coalfields generally experience a summer dominant rainfall which reduces slightly throughout the cooler winter months. The Lithgow (Birdwood Street) BoM site indicates that the mean maximum rainfall occurs during January with a mean monthly rainfall of 94 mm and mean minimum rainfall occurring during September with 59 mm.

The long term annual mean rainfall recorded at Lithgow (Birdwood Street) BoM station is 859 mm falling over an average of 96 days.

2.4.3 Evaporation

Data from the BoM Bathurst Agricultural Research Station was used to assess representative evaporative trends typical of the region. Summer months experienced higher daily evaporation in direct correlation with increased temperature and presence of afternoon winds typical of the region. Evaporation is greater than annual precipitation with mean monthly pan evaporation rates, varying seasonally from 211 mm during January to 33 mm during June, with a monthly mean evaporation of 112 mm.

2.4.4 Wind Speed and Direction

Data from the Cullen Valley Mine meteorological site shows prominent westerly and easterly patterns of winds on an annual basis.

Winds from the eastern quadrant are more prominent in summer and autumn and winds from the north are more prominent in summer and spring.

Winds from the western quadrant are predominant in winter and spring.

Table 3 Regional Meteorological Stations

Name	Location	Parameters Recorded	Period of Record
Lithgow (Birdwood Street)	Approximately 27 km south-east of the Project Boundary	• Mean Monthly Temperature • Mean Monthly Rainfall • Mean Monthly Rain Days • Mean Monthly Relative Humidity	1889 to 2006
Bathurst Agricultural Research Station	44 km west south-west of the Project Boundary	• Mean Daily Evaporation	1908 to Present

Table 4 Meteorological Data Summary

Month	Mean Daily Temperature (°C)		Mean Rainfall (mm)	Mean Rain Days	Mean Humidity (%)		Mean Evaporation (mm)
	Lithgow (Birdwood Street)		Lithgow (Birdwood Street)	Lithgow (Birdwood Street)	Lithgow (Birdwood Street)		Bathurst Agricultural Research Station
	Min	Max			9:00 AM	3:00 PM	
Jan	11.9	25.5	94.3	8.3	64.0	54.0	210.8
Feb	12.1	24.7	83.8	7.6	70.0	58.0	162.4
Mar	10.1	22.4	83.9	8.4	73.0	60.0	139.5
Apr	6.7	18.4	62.7	7.0	76.0	59.0	87.0
May	3.9	14.3	63.0	7.6	81.0	66.0	52.7
Jun	1.8	11.1	67.6	8.8	82.0	67.0	33.0
Jul	0.7	10.4	67.6	8.4	79.0	66.0	37.2
Aug	1.3	12.0	63.4	8.3	73.0	56.0	55.8
Sep	3.4	15.4	58.9	7.9	64.0	54.0	84.0
Oct	6.0	18.7	67.0	8.2	60.0	51.0	124.0
Nov	8.1	21.5	70.0	7.7	60.0	53.0	156.0
Dec	10.4	24.5	76.1	7.6	61.0	50.0	201.5
Mean	**6.4**	**18.2**	**71.5**	**8.0**	**70.0**	**58.0**	**112.0**

Data from the Invincible Colliery meteorological site shows prominent winds from the south-west and north-east directions. The summer and autumn windroses show a higher percentage of winds from the north-west sector whereas the winter windrose shows a higher percentage of winds from the south-west sector. The spring windrose shows a very similar pattern to the annual windrose.

On an annual basis, the percentage of calms received at both Cullen Valley Mine and Invincible Colliery sites are 41.2% and 12.9% respectively. Both sites indicate high level of calms and occur as a result of localised elevated terrain in the vicinity of both meteorological monitoring locations.

2.5 GEOLOGY

2.5.1 Stratigraphy

The Project is located within the Western Coalfields of NSW, which is geologically located on the western edge of the Sydney Basin. The Sydney Basin consists of a series of gently dipping sedimentary beds of shale and sandstone of Permo-Carboniferous age capped by massive sandstones of Triassic Age (Yoo *et al* 2001). Directly beneath the Triassic sandstone, these beds contain coal seams and form the Upper Coal Measures. The measures extend from the western boundary of the Western Coalfields in an easterly direction, dipping gently at an angle of 1 - 3° to the north-east.

The Western Coalfields are characterised by the prominent cliffs and eroding plateaus of the Triassic age sandstone and shale, the Narrabeen Group which overlies the shale, sandstone, conglomerate and coal of the Permian Aged Illawarra Coal Measures located within the Project Boundary, which form the eroded slopes that fall away from the sandstone and shale cliffs. The Western Coalfield extends from the south of Lithgow to the north of Ulan and is bounded to the west by outcroppings of the Lithgow Seam, the deepest coal seam of the measures.

There is no defined eastern boundary, given the dipping of the coal measures to the north-east below the Hawkesbury Sandstone of the Blue Mountains. The basement rocks of the western Sydney consist of folded Palaeozoic metamorphosed rocks of the Lachlan Fold Belt, Late Carboniferous granites and Early Permian Rylstone Volcanics (Yoo *et al* 2001).

Coal resources associated with the Project Boundary occur within the Permian Age Illawarra Coal Measures. There are seven coal seams located within these measures which will be extracted for the Project, which occur as follows (in descending order):

- Katoomba Seam;
- Middle River Seam;
- Moolarben Seam;

- Upper Irondale Seam;
- Irondale Seam;
- Lidsdale Seam; and
- Lithgow Seam.

An indicative stratigraphic column for the Project showing the target coal seams is presented in **Figure 4**.

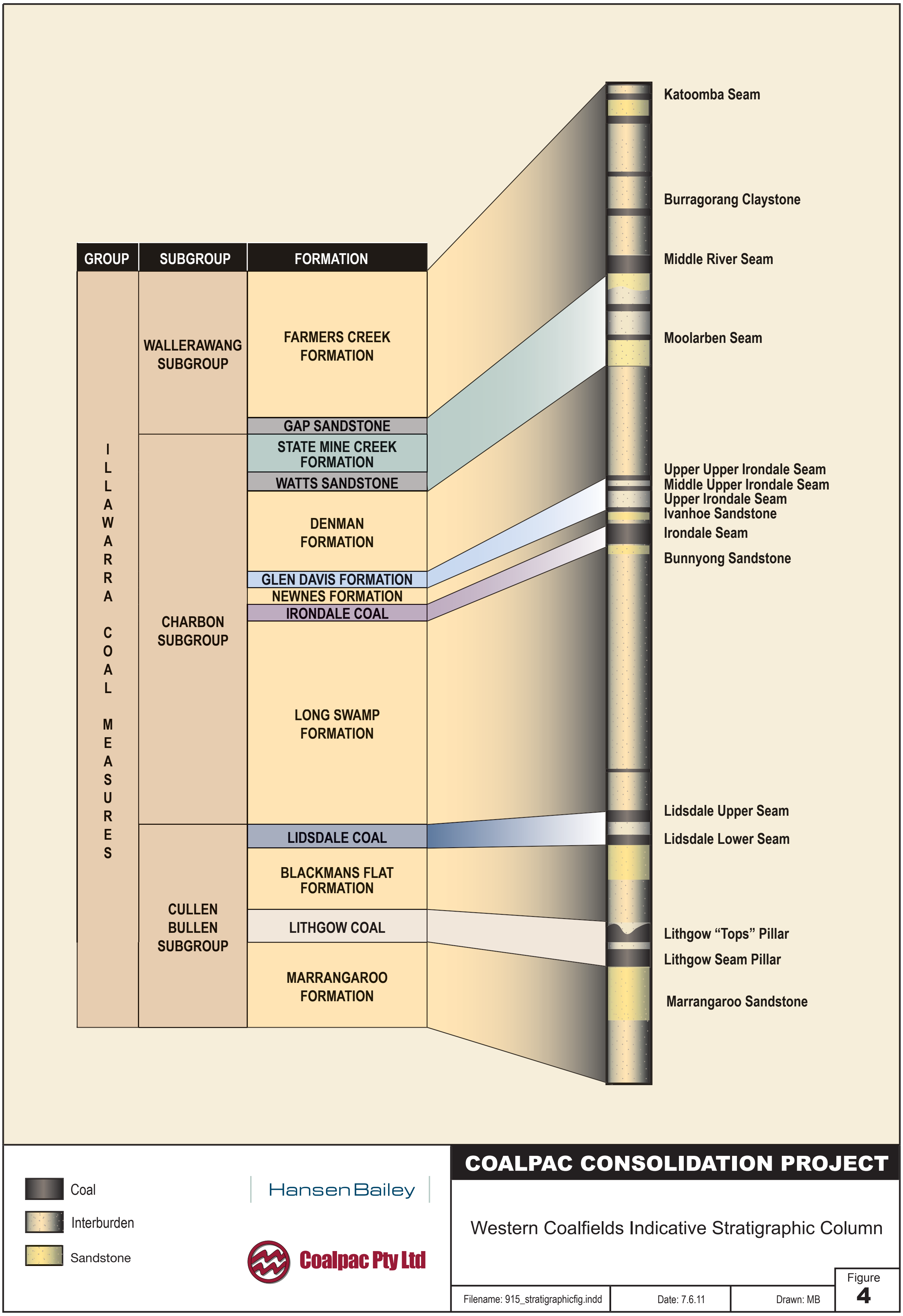
The Marrangaroo Formation, which is targeted in the sand extraction as a component of the Project, is located immediately beneath the Lithgow Coal Seam (typically separated by carbonaceous mudstone) and outcrops persistently throughout the Western Coalfield, ranging in thickness from 2 m to 16 m. The formation commonly has a sharp erosive basal contact with silty and coaly sedimentary rocks of the Nile Subgroup or sandy siltstone of the Berry Siltstone. Overburden and interburden materials consist predominantly of sandy conglomerate and sandstone, with minor amounts of siltstone and mudstone.

2.5.2 Reserves and Resources Utilisation

Exploration drilling, feasibility studies and geological modelling of the currently approved areas at Coalpac mining operations indicate that an estimated 0.8 Mt and 0.6 Mt of coal reserves are available from Cullen Valley Mine and Invincible Colliery as at the end of 2011.

The Project proposes to extract coal from a reserve of more than 108 Mt of ROM coal at rates of up to 3.5 Mtpa of product coal via open cut and highwall mining methods over a period of 21 years. The resource is anticipated to have a saleable mine yield of approximately 77% with an approximate ash content ranging from 14% to 30% for thermal coal throughout the life of the Project.

The predicted stripping ratio for coal accessible by open cut mining methods averages approximately 6 Million bank cubic metres (Mbcm) of overburden for every one tonne (t) of ROM coal resources (i.e. 6:1) based on the 21 Year life of the Project. An approximately 5 Mbcm of accessible sand resource is available within the Marrangaroo Sandstone formation.



COALPAC CONSOLIDATION PROJECT

Western Coalfields Indicative Stratigraphic Column

Filename: 915_stratigraphicfig.indd | Date: 7.6.11 | Drawn: MB | Figure 4

SECTION 3
Approved Operations

Approved Operations

This section includes a detailed description of the approved operations of Cullen Valley Mine and Invincible Colliery, including a discussion of activities currently undertaken at both sites in relation to mining, infrastructure, coal processing, handling and other associated activities.

It also provides a description of the existing environmental management system under which environmental issues at Cullen Valley Mine and Invincible Colliery are managed and an outline of existing ecological offset commitments Coalpac has established for each site.

3.1 CULLEN VALLEY MINE

3.1.1 Background

The Cullen Valley Mine site contains the former operational areas of the Tyldesley and Beaumaris Collieries, where coal mining via underground methods commenced in the late 1800s. A range of open cut and underground mining operations have been undertaken at the site since this time, with activities suspended at various times in the intervening period.

On 24 December 1997, the Lithgow Coal Company (previous owners of the Cullen Valley Mine) was granted DA 200-5-2003 by the Minister for Planning and Infrastructure for the operations described in the *'Feldmast Coal Project Environmental Impact Statement 1997'* (Feldmast EIS) (IEC 1997). The Feldmast EIS described and assessed open cut, underground and highwall mining activities at the Cullen Valley Mine. Open cut mining consistent with the Feldmast EIS commenced in May 2000.

Upon identification of additional northern open cut coal reserves, adjacent to the Wallerawang-Gwabegar Railway Line, the *'Cullen Valley Mine Open Cut Extension EIS'* (Cullen Valley Mine EIS) (IEC 2004) was lodged in April 2004.

This modification to DA 200-5-2003 was granted by the (then) Department of Infrastructure, Planning and Natural Resources on 19 August 2004. The EIS approved open cut mining activities on the western side of Tyldesley Hill and continued activities under the Feldmast EIS (Hillcroft pit and longwall mine are shown on **Figure 5**).

Product coal from Cullen Valley Mine has historically been supplied under contract to MPPS. However, with the failure of the mine to renew a supply contract, the operation was placed on a Care and Maintenance program in June 2007.

In February 2008, when Coalpac acquired Cullen Valley Mine from the Lithgow Coal Company, the mine was taken off Care and Maintenance. The open cut and highwall mining operations approved under DA 200-5-2003 re-commenced at that time.

3.1.2 Regulatory Approvals

Cullen Valley Mine's operations are approved under DA 200-5-2003 (see **Appendix A**) and occur within a number of mining authorities, the status of which is shown in **Table 5**.

Table 5 also lists supporting planning documents for the current Cullen Valley Mine approval which include the Cullen Valley Mine EIS and Feldmast EIS.

Coalpac also holds a number of other ancillary environmental licences and approvals to conduct its mining and associated activities which are also summarised in **Table 5**.

3.1.3 Coal Mining Operations

The Feldmast EIS and Cullen Valley Mine EIS identified operational limits within which open cut, highwall and underground mining at the Cullen Valley Mine will occur.

Currently, open cut mining at Cullen Valley Mine is approved to sell up to 1 Mtpa product coal. Of this volume, no more than 250,000 t may be transported to destinations other than the MPPS.

Open cut mining operations involve the extraction of coal from the combined Katoomba / Middle River / Moolarben; Upper Irondale; Irondale; and the coalesced Lidsdale / Lithgow Seams within the Illawarra Coal Measures.

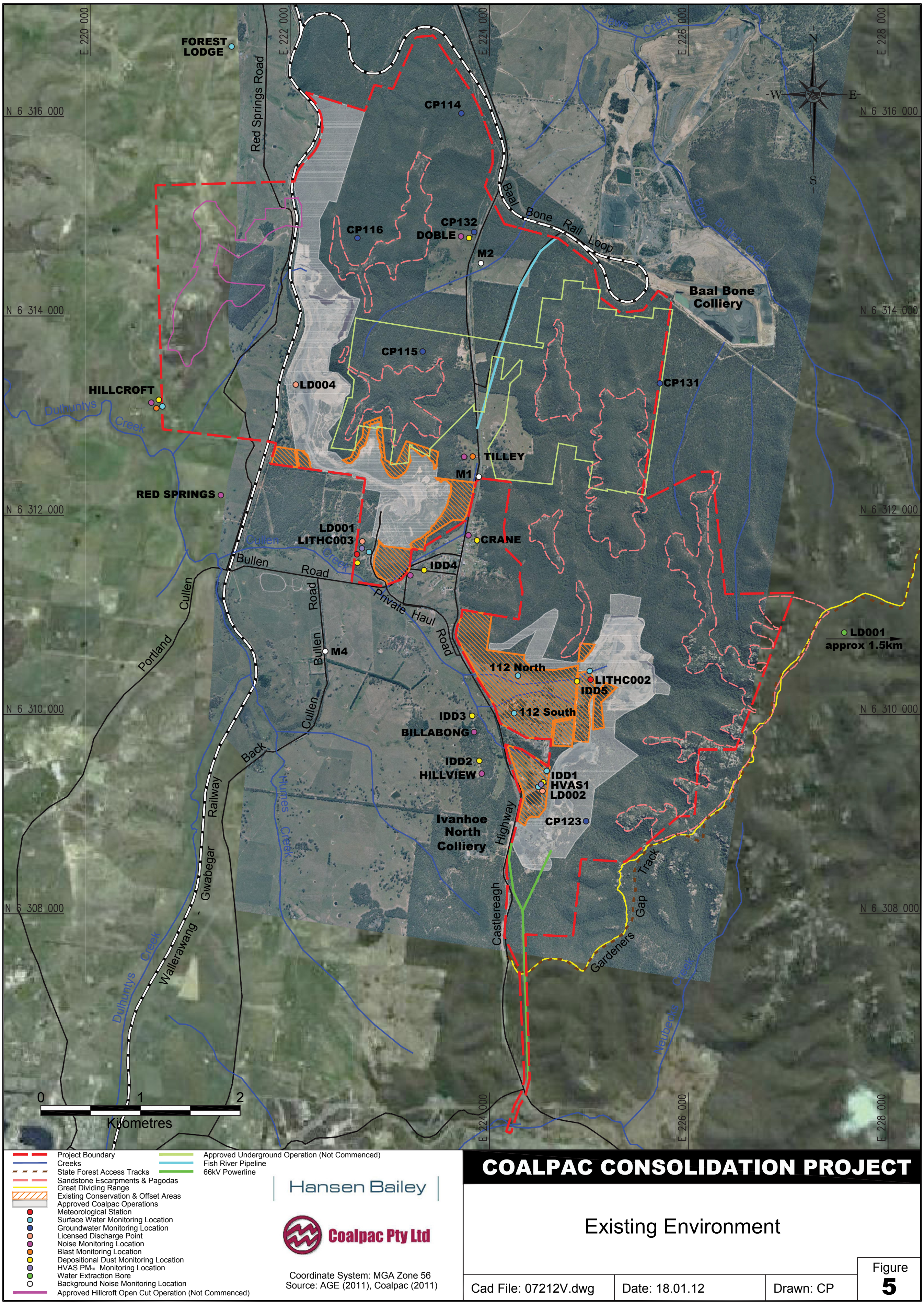

FOREST LODGE
Red Springs Road
CP114
CP116
CP132
DOBLE
M2
Baal Bone Rail Loop
Baal Bone Colliery
CP115
CP131
LD004
HILLCROFT
Dulhuntys Creek
TILLEY
M1
RED SPRINGS
LD001
LITHC003
CRANE
IDD4
Bullen Road
Private Haul Road
Cullen
Portland
M4
Bullen Road
Cullen
112 North
LITHC002
IDD5
112 South
IDD3
BILLABONG
IDD2
HILLVIEW
IDD1
HVAS1
LD002
CP123
Ivanhoe North Colliery
Highway
Castlereagh
Back
Railway
Gwabegar
Wallerawang
Dulhuntys Creek
Gardeners Gap Track
LD001 approx 1.5km
0 1 2
Kilometres
Project Boundary
Creeks
State Forest Access Tracks
Sandstone Escarpments & Pagodas
Great Dividing Range
Existing Conservation & Offset Areas
Approved Coalpac Operations
Meteorological Station
Surface Water Monitoring Location
Groundwater Monitoring Location
Licensed Discharge Point
Noise Monitoring Location
Blast Monitoring Location
Depositional Dust Monitoring Location
HVAS PM10 Monitoring Location
Water Extraction Bore
Background Noise Monitoring Location
Approved Hillcroft Open Cut Operation (Not Commenced)
Approved Underground Operation (Not Commenced)
Fish River Pipeline
66kV Powerline
Hansen Bailey
Coalpac Pty Ltd
Coordinate System: MGA Zone 56
Source: AGE (2011), Coalpac (2011)
COALPAC CONSOLIDATION PROJECT
Existing Environment
Cad File: 07212V.dwg
Date: 18.01.12
Drawn: CP
Figure
5

Table 5 Cullen Valley Mine Licences and Approvals

Ref	Approval No	Description	Approval Term	Authority
1	DA-200-5-2003	Development Consent	19/08/04 - 19/08/25	DP&I
1a	Cullen Valley Mine EIS	Open Cut Extension, 7 Mt coal to be removed within 10 years, with a maximum of 1 Mtpa production	20/05/04 - 20/05/25	N/A
1b	Feldmast EIS	Feldmast Project open cut, highwall mining and underground mine producing up to 1 Mtpa product coal	24/12/97 - 24/12/18	N/A
2	Mining Lease 1455	Mining Lease (open cut)	19/08/99 - 19/09/20	DTIRIS – MR
3	Mining Lease 1488	Lease extension granted (open cut / highwall)	21/06/01 - 21/06/22	DTIRIS – MR
4	Mining Lease 1556	Mining Lease (underground / highwall)	20/09/04 - 20/09/25	DTIRIS – MR
5	Mining Lease 1557	Mining Lease (open cut / highwall)	20/09/04 - 20/09/25	DTIRIS – MR
6	Authorisation (A) 324	Authorisation for area to east of the Castlereagh Highway	25/08/83 - 09/04/12	DTIRIS – MR
7	A 420	Authorisation for area to west of the railway	12/01/90 – 09/04/12	DTIRIS – MR
8	Exploration Lease (EL) 5712	Exploration Licence for area to the west of railway	10/04/00 – 09/04/12	DTIRIS – MR
9	EL 6007	Exploration Lease for area to the north-east of Cullen Valley Mine	08/10/02 – 07/10/12	DTIRIS – MR
10	Mining Operations Plan	Covering Lease Extension Area	30/09/04 – 30/09/11*	DTIRIS – MR
11	Environmental Protection Licence (EPL) 10341	Cullen Valley Mine Environment Protection Licence	10 December (Anniversary)	OEH
12	Dangerous Goods Notification Acknowledgement 35/036178	Cullen Valley Mine Dangerous Goods Notification	14 January (Anniversary)	WorkCover NSW
13	Monitoring Bore Licences under Part 5 of the Water Act	Monitoring Bore Licences 80BL620108 - 13	Approved in Perpetuity	NSW Office of Water (NOW)

* Approval of revised document pending

The existing open cut mining operation at Cullen Valley Mine progresses from south to north and is generally carried out utilising the following sequence:

- Removal of vegetation;
- Collection of topsoil and placement in a rehabilitation area or designated stockpile;
- Dozer push to develop first blast pad, approximately 5 m below the original surface;
- Drill and blast the overburden as required;
- Overburden removal with excavator / truck to a pre-determined level;
- Cleaning to the top of the first economic coal seam;
- Recovery of this seam by selectively removing stone bands within the working section, as required;
- Drill and blast the interburden down to the roof of the next economic coal seam;
- Stripping of the interburden using truck / excavator and push dozer as is feasible; and
- Continuing this procedure for each economic coal seam to the floor of the Lithgow Seam.

Following blasting, as much overburden as possible is removed by dozer, depending on the distance between the active mining area and in-pit emplacement location. The remaining proportion is removed by a shovel and truck fleet. It is placed in previously mined out areas as mining advances.

Coalpac has successfully undertaken open cut coal extraction and blasting within 170 m of sandstone overhang formations (pagodas) at Cullen Valley Mine with visual monitoring confirming that no impacts have occurred to these structures as a result of existing mining operations.

Highwall and underground mining operations were also approved under the Feldmast EIS, which included:

- Highwall mining operation of the Irondale Seam and coalesced Lidsdale / Lithgow Seam in areas exposed by open cut mining; auger mining has been carried out in both seams in the open cut mine during 2008 to good effect with no instability or surface subsidence occurring; and

- An underground operation using continuous miner units to access the Irondale and Lithgow Seams and the remnant resources of the Tyldesley Colliery workings.

Underground mining operations as described in the Feldmast EIS have not been developed to access the Irondale and Lithgow Seams as access was required via the Irondale Seam to be able to reach the remaining recoverable Lithgow Seam reserves east of the Castlereagh Highway. Access via the Irondale Seam proved to be sub-economic for the quality of coal produced and the market available. It is understood that the Irondale Seam has not been extensively mined by underground methods in the district in any quantity for this reason. A recent attempt at the adjacent Ivanhoe Colliery in 2005 by contractors was short-lived as a result of coal quality (Bounty 2006).

Up to 26 full time personnel are currently required to operate the Cullen Valley Mine, plus additional contractors.

Mining operations can occur 24 hours per day, seven days a week, with blasting occurring between 9:00 am and 3:00 pm Monday to Friday, inclusive. All haulage of product coal by road occurs between 7:00 am and 5:30 pm, Monday to Friday, and 7:00 am to 5:00 pm on no more than 30 Saturdays annually, in accordance with the requirements of OEH and LCC.

3.1.4 Coal Handling and Transportation

Coal handling systems at the Cullen Valley Mine include a coal crushing and sizing plant, which conveys the coal to the product stockpile prior to loading into coal haulage trucks for transportation to approved domestic destinations. Flexibility also exists under the Cullen Valley Mine EIS for the construction of a Coal Deshaling Plant (CDP). Construction of this facility has not yet been undertaken.

Product coal is transported by road from the product stockpile using semi-trailers along the main mine access road to its intersection with the Portland - Cullen Bullen Road. At this intersection, the trucks cross Portland - Cullen Bullen Road onto a 1.3 km Private Haul Road in order that Cullen Valley Mine coal haulage traffic can bypass to the south of the Cullen Bullen township. Product coal trucks exit the Private Haul Road onto the Castlereagh Highway heading south to travel to the MPPS, located approximately 5 km away.

3.1.5 Infrastructure

Mine infrastructure at Cullen Valley Mine comprises site offices, a workshop, car park and bathhouse facilities, access roads, mine water storage, 100,000 t coal stockpile and infrastructure including a 75,000 litre fuel storage tank.

3.1.6 Environmental Management and Monitoring

Coalpac has developed and implemented an Environmental Management System (EMS) and Management Plans for the Cullen Valley Mine site.

Environmental Management Plans are in place for key issues with the potential to impact on the environment and community and these documents include mitigation measures required for the appropriate control of each.

Coalpac has established an Environmental Monitoring Program (EMP) for the Cullen Valley Mine to assist in the management and measurement of the environmental performance of the operation. This program includes a network of monitors at the locations illustrated in **Figure 5**.

The Cullen Valley Mine EMP is undertaken in accordance with relevant Australian Standards and incorporates the following:

- A meteorological monitoring station;
- Five depositional dust gauges;
- One High Volume Air Sampler (HVAS) monitoring Particulate Matter less than 10 microns in diameter (PM_{10});
- Five quarterly noise monitoring locations;
- Monitoring of the standing water levels in the Tyldesley Colliery workings underlying Cullen Valley Mine;
- Two surface water monitoring locations at discharge points licensed under EPL 10431;
- Three background surface water quality monitoring locations; and
- Three groundwater monitoring bore locations.

3.1.7 Ecological Offsets

As a requirement of DA 200-5-2003, Coalpac has established and maintained Compensatory Habitat Areas to offset the environmental impacts from land disturbance associated with the existing Cullen Valley Mine. These areas comprise a total area of approximately 51.4 ha, as shown on **Figure 5**.

The Cullen Valley Mine Compensatory Habitat Areas are located adjacent to existing rehabilitation areas at the mine and the adjacent Ben Bullen State Forest. They are managed to conserve and enhance the ecological communities present, which include Sandstone Dry Ridgetop Woodland, Tablelands Sheltered Valley Forest, and Tablelands Dry Woodland.

The ongoing monitoring and management of the Compensatory Habitat Areas for Cullen Valley Mine is undertaken in accordance with the Cullen Valley Mine Flora and Fauna Management Plan.

3.2 INVINCIBLE COLLIERY

3.2.1 Background

Coal mining at the Invincible Colliery commenced in 1901, with the establishment of an underground mining operation located on the eastern side of the Cullen Bullen township. This operation continued into the mid 1950s, until the mining operations were relocated approximately 4 km to the south to commence another underground operation which remained active until 1998, when underground mining was suspended due to practical exhaustion of economically accessible reserves.

Limited open cut mining at the Invincible Colliery recommenced in 1998 and continued until 2001, when the site was placed on Care and Maintenance.

In May 2005, Coalpac secured a contract from Delta Electricity to supply coal to the MPPS over a three year period. An application for Project Approval under the EP&A Act, supported by the '*Environmental Assessment for Proposed Extension of Invincible Open Cut Mine and Rehabilitation Activities*' (Craven Elliston Hayes 2006), was submitted to DP&I for an extension to the open cut operations at the Invincible Colliery to allow this contract to be met.

Project Approval (PA 05_0065) was subsequently granted on 7 September 2006 for the mine extension and the Invincible Colliery was taken out of Care and Maintenance. This approval allowed the production of up to 0.35 Mtpa product coal by open cut methods at the site for a period of five years. Up to 0.2 Mtpa of the volume of product coal was approved for transportation to domestic destinations other than MPPS or WPS.

Following the recommencement of open cut mining at the Invincible Colliery being approved, two further applications for the modification of PA 05_0065 were successfully made. These modifications gained approval to recommence coal washing at the Invincible Colliery Preparation Plant (ICPP) and to introduce highwall mining activities from within the approved open cut footprint.

Invincible Colliery operates under PA 07_0217 which was granted by DP&I on 4 December 2008 (PA 05_0065 was surrendered at that time). PA 07_0127 enables the extension of the approved coal extraction area and an increase in the volume of ROM coal production at Invincible Colliery to ROM coal to 1.2 Mtpa and product coal of 0.9 Mtpa in order to secure supply of product to MPPS or WPS. This application was supported by the '*Environmental Assessment of the Proposed Extension to the Invincible Colliery Open Cut Mine and Production Increase 2008*' (Invincible Colliery EA) (RW Corkery 2008d). Since it was initially granted in 2008, three modifications to PA 07_0127 have been approved by DP&I, including for an increase in the product coal from 0.9 Mtpa to 1.2 Mtpa (in October 2010).

3.2.2 Regulatory Approvals

The currently approved mining activities at the Invincible Colliery are described below. Mining operations that are approved under PA 07_0127 (as modified) (see **Appendix A**) occur within a number of mining authorities held by Coalpac, the status of which is shown in **Table 6**. Coalpac also holds a number of other ancillary environmental licences and approvals to conduct its mining and associated activities which are also summarised in **Table 6**.

3.2.3 Coal Mining Operations

The Invincible Colliery EA (RW Corkery 2008) identified a number of mining areas for coal to be extracted by a combination of open cut and highwall mining methods at a rate of up to 1.2 Mtpa ROM to the year 2016.

Open cut mining operations at the Invincible Colliery are undertaken using similar methods to those employed for Cullen Valley Mine and extract coal from the coalesced Lithgow / Lidsdale Seams and Irondale Seam.

Highwall mining extracts coal primarily from the Irondale Seam, with limited mining of the Lithgow Seam identified in the Invincible Colliery EA in all but some areas in the west of the open cut due to pre-existing underground workings which negates the application of highwall mining.

Highwall mining is undertaken following completion of open cut operations for each target seam, where a bench of at least 35 m in width is established to provide access to the coal seams exposed from the face of the open cut highwall. Once the bench is established and the highwall miner is set up at the highwall face, the cutter head advances into the coal face by addition of individual conveying sections, or auger flights.

Mined coal extracted from the exposed seams is transferred from the highwall miner to a cross chain conveyor before transfer to an elevating conveyor for stacking or loading directly into haul trucks for transportation. Once each highwall mining drive is completed, the highwall miner machine moves along the coal face and after a short period of time (typically less than four weeks) the mouth of the exposed holes is backfilled with either overburden material or coarse rejects returned from the ICPP.

ROM coal is transported to either the centralised coal crushing and screening area or the ROM Pad adjacent to the Invincible Colliery site access road for washing at the ICPP. As noted above in **Section 3.2.1**, Invincible Colliery was granted approval in 2010 for the transportation of an additional 0.3 Mtpa of product coal by road, bringing the maximum allowable volume of product coal to 1.2 Mtpa.

At Invincible Colliery, employment consists of up to 20 full time personnel, plus additional contractors. Generally, mining operations may occur between 7:00 am and 10:00 pm, Monday to Saturday inclusive, with the exception of public holidays.

Table 6 Invincible Colliery Licences and Approvals

Ref	Approval No	Description	Approval Term	Authority
1	PA 07_0127	Invincible Colliery Project Approval	04/12/08 - 04/12/16	DP&I
1a	Invincible Colliery EA	Invincible Colliery open cut extension from 500,000 tpa to 1.2 Mtpa (ROM) and 900,000 tpa product coal	04/12/08 - 04/12/16	DP&I
1b	Invincible Colliery EA (MOD 1)	Amendment to schedule of land provided for PA 07_0127	04/12/08 - 04/12/16	DP&I
1c	Invincible Colliery EA (MOD 2)	Modification of the Project Boundary for consistency between this area and the mining authorities held by Coalpac for Invincible Colliery	04/12/08 - 04/12/16	DP&I
1d	Invincible Colliery EA (MOD 3)	Modification to PA 07_0127 to allow the transportation of up to an additional 300,000 tpa of product coal by public roads to the currently approved destination of MPPS	04/12/08 - 04/12/16	DP&I
2	Mining Lease 1635	Surface Mining Lease (23 ha)	10/09/09 - 10/09/30	DTIRIS – MR
3	Mining Lease 1638	Surface Mining Lease (405 ha)	06/11/09 - 06/11/30	DTIRIS – MR
3a	Mining Operations Plan	Covering Lease Extension Area	28/10/11 - 28/10/15	DTIRIS – MR
4	EPL 1095	Invincible Colliery EPL	27 February (Anniversary)	OEH
5	Groundwater discharge licence	Long Swamp Bore discharging underground workings water for 2 ML/day	Approved under EPL 1095	OEH
6	Water Licence Application under Part 5 of the Water Act	Licence Application before NOW for extraction of water from bore LD 001	Application Submitted October 2008	NOW
7	Monitoring Bore Licences under Part 5 of the Water Act	Monitoring Bore Licences 80BL620114 - 16	Approved in Perpetuity	NOW

Those open cut pits nominated in the Invincible Colliery EA as the West, Renown (Central) and South pits are not permitted to be mined between the hours of 6:00 pm and 10:00 pm, however maintenance activities and safety procedures may be undertaken at any time, with the approval of Department of Trade and Investment, Regional Infrastructure and Services – Mineral Resources (DTIRIS – MR) (formerly Industry & Investment NSW).

A combination of a truck / shovel open cut and highwall mining operations is used at the Invincible Colliery. The Invincible Colliery EA also identifies the conceptual layout, equipment requirements and operational areas for the approved open cut and highwall mining operations.

3.2.4 Coal Handling and Transportation

Coal handling systems at the Invincible Colliery include a Centralised Coal Crushing and Screening Area for sizing and screening of ROM coal, with stockpiling capacity of 15,000 t of ROM coal and 10,000 t of product coal.

Separate ROM and product stockpiles are maintained for the screening plant and crusher, with a further product stockpile maintained for the loading of road trucks for the transportation of product coal.

At the ICPP ROM coal is fed to a Klockner primary breaker for size reduction prior to being transported by conveyor to the Bradford Breaker for sizing and separation from coarse rejects. Sized coal <100 mm from the Bradford Breaker can be fed to two Jig Washers via a small surge bin at a maximum rate of 350 tonnes per hour (tph), which further separates coal into either of the four local product bins or the 5,000 t capacity conical stockpile. Excess coal from the conical stockpile can be pushed to an adjacent 80,000 t stockpile area, as required.

Coarse rejects are conveyed from the Jig Washer to a reject bin for truck loading. Up to 75% of coarse rejects are re-washed and combined with coal provided to the MPPS, with the remainder loaded onto empty trucks returning to the open cut for emplacement in these areas. Fine rejects from processing are pumped to a series of storage dams. Consolidated fines in these areas are regularly excavated for coal blending purposes, which allows for new material to be stored as additional space is created.

Product coal is approved for transportation by road-registered highway trucks to domestic destinations at a rate of 1.2 Mtpa. All product coal leaves the site via the access road onto the Castlereagh Highway. Product from the coal crushing and screening area is loaded onto highway trucks via front end loader. Washed coal from the ICPP is loaded onto the highway trucks from an overhead bin located near the site access road.

Product coal is predominantly transported to the MPPS, with approval also in place to supply the WPS on a limited campaign basis for up to two weeks in any three month period, following notification of relevant landholders and approval from DP&I. Up to 0.2 Mtpa of product coal may also be transported to domestic destinations other than the MPPS or WPS.

3.2.5 Infrastructure

Mine infrastructure including site offices, car parks, a workshop, bathhouse, ICPP, a coal crushing and screening area, site access and haul roads, fine rejects storage and Water Management System are utilised by Invincible Colliery under approved operations.

3.2.6 Environmental Management and Monitoring

Coalpac has developed and implemented an Environmental Management System (EMS) and Management Plans for the Invincible Colliery. As with the system in place for Cullen Valley Mine (see **Section 3.1.6**), Coalpac has developed and maintains an EMP for Invincible Colliery to assist in the management and measurement of the environmental performance of the current operation. This program includes the following network of monitors, which are also illustrated on **Figure 5**:

- A meteorological monitoring station;
- Six dust depositional dust gauges;
- One HVAS monitoring PM_{10};
- Five noise monitoring locations;
- Two surface water monitoring locations including for Main Colliery Dam which can flow to the wet weather discharge point approved under EPL 1095; and
- Three groundwater monitoring bore locations.

3.2.7 Ecological Offsets

Coalpac established an offset strategy for Invincible Colliery as a component of PA 05_0065, which was also carried over to PA 07_0127 and developed further. An *'Augmented Biodiversity Offset Strategy'* (R W Corkery 2008b) was developed for the extended operations to ensure no net loss of biodiversity values in the medium to long term. The document *'Lot 112, DP 877190 Biodiversity Offset Area'* (R W Corkery 2008c) was also prepared to supplement the offset strategy to ensure sufficient amounts of offset land was available.

The final offset package approved for the current operations of Invincible Colliery consists of approximately 165 ha of both moderate to good quality vegetation and degraded agricultural lands, as shown on **Figure 5**. Existing vegetation communities in these areas consisted primarily of the Tableland Gully Snow Gum – Ribbon Gum Grassy Forest vegetation community, Coxs Permian Red Stringybark – Brittle Gum Woodland, and Tableland Gully Mountain Gum – Broad-leaved Peppermint Grassy Forest. Suitable habitat for approximately 20 individuals of Black Gum, listed as Vulnerable under the *Threatened Species Conservation Act 1995* (TSC Act), is provided within the existing Invincible Colliery offsets. A significant assemblage of Aboriginal cultural material is also preserved within the offset in an extensive open camp site complex (Invincible OS1).

To ensure that these areas are appropriately managed in the long term, Coalpac has developed an overall strategy for the *'Implementation of Biodiversity Offset Areas'* (Coalpac 2009a). This strategy outlines and describes the proposed implementation process that Coalpac will employ to achieve the outcomes of the above mentioned documents and the *'Landscape Management Plan for Invincible Colliery'* (Global Soil Systems 2009). The Biodiversity Offset Areas in place for approved Invincible Colliery operations are being progressively rehabilitated. These rehabilitation activities include fencing of offset areas, revegetation with native tubestock species and the use of seeding techniques. Rehabilitation performance of these ecological offset areas is be monitored on an annual basis at fixed sites representative of different age structures.

SECTION 4
The Project

4

The Project

This section includes a detailed account of alternatives considered during the development of the Project for which approval is sought. It includes a detailed description of the Project including the conceptual mine plan, its staging, equipment and manning requirements and a description of the upgrades and modifications to site infrastructure.

4.1 PROJECT OVERVIEW

Coalpac is seeking Project Approval from the Minister for Planning and Infrastructure under Part 3A of the EP&A Act to consolidate the operations and management of the Cullen Valley Mine and Invincible Colliery under a single, contemporary planning approval.

The Project will allow coal mining operations largely within Coalpac's current mining authorities to continue for a further period of 21 years within the Project Boundary on the lands listed in **Appendix B**. Opportunistic sand extraction is also proposed within the coal seam stratigraphy. The Project Boundary includes areas for required infrastructure such as the rail siding, water, power and communications.

The Project generally comprises the following:

- Consolidation and extension of the existing Cullen Valley Mine and Invincible Colliery operations to produce up to a total of 3.5 Mtpa of product coal, including:
  - The continuation of mining operations at Cullen Valley Mine (the area west of the Castlereagh Highway) via both open cut and highwall mining methods to access an additional resource of approximately 40.1 Mt ROM; and
  - The continuation of mining operations at Invincible Colliery (including an extension north into the East Tyldesley area) via open cut and highwall mining methods to access an additional resource of approximately 68.4 Mt ROM;
- Mining and coal processing 24 hours per day up to seven days per week with approximately 120 full time personnel plus contractors;
- Continuation of coal supply to the local MPPS via a dedicated coal conveyor over the Castlereagh Highway (to be constructed), and emergency supply to MPPS and WPS (via road), with flexibility for supply to additional domestic destinations and Port Kembla (via rail) for export;
- Upgrades to existing Invincible Coal Preparation Plant, administration and other infrastructure;
- Construction and operation of additional offices at Cullen Valley Mine;
- Construction and use of the East Tyldesley Coal Preparation Plant (incorporating the previously approved CDP at Cullen Valley Mine);
- Construction and operation of a bridge and haul road across the Wallerawang - Gwabegar Railway Line to permit access to mine the previously approved Hillcroft resource;
- The extraction of the Marrangaroo Sandstone horizon from immediately below the Lithgow Coal Seam in the northern coal mining area of Cullen Valley Mine. This material will be trucked to an onsite crushing/screening station prior to sale into the Sydney (and surrounds) industrial sand market;
- Construction of a rail siding and associated infrastructure to permit transport of coal and sand products;
- Integration of water management infrastructure on both sites into a single system; and
- Integration of the management of mine rehabilitation and conceptual final landform outcomes for Cullen Valley Mine and Invincible Colliery.

Other minor disturbance required for the Project in addition to that associated with mining operations includes (but is not limited to) minor disturbance works including fencing, firebreaks, water diversion structures and pipelines, minor contour banks, access tracks, other minor power infrastructure, monitoring stations and sediment and erosion control structures. These would be undertaken in accordance with the Land Disturbance Protocol for the Project, as described in **Section 8.14.4**.

4.2 PROJECT ALTERNATIVES

Coalpac has undertaken comprehensive pre-feasibility studies for the Project, which included the review of various mine planning, infrastructure and operating scenarios. The key objective of these studies were to minimise environmental and social impacts on the Cullen Bullen township and other nearby receivers, whilst maximising resource recovery and operational efficiencies that could be achieved through the consolidation of Coalpac's two existing mining operations.

The review process for the alternative mine plan options considered various additional mining areas and production scenarios. A range of infrastructure, equipment fleet and coal processing options and methodologies were also considered during the feasibility phase to assist in the definition of the conceptual mine plans proposed for the Project. The location and extent of the proposed operational areas is largely dictated by the location of the coal and sand resources and the topography of the Project area.

Prior to the detailed planning and finalisation of the Project mine plans, a range of other options for the extraction of the identified coal resource were assessed in consideration of the principles of Ecologically Sustainable Development (ESD).

The stakeholder consultation process undertaken for the Project as described in **Section 6** has also led to various mine plan enhancements. Options considered and modifications to the Project are illustrated in **Figure 6** and included consideration of: an optimal open cut mine layout, underground mining, various infrastructure and transport options, or 'Do nothing'; each of which are discussed in detail below.

4.2.1 Optimal Open Cut Mine Layout

The Optimal Open Cut Mine Plan Layout considered maximising the available open cut coal resource within Coalpac mining authorities shown as areas 'A' in **Figure 6**.

In all cases, economically recoverable reserves were not included to be extracted via open cut methods where sandstone escarpments had a potential to be threatened by stability issues.

During the mine planning review process and environmental constraints analyses, a number of areas that were initially proposed to be open cut mined were removed from the mine plan on environmental grounds to prevent impacts to the community surrounding the mine.

Key areas where the full extent of mining was reduced to minimise environmental and social impacts included:

- To the north of the Cullen Valley mining area, reducing reserves by 4.45 Mt ROM coal, to avoid unacceptable amenity impacts on residences located on Red Springs Road;
- To the north of the Hillcroft mining area, reducing reserves by 1.65 Mt ROM coal, to avoid impacts on a private property to the north of the Hillcroft mining area;
- In the north-western portion of the East Tyldesley mining area, reducing mineable coal reserves by 4.1 Mt, to avoid unacceptable amenity impacts on the residences located east of the Castlereagh Highway to the north of the Project Boundary;
- Surrounding the township of Cullen Bullen to the north and east, reducing the proposed mining area and reducing reserves by 3.4 Mt to avoid unacceptable amenity impacts on local residences; and
- Consideration of a range of mine planning management options such as bunding, shielding, progression of mining and operating hours. These options were reviewed and incorporated into the Project mine plans to provide further mitigation of predicted environmental impacts that were assessed during the constraints analyses undertaken for this EA.

Figure 6 shows options considered in the Optimal Open Cut Mine Plan Layout case and should be read in conjunction with the text below, which outlines the key changes made in response to environmental constraints identified:

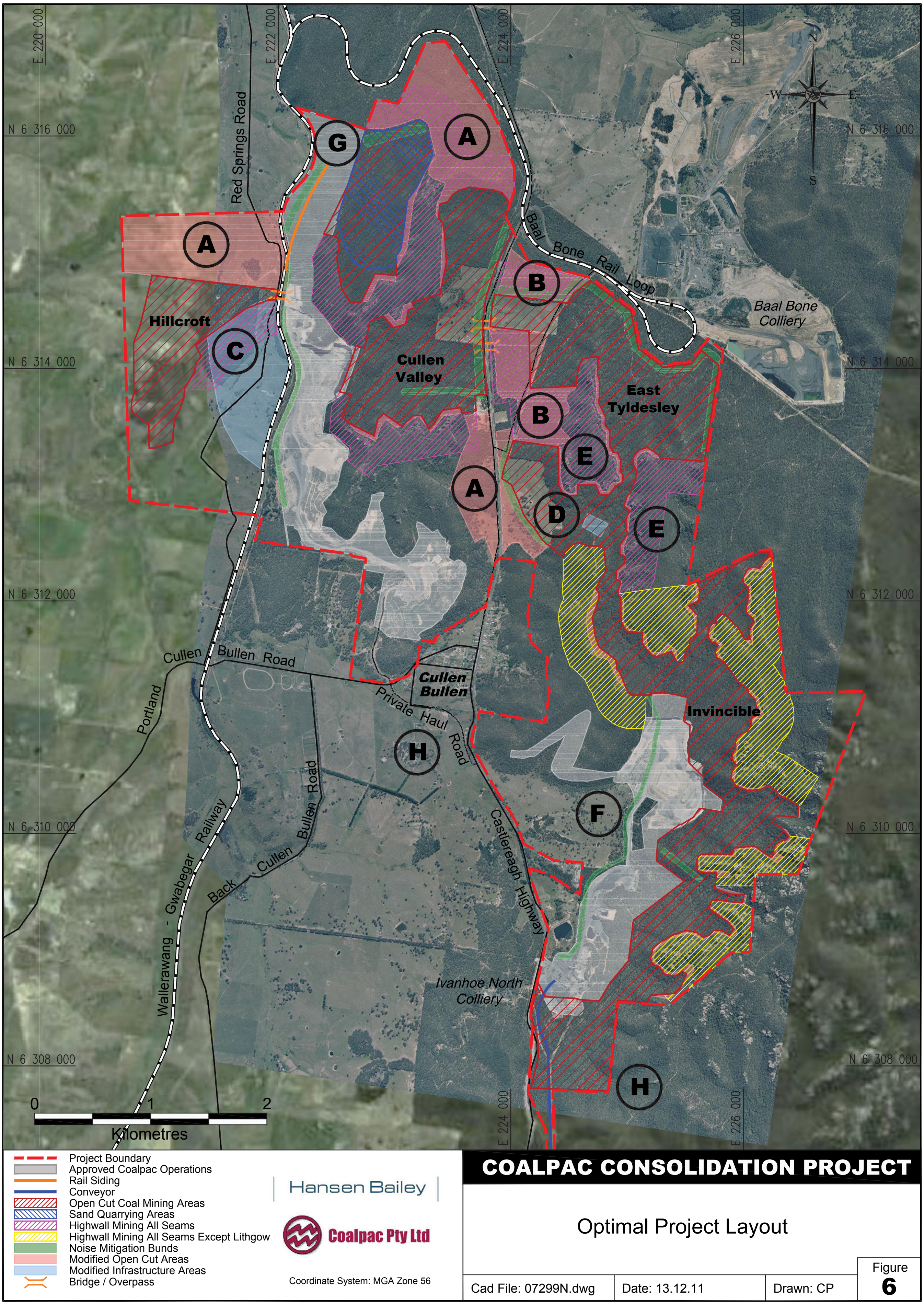
A. Reducing the areas initially planned for open cut mining under the optimised mine plan case within the northern Cullen Valley and Hillcroft mining areas of the Project Boundary to minimise impacts to ecology, noise and air quality for residences to the north and west;

B. Restricting open cut mining within the East Tyldesley mining area adjacent to the Castlereagh Highway and Cullen Bullen General Cemetery, instead accessing coal in these locations via highwall mining methods only. The change of mining methods in this area was made to minimise noise impacts to receivers located to the north of the East Tyldesley area, the potential for visual impacts at the Cullen Bullen General Cemetery and Castlereagh Highway and vegetation disturbance required for the Project;

C. Constructing a rail siding and associated loading infrastructure within the existing footprint of Cullen Valley Mine, rather than cause additional disturbance by constructing a rail loop or siding adjacent to the Hillcroft area;

D. Lowering the siting of the infrastructure layout of the East Tyldesley Coal Preparation Plant (ETCPP) facility to a more shielded location, to further reduce the potential for noise and visual impacts to nearby residences;

E. Undertaking highwall mining in key sensitive areas to minimise the area of impacts to surface features;


Red Springs Road
Hillcroft
Cullen Valley
East Tyldesley
Invincible
Cullen Bullen
Baal Bone Rail Loop
Baal Bone Colliery
Ivanhoe North Colliery
Cullen Bullen Road
Portland
Private Haul Road
Bullen Road
Back Cullen
Wallerawang - Gwabegar Railway
Castlereagh Highway
A
B
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0 1 2
Kilometres
Project Boundary
Approved Coalpac Operations
Rail Siding
Conveyor
Open Cut Coal Mining Areas
Sand Quarrying Areas
Highwall Mining All Seams
Highwall Mining All Seams Except Lithgow
Noise Mitigation Bunds
Modified Open Cut Areas
Modified Infrastructure Areas
Bridge / Overpass
Hansen Bailey
Coalpac Pty Ltd
Coordinate System: MGA Zone 56
COALPAC CONSOLIDATION PROJECT
Optimal Project Layout
Cad File: 07299N.dwg
Date: 13.12.11
Drawn: CP
Figure 6

F. Progressively developing earthen bunds in various areas which machinery can work behind, providing reductions in noise and visual impacts at nearby residences. Bunds in key sensitive locations will be treated as quickly as possible to promote the rapid establishment of rehabilitation. The construction and development of these bunds during the life of the Project will also significantly reduce noise impacts for the township of Cullen Bullen and for private receivers (i.e. the location of an existing private residence) located to the north, west and south of the Project Boundary;

G. Reducing the area proposed for sand mining operations to avoid impacts to habitat of the Threatened species Clandulla Geebung; and

H. Construction of an overland conveyor linking the Project to MPPS to reduce truck haulage on local roads. No coal will be hauled along the Cullen Bullen Private Haul Road after the conveyor and bridge across the Castlereagh Highway is constructed, unless prior approval from appropriate regulators is granted for limited periods.

Table 7 provides a description of reduced environmental impacts attributable to the implementation of the Project, in lieu of the Optimal Mine Plan as shown in **Figure 6**.

Key areas where the full extent of mining was reduced to minimise environmental and social impacts included:

- Implementing an increased stand off zone up to 50 m between the open cut highwall and any areas of sandstone escarpments or pagodas to further reduce any environmental impact, reducing open cut and highwall mining reserves;
- To the north of the Cullen Valley mining area, reducing reserves by 4.45 Mt ROM coal, to avoid unacceptable amenity impacts on residences located on Red Springs Road;
- To the north of the Hillcroft mining area, reducing reserves by 1.65 Mt ROM coal, to avoid impacts on a private property to the north of the Hillcroft mining area;
- In the north-western portion of the East Tyldesley mining area, reducing mineable coal reserves by 4.1 Mt, to avoid unacceptable amenity impacts on the residences located east of the Castlereagh Highway to the north of the Project Boundary;
- Surrounding the township of Cullen Bullen to the north and east, reducing the proposed mining area and reducing reserves by 3.4 Mt to avoid unacceptable amenity impacts on local residences; and
- Consideration of a range of mine planning management options such as bunding, shielding, progression of mining and operating hours. These options were reviewed and incorporated into the Project mine plans to provide further mitigation of predicted environmental impacts that were assessed during the constraints analyses undertaken for this EA.

As a result of this process, the reduction in impacts for the Project area totals 179 ha and the total reduction in reserves from the optimal resource extraction mine plan is 13.6 Mt ROM coal. This has a total direct loss in revenue to Coalpac of approximately $610.5 Million. Further details of the key changes are outlined in **Table 7**.

An additional stand off zone of up to 50 m between the open cut highwall and any areas of sandstone escarpments or pagodas (as shown on **Figure 5**) was also implemented by Coalpac to reduce the potential for environmental impact which further reduced Project open cut and highwall mining reserves. This represents a further reduction in the Project coal reserve of 14 Mt and approximately $629.4 Million in revenue to Coalpac.

4.2.2 Underground Mining Operation

Development of an underground mining operation was also considered during the pre-feasibility planning stage. Coalpac reviewed the available coal resource to determine whether an underground operation would be a viable option to extract the coal resource defined in this EA.

As shown and described further in **Section 8.10**, much of the central and southern extents of the Project Boundary are located above areas which have previously been extensively mined in the Lithgow Seam (the lowest seam in the vertical sequence) via underground methods and as such, are only amenable to open cut mining. In the far north of the Project the Lithgow Seam thins to a point where it is no longer present.

For the remaining northern areas, the Coalpac review found that the Lithgow Seam over much of the area is not able to be economically mined by underground methods. Where the Lithgow Seam is present, the reduced seam thickness, limited reserve size, low depth of cover, sensitive overlying topography (including the presence of pagodas and publically-visible sandstone cliffs), poorer coal quality and other contributory factors did not represent a feasible environmental and economic underground mining option for the Project in comparison with the combined open cut / highwall mining operation proposed.

Highwall mining allows economic access to smaller reserves beyond the reach of open cut mining at lower cost whilst not impacting the surface. As such, this mining method has been selected to maximise economic coal recovery at the lowest environmental impact across the Project as a viable alternative to underground mining.

Table 7 Reduced Impacts and Costs by Not Adopting the Optimal Mine Plan Layout

Ref	Description	Environmental Impact Reduction	Socio-Economic Costs
A	Reduction in open cut mining area	• Approximately 30 receivers north of the Project Boundary no longer impacted above noise impact criteria • Approximately 17 receivers west and south of the Project Boundary no longer impacted above noise impact criteria • Receivers in Cullen Bullen township no longer impacted above noise impact criteria • Up to 15 receivers no longer impacted above air quality criteria • 101 ha of native vegetation retained (including 6.5 ha Critically Endangered Ecological Communities (CEEC)) • Avoidance of impacts to 4.5 ha of habitat of the Threatened species Clandulla Geebung • Avoidance of impacts to 48 ha of potential Capertee Stringybark Threatened species habitat • Reduction in visual impact to northern and north-eastern receivers and passers-by on Castlereagh Highway • Reduction in blast vibration impacts to northern and north-east receivers	• Area A in the northern extent of the Cullen Valley mining area: 4.45 Mt ROM coal sterilised • $200.3 Million loss in direct revenue • Area A at Northern Hillcroft mining area: 1.65 Mt ROM coal sterilised. $74.2 Million loss in direct revenue • Area A in Central Cullen Valley mining area: 3.4 Mt ROM coal sterilised • $152.7 M loss in direct revenue • Total coal loss: 9.5 Mt • Total loss in direct revenue: $427.2 M
B	Replacement of open cut mining area with highwall mining	• 63 ha of native vegetation retained (including 23 ha CEEC) • Significant reduction in visual impacts to Cullen Bullen General Cemetery and on passers-by on Castlereagh Highway (see photomontage in **Appendix I**) • Reductions in amenity impacts on receivers north of the Project • Existing surface water catchment flow path retained in the East Tyldesley area ensuring no flooding impacts to Cullen Bullen General Cemetery or Baal Bone Rail Loop	• 4.1 Mt ROM coal sterilised • $183.3 m loss in direct revenue
C	Constructing a rail siding instead of rail loop	• 15 ha of native vegetation retained that would otherwise be disturbed, all of which is potential Capertee Stringybark Threatened species habitat • Siding infrastructure area within existing Cullen Valley Mine footprint that will not be rehabilitated until mine closure	• Cost effective solution
D	Lowering the site of the ETCPP infrastructure	• Noise reductions to northern receivers • Reduction in potential visual impacts to receivers on and adjacent to the Castlereagh Highway	• Additional design cost requirements
E	Highwall mining	• No impact to surface features	• None
F	Progressive development of earthen bunds	• Approximately 23 receivers no longer impacted above noise impact criteria in north, south and west of the Project Boundary • Reduction in noise impacts to below impact criteria for all receivers in Cullen Bullen • Reduction in potential for visual impacts to receiver properties and road users on the Castlereagh Highway	• Additional design cost requirements • Six iterations of noise modelling
G	Reduction in sand mining area	• Avoidance of impacts to approximately 4.5 ha of known habitat of the Clandulla Geebung Threatened species	• 1 Mbcm sand resource loss
H	Construction of conveyor to MPPS in lieu of road haulage	• Reduction in truck haulage from the Project to MPPS by a net 202 one-way truck movements per day • Minimising noise impacts to receivers in Cullen Bullen and adjacent the southern end of the Castlereagh Highway • Reduction in impacts to road surfaces on the Castlereagh Highway and Boulder Road • Enhanced road safety at intersections on existing heavy vehicle haulage route	• $15 M direct cost in development of conveyor link • Additional design cost requirements

The overlying seams have never been successfully mined underground in the district on any scale due principally to lower coal quality. The lower coal quality makes it sub-economic to recover coal by underground methods in this area. The Katoomba Seam is mined underground at Clarence Colliery to the south but the seam is considerably thicker and higher quality in this area making the operation economically and practically viable.

As noted above in **Section 3.1.3**, underground mining operations described in the Feldmast EIS have not been developed to access the Irondale and Lithgow Seams as access was required via the Irondale Seam to be able to reach the remaining recoverable Lithgow Seam reserves east of the Castlereagh Highway. Economic access via the Irondale Seam proved to be sub-economic for the quality of coal produced and the market available. It is understood that the Irondale Seam has not been extensively mined by underground methods in the district in any quantity for this reason. A recent attempt at the adjacent Ivanhoe Colliery in 2005 by contractors was short-lived as a result of coal quality (Bounty 2006).

4.2.3 Infrastructure

The existing infrastructure approved for Cullen Valley Mine and Invincible Colliery is proposed to be used wherever feasible for the Project so as to minimise additional environmental impacts and land disturbance. Any additional infrastructure is proposed in areas where there will be a net reduction in additional environmental impacts on the local community and environment.

In developing the final infrastructure design and layouts nominated for the Project, other options considered included:

- Three potential alignment options for the overland conveyor connection to MPPS, with the one which resulted in no substantial tree clearance selected;
- Construction of a rail loop to provide connection to the Wallerawang – Gwabegar Railway Line, with a rail siding option determined in preference to a rail loop due to reduced environmental impacts and development costs;
- Two rail siding options within Coalpac land to provide connection to the Wallerawang – Gwabegar Railway Line, with the one chosen for the Project which did not require further surface disturbance;
- Utilisation of the existing rail spur and loop in place for Baal Bone Colliery to provide connection to the Wallerawang – Gwabegar Railway Line (located north of the Project Boundary);
- Three locations and infrastructure layouts for the ETCPP infrastructure area were considered, with the option resulting in the least visual impact and lowest noise impact chosen;
- Optional construction of an internal conveyor to move product coal from the ETCPP to the ICPP – this option may be implemented if economically feasible;
- Alternate locations for the bridges to be constructed over the Castlereagh Highway and Wallerawang – Gwabegar Railway Line;
- Development of additional noise abatement components to be added to the existing infrastructure at the ICPP facility (see **Section 8.6.4**); and
- Cessation of the use of the Cullen Valley Private Haul Road for coal haulage adjacent to the township of Cullen Bullen.

4.2.4 Transportation

Detailed planning for the effective transportation of ROM and product coal, overburden, and other materials both within and outside of the Project Boundary was undertaken to determine the most efficient transport arrangements for the Project. In addition to the infrastructure options summarised above, other key factors in implementing the transportation strategy for the Project included:

- Minimising product coal truck movements external to the Project Boundary from the existing Cullen Valley Mine and Invincible Colliery access roads to reduce impacts to the local community;
- Developing a direct transport connection between the eastern and western sides of the Project to allow the consolidation of Cullen Valley Mine and Invincible Colliery, which had previously been bisected by the Castlereagh Highway;
- Gaining access to the Wallerawang – Gwabegar Railway Line for the transportation of product coal and sand; and
- Accessing the additional coal resource within the Project Boundary located to the west of the Wallerawang – Gwabegar Rail Line.

4.2.5 'Do Nothing' Approach

The 'Do nothing' approach in regard to the Project would result in the sterilisation of a total resource in excess of 100 Mt of ROM coal, the loss of 90 existing full time jobs upon the expiration of current approvals and the significant socio-economic benefits and royalties to both the Federal and NSW governments not being realised. In addition, the loss of over 40% of the existing coal supply for MPPS from the end of 2012 increasing to 70% in 2014 when 2.625 Mtpa is proposed to be supplied to MPPS from the Project. This reduction in coal supply would threaten the continued supply of electricity from the MPPS, and significantly affect the viability of current NSW baseload electricity supply and the proposed extension to that facility.

In the current market context and in consideration of other known coal reserves available in the region that are yet to be developed, it is also considered that the Project also represents the closest, most efficient, reliable and low cost source of product coal available to supply the ongoing operations of MPPS.

The 'Do nothing' approach was therefore rejected on the basis of the significance of the Project in providing an economic coal resource to MPPS and other markets.

The Project will also provide sand product for the greater Sydney area for use in construction activities. There is a significant shortage of construction sand in that market since the closure of Penrith Lakes and as a result the proposed development of this sand resource within the footprint of an existing open cut mine would allow that market to be partially satisfied with a minimal additional environmental impact to that which is currently approved.

4.2.6 Summary

Extensive planning and assessment of the resource by Coalpac and the Project team has been completed to develop a thorough understanding of the likely operational, environmental and social constraints which may apply to the Project as discussed above.

Detailed mine planning and engineering assessment completed during the preliminary studies has identified that the most effective ESD option to recover the proposed resources within the Project Disturbance Boundary is via the proposed combination of open cut and highwall mining methods as presented as the Project for which planning approval is sought in **Section 4.3**. Other available options are either not economically or practically viable.

4.3 COMPARISON OF THE EXISTING OPERATIONS TO THE PROJECT

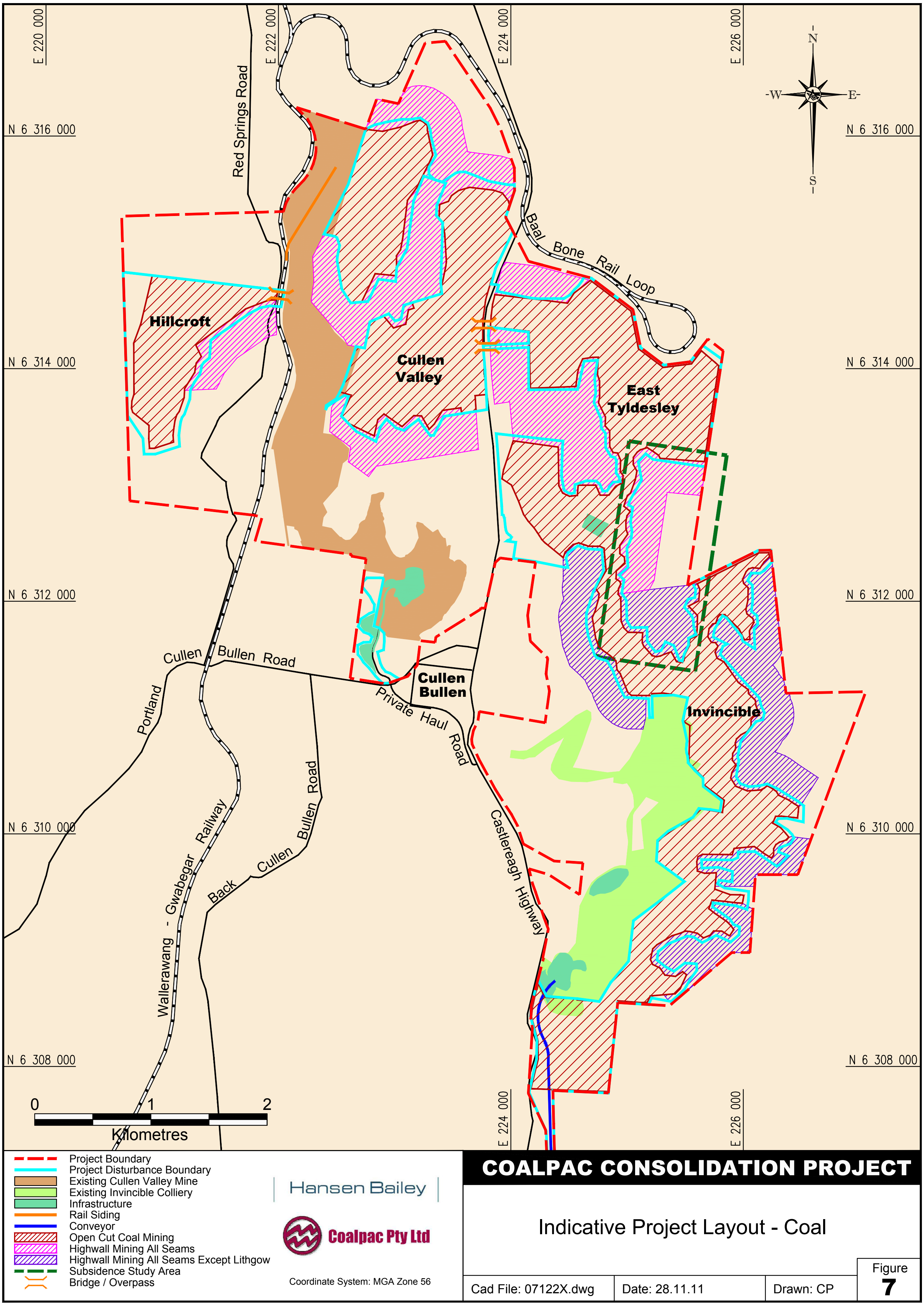
During the formulation of the Project, existing operational constraints from Planning Approvals (see **Appendix A**) on the current activities were considered and have been incorporated into this EA as relevant. **Figure 7** and **Figure 8** show the general layout of the Project for each of the proposed coal and sand operations, respectively. **Figure 5** shows the existing environment of the current Cullen Valley Mine (including the approved but not commenced Hillcroft Pit and Underground Mine) and Invincible Colliery.

Table 8 provides a detailed summary of key Project components and comparison with existing Coalpac Planning Approvals.

4.4 CONCEPTUAL MINE PLAN

4.4.1 Mine Layout

The Project seeks to continue open cut and highwall mining activities for a period of 21 years and further develop a thermal coal resource of more than 108 Mt ROM coal from within Coalpac's mining authorities. The Project will extract coal from the combined Katoomba / Middle River / Moolarben, Upper Irondale, Irondale and the coalesced Lidsdale / Lithgow Seams within the Illawarra Coal Measures (see **Figure 7**). The Project will also extract Marrangaroo Sandstone below the Lithgow Coal Seam from a resource assessed to be approximately 5 Mbcm ROM sandstone in the area indicated on (**Figure 8**).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Project Disturbance Boundary
Existing Cullen Valley Mine
Existing Invincible Colliery
Infrastructure
Rail Siding
Conveyor
Open Cut Coal Mining
Highwall Mining All Seams
Highwall Mining All Seams Except Lithgow
Subsidence Study Area
Bridge / Overpass
Hansen Bailey
Coalpac Pty Ltd
Coordinate System: MGA Zone 56
COALPAC CONSOLIDATION PROJECT
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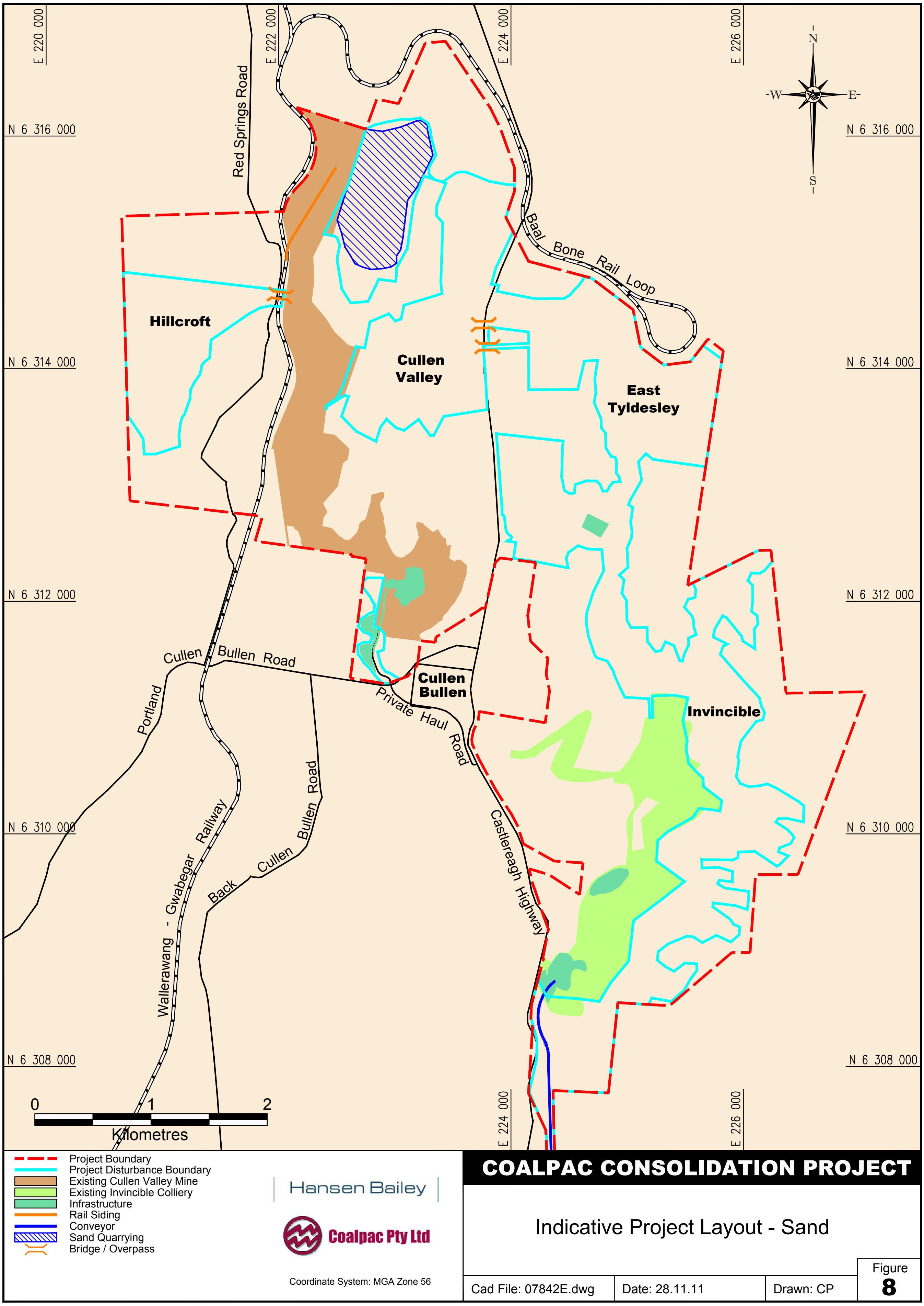
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Project Disturbance Boundary
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Existing Invincible Colliery
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Rail Siding
Conveyor
Sand Quarrying
Bridge / Overpass
Hansen Bailey
Coalpac Pty Ltd
Coordinate System: MGA Zone 56
COALPAC CONSOLIDATION PROJECT
Indicative Project Layout - Sand
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Table 8 Key Project Components and Comparison with Existing Coalpac Approvals

Component	Cullen Valley Mine Existing Approvals	Invincible Colliery Existing Approvals	Consolidation Project
Planning Approval	• Development Consent DA 200-5-2003	• Project Approval PA 07_0127 (modified) • ICPP Approval from Blaxland Council	• Single Planning Approval for consolidated operations • Surrender existing approvals to DP&I in mutually agreeable timeframe
Supporting Documents	• Feldmast Coal Project Environmental Impact Statement (IEC 1997) • Cullen Valley Mine EIS (IEC 2004)	• EA for *'Proposed Extension of Invincible Open Cut Mine and Rehabilitation Activities'* (CEH 2006) • EA of the Proposed Extension to the *'Invincible Colliery Open Cut Mine and Production Increase 2008'* (R.W. Corkery 2008) • Invincible Colliery Modification to Project Approval EA (Hansen Bailey 2010)	This EA
Life of Mine Approval	To August 2025	To December 2016	• 21 years from grant of required surface mining authorities
Resource	7 Mt ROM coal	7.4 Mt ROM coal	• 108 Mt ROM open cut and highwall coal total reserve, including: – 40 Mt ROM coal in Cullen Valley Mine and Hillcroft mining areas – 68 Mt ROM coal in Invincible Colliery and East Tyldesley mining areas • 5 Mbcm sand resource in the Cullen Valley Mine area
Mine Plan	• Open Cut Cullen Valley (and Hillcroft not commenced) • Highwall • Underground (not commenced)	• Open Cut Mining • Highwall Mining	• Open Cut operations in four areas (Cullen Valley, Hillcroft, Invincible and East Tyldesley extension) • Highwall Mining
Production	1.0 Mtpa product coal	1.2 Mtpa product coal	• 3.5 Mtpa product coal • Up to 0.45 Mbcm product sand per annum
Operational Hours	• Mining operations and coal processing 24 hours per day, seven days a week • Blasting between 9:00 am and 3:00 pm Monday to Friday, inclusive • Product coal haulage by road between 7:00 am and 5:30 pm, Monday to Friday, and 7:00 am to 5:00 pm on no more than 30 Saturdays annually	• Mining operations and coal processing between 7:00 am and 10:00 pm, Monday to Saturday, excepting public holidays and operations in West, Renown and Central Pits, which may not operate from 6:00 pm to 10:00 pm • Maintenance activities and safety procedures at any time approved by DP&I • Product coal haulage by road between 7:00 am and 9:30 pm, Monday to Saturday, inclusive and at no time on Sundays or public holidays	• 24 hour operation, seven days per week (including rail haulage) • Blasting 9:00 am to 5:00 pm Monday to Saturday, no blasting outside these hours or on public holidays without prior approval from OEH • Coal and sand haulage via truck on Castlereagh Highway: – All Areas – 7:00 am to 9:30 pm, no Sundays or public holidays (and Cullen Valley Mine via Invincible Colliery Entry after Year 2) – Cullen Valley Mine, Hillcroft and East Tyldesley – 7:00 am to 5.30 pm Monday to Friday, and 7:00 am to 5:00 pm on no more than 30 Saturdays annually (after Year 2) • Truck haulage of product sand to Sydney via Castlereagh Highway and Great Western Highway from the Invincible Colliery site access after Year 2 – 7:00 am to 9:30 pm, no Sundays or public holidays

Component	Cullen Valley Mine Existing Approvals	Invincible Colliery Existing Approvals	Consolidation Project
Workforce	26 full time personnel, plus approximately 20 additional contractors	20 full time personnel, plus approximately 25 additional contractors	120 full time personnel, plus additional contractors
Mining Method	• Truck / shovel open cut coal mining • Highwall coal mining • Continuous miner underground coal mining	• Truck / shovel open cut coal mining • Highwall coal mining	• Truck and shovel / excavator open cut coal mining and sand extraction • Highwall mining of selected coal plies within all seam horizons
Infrastructure and Construction • Buildings • Bridge • Water • Processing • Roads • Rail loop/siding • Power lines	• Site Infrastructure (Office, carpark workshop and bathhouse) • Haul Roads • Noise Bund • Water storage dam and management infrastructure • 100,000 t coal stockpile • Hydrocarbon storage facilities • Private Haul Road • CDP • Explosives Storage Facility and other hazardous goods storage	• Site Infrastructure (Office, carpark, workshop and bathhouses) • Noise and Visual bund • Water storage dams and management infrastructure • Coal stockpile • Fine rejects / tailings storage • Hydrocarbon and hazardous goods storage facilities	• Construct Castlereagh Highway overpass bridge for use from Year 2 • Retain approval for Cullen Valley CDP • Continued use of all existing site infrastructure • Construct ETCPP and associated infrastructure which includes proposed relocation of Cullen Valley Mine CDP to ETCPP • Administration and workshops will be constructed in the ETCPP precinct • Administration and workshops will be constructed in the Cullen Valley Mine area • ICPP continued use for the life of the Project (process a proportion of coal, from all pits. In addition, the ICPP will be used to transfer MPPS product coal to Overland Conveyor) • Construction of preferred rail siding and load out infrastructure for use from Year 2 • Construction of product coal conveyor from ICPP to MPPS along existing power line easement for use in Year 2 • Construction and use of conveyor from ETCPP to ICPP along proposed haul road to reduce haulage requirements (should economic conditions be suitable) • Fish River pipeline diversion and other infrastructure (communications and data) prior to Year 14 • Relocation of Endeavour Energy powerline in south of Invincible Colliery prior to Year 2
Processing • Coal Handling and Preparation Plant (CHPP) • CDP • Crushing	• Coal crushing plant • CDP (approved but not constructed)	• Invincible Colliery central coal crushing and screening area. Capacity of 15,000 t ROM and 10,000 t product stockpiles respectively • Invincible Colliery Coal Preparation Plant (breaker and washery). Capacity for 80,000 t product coal stockpiles	• Operation of ETCPP from Year 2. Includes proposed relocation of the approved Cullen Valley Mine CDP to ETCPP • Continued use of ICPP • Continued use of Invincible Colliery Crushing and Screening Area • Crushing and washing/wet screening of raw sandstone material into a saleable product • Crushing of aggregate for internal use

Component	Cullen Valley Mine Existing Approvals	Invincible Colliery Existing Approvals	Consolidation Project
Rejects Management • Coarse • Tailings • Overburden	• Backfilling of overburden and interburden separated in ROM coal extraction • Flexibility for CDP (not yet utilised). Tailings to be emplaced in open cut backfilling	• Assuming maximum production of 1.2 Mtpa ROM, rejects would include a maximum of 0.21Mtpa • Coarse reject materials to be emplaced in-pit	• ICPP tailings continued to be emplaced in dams in the Invincible Colliery area and consistent with existing processes • All coarse rejects will be emplaced in overburden dumps • ETCPP tailings will be emplaced / encased within overburden emplacement areas (OEAs)
Transport • Coal • Sand	• 1 Mtpa product coal transport by road truck primarily to MPPS via Private Haul Road. No more than 250,000 tpa to other destinations	1.2 Mtpa product coal transport by road truck primarily to MPPS, with up to 0.2 Mtpa to be transported to other domestic destinations, with approval	• Sand transport by truck to domestic markets • Truck transport of coal to MPPS to continue until product coal conveyor completed from ICPP to MPPS from Year 2 up to 2.625 Mtpa (emergency transport with notification to DP&I) • Rail transport on Wallerawang – Gwabegar Railway Line up to 1.0 Mtpa via rail siding facility to market from Year 2 • Transport up to 0.45 Mbcm product coal by road to destinations other than the WPS and MPPS
Rehabilitation and Closure	None	• Mine Closure Plan and Landscape Management Plan under PA 07_0127	• Development of a consolidated final landform for the Project

Indicative open cut mining areas during each year of the Project are shown in **Figure 9**. Typically, the total area of active open cut mining in any given year will be limited to less than 100 ha throughout the life of the Project. Conceptual mine plan layouts for Project Years 2, 8, 14 and 20 are presented in **Figure 10** to **Figure 13**. Each shows indicative disturbance areas, mining areas, OEAs and rehabilitation progress and proposed noise and visual bunds (described further in **Section 8.6**). These stages of the mine plan have been selected for modelling as they represent a combination of mining at the extremities of the Project Disturbance Boundary and the years of the greatest intensities of mining. The timings referred to are indicative only and may vary due to actual production achieved. The extent of the Project Disturbance Boundary will be marked out in the field and appropriate signage put in place by an appropriately qualified surveyor prior to any disturbance commencing and notification to Forests NSW made.

The Project mine design and scheduling will enable coal to be produced at approximately equal volumes, dependant on in-situ coal quality and environmental constraints from: Cullen Valley Mine (including Hillcroft); and Invincible Colliery (including East Tyldesley). Some flexibility in the rate of coal extraction varying from area to area over the life of the Project may also be required to respond to market forces and seasonally unfavourable weather conditions. No final void will remain after mining, as shown in **Figure 14**.

This figure conceptually presents the final landform for the Project, at a period of approximately four years after the completion of mining operations (i.e. Year 25 post-approval).

Cullen Valley Mine

In the Cullen Valley Mine area, open cut mining will progress in a northerly direction along the eastern side of the Wallerawang - Gwabegar Rail line to the northern extent of the Project Boundary. Following this, mining activities will occur during Year 2 on the western side of the rail line in the Hillcroft Area before relocating back to progress through the additional mining areas east of the rail line. The extraction of the Marrangaroo Sandstone below the level of the Lithgow Seam in the Cullen Valley Mine area will commence progressively following coal mining activities above the location of this resource (shown in **Figure 8**). It is anticipated that sand extraction operations associated with the Project will conclude in approximately Year 14.

Invincible Colliery

Mining operations in the Invincible Colliery area will generally progress in a northerly direction through the life of the Project in lands located to the east and north of the previously approved mining activities. The progression of mining into the East Tyldesley area will initially involve mining from east to west toward the Castlereagh Highway from the location at which the ETCPP will be constructed.

Once the ETCPP facility is constructed, open cut mining operations will generally progress north and then from east to west following the topography of the area.

The conceptual mine plans also show the locations at which earth bunds are proposed to be established. These structures will be constructed at various stages of the Project life in order to minimise impacts of the Project to receptors for a range of environmental issues such as noise, air quality and visual amenity.

4.4.2 Indicative Mining Schedule

An indicative production schedule for coal, sand and waste (overburden and rejects) for the Project corresponding to the conceptual mine plans is provided in **Table 9**. Indicative coal volumes presented include both open cut and highwall mining operations.

Table 9 Indicative Production Schedule

Year	Total Overburden (Mbcm)	Product Coal (Mtpa)	Product Sand (Mbcm)	Coarse Reject and Tailings (Mtpa)
2	14.2	3.5	0.00	0.9
8	20.5	3.5	0.45	1.1
14	23.8	3.5	0.45	1.1
20	19.7	3.5	0.45	1.1
TOTAL:	**422.3**			**15.2**

4.4.3 Mining Methods

Coalpac intends to undertake the extraction of the coal resource via either open cut coal mining or highwall mining methods. Each is described below.

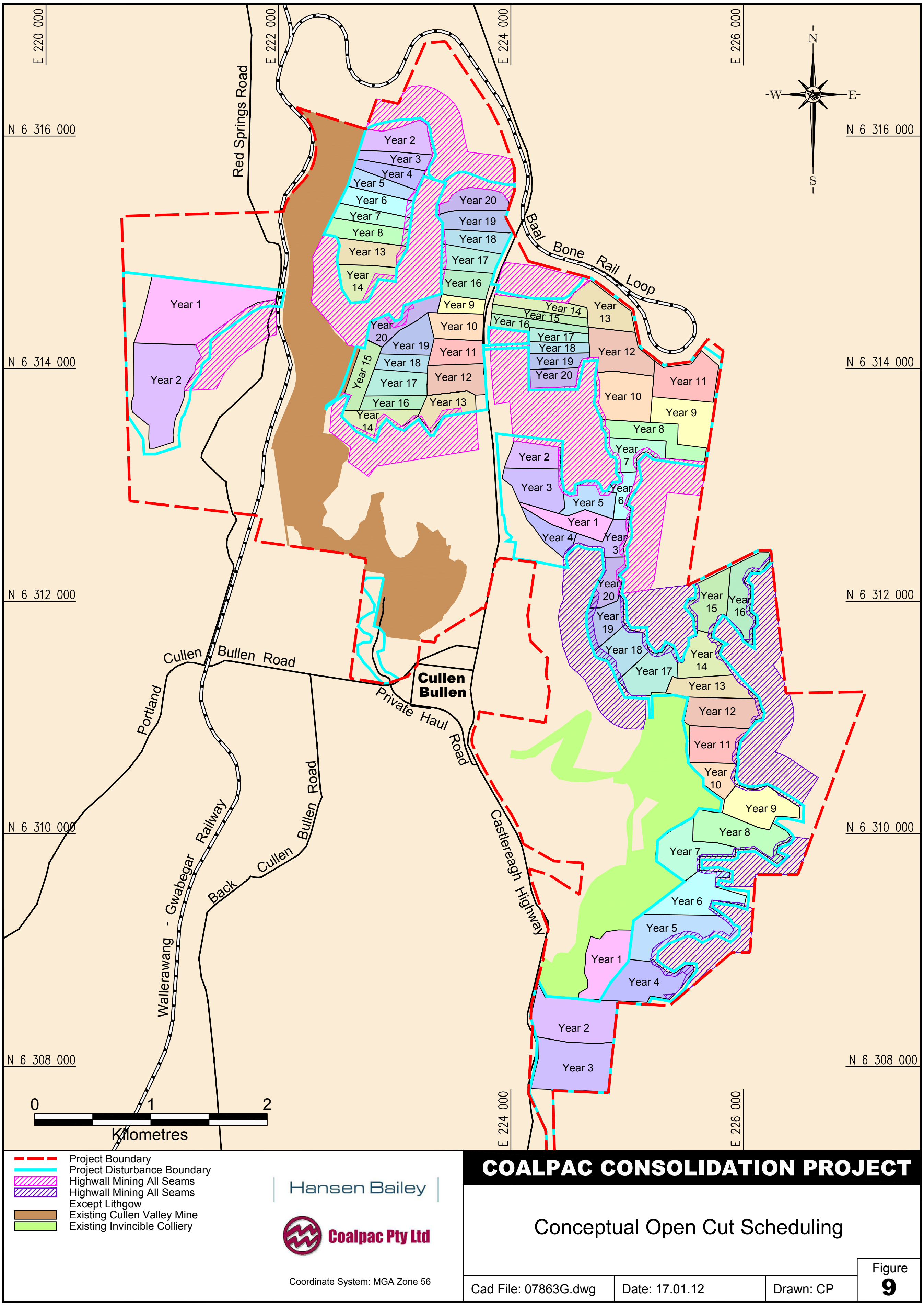
Open Cut Mining

The Project will utilise the conventional open cut (haul-back) mining method using a shovel/excavator supported by a fleet of trucks to haul coal to processing and transport facilities and overburden to emplacement areas. This will involve the sequential removal of topsoil, overburden and interburden (above and between each coal seam), coal removal and progressive backfilling and rehabilitation of mined-out areas.

Open cut coal extraction for the Project will be undertaken generally consistent with currently employed methods which includes the following:

- Vegetation Clearing, Soil Stripping and Overburden Removal: The vegetation on the surface of the open cut mining block will be cleared and stockpiled for future use in the rehabilitation of the final landform. Any topsoil material able to be salvaged will then be stripped (and transported to active rehabilitation areas), to expose the subsoils and overburden above the coal seam(s). The limit of the open cut mining in each block represents the economic limit of open cut mining beyond which the overburden to coal stripping ratio becomes too great;
- The overburden above the target coal seam(s) would be fractured by controlled blasting, loaded (via excavator or front end loader) into haul trucks ('Truck and Shovel') and transferred to a tipping location as part of open cut backfilling operations. Where waste is adjacent to an open cut void, waste is pushed into the void with a bulldozer ('Dozer Push'). The transfer of overburden materials via Dozer Push and Truck and Shovel will continue using the Project equipment fleet (see **Section 4.5**); and
- Mining of the Coal Seam: Once exposed by overburden removal, an excavator or loader is used to mine the coal seam and load the exposed coal into haul trucks. It should be noted that open cut mining to the level of the Lithgow Coal Seam will not occur in areas that would intersect the abandoned Tyldesley Colliery underground workings that are flooded adjacent to the southern parts of the Cullen Valley and East Tyldesley open cut mining areas (see **Section 8.10**). Coal mining would be limited to the Irondale Seam above the abandoned Tyldesley Colliery underground workings, and for a standoff distance of 50 m laterally in the Lithgow Seam from flooded underground workings to ensure the workings are not breached, and water is retained within these abandoned underground workings.
- In addition to those methods described above, the open cut mine plan includes a standoff zone from the open cut highwall crest of an additional 50 m (from original mine planning) from all pagodas or significant sandstone cliffs or escarpments. The open cut highwall crest will also include a standoff zone of a minimum of 20 m from any significant exposed outcrop or formation that does not fall under the above categorisation. Other restrictions and management measures are proposed to be implemented to ensure that Project open cut operations will not impact on sensitive geological features or natural heritage sites; this is discussed further in **Section 8.7**.

Overburden material is emplaced using rear dump trucks at 3 emplacement levels, being the Irondale Seam level (lowest dump bench), midway between the Irondale Seam and the Moolarben Seam (mid-dump height) and Moolarben Seam level (highest dump bench). These form the primary levels of the overburden emplacement that follows the advancing open cut mining faces. **Figure 15** shows this process schematically.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Kilometres
Project Boundary
Project Disturbance Boundary
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Highwall Mining All Seams Except Lithgow
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Existing Invincible Colliery
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Coalpac Pty Ltd
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Conceptual Open Cut Scheduling
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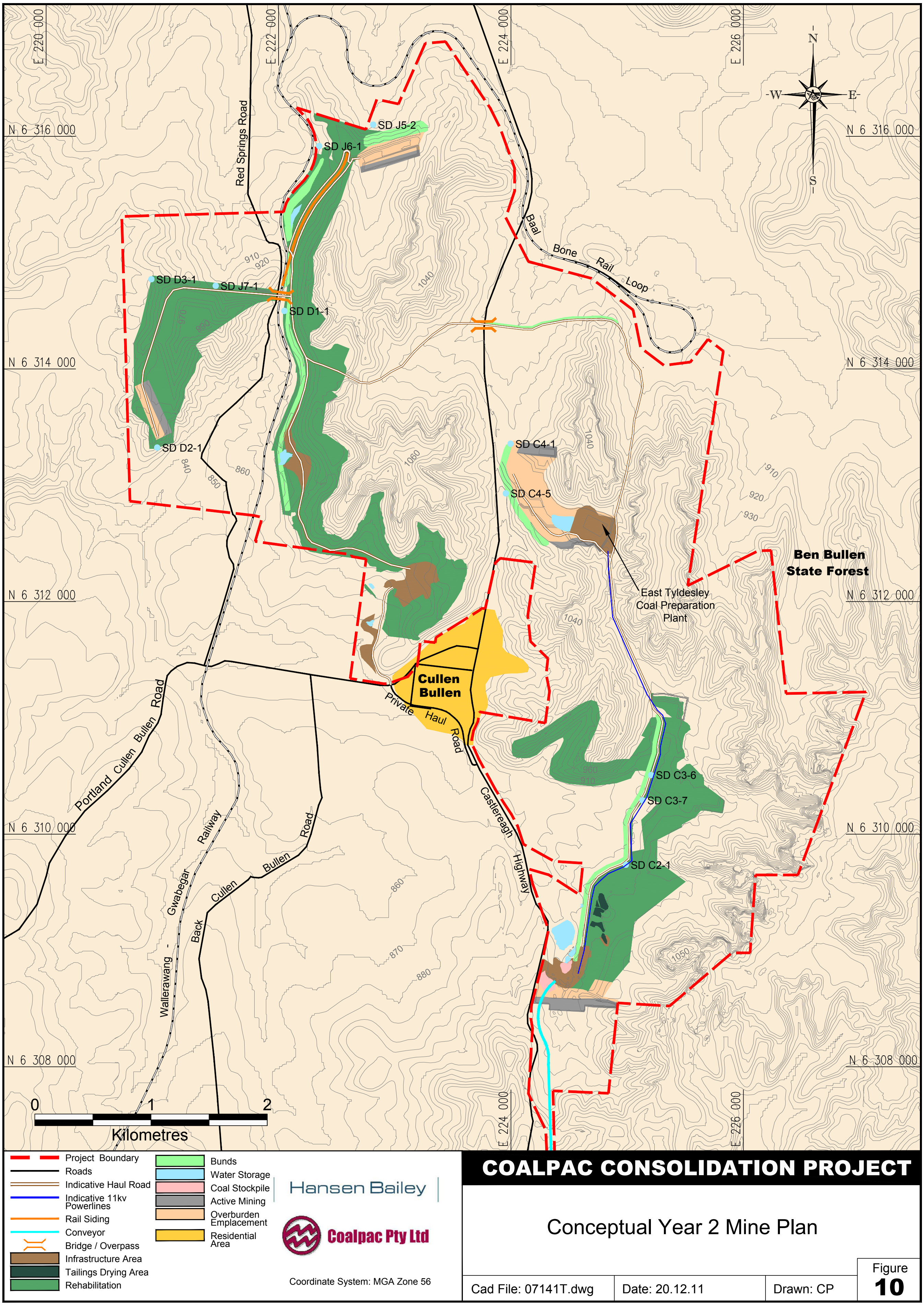

COALPAC CONSOLIDATION PROJECT

Conceptual Year 2 Mine Plan

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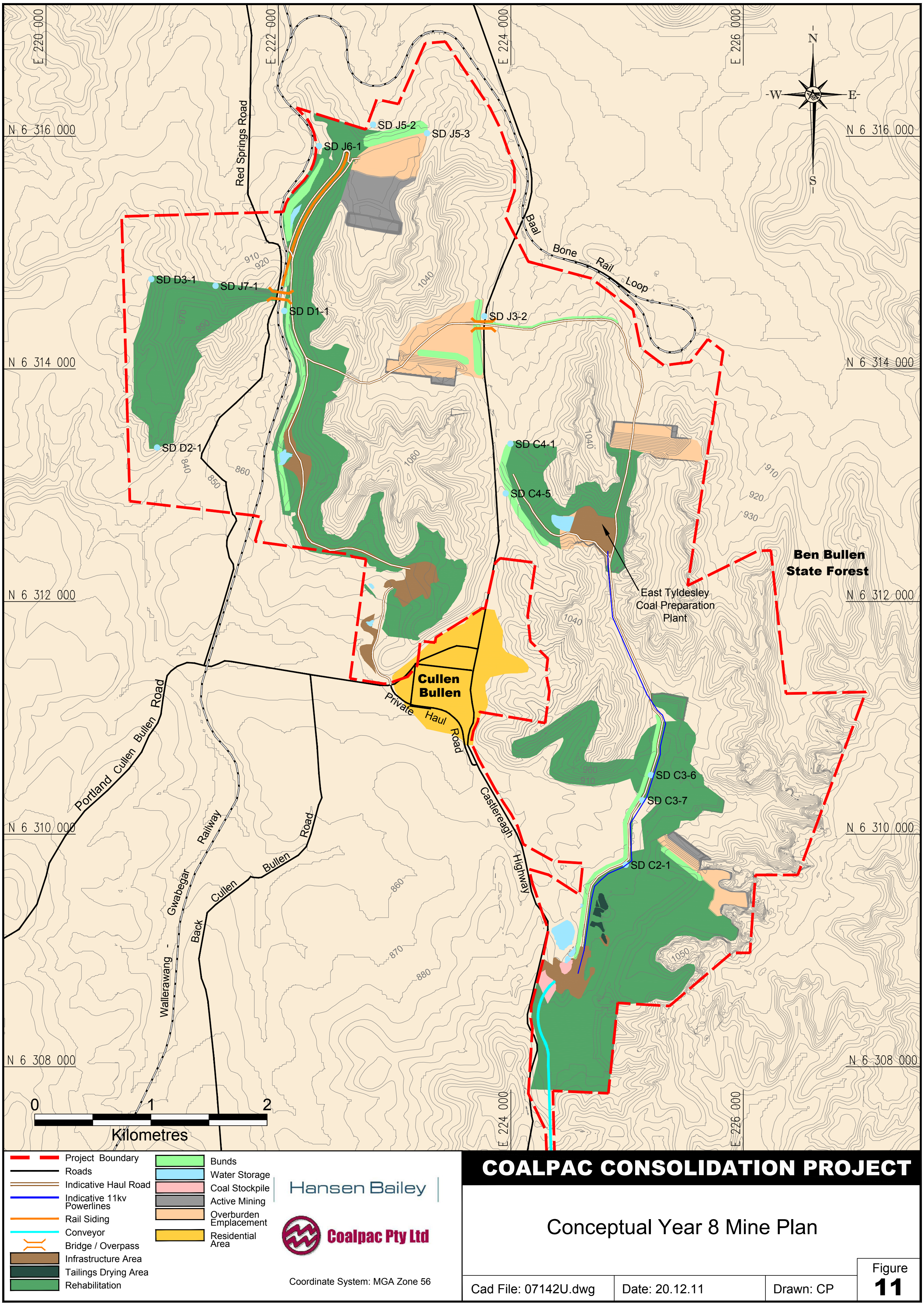
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SD C2-1
East Tyldesley Coal Preparation Plant
Ben Bullen State Forest
Cullen Bullen
Private Haul Road
Castlereagh Highway
Portland Cullen Bullen Road
Railway
Wallerawang - Gwabegar
Back Cullen Bullen Road
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Project Boundary
Roads
Indicative Haul Road
Indicative 11kv Powerlines
Rail Siding
Conveyor
Bridge / Overpass
Infrastructure Area
Tailings Drying Area
Rehabilitation
Bunds
Water Storage
Coal Stockpile
Active Mining
Overburden Emplacement
Residential Area
Hansen Bailey
Coalpac Pty Ltd
Coordinate System: MGA Zone 56
COALPAC CONSOLIDATION PROJECT
Conceptual Year 8 Mine Plan
Cad File: 07142U.dwg
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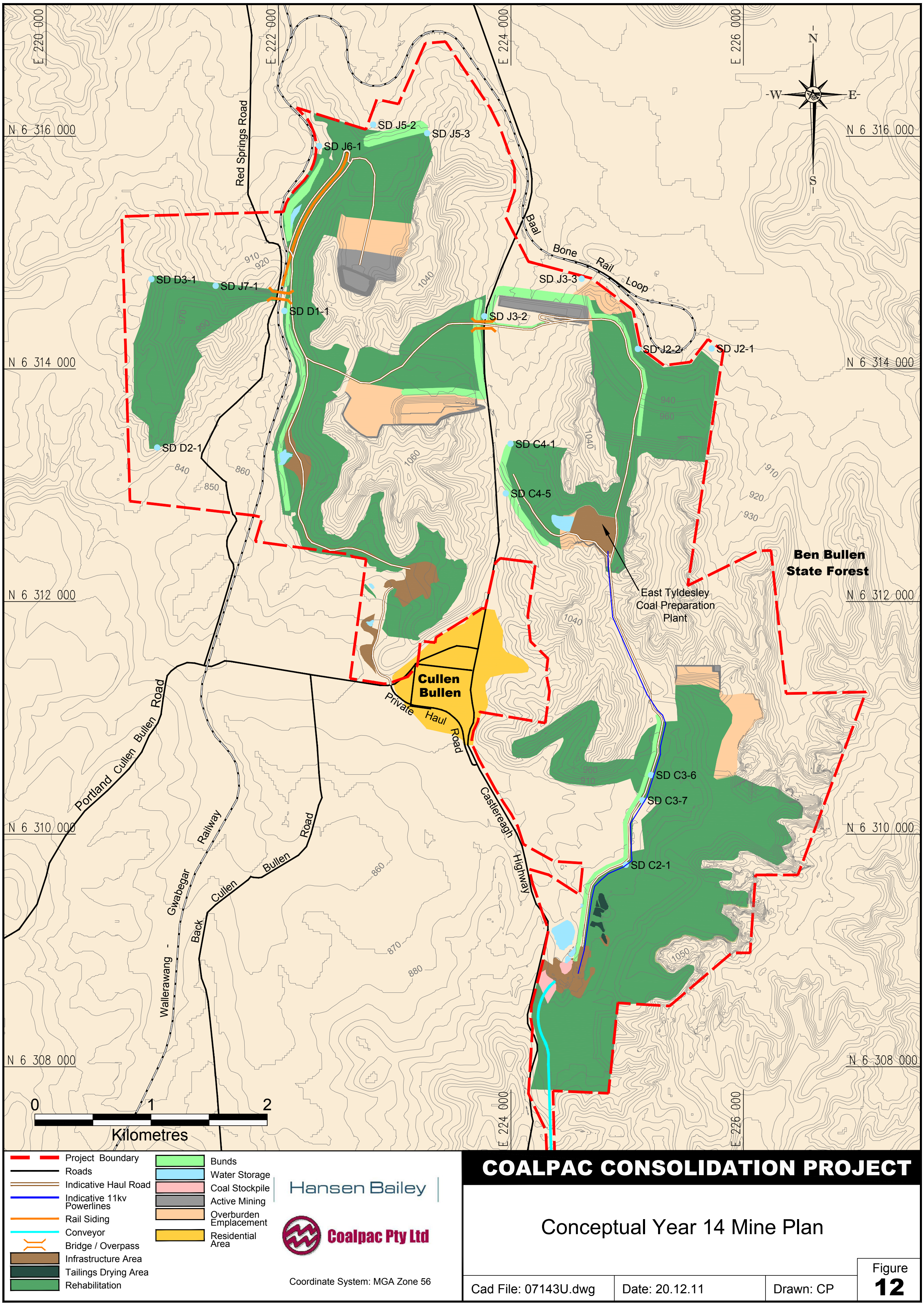
Figure
11



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SD C2-1
Baal Bone Rail Loop
Ben Bullen State Forest
East Tyldesley Coal Preparation Plant
Cullen Bullen
Private Haul Road
Castlereagh Highway
Portland Cullen Bullen Road
Wallerawang - Gwabegar Railway
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Project Boundary
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Indicative 11kv Powerlines
Rail Siding
Conveyor
Bridge / Overpass
Infrastructure Area
Tailings Drying Area
Rehabilitation
Bunds
Water Storage
Coal Stockpile
Active Mining
Overburden Emplacement
Residential Area
Hansen Bailey
Coalpac Pty Ltd
Coordinate System: MGA Zone 56
COALPAC CONSOLIDATION PROJECT
Conceptual Year 14 Mine Plan
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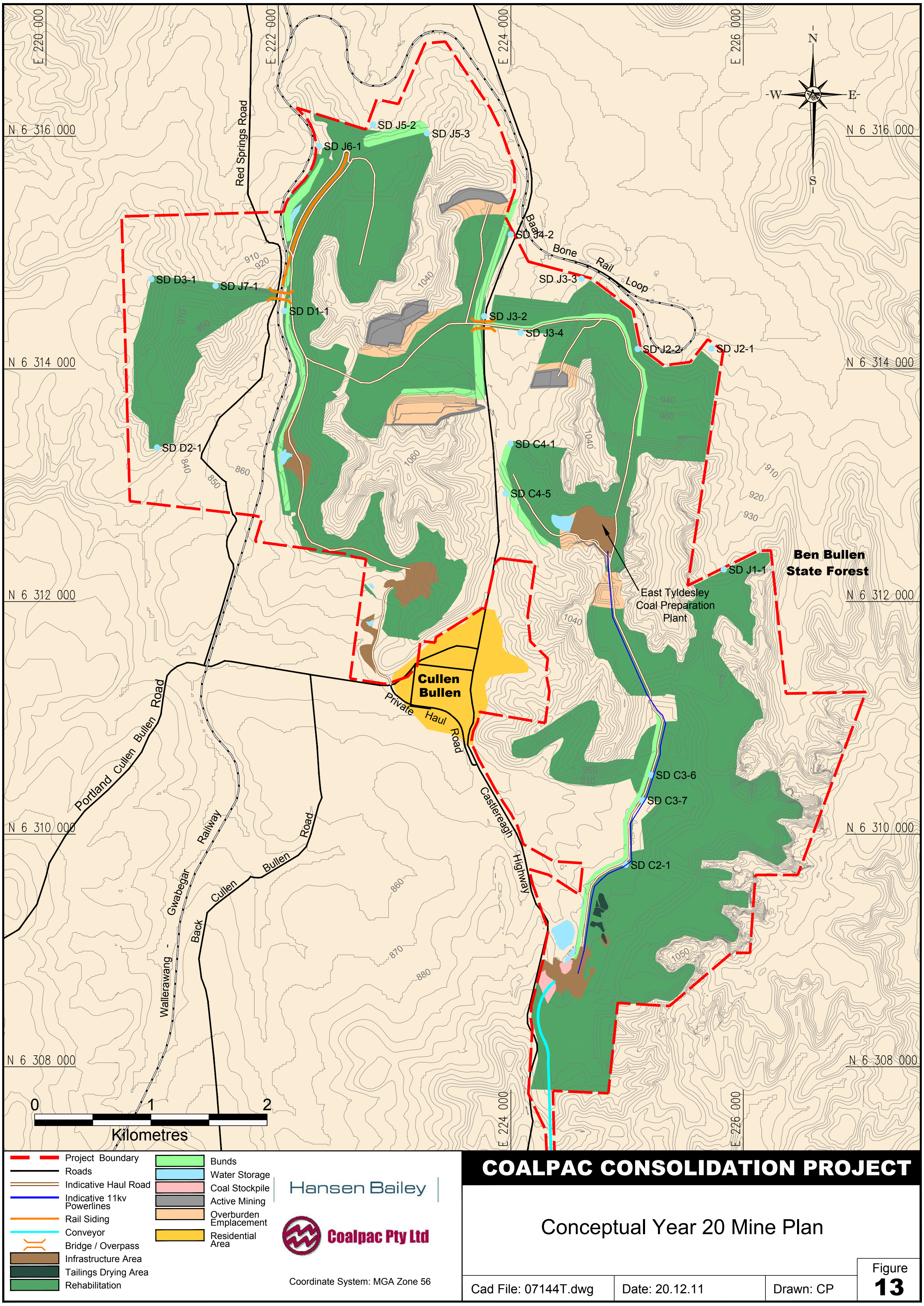
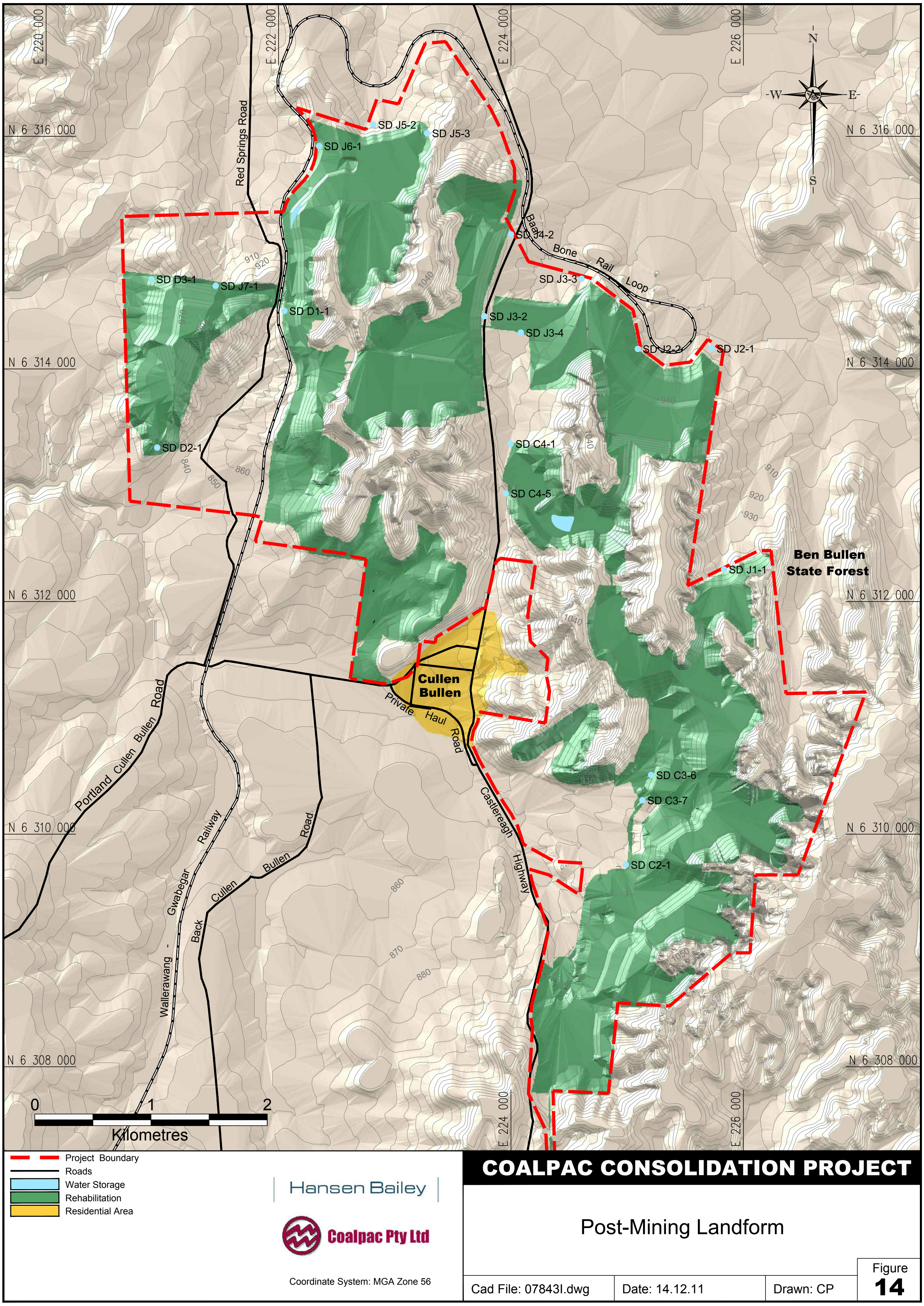
Figure 12



COALPAC CONSOLIDATION PROJECT

Conceptual Year 20 Mine Plan

Figure 13



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SD D2-1
SD C4-1
SD C4-5
SD J1-1
Ben Bullen State Forest
Cullen Bullen
Private Haul Road
Castlereagh Highway
Portland Cullen Bullen Road
Wallerawang - Gwabegar Railway
Back Cullen Bullen Road
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SD C3-7
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Kilometres
Project Boundary
Roads
Water Storage
Rehabilitation
Residential Area
Hansen Bailey
Coalpac Pty Ltd
Coordinate System: MGA Zone 56
COALPAC CONSOLIDATION PROJECT
Post-Mining Landform
Cad File: 07843I.dwg
Date: 14.12.11
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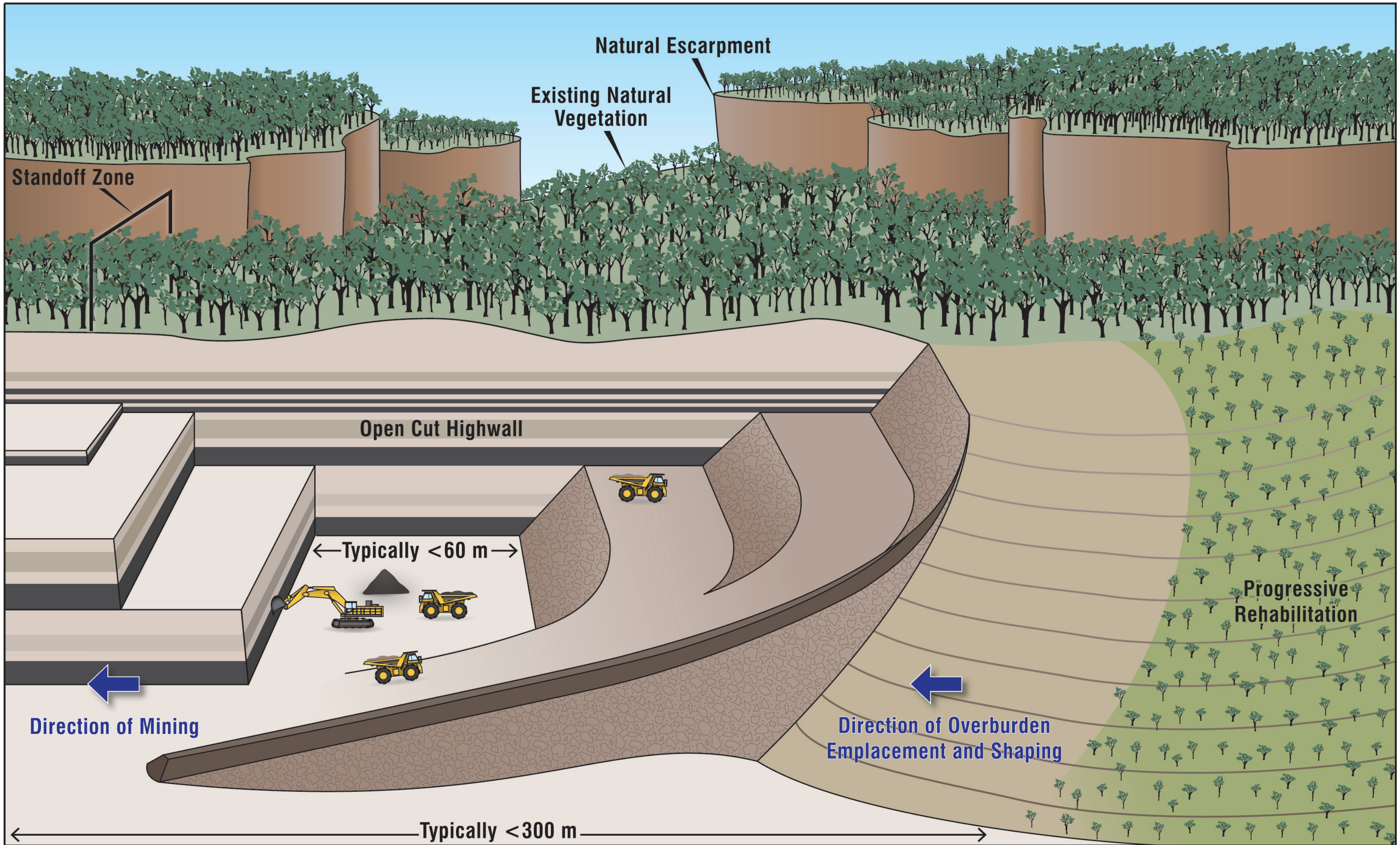
Figure
14



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Overburden Emplacement Area Formation

Filename:1153-30-40 Fig 15 OEA Formation.ai	Date: 14.12.11	Drawn: BD	Figure 15

The advancing levels of the emplacement (known as 'tip-heads') form stable slope angles at the natural angle of repose of the overburden material, which is typically 35 degrees from the horizontal. As the tip-heads advance, and approach the final rehabilitation slope position, then overburden emplacement is restricted to that slope position.

For the Project, the maximum slope angle for final rehabilitation surfaces is 18 degrees from the horizontal. This is a stable slope angle based on 10 years of experience in the development of OEAs at both Cullen Valley Mine and Invincible Colliery. Stability is achieved via semi-compacted placement of overburden material, as a result of trucks and dozers continuously compacting the OEA tip-head running surface. The emplacement of overburden material against the final highwall provides a 'buttress' effect, by providing confinement of the highwall face. This provides support to any potential planes of weakness and ensures the long term integrity of the highwall. Monitoring and management of slope stability at both operations is undertaken in accordance with the *Slope Stability Major Hazard Management Plan* (Coalpac 2010c).

Open cut highwall slope angles in excess of 80 degrees from the horizontal have been employed at both Cullen Valley Mine and Invincible Colliery to good effect over a period in excess of 10 years with no major instability occurring over that time. Annual independent geotechnical inspections of highwalls at both of Coalpac's current mining operations have confirmed the inherent rock mass stability under these mining conditions (GeoTek Solutions 2010a, 2010b). As noted above, the exposed open cut highwall is buttressed by the advancing overburden emplacement as previously discussed (see **Figure 15**). These well proven and effective practices will continue for the Project.

The aim of this haul-back mining method is to maintain an active mining "footprint" or disturbed area which is as small as practically possible at all times. This method has been used at both Cullen Valley and Invincible open cut mines since 1999. This limits the environmental impact as well as ensuring the maximum efficiency of the mining process. This is in marked contrast to open cut mining methods practiced elsewhere in NSW where large areas are held open for prolonged periods.

Highwall Mining

Highwall mining is a mining method developed to recover reserves beyond the economic reach of open cut mining or where there are surface features or structures that need to be preserved. It is a lower cost substitute for conventional underground mining but has limited penetration depth. The mining method requires pillar stability to be maintained as a fundamental requirement in order to preserve the exposed highwall and operate the mining equipment safely.

The highwall mining method enables coal to be mined without the need for overburden or interburden removal. Coal is recovered via the excavation of unmanned entries beyond the final highwall position and allows for the recovery of coal that would otherwise be sterilised. The locations proposed for highwall mining are shown on **Figure 7**, with a schematic overview of the process presented in **Figure 16**.

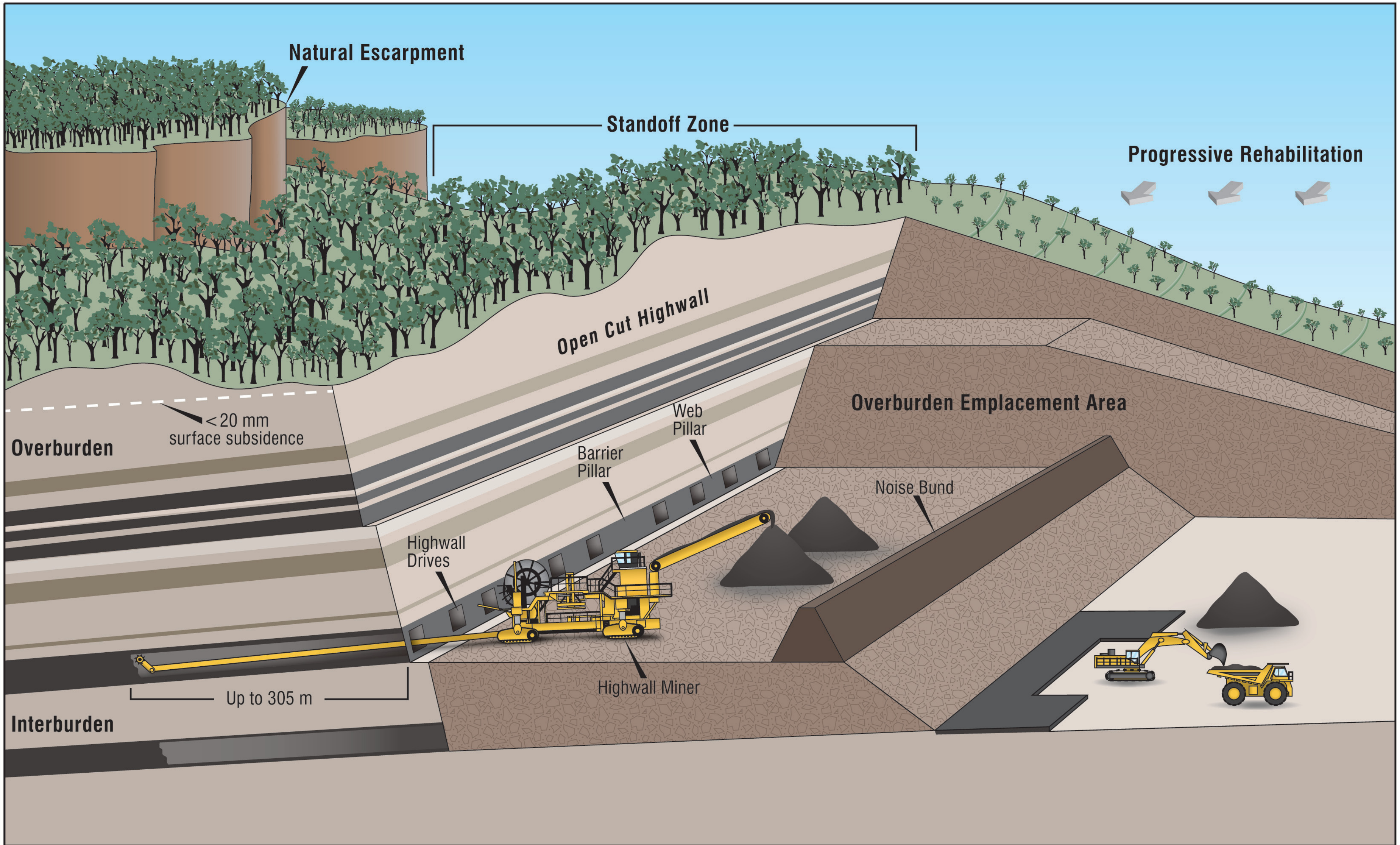
A continuous miner machine or auger will be utilised to facilitate highwall mining which is proposed to be undertaken following the completion of open cut operations. As mining progresses down through the coal seam sequence, a temporary horizontal bench of at least 35 m will be retained to allow the highwall mining equipment to access the target coal seam. This bench will generally dip gently toward the highwall and will be temporarily bunded by the low wall using overburden to facilitate effective water management and provide acoustic shielding of the equipment while it is in operation. Once the highwall bench has been established, the highwall mining machine is set up. A typical cross section of the highwall mining process is shown in **Figure 17**. The area shown on this plan is indicative of the highwall mining process to be undertaken for the 'Subsidence Study Area' outlined in **Figure 7**.

The cutting head of the highwall mining machine will advance into the coal face. The coal will be mined in this way to various lengths up to 305 m penetration depth from the highwall face, leaving a stable pillar width or 'web' between each entry to maintain the integrity of the highwall and limit subsidence. The mined coal will be conveyed from the cutting face to the bench and transferred to an elevating conveyor for stacking or loading directly into trucks for transportation to coal stockpiling areas. No noticeable surface subsidence is predicted to occur as a result of highwall mining for the Project. **Section 8.1** provides a detailed discussion on how this outcome will be achieved.

Sand Mining

The sand resource is contained within a friable, weakly-cemented sandstone horizon which is stratigraphically located within a few metres of the immediate floor of the Lithgow Seam. It is anticipated that the sand resource identified for the Project (of approximately 5 Mbcm) will be extracted for processing at the mobile crushing and screening plant (see **Section 4.6**) by a low intensity truck / shovel operation.

As outlined in **Section 8.11**, it is anticipated that the waste materials from washing of the sandstone (clays and fine sand particles) will be pumped into the abandoned Tyldesley Colliery underground via boreholes drilled to intersect the workings. This would only be done should further analysis confirm that the waste is inert as described in **Section 8.11**). This would facilitate the filling of the old workings on the western side of the abandoned Tyldesley Colliery and assist the management of the existing subsurface heating issues in this area. Alternatively, waste material could be emplaced in active overburden emplacements, as described in **Section 4.7**.



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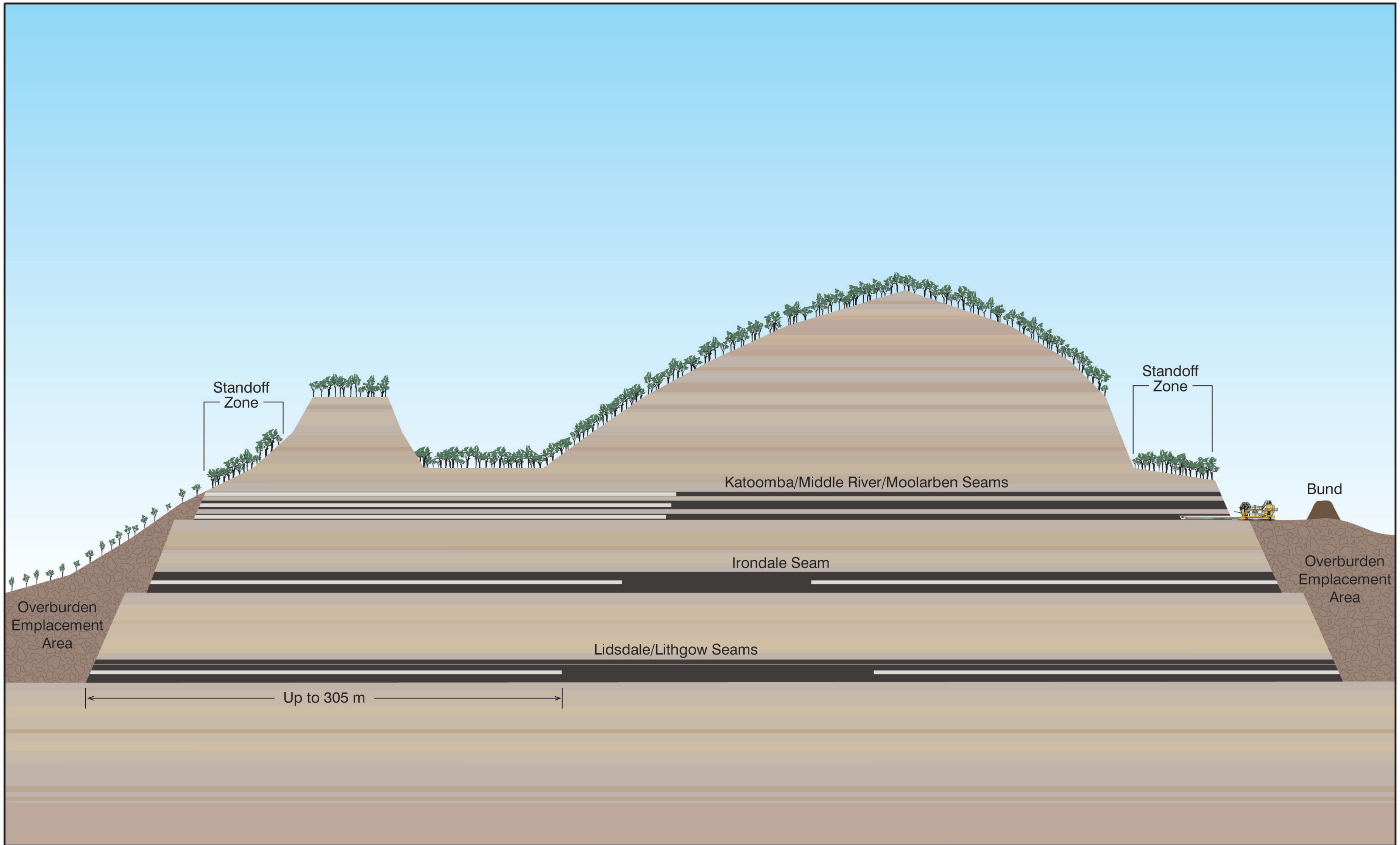
Highwall Mining Schematic

Filename:1153-30-40 Fig 16 Highwall Mining Schematic.ai	Date: 14.12.11	Drawn: BD	Figure 16



Vertical Exaggeration x 1.5

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Highwall Mining Schematic Cross Section

Filename:1153-30-40 Fig 17 Schematic Cross Section.ai	Date: 14.12.11	Drawn: BD	Figure 17

4.4.4 Blasting

Where sufficiently friable, the initial few metres of overburden will be fractured by ripping with dozers, however, as the overburden hardens with depth, this material will typically require some blasting to achieve suitable fracturing and fragmentation to enable efficient loading and removal. Following blasting (or ripping), the majority of the overburden / interburden materials will be loaded by shovel/excavator into haul trucks and transported to a completed section of the open cut mine for backfilling and final landform creation. Overburden is then pushed and shaped by dozers to ensure a natural final landform.

Blast events will be limited to 20 per month, or five blasts per week. As noted in **Section 8.7**, on occasion, smaller more frequent blasts would be required in areas of the Project in closest proximity to receivers and sensitive heritage structures to ensure predictions are met.

Blasting will be undertaken during the hours 9:00 am to 5:00 pm Monday to Saturday, excluding Sundays and public holidays unless prior approval is granted from OEH. Each blast will be designed, loaded and fired by a suitably qualified and experienced blasting engineer holding a shotfirer's certificate approved by DTIRIS – MR, to provide an adequate level of fragmentation.

All storage of explosives and other related materials for the Project will be located in facilities designed and sited within the Project Disturbance Boundary in accordance with the relevant Standards and Guidelines (*'AS2187.2-2006 – Explosives – Storage, Transport and Use. Part 2: Use of Explosives'*).

4.4.5 Rehabilitation

Rehabilitation activities for the Project will be undertaken progressively to ensure that the total area of disturbance at any one time is minimised. This will be conducted in concert with the haul-back open cut and highwall mining process. This minimisation of disturbed areas reduces the potential for wind-blown dust, visual impacts and any increases in sediment-laden runoff. Rehabilitation areas will be developed to be consistent with conceptual landform design objectives and guidelines so that disturbed areas are returned to a condition that is compatible with the surrounding landscapes of the Ben Bullen State Forest and is sustainable in the long term. Current practice at Invincible Colliery and Cullen Valley Mine has demonstrated that this can be carried out effectively. Coalpac has a well proven preparation and seeding technique which would be applied to the Project.

The general progression of rehabilitation over the life of the Project is shown in the conceptual mine plans (**Figure 10** to **Figure 13**). A conceptual final rehabilitation and landform design prepared for the Project is discussed further in **Section 8.24**.

Generally, overburden will be emplaced up to final rehabilitation surface level and bulldozers will progressively shape the spoil to 18 degree slopes or less. This will allow continuous emplacement of overburden and topsoil over the shaped surface to ensure a stable final landform, ready for seeding during spring and autumn.

Once shaped to the appropriate form, overburden will be topsoiled and seeded with a mixture of native trees; mid-storey and groundcover to re-establish vegetation communities similar to those of the pre-mining landscape that provides appropriate habitat for local fauna species consistent with the Project Offset Strategy (see **Section 8.15**). A post-mining landform has been developed for the Project to integrate all mining areas with the surrounding landscape and vegetation communities.

Some localised areas of historical heating occur in previously rehabilitated areas of the Cullen Valley Mine as described in **Section 8.4**. The Project will continue to manage and maintain these areas within and adjacent to the Project Boundary to the approval of DTIRIS – MR and DP&I to minimise impacts to vegetation and the neighbouring community.

4.5 EQUIPMENT FLEET

An indicative list of mobile equipment for the Project is listed in **Table 10**. The actual equipment utilised for the Project may vary. Sound suppressed equipment will be utilised for the Project.

4.6 COAL AND SAND PROCESSING

4.6.1 Invincible Coal Preparation Plant

The ICPP will continue to be used during the life of the Project to process a proportion of coal from each of the mining areas. There will also be continued use of the relocatable Invincible Colliery Crushing and Screening Area up to the end of Year 2 (shown indicatively on **Figure 7**) whilst the ETCPP is being constructed.

As an alternative to the road haulage of product coal to MPPS, the ICPP will be modified for the Project to allow the transfer of product coal to an overland conveyor.

The flexibility to transport product coal by road will be retained for use during limited periods of major conveyor downtime to ensure supply to MPPS under emergency circumstances (see **Section 4.8.2**). This would occur only with prior notification to DP&I.

The route of the conveyor will follow the areas disturbed for existing power infrastructure corridors for most of its length as shown on **Figure 7**.

The conveyor will cross the Castlereagh Highway (shown on **Figure 19**) on Delta Electricity land via an overpass bridge with product coal transferred to coal stockpile facilities at MPPS.

4.6.2 Cullen Valley Sand Crushing Plant

Sand extracted from the Cullen Valley mining area will be transported to an in-pit crushing and screening plant for processing, with minor washing and centrifuging to separate the sand grains from the sandstone matrix of minerals and clays. Washing activities will be undertaken in pit with the crushing and screening plant area comprising:

- A hopper to receive raw sandstone;
- A crusher to size the raw sandstone prior to screening to product specifications;
- A screening component to remove oversize material;
- Second screening deck where the product sand is wet-screened and the silt material removed;

Table 10 Indicative Mobile Equipment List

Equipment Type	Project Fleet	
	Coal Fleet	Sand Fleet
Waste Excavator (Hitachi EX2500 or equivalent)	4	-
Rear Dump Truck (Cat 785 or equivalent)	13	-
Rear Dump Truck (Cat 777 or equivalent)	4	2
Push to Fill Waste Dozer (Cat D11R)	3	-
Bench Dozer (D11R)	3	1
Dump Dozer (Cat D10R)	3	
Rehabilitation Dozer (Cat D11R)	2	-
Coal Excavator (Hitachi EX1200 or equivalent)	2	-
Coal Front End Loader (Cat 992 or equivalent)	1	1
Coal Hauler	4	-
Grader	2	-
Water Cart	2	-
Service Truck	2	-
Blasthole Drill	2	-
Highwall Miner	1 - 2	-
Mobile Impact Crusher	-	1
Other ancillary equipment (e.g. pumps, lighting plants, etc)	Various	Various

- Cyclones for dewatering the sand product prior to stockpiling; and
- Product stackers.

The resultant product will then be stockpiled prior to being hauled by truck to domestic markets via the internal Castlereagh Highway overpass bridge (see **Figure 8**) to access the public road network via the Invincible Colliery site access road. All haulage of product sand to the Sydney market for the Project will be via the Castlereagh Highway and Great Western Highway. The Bells Line of Road will not be utilised for any sand haulage operations.

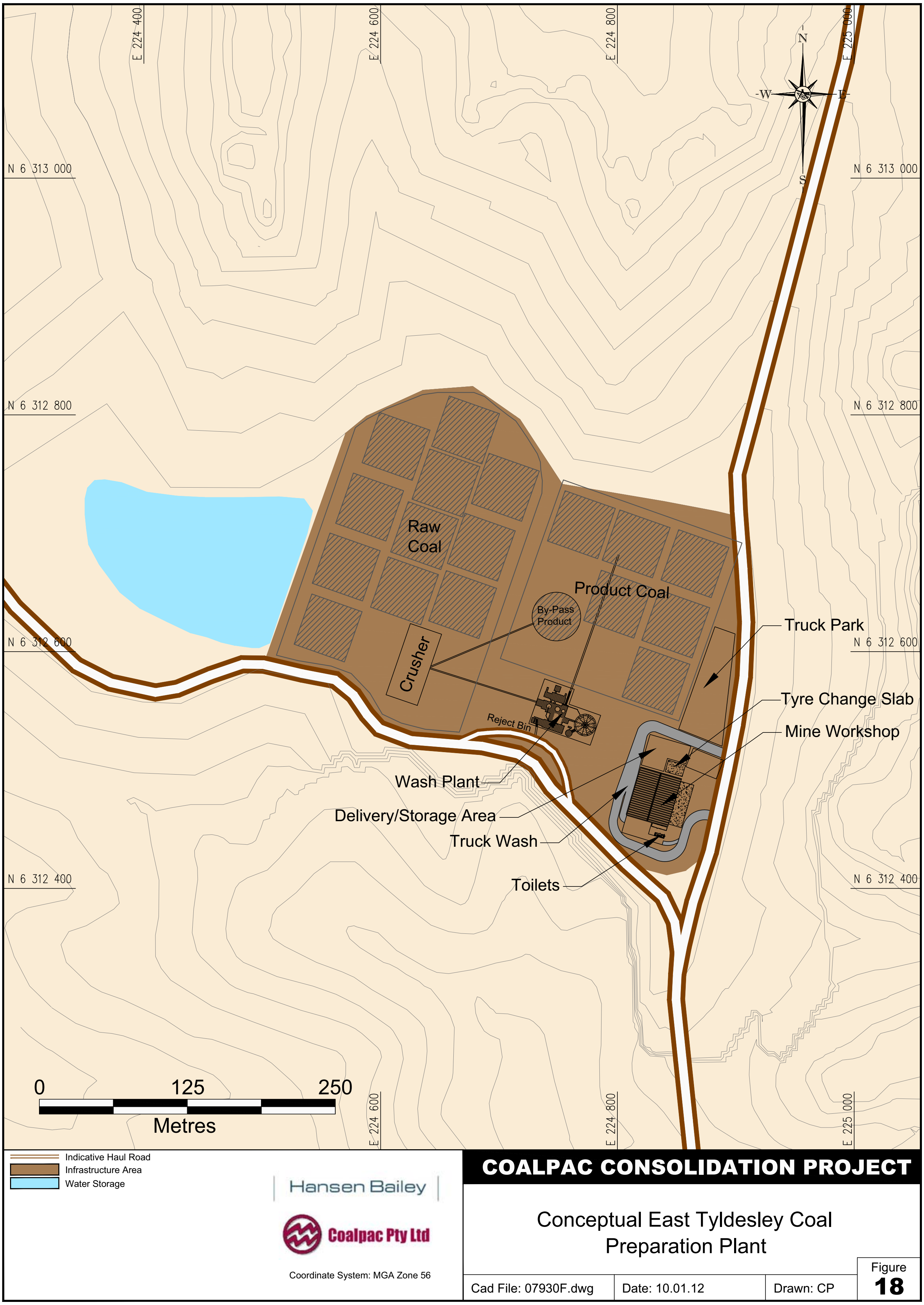
Water will be utilised during sand processing to remove waste materials such as clay and silt fines from the raw material and ensure product is created at required specifications. Of the 0.45 Mbcm per annum of ROM sand proposed to be extracted for the Project, approximately 0.2 Mbcm would generally require wet screening.

As with similar sandstone wet screening operations, approximately 4,000 L - 5,000 L of water per tonne of product sand would be required during processing. Of the total volume required for processing, the majority would be recycled as part of the wet screening recovery process. Of this, some water would be retained within the sand product sold (in a range of approximately 5% to 9%). Depending on the moisture content of the raw sand fed for processing, this may also include a small proportion of the water added through the washing process.

4.6.3 East Tyldesley Coal Preparation Plant

All coal stockpiling, handling and beneficiation activities will be conducted using existing infrastructure and processes up to approximately Year 2 (see **Section 4.6.1** above). At that time, the total throughput will increase as a result of higher coal production rates sought for the Project. This increase will therefore require the construction of additional coal processing infrastructure at the East Tyldesley area, including the ETCPP and associated facilities. The ETCPP will include the approved CDP (proposed to be relocated from Cullen Valley Mine) and the construction of coal preparation facilities and associated offices, amenities, heavy equipment repair and maintenance workshops. The proposed location and conceptual layout of the ETCPP and associated facilities is shown on **Figure 10** and in detail on **Figure 18**. Minor crushing of aggregate for internal usage will also be undertaken at the ETCPP.

To allow for the additional capacity required for the increase in ROM coal extraction for the Project, two coal stockpile areas will also be developed within the ETCPP infrastructure area. These stockpiles will have capacities of 80,000 t and 100,000 t for ROM and product coal, respectively.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By-Pass Product
Crusher
Reject Bin
Truck Park
Tyre Change Slab
Mine Workshop
Wash Plant
Delivery/Storage Area
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Indicative Haul Road
Infrastructure Area
Water Storage
Hansen Bailey
Coalpac Pty Ltd
Coordinate System: MGA Zone 56
COALPAC CONSOLIDATION PROJECT
Conceptual East Tyldesley Coal Preparation Plant
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Figure 18

4.7 REJECT, TAILINGS AND SAND WASTE

All coarse reject that remains following coal processing at the existing ICPP, CDP and ETCPP will continue to be emplaced within the open cut pit voids. This existing strategy will provide adequate capacity for the ongoing management of all coarse rejects produced from the ICPP, CDP and ETCPP as a result of Project operations.

Tailings produced from the ICPP will continue to be emplaced and managed in the existing tailings drying areas generally as shown in **Figure 10** to **Figure 13**. Emplacement of tailings will be managed and rehabilitated in accordance with regulatory requirements.

Tailings produced from the ETCPP will be transported to storage areas constructed within active overburden areas in the East Tyldesley operational areas whereby they will be allowed to dry prior to covering with at least 2 m of clay material and rehabilitated in accordance with site practices.

Extracted sand may be washed up to twice during processing, dependent on the product specification requirements. The washing operation also requires a water pump and pipeline for the delivery of the slurry containing silts to nearby cells for settlement. Much of the settled water captured in these cells would be recycled and reused in the sand crushing plant.

Alternatively, waste from the washing of sandstone waste water generated after processing in the fines circuit may be pumped into the abandoned Tyldesley Colliery underground workings via boreholes drilled to intersect the workings (after further analysis confirms the waste is inert, as described in **Section 8.11.4**). This methodology will assist in maintaining water levels in the western side of the old workings and also to progressively fill the voids with fine solids, ultimately filling the workings and support the management of the existing underground heating.

4.8 PRODUCT TRANSPORTATION

Coalpac has approval to transport up to 2.2 Mtpa product coal to market from Cullen Valley Mine and Invincible Colliery combined.

Product coal haulage is undertaken by truck to all destinations, with the main destination being MPPS to facilitate electricity generation. Trucks exit Cullen Valley Mine from the access along the Castlereagh Highway via the dedicated Private Haul Road, while the Invincible Colliery access road allows direct access to the Castlereagh Highway.

Up to 17 road haulage trucks will continue to transport product coal up to Year 2 via the Cullen Valley Private Haul Road or Invincible Colliery site access whilst the MPPS conveyor and rail siding are being constructed.

Internal haul roads will be utilised to transport coal from various pits to processing and distribution areas. However, the construction and use of a conveyor from ETCPP to ICPP along the proposed haul road may be undertaken should economic conditions be suitable with impacts to remain within those predicted in this EA.

Modifications to product coal transport arrangements for the Project are summarised below.

4.8.1 Cullen Valley Mine Private Haul Road

The Cullen Valley Mine Private Haul Road will continue to be used for the transportation of product coal from the Cullen Valley Mine area to bypass the township of Cullen Bullen consistent with current approval (approximately 140 one-way truck movements per day) to MPPS up to Year 2.

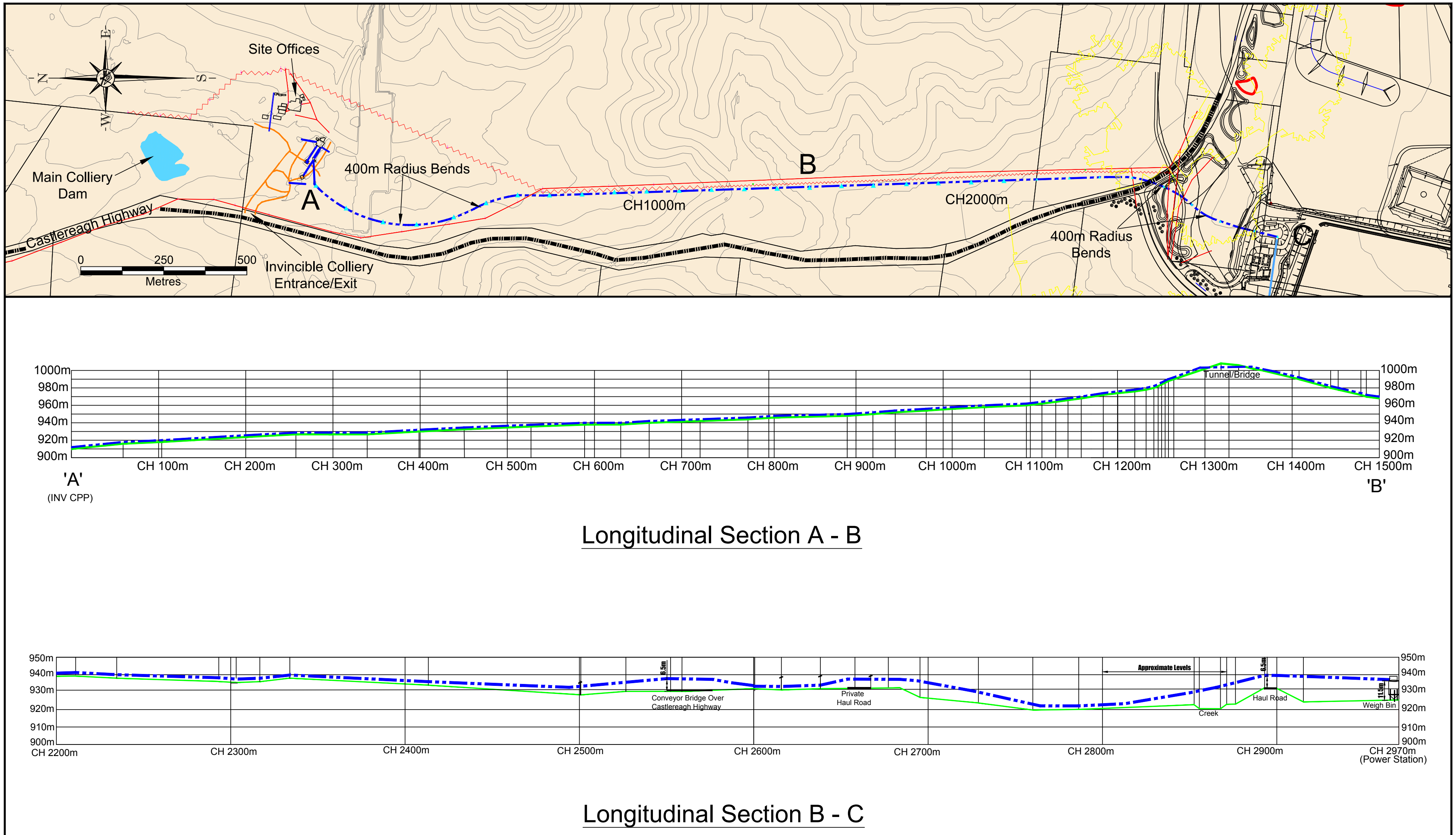
After Year 2, this road will then only be used intermittently by staff light vehicles, or by limited heavy vehicle deliveries accessing and returning from the Cullen Valley Mine Offices or workshop area. As with current arrangements access to the Cullen Bullen Speedway and Sports Ground will not be restricted by the Project.

4.8.2 Invincible Colliery Site Access

The Invincible Colliery site access will continue to be used for the Project consistent with the currently approved operations, which allow a maximum of 16 one-way product coal truck movements per hour.

When utilised for the transportation of product coal to MPPS, haul trucks leaving the site from the Invincible Colliery site access road travel south on the Castlereagh Highway (where there is an existing overtaking lane on the Castlereagh Highway that allows vehicles already travelling on the road to pass the trucks as they leave the site) for approximately 3 km until the intersection with Boulder Road. At this intersection, trucks turn right (west) onto Boulder Road to access the dedicated heavy vehicle entry to MPPS.

Cullen Valley Mine will also continue to deliver up to 5,000 t of coal per month via the Cullen Valley Private Haul Road and along the Castlereagh Highway to be processed at the ICPP. Assuming that this activity is distributed evenly over 20 haulage days per month, a maximum of nine movements per day will continue to be required up to Year 2. Coal transport via these routes will cease after Year 2 when the MPPS conveyor and rail siding are operational.



Longitudinal Section A - B

Longitudinal Section B - C

Proposed Conveyor
Natural Surface
66KV Overhead Lines
11KV Overhead Lines
100m Chainages

Hansen Bailey

Coalpac Pty Ltd

COALPAC CONSOLIDATION PROJECT

Conceptual MPPS Conveyor Section

Cad File: 07968C.dwg | Date: 13.12.11 | Drawn: CP | Figure 19

The only scenario under the Project that that would require the transportation of product coal to MPPS (or WPS) by road after Year 2 would be under emergency circumstances, if supply via the conveyor was unexpectedly disrupted and operation of the power station may be threatened. In such an event, road haulage trucks would access MPPS via the pre-Project Approval route to the south via the Castlereagh Highway and Boulder Road.

During any emergency road haulage, it is anticipated that truck movements would occur between the hours of 7:00 am and to 9:00 pm, not exceeding a frequency (as currently approved) of 16 one-way truck movements per hour. Any such haulage of product coal by road under emergency conditions would only occur with relevant prior notification being provided to relevant regulators and the local community.

For the life of the Project, up to 0.45 Mtpa (combined existing approval limits) of product coal will continue to be transported by road via the Invincible Colliery site access to other domestic destinations.

Product sand material will be transported within the site across the Castlereagh Highway overpass bridge and will access the Castlereagh Highway for haulage to market using the existing Invincible Colliery site access. It is anticipated that product sand for the Project would predominantly be transported from the site to the Sydney market. From the intersection with the Castlereagh Highway, transportation of product sand destined for this market will occur via the Great Western Highway. This representative route to the Sydney market was assessed as a central point that would provide the most efficient and safe access to potential customers in that region for the sand product from the Project.

No transport of product sand to the Sydney market will occur via the Bells Line of Road.

Potential markets in the Sydney region for the Marrangaroo sand include concrete batching plants, concrete products manufacturers, the RTA and its contractors, major construction companies and local government authorities. The RTA is proposing to upgrade the Great Western Highway between Mt Victoria and Lithgow, a large project that may provide further impetus for the development of a quarry. This indicates the potential for final destinations of the Project's sand product to vary, requiring flexibility for deliveries to a numerous destinations.

4.8.3 MPPS Conveyor

The Project proposes to increase the quantity of product coal delivery to MPPS. The continuation of road transport would place added pressure on the local road system, impacting the community. In addition, the existing truck-receiving infrastructure at the MPPS is not capable of accepting this amount of increased product coal under the existing approved hours for transport of coal from Cullen Valley Mine and Invincible Colliery.

As such, Coalpac has therefore committed to constructing an overland conveyor for product coal transportation to MPPS.

An overland conveyor will be constructed to operate after Year 2, linking the MPPS with the existing ICPP area. The conveyor will operate up to 24 hours per day, seven days per week to convey up to 2.625 Mtpa to MPPS. The MPPS conveyor will generally follow the areas disturbed for existing power infrastructure corridors and will cross the Castlereagh Highway via an overpass as shown on **Figure 7**. The conveyor will also cross the Coal Link Private Haul Road. A section of the proposed conveyor is shown in **Figure 19**, with the final design to be undertaken in consultation with relevant existing infrastructure owners.

On Delta Electricity land, the conveyor will drop to a loading bin and loaded to existing stockpiles via an existing conveyor located at MPPS.

4.8.4 Rail Siding

From Year 2, up to 1 Mtpa product coal from the Project may be transported to the rail siding for transport to export markets. The rail siding will operate up to 24 hours a day, seven days per week as rail pathing permits.

4.9 HOURS OF OPERATION AND EMPLOYMENT

Mining operations and maintenance activities will be conducted 24 hours per day, seven days per week.

Product coal and sand will be transported as part of the Project as follows:

- Conveyor to the MPPS from the ICPP area will operate 24 hours per day seven days per week from Year 2;
- Rail to domestic destinations and Port Kembla for export 24 hours per day seven days per week from Year 2;

- Road trucks to the MPPS from Cullen Valley Mine and along the Cullen Valley Mine Private Haul Road will travel only between 7:00 am and 5:30 pm Monday to Friday and between 7:00 am and 5:00 pm Saturday for no more than 30 days annually up to Year 2;
- Road trucks to the MPPS from Invincible Colliery will travel only between 7:00 am to 9:30 pm, no Sundays or public holidays up to Year 2 (and after Year 2 on a limited basis under emergency circumstances with prior notification); and
- Coal and sand trucks to other domestic markets consistent from 7:00 am to 9:30 pm, Monday to Saturday (excluding public holidays) via the existing Invincible Colliery site access.

Approximately 120 full time personnel plus additional contractors are required to operate the Project assuming maximum production is achieved.

4.10 WATER MANAGEMENT

The Project will involve the progressive augmentation and integration of the existing water management of both sites into a single consolidated system. This system will continue to be utilised to enable the effective capture and storage of water onsite and for use in ROM coal processing and dust suppression. The erosion and sediment control and general water management structures required for the Project are shown indicatively on **Figure 10** to **Figure 13**.

In addition to these management structures, the minimisation of mine dewatering requirements from potential inflows will be achieved by the progressive installation and / or extension of diversion / contour banks and drains on the upslope margin of the limit of mining areas and the transfer of the collected water to the drainage line down slope of the advancing excavation. Runoff from infrastructure, workshop and stockpile areas will also continue to be captured in dams and recycled within the mine Water Management System. Additional pumps, pipelines and bores will also be required to be installed during the life of the Project within the Project Boundary to facilitate the integration of Site Water Management Systems and the efficient utilisation of water resources.

Tailings decant water from the ICPP will continue to be reclaimed into the Water Management Systems from the existing tailings storages via the Environment Dam and Main Colliery Dam (see **Figure 10**).

Three discharge licences are held for existing operations at the locations shown on **Figure 5**. These discharge licences will be retained for the Project. Water levels in the flooded Tyldesley Colliery underground workings adjacent to Cullen Valley Mine will also continue to be regularly monitored to confirm that the area of underground heating remains constrained. Water can be pumped into and out of the flooded workings as required to maintain water levels appropriately for heating mitigation purposes.

4.11 OTHER INFRASTRUCTURE

The existing infrastructure at Cullen Valley Mine and Invincible Colliery will generally be retained in its current locations and continue to be used for the Project. **Figure 7** illustrates the existing infrastructure and the changes proposed to facilitate the Project. Modifications to existing site infrastructure and the various additional requirements for the Project are outlined below. Detailed designs will be undertaken in accordance with relevant Australian Standards and Guidelines with the approval of relevant regulators prior to construction commencing.

4.11.1 Castlereagh Highway Overpass Bridge

The road overpass bridge over the Castlereagh Highway will be constructed to allow connectivity between the western and eastern mining areas of the Project for the movement of personnel, equipment, ROM coal and to a lesser extent, overburden materials. The proposed bridge will be approximately 60 m in length and is anticipated to be constructed in one of the two locations shown on **Figure 7**.

The two location options presented are the preferred sites of this infrastructure that were noted during consultation with the NSW Roads and Traffic Authority (now Transport, Roads and Maritime Services (RMS)) in 2010 and 2011. The northern bridge site was adopted for the purposes of this EA and in the preparation of the Project mine plans (**Figure 10** to **Figure 13**).

The following requirements will be considered when determining the final location, design and construction of the bridge, as required by RMS:

- Compliance with *'AS 5100 Bridge Design'*;
- Minimum vertical clearance of 6.5 m from the highway centreline to the underside of bridge;

- Minimum horizontal clearance of 14 m for a two-lane highway. The 14 m horizontal clearance must be increased by the width for any additional lanes and medians; and
- At least 1.5 m back clearance between wire rope crash barriers between the carriageway and bridge structure.

4.11.2 Wallerawang - Gwabegar Railway Line Overpass Bridge

The road overpass bridge over the Wallerawang – Gwabegar Railway Line will be constructed to allow connectivity to the western Hillcroft resource at Cullen Valley Mine. This overpass will be required to allow the safe movement of personnel, equipment, ROM coal and overburden materials between this area and the rest of the Project, reducing the risk associated with equipment crossing the rail line. The proposed bridge location is shown on **Figure 7**.

4.11.3 Red Springs Road Crossing

Access to the Hillcroft resource will also require the construction of appropriate infrastructure to allow equipment from the Project to cross Red Springs Road. The crossing to be constructed for Red Springs Road will comprise an upgraded level crossing for heavy equipment at an existing access point located to the north of the Wallerawang – Gwabegar Railway Line Overpass Bridge. The exact design will occur in consultation with the relevant landholder to the approval of LCC. Public access to all residences along Red Springs Road will not be impacted by the Project.

4.11.4 Rail Siding

The indicative location of the rail siding proposed for the Project to provide connectivity to the Wallerawang – Gwabegar Railway Line is shown on **Figure 20**. This siding and associated infrastructure will be constructed from Year 2 and shall include:

- A 1,100 m long rail siding infrastructure with capacity for several locomotives and approximately 60 wagons. Loading of product coal to trains on the siding will be completed by two front end loaders;
- An export coal stockpile approximately 850 m in length with a minimum capacity of 7,000 t located adjacent to the rail siding;
- An access road for product coal haul trucks using the existing haul road alignment from Cullen Valley Mine, with a turning bay of approximately 60 m radius located to the north of the siding infrastructure; and
- Establishment of associated rehabilitation and bunding to the west and south of the siding.

4.11.5 Surface Facilities

Both Cullen Valley Mine and Invincible Colliery utilise a range of administrative and operational support infrastructure. These include site offices, bathhouse, first aid station, crib facilities, ablution facilities, heavy vehicle workshop, access roads, car parks and site security infrastructure. These will be retained and remain largely unchanged for the Project, being supplemented after Year 2 with the construction of the additional facilities at the ETCPP such as administration offices and workshops shown conceptually on **Figure 18**.

Additionally, the existing offices at Cullen Valley Mine will be upgraded, at the location shown on **Figure 21**. This will include the relocation of components of the existing site offices as well as the construction of a new administration office and bathhouse building and additional parking for light vehicles. A conceptual layout of the new Cullen Valley Mine office location for the Project is shown on **Figure 21**.

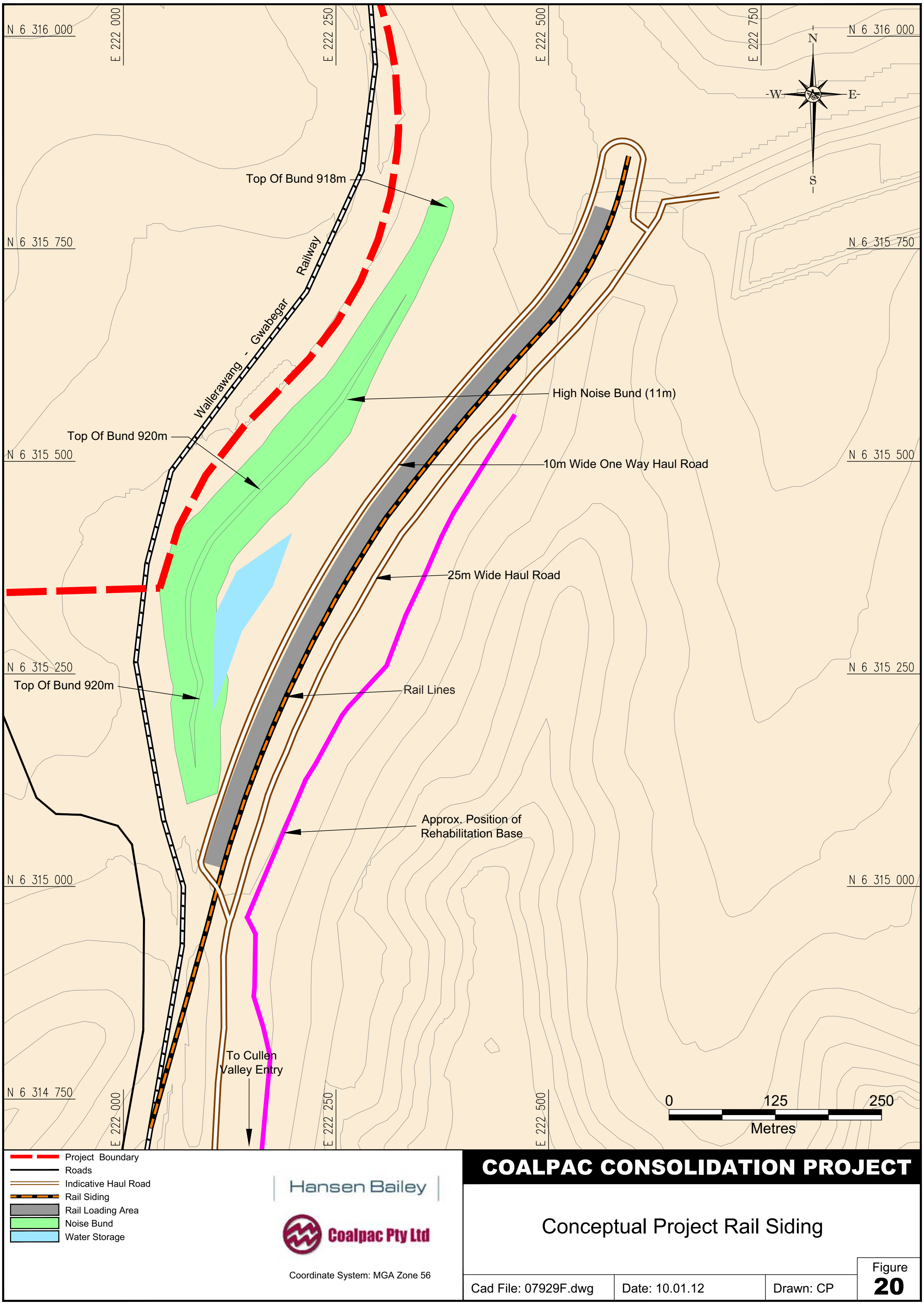
The Project will also require the installation of a range of safety, security and environmental management infrastructure to increase efficiencies through the consolidation of Cullen Valley Mine and Invincible Colliery. These works will include the establishment of additional lighting, communications, waste and Water Management Systems (consolidated surface water reticulation structures), dams, fire management measures and sewage treatment systems. All additional works required will be located within the Project Disturbance Boundary shown on **Figure 7**.

4.12 EXTERNAL INFRASTRUCTURE SERVICES

As shown on **Figure 5**, the Project will also require modifications to or interactions with some existing services infrastructure that is located within the Project Disturbance Boundary.

The required infrastructure modifications will be undertaken in consultation with the relevant regulators prior to any disturbance and will include interactions with or realignment of the:

- Realignment of the existing Fish River Pipeline infrastructure prior to Year 14;
- Realignment of some communications infrastructure;
- Interactions with the Gardeners Gap Track and other Forests NSW Access Tracks; and
- Realignment of Existing 66 kV overhead power lines adjacent to the Invincible Colliery site offices.


N 6 316 000
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S
Top Of Bund 918m
N 6 315 750
Wallerawang - Gwabegar Railway
High Noise Bund (11m)
Top Of Bund 920m
N 6 315 500
10m Wide One Way Haul Road
25m Wide Haul Road
N 6 315 250
Top Of Bund 920m
Rail Lines
Approx. Position of Rehabilitation Base
N 6 315 000
To Cullen Valley Entry
N 6 314 750
0
125
250
Metres
Project Boundary
Roads
Indicative Haul Road
Rail Siding
Rail Loading Area
Noise Bund
Water Storage
Hansen Bailey
Coalpac Pty Ltd
Coordinate System: MGA Zone 56
COALPAC CONSOLIDATION PROJECT
Conceptual Project Rail Siding
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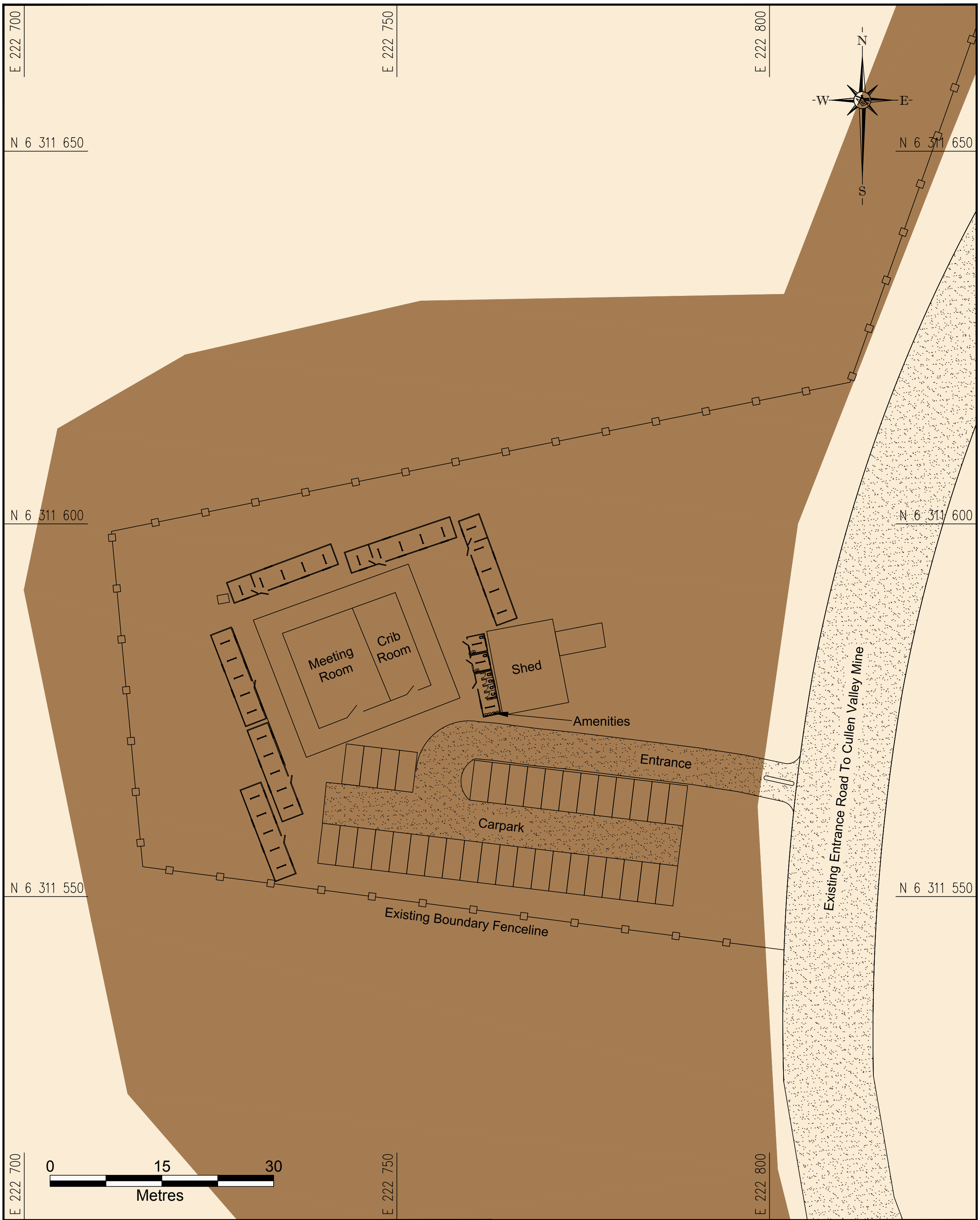

Infrastructure Area
Offices (new)
Existing Offices

Hansen Bailey

Coalpac Pty Ltd

Coordinate System: MGA Zone 56

COALPAC CONSOLIDATION PROJECT

Cullen Valley Site Offices

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4.13 CONSTRUCTION

The construction of the additional infrastructure required for the Project is proposed to be undertaken up to Year 2. The indicative construction schedule for the key components of the Project is presented below in Table 11. The maximum construction workforce for the Project would be required around Month 4 of the construction schedule outlined below.

Up to 56 personnel are anticipated to be required for the three components of the Project that are scheduled to be constructed during that month. Access to Ben Bullen State Forest tracks and all other public roads will be maintained during construction and operation of the Project.

Table 11 Indicative Construction Schedule

	Project Year 1												Project Year 2			
Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
Upgrade offices at Cullen Valley Mine		■														
Overpass bridge over Castlereagh Highway				■	■	■										
Overpass bridge over Wallerawang -Gwabegar Rail Line				■	■	■										
Rail siding infrastructure				■	■	■										
ETCPP Infrastructure area									■	■	■	■				
Overland conveyor to MPPS													■	■	■	■

SECTION 5

Regulatory Framework

5

Regulatory Framework

This section describes the environmental and planning legislative framework applicable to the Project under both NSW and Commonwealth legislation. A flowchart illustrating the planning approvals assessment and consultation process relevant to the consideration of the approval of the Project is presented in **Figure 22**.

5.1 BACKGROUND

Both Cullen Valley Mine and Invincible Colliery were in operation prior to the commencement of planning controls in NSW. The Cullen Valley Mine was originally granted Development Consent DA 200-5-2003 under Part 4 the EP&A Act on 24 December 1997 by the (then) Minister for Planning and Infrastructure. Invincible Colliery was granted planning approval under the EP&A Act by the issue of Project Approval PA 05_0065 under the EP&A Act on 7 September 2006 by the (then) Minister for Planning. Subsequently this was surrendered at the time of grant of PA 07_0127 on 4 December 2008.

Figure 7 illustrates the layout of the approved Cullen Valley Mine and Invincible Colliery generally consistent with DA-200-5-2003 and PA 07_0127. The current licences and leases held by Coalpac are summarised in **Table 5** and **Table 6** for Cullen Valley Mine and Invincible Colliery, respectively.

5.2 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

5.2.1 Approval Path

The Project Application for the Project was lodged by Coalpac with the Director-General of the DoP on 29 October 2010 and accepted as Project Application number 10_0178. The Project Application was the subject of Environmental Assessment Requirements (EARs) issued by the Director-General under section 75F of the EP&A Act on 16 December 2010.

The Project is a "transitional Part 3A project" because it is a project for which EARs were notified before the repeal of Part 3A.

As a transitional Part 3A project, the Project will be regulated by the provisions of Schedule 6A of the EP&A Act which provides that Part 3A of the EP&A Act (as in force on 30 September 2011 and as amended under Schedule 6A) continues to apply to such projects irrespective of its repeal. Similarly, all SEPPs and declarations, orders, determinations as relevant to the Project continue to apply after the repeal of Part 3A. The regulations relevant to Part 3A (namely Part 1A of the EP&A Regulation) (made pursuant to the power to make regulations conferred by Part 3A) will also continue to apply to the Project.

5.2.2 Approval Authority

Section 75D of the EP&A Act (preserved via Schedule 6A) provides that a person is not to carry out development that is a project to which Part 3A applies unless the Minister has approved of the carrying out of the project under Part 3A. Under *State Environmental Planning Policy (Major Development) 2005* (SEPP Major Development), development *"for the purpose of mining that is coal mining"* is declared to be a project to which Part 3A of the EP&A Act under subclause (1) (see Clause 6(2) of SEPP Major Development) applies.

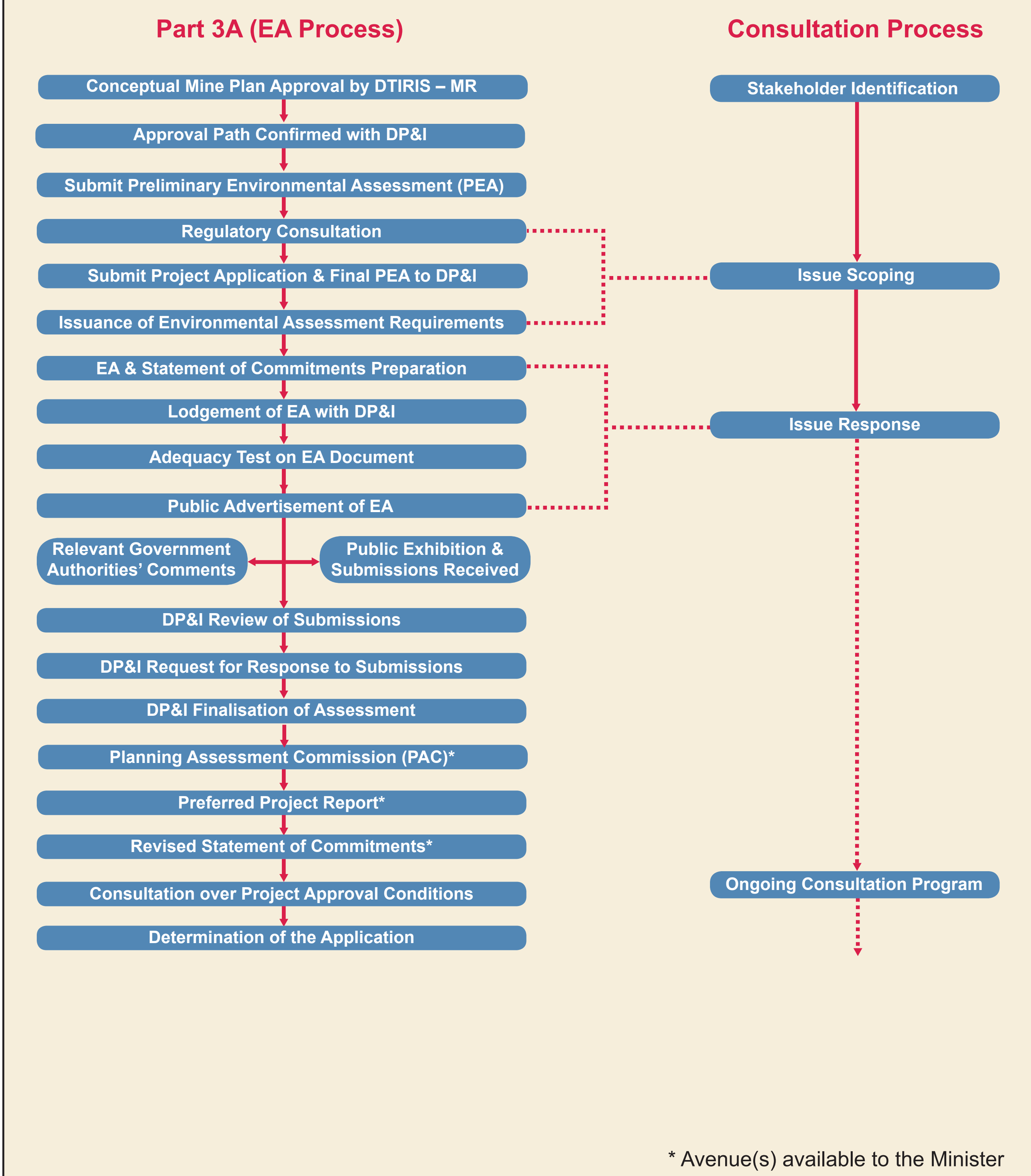
5.2.3 Permissibility

The Project is proposed on land zoned as either 1(a) – Rural (General) or 1(f) – Rural (Forestry) under the *Lithgow City Local Environmental Plan 1994* (Lithgow LEP). Under the Lithgow LEP, both agriculture and mining are permissible on lands within zone 1(a), mining with development consent and agriculture without development consent. Within lands zoned 1(f) under the Lithgow LEP, development for any purpose is permitted with development consent.

Under clause 7 of the *State Environmental Protection Policy (Mining, Petroleum and Extractive Industries) 2007* (SEPP Mining), mining may be carried out on land where development for the purposes of agriculture may be carried out.

5.2.4 Environmental Assessment Requirements

The Director-General notified Coalpac of the EARs for the Project under Section 75F of the EP&A Act via letter dated 16 December 2010. This EA has been prepared to address these EARs as required by Section 75D of the EP&A Act (see **Section 6.4.2**).



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Coalpac Pty Ltd

COALPAC CONSOLIDATION PROJET

Planning Approvals and Consultation

Filename: CPfigure22_ind	Date: 14.3.12	Drawn: MB	Figure 22

5.2.5 Director-General's Assessment Report

Section 75I of the EP&A Act requires that the Director-General of DP&I must provide a report on the Project to *'the Minister for the purposes of the Minister's consideration of the application for approval to carry out the project'*. Section 75I requires that the Director-General's report contain the following:

"(a) a copy of the proponent's environmental assessment and any preferred project report, and

(b) any advice provided by public authorities on the project, and

(c) a copy of any report of the Planning Assessment Commission in respect of the project, and

(d) a copy of or reference to the provisions of any State Environmental Planning Policy that substantially govern the carrying out of the project, and

(e) except in the case of a critical infrastructure project - a copy of or reference to the provisions of any environmental planning instrument that would (but for this Part) substantially govern the carrying out of the project and that have been taken into consideration in the environmental assessment of the project under this Division, and

(f) any environmental assessment undertaken by the Director-General or other matter the Director-General considers appropriate, and

(g) a statement relating to compliance with the environmental assessment requirements under this Division with respect to the project."

Section 75J(2) of the EP&A Act requires that the Minister take into consideration the Director-General's Assessment report in deciding whether or not to approve the carrying out of a project.

5.2.6 Development Contributions

Under Section 75R(4), Divisions 6 and 6A of Part 4 of the EP&A Act apply to Part 3A projects. The Minister has the power under Section 94 of the EP&A Act (which is in Division 6) to impose a condition on any Project Approval requiring the payment of money or the dedication of land to the local council. The amount is determined having regard to the increase in demand for public facilities and services created by the Project.

Section 93F of the EP&A Act enables a Planning Agreement (usually referred to as a Voluntary Planning Agreement (VPA)) to be established. A VPA proposed by Coalpac will (as is enabled by the EP&A Act) replace any imposition of a requirement for infrastructure contributions pursuant to Section 94 of the EP&A Act. Section 93I of the EP&A Act provides that:

"a consent authority can require a planning agreement to be entered into as a condition of a development consent, but only if it requires a planning agreement that is in the terms of an offer made by the developer in connection with:

(a) the development application, or

(b) a change to an environmental planning instrument sought by the developer for the purposes of making the development application, or that is in the terms of a commitment made by the proponent in a statement of commitments made under Part 3A."

Coalpac and LCC are in discussions about entering into a VPA for the payment of contributions in connection with the Project which is further described in the Social Impact Assessment (SIA) in **Section 8.21** and Statement of Commitments (SOC) in **Section 9**. The proposed VPA is intended to make provision for all contributions by Coalpac for the Project under Division 6 of the EP&A Act.

5.2.7 Disclosure of Reportable Political Donations and Gifts

Under Section 147 of the EP&A Act reportable political donations and gifts be disclosed when making planning applications or when making submissions on planning applications after 1 October 2008.

Coalpac has provided a statutory declaration to the DP&I confirming that no reportable donations or gifts have been made during the period.

5.2.8 Landowners Consent

Clause 8F of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) provides that the consent of the owner of the land the subject of transitional Part 3A Project Application is not required where the application relates to a mining project provided that notice of the application by advertisement in a newspaper published on the area of the Project is given before the end of the period of 14 days after the application is made.

5.3 ENVIRONMENTAL PLANNING INSTRUMENTS

Under Section 75R of the EP&A Act, environmental planning instruments other than SEPPs do not apply to an approved Project. The Minister may, but is not required to take into account the provisions of any environmental planning instrument (Section 75J of the EP&A Act).

Section 75J of the EP&A Act has the effect of removing the obligation for the Minister to consider any other environmental planning instrument (except SEPPs which *"...expressly provide that they apply to and in respect of the particular project"*) (Section 75R (2) (b)) but allows him to do so if he so elects.

In this context, the following instruments apply to the consideration of the Project Application.

5.3.1 SEPP (Major Developments) 2005

SEPP Major Developments identifies development to which the assessment and approval process under Part 3A of the EP&A Act applies and establishes the Minister for Planning and Infrastructure as the consent authority for development classified as a *"major project"*. As described in **Section 5.2.1**, coal mining is classified as a project to which Part 3A of the EP&A Act applies by SEPP Major Developments.

5.3.2 SEPP (Infrastructure) 2007

SEPP (Infrastructure) aims to provide a consistent planning regime for infrastructure and the provision of services across NSW, along with providing consultation with relevant public authorities during the assessment process.

The provision of public infrastructure for the Project may be required to comply with the following planning regimes designated within SEPP Infrastructure, including: electricity transmission or distribution, networks, emergency services facilities and bushfire hazard reduction, railway infrastructure facilities, development in railway corridors, road infrastructure facilities, development in or adjacent to road corridors and road reservations, traffic generating development, sewerage systems, soil conservation works and stormwater management systems.

This Policy applies to the State of NSW. Certain items of infrastructure associated with the Project may be subject to SEPP Infrastructure.

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

The aims of SEPP Mining (as specified in Clause 2) are to provide for:

(i) "the proper management and development of mineral, petroleum and extractive material resources for the social and economic welfare of the State;

(ii) to facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources;

(iii) establishment appropriate planning controls to encourage ESD; and

(iv) establishment of relevant matters for consideration by a consent authority."

The considerations set out by Clauses 12 to 17 of SEPP Mining (which set out matters for consideration in DAs) are examined and reported upon throughout this EA.

In particular, Clause 12 of SEPP Mining provides:

"Before determining an application for consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must:

(a) consider:

(i) the existing uses and approved uses of land in the vicinity of the development, and

(ii) whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to land use trends, are likely to be the preferred uses of land in the vicinity of the development, and

(iii) any ways in which the development may be incompatible with any of those existing, approved or likely preferred uses, and

(b) evaluate and compare the respective public benefits of the development and the land uses referred to in paragraphs (a) (i) and (ii), and

(c) evaluate any measures proposed by the Proponent to avoid or minimise any incompatibility, as referred to in paragraph (a) (iii)."

This EA undertakes the assessments required by Clause 12 of SEPP Mining.

5.3.4 SEPP 33 – Hazardous and Offensive Development

SEPP 33 – Hazardous and Offensive Development (SEPP 33) applies to *"potentially hazardous"* and *"potentially offensive"* industries (as defined in the SEPP).

A review of the relevant components of this Project in **Section 8.19** has confirmed that the Project is not considered to be potentially hazardous or offensive and that a detailed preliminary hazardous analysis is not required.

Further, as SEPP 33 applies only to proposals that are potentially hazardous or offensive and the Project does not constitute a potentially hazardous or offensive industry under Clause 3, SEPP 33 does not apply to this Project.

5.3.5 SEPP 44 – Koala Habitat Protection

SEPP 44 – Koala Habitat Protection (SEPP 44) encourages the conservation and management of Koala habitats, to ensure permanent free living Koala populations will be maintained over their present range. The SEPP requires the consent authority to consider whether land the subject of a development application is *"potential Koala habitat"* or *"core Koala habitat"*.

The Ecological Impact Assessment carried out for the Project included the consideration of Koala habitat and detected no Koala during the current and previous surveys within and surrounding the Project Boundary (see **Section 8.14**).

5.3.6 SEPP 55 – Remediation of Land

SEPP 55 – Remediation of Land (SEPP 55) was enacted to provide a State wide approach to the remediation of contaminated land for the purpose of minimising the risk of harm to the health of humans and the environment.

No contaminated lands within the Project Disturbance Boundary (shown on **Figure 7**) that will be disturbed for mining or mining related purposes have been identified.

5.3.7 Lithgow City Council Local Environment Plan 1994

The Project Boundary is located within the LCC LGA and the land on which it will be carried out is subject to the Lithgow LEP.

As identified in **Section 5.2.3**, all components of the Project (the entire Project Boundary) fall within land zoned as either 1(a) – Rural (General) or 1(f) – Rural (Forestry) under the Lithgow LEP. Mining is permissible on land zoned as 1(a) – Rural (General) with development consent. Mining is permissible on land zoned as 1(a) – Rural (General) with development consent in both zones.

Therefore under SEPP Mining, open cut coal mining and facilities for the transportation and processing of minerals extracted from that land or adjoining land is permissible with development consent under the Lithgow LEP.

The objectives of Zone 1(a) are the proper management and utilisation of natural resources by:

"(a) protecting, enhancing and conserving:

(i) rural land, in particular prime crop and pasture land, in a manner which sustains its efficient and effective agricultural production potential,

(ii) soil, by controlling and locating development in accordance with soil capability,

(iii) forests of existing and potential commercial value for timber production,

(iv) valuable deposits of minerals, coal and extractive materials, by controlling the location of development for other purposes in order to ensure the efficient extraction of those deposits,

(v) trees and other vegetation in environmentally sensitive areas, where the conservation of the vegetation is significant for scenic amenity or natural wildlife habitat or is likely to control land degradation,

(vi) water resources for use in the public interest, preventing the pollution of water supply catchment and major water storages,

(vii) localities of significance for nature conservation, including places with rare plants, wetlands and significant wildlife habitat, and

(viii) items of heritage significance,

(b) preventing the unjustified development of prime crop and pasture land for purposes other than agriculture,

(c) facilitating farm adjustments,

(d) minimising the cost to the community of:

(i) fragmented and isolated development of rural land, and

(ii) providing, extending and maintaining public amenities and services,

(e) providing land for other non-agricultural purposes, in accordance with the need for that development, and

(f) providing for the separation of conflicting land uses."

The objectives of Zone 1(f) are:

> *"(a) to identify land managed by the Forestry Commission under the Forestry Act 1916;*
>
> *(b) to preserve existing forests within the City of Lithgow, while allowing compatible development; and*
>
> *(c) to prevent pollution of water supply catchments and water quality in major water storages."*

This EA considers the above objectives and demonstrates how the Project is consistent with them, which will be relevant in the event that the Minister exercises his discretion to take into account the provisions of the Lithgow LEP.

5.4 APPROVALS EXEMPTED WITH PROJECT APPROVAL

Pursuant to Section 75U of the EP&A Act, there are a number of authorisations that will not be required for the Project, should Project Approval be granted by the Minister for Planning and Infrastructure under Schedule 6A / Part 3A of the EP&A Act as described below. The granting of Project Approval under Part 3A of the EP&A Act makes the Project an *"approved project"*.

5.4.1 National Parks and Wildlife Act 1974

Under the *National Parks and Wildlife Act 1974* (NP&W Act), it is an offence to harm or desecrate an Aboriginal place or object without a permit. By virtue of Section 75U of the EP&A Act, a Section 90 permit is not required for any impact on an Aboriginal place of object arising from a project if a Project Approval is held under Part 3A of the EP&A Act.

5.4.2 Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) makes provision for control over the manner in which items of European Heritage Significance (*relics*) are managed and prevents their uncontrolled destruction or change without an excavation permit under Section 139. By virtue of Section 75U of the EP&A Act, an excavation permit under Section 139 is not required for any impact to an item of heritage significance arising from a Project if a Project Approval is held under Part 3A of the EP&A Act.

5.4.3 Native Vegetation Act 2003

Under the *Native Vegetation Act 2003* (NV Act) it is an offence to clear native vegetation without development consent (subject to certain exceptions).

By virtue of Section 75U of the EP&A Act development consent under Section 12 of the NV Act is not required and the NV Act does not operate to prohibit the clearing if a Project Approval is issued for the disturbance under Part 3A the EP&A Act.

5.4.4 Rural Fires Act 1997

The *Rural Fires Act 1997* (Rural Fires Act) provides the statutory framework to prevent, mitigate and suppress bush fires in rural districts, and to coordinate bush fire fighting and prevention, however by virtue of Section 75U of the EP&A Act, a bushfire safety authority under Section 100B is not required should a Project Approval be granted under Part 3A of the EP&A Act.

5.4.5 Water Management Act 2000

The licensing provisions *Water Management Act 2000* (WM Act) are progressively replacing the licensing framework in the *Water Act 1912* (Water Act). Parts 2 and 3 of Chapter 3 of the WM Act apply to those parts of the NSW which are the subject of a proclamation (which is where a Water Sharing Plan (WSP) has commenced).

The Project is located within the boundary of two groundwater management areas where a WSP has recently been developed. These draft WSP's are:

- The NSW Murray-Darling Basin (MDB) Porous Rock Groundwater Sources (which is predicted to apply within the Project Disturbance Boundary from 2012); and
- Greater Metropolitan Region Groundwater Sources (which commenced on 1 July 2011 and is predicted to apply to the historical underground workings of Invincible Colliery).

It is anticipated that a Water Access Licence (WAL) with sufficient share component for the Project open cut pit areas will be required to authorise taking of water. A summary of each WSP is provided below.

As a consequence of Section 75U of the EP&A Act, approvals under Section 89 – Water Use Approval, 90 – Water Management Work Approval or 91 – Controlled Works Approval are not required for the Project should a Project Approval be granted under Part 3A of the EP&A Act.

It is, however, expected that an aquifer interference activity approval will be required when those approvals provisions of the WM Act are proclaimed to commence (which is expected to be during 2012).

Any water taken from a WM Act regulated water source as part of or as a result of the Project must be authorised by a Water Access Licence. The only water sources which are subject of water sharing plans affected by the Project are as follows:

- Where open cut operations receive water from the porous rock aquifers of the Permian Coal Measures (including the coal seams), these being located within the NSW Murray-Darling Basin Porous Rock Groundwater Sources – Sydney Basin MDB; and
- Where water is extracted from the underground workings of the Invincible Colliery – Greater Metropolitan Region Groundwater Sources – Coxs Basin Cox River.

NSW Murray Darling Basin Porous Rock Groundwater Sources Draft Water Sharing Plan

The *'NSW Murray Darling Basin Porous Rock Groundwater Sources Draft Water Sharing Plan'* (Draft Porous Rock WSP) was on exhibition by the NSW Office of Water (NOW) throughout December 2010 and January 2011. The WSP is scheduled to commence in early 2012.

The Draft Porous Rock WSP applies to *"groundwater sources … within the Sydney Basin MDB Groundwater Source … [including] … rocks below the surface of the ground shown on the Registered Map."* (See clause 4 of the Draft Porous Rock WSP). These groundwater sources do not include water contained in any fractured rock below the ground or any alluvial aquifer overlying the porous rock.

If the Draft Porous Rock WSP commences in the form it was exhibited and if the WM Act is commenced for Part 2 of Chapter 3 (by proclamation) in respect of the water sources covered by the Draft Porous Rock WSP then it will be relevant to the Project in the following ways:

- A WAL for the pit will be required to authorise the taking of water from the *"porous rocks"* (in addition to other WALs required for the Project); and
- The grant of the WAL and the management of allocation and share component which attach to it will be bound by the rules established in the Draft Porous Rock WSP.

Greater Metropolitan Region Groundwater Sources Water Sharing Plan

The *'Greater Metropolitan Region Groundwater Source Draft Water Sharing Plan'* (MWSP) was made on 2 March 2011 and commenced on 1 July 2011. The MWSP applies to the Sydney Basin North Groundwater Source.

The MWSP is relevant to the Project in the following ways:

- A WAL will be required to authorise the taking of water from the water source; and
- The grant of the WAL and the management of allocation and share component which attach to it will be bound by the rules established in the WSP.

Water Management System / Sediment Dams

Clause 18(1)(i) of the *Water Management (General) Regulation 2004* (WM Regulation) provides that there is no requirement for a WAL when taking water by means of an *"excluded work"*. Excluded works are described in Schedule 1 of the WM Regulation and include:

> *"Dams solely for the capture, containment and recirculation of drainage and / or effluent, consistent with best management practice for required by a public authority to prevent the containment of a water source, provided such dams are located on a minor stream referred to in section 53(3)(b) of the Act."*

The requirements for water supply works approvals and water use approvals (sections 90 and 89 of the WM Act) are similarly exempt by virtue of clauses 39 and 38 of the WM Regulation and are also subject to section 75U of the EP&A Act. These provisions apply to all of the dams and water management structures which receive water from disturbed areas (and upstream catchment dams for diversion) within the active mining and mine related areas.

Prescribed Dams

The proposal to construct the dams will be referred to the Dams Safety Committee as part of the Part 3A process. If any dams within the Project become *prescribed dams* they will be subject to the *Dams Safety Act 1978 NSW* and the oversight of the Dams Safety Committee constituted under that Act.

5.5 APPROVALS TO BE GRANTED CONSISTENT WITH PROJECT APPROVAL

Pursuant to Section 75V of the EP&A Act, there are a number of authorisations that must be issued *"substantially consistent with"* a Part 3A Project Approval if such an approval is required for the conduct of an approved project. Coalpac will seek some of these approvals if Project Approval is granted. These authorisations are described further below.

5.5.1 Mining Act 1992

The *Mining Act 1992* (Mining Act) provides for the control and management of mining and exploration titles for access to mineral resources including coal. The Mining Act provides that exploration for or mining (and some mining purposes) of coal must not occur except in accordance with an authority under the Mining Act.

Coalpac holds a number of mining authorities for the two operations, including Mining Lease 1455, Mining Lease 1488, Mining Lease 1556, Mining Lease 1557, A 324, A 420, EL 5712 and EL 6007 for Cullen Valley Mine and Mining Lease 1635, Mining Lease 1638 and CCL 702 for Invincible Colliery (see **Figure 23**, **Table 5** and **Table 6**). The majority of these mining authorities will require renewal during the life of the Project.

The following surface mining leases (or mining purposes leases) will be required as indicated on **Figure 23**:

- Areas included in Mining Lease Application (MLA) 392 and MLA 393;
- Mining lease over private properties within the Project Boundary (which are not included within MLA 392 and MLA 393);
- Part transfer of CCL712 held by Ivanhoe Coal Pty Ltd;
- Surface mining lease overlying the area of CCL712 subject to the part transfer; and
- Potentially mining leases for various mining purposes.

Section 75V of the EP&A Act provides that if a Project Approval is issued for the Project, then an application for a mining lease cannot be refused if it is necessary for the carrying out an approved project and must be granted substantially consistent with the approval. The mining leases for the Project will also impose the requirement for a MREMP to be prepared for the approval of the Director-General of DTIRIS – MR.

5.5.2 Protection of the Environment Operations Act 1997

The Project is deemed to be a scheduled activity under Schedule 1 of the *Protection of the Environment Operations Act 1997* (POEO Act).

Two separate EPLs are currently held for Cullen Valley Mine (EPL 10341) and Invincible Colliery (EPL 1095).

It is intended to make an application to the Environment Protection Authority (the appropriate regulatory authority by virtue of Section 6 of the POEO Act) (now OEH) for a single EPL consistent with the Project Approval if be granted.

Section 75V of the EP&A Act requires that such an application cannot be refused if it is necessary for carrying out an approved project and that it is to be granted substantially consistent with the approval.

5.5.3 Roads Act 1993

The Project proposes various items of infrastructure which will interact with public roads. These include: construction and use of a bridge over the Castlereagh Highway to link operations east and west; a conveyor across the Castlereagh Highway to deliver coal to MPPS and the crossing to be developed for Red Springs Road.

Consent under Section 138 of the *Roads Act 1993* (Roads Act) from the appropriate roads authority (LCC for local roads and / or RMS for the Castlereagh Highway) will be required for any work in or over the surface of any road which has not been closed.

Section 75V of the EP&A Act requires that such an application cannot be refused if it is necessary for carrying out of an approved project and that it is to be granted substantially consistent with the approval.

5.6 OTHER RELEVANT NSW LEGISLATION

In addition to a Project Approval under Part 3A of the EP&A Act and approvals required consistent with Section 75V of the EP&A Act, the Project will also require authorisations under other NSW legislation. These are discussed below.

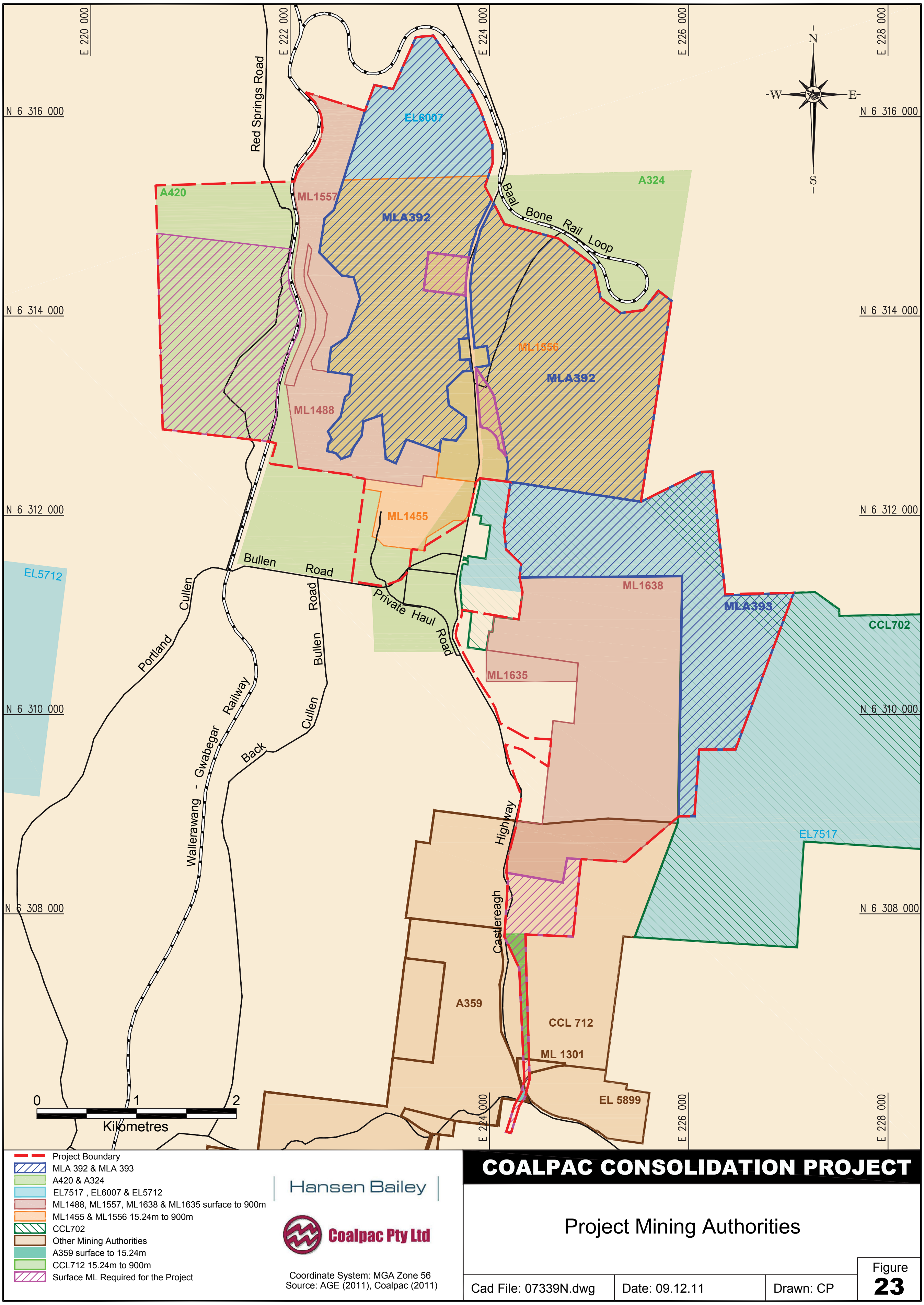
Coalpac will seek these other relevant approvals from the appropriate authorities should Project Approval be granted.

5.6.1 Water Act 1912

Part 5 of the Water Act requires that prior to the construction of a bore, a licence must be held. Coalpac holds various bore licences as described in **Table 5** and **Table 6** for groundwater monitoring bores.

Section 129A of the Water Act provides that Part 5 of the Water Act does not apply to 'any part of the state to which Part 3 of Chapter 3 of the *Water Management Act 2000* (WM Act) applies in relation to water supply work approvals'. At the date of this EA, the Project is outside parts of the State to which Part 3 of Chapter 3 of the WM Act applies and therefore Part 5 of the Water Act will apply to the Project.

Water Act licences will need to be secured to authorise water which will be taken from the porous rocks in each of the proposed pits unless the Porous Rock WSP described above commences (with the appropriate implementing provisions made) prior to excavation. In that situation, WALs with sufficient share component would be secured under the Porous Rock WSP in respect of each pit.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ML1455
EL5712
Bullen Road
Private Haul Road
ML1638
MLA393
CCL702
Portland Cullen
Road Bullen
ML1635
Wallerawang - Gwabegar Railway
Back Cullen
Castlereagh Highway
EL7517
A359
CCL 712
ML 1301
EL 5899
0 1 2
Kilometres
Project Boundary
MLA 392 & MLA 393
A420 & A324
EL7517 , EL6007 & EL5712
ML1488, ML1557, ML1638 & ML1635 surface to 900m
ML1455 & ML1556 15.24m to 900m
CCL702
Other Mining Authorities
A359 surface to 15.24m
CCL712 15.24m to 900m
Surface ML Required for the Project
Hansen Bailey
Coalpac Pty Ltd
Coordinate System: MGA Zone 56
Source: AGE (2011), Coalpac (2011)
COALPAC CONSOLIDATION PROJECT
Project Mining Authorities
Cad File: 07339N.dwg
Date: 09.12.11
Drawn: CP
Figure
23

5.6.2 Crown Lands Act 1989

The approval of the Department of Lands will be required under the *Crown Lands Act 1989* (Crown Lands Act) for any works within Crown road reserves or on Crown land for the Project.

Should Project Approval be granted, further approval from the DP&I will be sought for the construction of any mining related activities required to be carried out on Crown lands.

5.6.3 Coal Mine Health and Safety Act 2002

The primary objective of the *Coal Mine Health and Safety Act 2002* (CMHS Act) is to assist in securing the objects of the *Occupational Health and Safety Act 2000* in relation to coal operations and to put in place special provisions necessary for the control of particular risks arising from the mining of coal.

Section 54 of the CMHS Act requires the *'Operator'* of a coal operation to notify of an intended high risk activity. Clause 49 of the *Coal Mine Health and Safety Regulation 2006* identifies highwall mining (mining by entry into a previously formed highwall and during which no people are underground) as a high risk activity.

Prior to conducting proposed highwall mining activities, Coalpac will notify DTIRIS – MR in accordance with Mine Safety CTR-001 NSW DPI Technical Reference *'For a Notification of Highwall Mining and Auger Mining (as a high risk activity)'* dated August 2008.

Further, should Project Approval be granted, Coalpac will seek the approval of the Minister for DTIRIS – MR under the provisions of Section 100 of the CMHS Act for the establishment of new emplacement and tailings disposal areas.

5.6.4 Threatened Species Conservation Act 1995

The 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 because of 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 Project Boundary.

A comprehensive Threatened species impact assessment process, consistent with the provisions of the TSC Act, was adopted for the Project. This is discussed in **Section 8.14**.

5.6.5 Forestry Act 1916

The Forestry Act provides the statutory framework for the dedication, reservation, control and use of State forests, timber reserves, and Crown lands for forestry and other purposes.

The Forestry Act is governed by the Forestry Commission of NSW (trading as Forests NSW), a division of DTIRIS – MR.

The Project is located predominantly within lands dedicated for the Ben Bullen State Forest. Coalpac has an agreement in place with Forests NSW for exploration and mining activities. This Agreement will be revised for the Project to continue all mining and exploration related activities within the Ben Bullen State Forest (including sharing Endeavour Energy's existing power access corridor to enable the construction and use of the Project conveyor to MPPS). This Agreement will be developed in consultation with Endeavour Energy and Forests NSW for the access and management of lands within the Ben Bullen State Forest for the Project.

5.6.6 Consistency with the Central West Catchment Action Plan

The Central Western Catchment Action Plan (CAP) (2007) has the following objectives by 2016:

- 1,200,000 ha (13%) of the catchment area is managed primarily to maintain or achieve optimal native vegetation condition, and all vegetation types are represented in the catchment;
- Restore and enhance the area of high conservation value vegetation by 10,000 ha;
- 3,000 hectares of remnant vegetation identified as high conservation value, enhanced and managed as functional ecosystems, incorporating cultural heritage values; and
- 100 hectares of remnant vegetation managed to enhance the condition of the native vegetation.

The CAP also aims to:

- Reduce salinity through optimising land use practices, establishing plantings on key upland landscape, retain and improve vegetation in key saline landscapes, increase water use and efficiency in irrigation farming systems and improve perennial based management of known salinity discharge sites in priority hazard areas;
- Improve surface and groundwater system health across the catchments, increase sustainably managed native grass based production systems, enhance native riparian vegetation along degraded streams, reduce environmental weeds and optimise nature conservation on public lands;

- Manage 5% of the catchment biodiversity outcomes (aquatic and terrestrial), with High Conservation value habitat types to maintain or improve their biodiversity value and enhance in-stream habitat features;
- Have 20% of agricultural land in the catchment management to meet critical landscape specific thresholds;
- For 12,000 ha Improve soil structure and restore productive vegetation cover;
- Increase the level of awareness and engagement between Non-Aboriginal and Aboriginal community in relation to natural resource management; and
- Increase the protection of Aboriginal and Non-Aboriginal significant sites within the catchment.

The Project, through its detailed Aboriginal heritage, non-Aboriginal, ecological, soils and surface water impact mitigation measures, including the Biodiversity Offsets Strategy as described in **Section 8.15**, is consistent with and will assist in meeting the long-term objectives and aims of the CAP. Further to this, the proposed support of the Gardens of Stone Stage 2 (GoS2) proposal is also consistent with these objectives.

5.7 COMMONWEALTH LEGISLATION

5.7.1 Environment Protection and Biodiversity Conservation Act 1999

An approval from the Minister for Environment (Commonwealth) under Part 3 of the EPBC Act is required for actions which are likely to have a significant impact on a MNES.

Under Section 68 of the EPBC Act, a person proposing to take an *"action"* which the person thinks may be or is a *"controlled action"* is required to refer the proposal to the Minister for the Minister's decision as to whether the proposal is a *"controlled action"*.

A *"controlled action"* is defined under the EPBC Act to be an action, the taking of which without approval under Part 9 of the EPBC Act would be prohibited. If the proposal will have, or is likely to have, a significant impact on a MNES which is set out in Part 3 of the EPBC Act, then it is prohibited without an approval (subject to a few exceptions).

The Project was referred to the Minister for SEWPaC as a proposal under Section 68 of the EPBC Act on 24 November 2010. The *"controlling provisions"* of the EPBC Act (for the purposes of Section 67 EPBC Act) are:

- Sections 18 and 18A (threatened species and communities); and
- Sections 20 and 20A (migratory species).

The Project is considered to be likely to have a significant impact on listed CEEC (see Section 18 of the EPBC Act) mapped for the Project as Capertee Rough-barked Apple – Red Gum – Yellow Box Grassy Woodland (Box Gum Woodland) and potential habitat for the Vulnerable Capertee (Cannon's) Stringybark (Capertee Stringybark) (see **Section 8.14**).

The Project was also considered by SEWPaC to be likely to have a significant impact on native vegetation which provides potential habitat for listed Threatened species and migratory birds including Regent Honeyeater, the Swift Parrot and the critically endangered Leek Orchid (see Section 20 of the EPBC Act).

The Project was declared a 'controlled action' by SEWPaC on 24 January 2011. Correspondence from SEWPaC on 13 August 2010 confirmed that the Project will be assessed by the accreditation of Part 3A of the EP&A Act (see **Appendix C**). The Minister for SEWPaC will review this EA and determine whether to approve of the taking of the action (with or without conditions).

A summary of the Ecological Impact Assessment undertaken in accordance with the relevant requirements of the EPBC Act is provided in **Section 8.14** and **Section 8.15**.

5.7.2 Native Title Act 1993

The Commonwealth *Native Title Act 1993* (NT Act) was enacted on 1 January 1994 to provide for the recognition of Native Title and for the statutory mechanism for its protection. The NT Act considers the possible acts that may affect Native Title and provides a process to determine if Native Title exists and how compensation for acts affecting Native Title should be managed.

The Minister for DTIRIS – MR will not issue a new mining lease unless satisfied that Native Title on all lands within the area of the lease has been extinguished or that the right to negotiate process has been carried out in connection with the proposed grant of the mining lease.

As described in **Section 5.5.1**, additional mining leases, transfers or mining purposes leases will be required, some of which occur on Crown land where Native Title has not been extinguished. Coalpac commenced the right to negotiate process for these leases on 10 March 2011 with public advertisement and DTIRIS – MR subsequently provided a notification date for the process on 24 March 2011. This process is now closed and Coalpac is in negotiation with the relevant native title parties and the National Native Title Tribunal.

5.8 SUMMARY OF REQUIRED APPROVALS

Table 12 provides a summary of the key licences, leases and approvals which will be required from various Ministers under NSW and Commonwealth environmental and planning legislation to enable the construction and the operation of the Project.

Table 12 Licences and Approvals Required for the Project

Approval	Legislation	Authority	Comment
Project Approval for the construction and operation of the Project	Section 75J of Part 3A of the EP&A Act provides the Minister for Planning and Infrastructure the power to grant a Project Approval	Minister for Planning (DP&I)	Separate Approval
Approval for the carrying out of a *"Controlled Action"*	EPBC Act adopting Part 3A assessment process under Section 87	SEWPaC	Separate Approval
Mining authorities	Part 5, Division 3, Clause 63 of the Mining Act provides the Minister for DTIRIS – MR the power to grant a mining lease	DTIRIS – MR	Section 75V of the EP&A Act applies
Preparation of a MREMP	Condition of a Mining Lease issued under the Mining Act	DTIRIS – MR	Separate Approval
Approval for Emplacement Areas	CMHS Act	DTIRIS – MR	Separate Approval
Notification of Highwall Mining and Auger Mining	CMHS Act	DTIRIS – MR	Separate Approval
EPL	Chapter 3 of the POEO Act	OEH	Section 75V of the EP&A Act applies
WAL	Part 5 of the Water Act	NOW	Separate Approval
WAL	Parts 2 and 3 of Chapter 3 of the WM Act	NOW	Required for relevant WSPs
Licence Under TSC Act	NP&W Act	OEH	Exemption under Section 118A and 118C of the NP&W Act
Consent to carry out a work in, on or over a public road	Section 138 of the Roads Act	RMS / LCC	Section 75V of the EP&A Act applies
Construction Certificates for Project infrastructure	EP&A Act	LCC	Separate Approval
Compensation and Access Agreement with Forests NSW	Forestry Act	Forests NSW	Separate Approval
Revised Notification of Dangerous Goods	*Occupational Health and Safety Regulation 2001*	Work Cover	Separate Approval
Approval for works over Crown land	Crown Lands Act	DoL	Separate Approval
Environment Management Plans and Monitoring Programs	Conditions of Project Approval and as described in the Statement of Commitments of this EA (**Section 9**)	DP&I	Separate Approval

SECTION 6
Stakeholder Engagement

6 Stakeholder Engagement

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

A SIA was also undertaken as a component of this EA and is discussed further in **Section 8.21**.

Since their involvement with Invincible Colliery in 2006 and Cullen Valley Mine in 2008, Coalpac has also continued to explore further opportunities for its community engagement processes through the development of stakeholder relationships with neighbouring landholders, Government and surrounding industry.

The ongoing stakeholder engagement process aims at enhancing the potential benefits associated with the approved operations of Cullen Valley Mine and Invincible Colliery at the local and regional level. Current stakeholder engagement methods employed by Coalpac that will continue for the Project are provided in **Table 13**.

6.1 EXISTING STAKEHOLDER ENGAGEMENT

Coalpac has actively participated in formal engagement activities utilising regular Community Consultative Committee (CCC) meetings, with separate meetings held for the Invincible Colliery CCC and Cullen Valley Mine CCC.

6.2 STAKEHOLDER IDENTIFICATION

A range of stakeholders were identified for the Project based on existing records held by Coalpac, regulatory requirements for the Project and this EA and the confirmation of near neighbour contact details through cadastral analysis and the background research into the Cullen Bullen area in particular.

The key stakeholders relevant to the Project and the engagement methods employed for each are listed in **Table 14**.

Table 13 Coalpac Existing Stakeholder Engagement

Activity	Details
Community Engagement and Communications	• CCC members and near neighbour consultation • State and local Government briefings and meetings • Employee briefings • Focus Group Surveys
Community Issues Management	• Community contact line • Near neighbour engagement • Issue response procedures • Reporting of community complaints / concerns to the CCC and Annual Environmental Management Report (AEMR)
Community Support	• Financial contributions to Cullen Bullen and wider local community groups via LCC and directly
Environmental Monitoring and Management	• Environmental impact monitoring • Environmental management procedures • AEMR (Annual Review) reporting

Table 14 Project Stakeholders and Methods of Engagement

Stakeholders	Method of Engagement
Community Stakeholders	
Individual landholders / near neighbours	• Personal briefings with 45 near neighbours from 3 November 2010 to 31 March 2011 • Project Newsletters • Project Information Days from 16 to 17 December 2010
Cullen Bullen Community	• Project Newsletters • Project Information Days from 16 to 17 December 2010
Neighbouring Mines and Industry	• Project Newsletters to Ivanhoe North Colliery, Pine Dale Mine and Baal Bone Colliery • Briefing on two occasions with Baal Bone Colliery Site Environmental Coordinator on 30 November 2010 and 24 January 2011 • Briefing with mine owners of Pine Dale Mine on 30 August 2010 • Briefing with Delta Electricity Project Managers on 12 October 2010 and ongoing monthly management meetings with senior staff
Aboriginal Community	• Consultation in accordance with OEH Guidelines as described in **Section 6.5**
Invincible Colliery and Cullen Valley CCC	• Presentation on 30 November 2010 • Follow up presentation in July 2011 • Project Newsletters • Project Information Days from 16 to 17 December 2010 • Monthly staff communication sessions
Coalpac Employees and Contractors	• Toolbox Talks • Project Briefings • Project Newsletters • Project Information Days from 16 to 17 December 2010
Colong Foundation and Wilderness Society	• Meeting in Sydney Offices on 15 December 2010 • Project Newsletters
Regulatory Stakeholders	
DP&I	• Project Briefing on 1 November 2010 • PEA review • Project Newsletters • Project Briefing on Ecological Offsets on 13 April 2011 • Follow-up meeting to provide EA update on 17 November 2011
SEWPaC	• Project Briefing on 16 November 2010 • PEA review • Project Newsletters • Meeting to discuss proposed Ecological Offsets Strategy on 31 March 2011 • Meeting to discuss Ecological Offsets Strategy 30 November 2011
LCC Mayor, General Manager and Officers	• Project Briefing on 11 November 2010 • Cullen Valley Mine / Invincible Colliery CCCs • PEA review • Project Newsletters • Follow up briefings including discussions on the proposed VPA in May and June 2011

Stakeholders	Method of Engagement
DTIRIS – MR	• Project Briefing on 23 February 2009 • Offer of Briefing December 2010 • Offer of briefing to Environment Section (Wollongong) in June 2011 • PEA review • Project Newsletters
Forests NSW	• Project Briefing on 12 November 2010 • PEA review • Project Newsletters
NOW	• Project Briefing on 29 November 2010 • PEA review • Project Newsletters • Meeting to discuss surface and groundwater impact assessments on 11 November 2011
OEH	• Meeting and discussion with Lisa Corbyn, Director General OEH on 15 October 2010 • Project Briefing on 12 November 2010 • PEA review • Project Newsletters • Meeting to present Ecological Offsets Strategy 21 June 2011 • Discussion on Ecological Offsets Strategy 2 December 2011
NSW Roads & Traffic Authority (now RMS)	• Project Briefing in October 2010 • PEA review • Project Newsletters
Australian Rail Track Corporation (ARTC)	• Project Briefing in October 2010 • PEA review • Project Newsletters
Central West Catchment Management Authority	• Offer of briefing, meeting not requested
Sydney Catchment Management Authority	• Phone discussion March 2012
Delta Electricity / TRUenergy	• Letter received on 12 November 2010 following initial Project Briefing to Delta Electricity from David Hogg (General Manager, Fuel and Environment) confirming necessity of Project (see **Appendix D**) • Further letters received in November 2011 from David Hogg of Delta Electricity and Mark Collette (Director, Energy) of TRUenergy (see **Appendix D**) • Copy of draft PEA provided • Additional Project Briefing on 12 December 2010 • Project Newsletters • Meetings held at MPPS in February, April and June 2011 regarding Project engineering issues • Monthly progress updates throughout preparation of this EA
Relevant Local, State and Federal Members of Parliament (MPs)	• Meeting and Project Presentation with Gerard Martin Member of Parliament (MP) on 22 July 2009 and 2 February 2011 • Project Newsletter and Briefing with Gerard Martin (State Member for Bathurst), Planning Minister Kelly, D Kitto of DP&I on 6 October 2010 • Project Newsletter and Site Visit (13 December 2010) – John Cobb (Federal Member for Calare) • Project Newsletter and Updated Briefing with Paul Toole (State Member for Bathurst and Parliamentary Secretary to the Deputy Premier and for Asia-Pacific Trade) on 13 May 2011

6.3 ISSUE SCOPING

Engagement with community and regulatory stakeholders to assist in the identification of key Project issues is outlined below in **Section 6.3.1** to **Section 6.3.3**. Community and regulatory stakeholder engagement for the Project was undertaken in accordance with the following key objectives:

- To identify potential stakeholders;
- To engage with relevant stakeholders to record stakeholder / community issues and concerns;
- To assess the compatibility of the Project with existing land uses in the local area and the values of the local community;
- To maintain a process for consistent, ongoing consultation and communication with key stakeholders and the local community;
- To enable stakeholders to have input into this EA and Project planning (especially in relation to final land use and any VPA funds); and
- To proactively respond to and work to address the issues of relevant stakeholders to develop appropriate solutions and mitigation strategies to minimise the potential impacts of the Project.

Various methods were employed to engage with the local community including personal briefings, the distribution of newsletters, project information days and presentations as discussed below.

6.3.1 Local Community Engagement

During the issue scoping phase of the Project and in the preparation of this EA, consultation was undertaken with approximately 45 landholders who live in the local community. As a follow up to the issues raised during this consultation, Coalpac representatives provided personal briefings to 19 of these neighbours to further discuss their concerns in relation to the Project to ensure that these were considered as appropriate in this EA. Responses to the issues raised by members of the local community during the preparation of this EA as a result of these briefings are discussed further in **Section 6.4**.

A Project briefing was also provided to the Coalpac CCC's on 30 November 2010, with issues raised at the meeting included in **Table 15**. Issues raised by representatives from the Colong Foundation and Wilderness Society following a Project briefing on 15 December 2010 have also been considered in this EA.

Engagement with Coalpac's near neighbours and the wider local community was complemented by the distribution of several Project newsletters during the preparation of this EA. Over 200 newsletters were distributed to the local community, regulators and other interested stakeholders in October 2010, May 2011 and December 2011 (see **Appendix D**).

Requests for individual meetings were made to neighbours who have been predicted to receive noise impacts from the Project above the recommended criteria as described in **Section 8.6.3**.

A third Newsletter is proposed to be distributed prior to this EA being placed on public exhibition notifying stakeholders of the key findings from the assessment and where they will be able to view a copy of this EA.

6.3.2 Project Information Days

Following notification being provided to the local community via a letterbox drop to properties surrounding the Project, Project Information Days were held at the Cullen Bullen Progress Association Hall over 16 and 17 December 2010. The Project Information Days were set up by Coalpac to provide the local community the opportunity to gain additional information on the Project and to seek feedback.

Approximately 35 stakeholders from the local community attended the information centre to discuss the Project and their issues in relation to it. Stakeholders asked the Coalpac representatives who were present a number of questions on the Project on a range of issues. These concerns were initially either discussed at the time or followed up with further information and were also recorded to be considered for assessment within this EA. The community issues raised during the open days are included in **Section 6.4.4**.

6.3.3 Regulatory Engagement

A series of Project briefings and presentations were provided to relevant regulators throughout the preparation of this EA (see **Table 14**).

This consultation generally included providing information on the Project description and environmental studies and methodologies proposed, providing updates on the findings of Environmental Impact Studies and outlining the progress of the planning approvals process. This level of engagement assisted with the identification of regulatory stakeholder issues in relation to the Project that were required to be addressed within this EA. Responses to issues raised by regulatory stakeholders are discussed further in **Section 6.4.3**.

6.4 ISSUE RESPONSE

The objective of this stage of stakeholder engagement was to ensure that appropriate responses were provided to stakeholder issues raised in relation to the Project and that relevant strategies for their management and mitigation were considered in this EA.

6.4.1 Project Feedback

Following the completion of the initial community and regulatory stakeholder engagement processes all relevant issues raised were addressed by either Coalpac or the relevant specialists for inclusion in the impact studies undertaken for this EA. Those stakeholder issues relevant to the current Cullen Valley Mine and Invincible Colliery 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.

6.4.2 Director - General's Environmental Assessment Requirements

In response to the stakeholder engagement undertaken for the Project and the Major Projects Application, DP&I issued Director-General's EARs for the Project on 16 December 2010 (and revised on 19 April 2011 to incorporate SEWPaC's requirements) which incorporated responses from other regulators. The Director-General's EARs are provided in full in **Appendix C**, while **Table 15** lists each requirement and where it is addressed in this EA.

6.4.3 Regulatory Consultation Feedback

Following the completion of initial regulatory consultation and discussions on the Project as outlined above in **Sections 6.2** and **6.3**, relevant specialists preparing each of the environmental impact studies for this EA were briefed on the issues raised to ensure that these are appropriately considered in this EA. A summary of these issues and where these have been addressed in this EA is included in **Table 16**.

6.4.4 Near Neighbour and Other Stakeholders Feedback

Table 17 provides a summary of the issues raised by stakeholders and where each is addressed in this EA.

The findings of the stakeholder engagement program were also incorporated in the risk assessment outlined in **Section 7** to ensure that they are adequately assessed.

6.4.5 Community Response to Final Land Use and VPA

A component of the stakeholder engagement process described above in **Section 6.4.4** also involved requesting feedback from the near neighbours on suitable final land use within the Project Boundary and also for input into contributions that could be made by Coalpac to the local community over the life of the Project.

A summary of the key issues raised are listed in **Table 18**. These have been considered in the social and rehabilitation sections (**Sections 8.21** and **8.24**) respectively.

Table 15 Director-General's Environmental Assessment Requirements

Issue	Description	EA Section
General Requirements	This EA of the Project must include: • An executive summary.	Executive Summary
	• A detailed description of: – Existing and approved mining operations / facilities, including any statutory approvals that apply to these operations / facilities; – The existing environmental management and monitoring regime; and – The existing approved and proposed mining operations in the vicinity of the site.	2 & 3
	• 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 the Project and existing, approved and proposed mining operations in the vicinity of the site; and – Plans of any proposed building works.	3

<table>
<tr><th>Issue</th><th>Description</th><th>EA Section</th></tr>
<tr><td></td><td>• A risk assessment of the potential environmental impacts of the Project, identifying the key issues for further assessment.</td><td>7</td></tr>
<tr><td></td><td>• A detailed assessment of the key issues specified below, and any other significant issues identified in the risk assessment (see above), which includes:
– A description of the existing environment, using sufficient baseline data;
– An assessment of the potential impacts of the Project, including any cumulative impacts, taking into consideration any relevant guidelines, policies, plans and statutory provisions (see below); and
– A description of the measures that would be implemented to avoid, minimise and if necessary, offset the potential impacts of the Project, including detailed contingency plans for managing any significant risks to the environment.</td><td>2 & 8</td></tr>
<tr><td></td><td>• A statement of commitments, outlining all the proposed environmental management and monitoring measures;</td><td>9</td></tr>
<tr><td></td><td>• A conclusion justifying the Project on economic, social and environmental grounds, taking into consideration whether the Project is consistent with the objects of the EP&A Act; and</td><td>1</td></tr>
<tr><td></td><td>• A signed statement from the author of this EA, certifying that the information contained within the document is neither false nor misleading.</td><td>i</td></tr>
<tr><td>Key Issues</td><td>• Biodiversity – including:
– Measures taken to avoid, reduce or mitigate impacts on biodiversity;
– Accurate estimates of the proposed vegetation clearing;
– A detailed assessment of the potential impacts of the Project on any:
• Terrestrial or aquatic Threatened species or populations and their habitats, endangered ecological communities and water dependent ecosystems; and
• Regionally significant remnant vegetation, or vegetation corridors; and</td><td>8.14 & 8.15</td></tr>
<tr><td></td><td>– A comprehensive offset strategy to ensure the Project maintains or improves the terrestrial and aquatic biodiversity values of the region in the medium to long term (in accordance with NSW and Commonwealth policies), and considers offsets or compensation in relation to forestry production.</td><td>8.15 & 8.23</td></tr>
<tr><td></td><td>• Traffic and Transport – including:
– Economic justification of transporting coal and sand products on public roads, including an assessment of the costs and benefits of alternative transport methods;
– An assessment of the potential traffic impacts from the proposal on the safety and efficiency of rail and road networks; and
– A description of the measures that would be implemented to upgrade and / or maintain rail and road infrastructure over the life of the Project.</td><td>8.16 & 8.22</td></tr>
<tr><td></td><td>• Air Quality – including a quantitative assessment of potential:
– Construction, operational and blasting impacts;
– Reasonable and feasible mitigation measures, including costing of the proposed measures; and
– Monitoring and management measures, in particular real-time and attended air quality monitoring (including predictive meteorological modelling) to facilitate reactive management of activities to ensure impacts are within relevant criteria and goals throughout the life of the Project.</td><td>8.3 & 8.5</td></tr>
<tr><td></td><td>• Noise and Blasting – including a quantitative assessment of the potential:
– Construction, operational, transport and off rail and road noise impacts;
– Blasting impacts on people, livestock and property;
– Reasonable and feasible mitigation measures, including costing of the proposed measures; and
– Monitoring and management measures, in particular real-time and attended noise monitoring (including predictive meteorological modelling) to facilitate reactive management of noise to ensure impacts are within relevant criteria and goals throughout the life of the Project.</td><td>8.6 & 8.7</td></tr>
<tr><td></td><td>• Heritage – both Aboriginal and non-Aboriginal, including a landscape heritage assessment.</td><td>8.12 & 8.13</td></tr>
</table>

Issue	Description	EA Section
	• **Soil and Water** – including: – A detailed Project water balance, including a description of site water demands, water disposal methods, water supply infrastructure and water storage structures; – A detailed assessment of the potential impacts on: • The quality and quantity of existing surface and groundwater resources; • Affected licensed water users and basic landholder rights; and • Environmental flows. – A detailed description of the proposed water management system and water monitoring program for the Project and other measures to mitigate surface and groundwater impacts; and – Detailed assessment of the likely impacts on soil and the proposed soil management measures to avoid, mitigate or offset those impacts.	8.9, 8.10 & 8.18
	• **Visual** – including a detailed assessment of the pre-mining, operational and proposed post-mining landforms.	8.8
	• **Rehabilitation** – a detailed description of the proposed rehabilitation strategy for the Project area having regard to the key principles in the *Strategic Framework for Mine Closure*, including: – Rehabilitation objectives, methodology, monitoring programs, performance standards and proposed completion criteria; and – The potential for integrating this strategy with any other offset and rehabilitation strategies in the area.	8.23
	• **Greenhouse Gases** – including: – A quantitative assessment of the potential scope 1, 2 and 3 greenhouse gas emissions of the Project; – A qualitative assessment of the potential impacts of these emissions on the environment; and – An assessment of all reasonable and feasible measures that could be implemented onsite to minimise the greenhouse gas emissions and ensure energy efficiency.	8.5
	• **Waste** – including: – Accurate estimates of the quantity and nature of the potential waste streams of the Project, including tailings, course reject and sand processing waste; and – 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.	8.20
	• **Hazards** – including bushfires.	8.19
	• **Social and Economic** – including: – An assessment of the potential impacts of the Project on the local and regional community; – An assessment of the demand the Project may generate for the provision of additional infrastructure and services; and – A detailed assessment of the costs and benefits of the Project as a whole, and whether it would result in a net benefit for NSW.	8.21 & 8.22
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 this Project.	12
Consultation	During the preparation of this EA, you should consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners. In particular you must consult with: • SEWPaC; • OEH, including the NOW; • DTIRIS (including Forestry NSW); • RMS; • ARTC; • LCC; • Central West CMA; and • Sydney Catchment Authority. The consultation process and the issues raised must be described in the EA.	6

Table 16 Regulatory Stakeholder Issues Raised

Ref	Details	Issue Raised	EA Section
1	NOW meeting 29 November 2010 with Fergus Hancock, James Tomlin, Bret Leisemann, Dave Eustace and Dianne Munro	Consideration of Groundwater Dependant Ecosystem (GDE)	8.10
		Consideration of cumulative water impacts	8.10
		Identification of site water demand and any additional requirements for discharge or additional management infrastructure	8.9
		Existing and proposed water licensing requirements for the Project	3 & 8.10
		Additional OEH guidelines for upland swamps: • Assess aquatic / discharge and effect on surface water systems; • The seepage out of Marrangaroo sandstone to the west of Hillcroft should be assessed; and • Loss of water from mining Marrangaroo and potential reduction in downstream flows should be assessed.	8.10
		Show all existing underground workings under the Ben Bullen State Forest and Coalpac Authorities	8.10
		Fluctuations in bore data due to influences from Baal Bone Colliery should be modelled	8.10
		Baseline monitoring data for surface and groundwater sources and any recommendations for additional mitigation and monitoring	8.10
		Impacts to surrounding groundwater users	8.10
		Description and predictions of any potential for impacts to groundwater	8.10
2	OEH meeting 12 November 2010 with Richard Whyte, Andrew Helms, Bret Leisemann, and Dianne Munro	Coal haulage off public roads would be supported by OEH	8.16
		Light pollution to be considered	8.8
		Consideration of the recent northern extension (Yarraboldy) EA for the nearby Pine Dale Mine	2.2.2 & 8
		Rail line capacity	8.16
		OEH would prefer that sand left site via the Invincible Colliery entry	8.16
3	DP&I meeting 1 November 2010 with Howard Reed, Colin Phillips, Carl Dumpleton, Bret Leisemann, Dianne Munro and Dorian Walsh	Air, noise and visual impacts to Cullen Bullen	8.3, 8.6 & 8.8
		Cullen Valley Mine haul trucks using Invincible Colliery site access and ICPP facilities	8.16
		Option for utilisation of the existing Baal Bone Colliery Rail Loop for the Project	4.1
		Consideration of conveyor for internal coal haulage	4.1
		Potential impacts on the Gardens of Stone National Park	8.14
		Consideration of timing of approvals of nearby operations in cumulative assessments	8
		Land ownership figure should include State Forest area to east of EA Boundary	Figure 2
		Aquifer properties of the sandstone resource	8.10
		Noise assessment should be completed in accordance with the *NSW Industrial Noise Policy* (INP), with all reasonable and feasible measures taken, including some consideration of proactive monitoring and operational response management	8.6
		Impact of double handling of materials and additional truck movements due to location of the ETCPP	8.3
		Air quality in the town and at the school should be assessed, including for 24 hour PM_{10}	8.3
		Visual impacts to Cullen Bullen	8.8
		Ecology is a major consideration including but not limited to Capertee Stringybark and Bathurst Copper Butterfly	8.14
		Consider cumulative impacts, especially with consideration of infrastructure location and approved operations of Baal Bone Colliery	8
		The main volume of the EA is to include detailed discussion on technical assessments completed	8

Ref	Details	Issue Raised	EA Section
4	Forests NSW meeting 12 November 2010 withWilliamShearman, Bret Leisemann and Dianne Munro	New Access Agreement to be put in place with DTIRIS – MR for future mining and activities in the State Forest area	5.6
		Consideration will need to be given to the safety issues associated with the Ben Bullen State Forest as a declared hunting area	4.3
		Forests NSW access tracks will need to be diverted / replaced as part of the Project	8.23
		Impact of conveyor easement on landowners at the southern end	Table 12
		A new Mining Lease will be required in some areas where no surface lease is held	Figure 23
		Integral (now Endeavour) Energy specifications for conveyor alignment should be included in EA	4.8.3
		Cost to power supply if approval not given	8.22
		Fire Break Management	8.17
		Ensure that access to Gardener's Gap Track is reinstated	4.12
5	LCC meeting 11 November 2010 with Neville Castle, Roger Bailey, Bret Leisemann, Terry Flynn and Dianne Munro	Ensure progressive rehabilitation	8.24
		Remain diligent about past dust complaints	8.3
		Visual impacts should be well addressed	8.8
		Extensive community consultation should be undertaken	6
		Blasting impacts on Cullen Bullen	8.7
		Areas of potential VPA include: assisting with community support, upgrade to sewerage at Cullen Bullen or assistance with subdivision	8.21
6	SEWPaC meeting 16 December 2010 with Annie Shumaker, Mark Say, Bret Leisemann, David Robertson and Dianne Munro	Project is a 'Controlled Action'	5.7.1, 8.14 & 8.15
		5-10:1 offset ratio for CEEC	8.15
		Show quality of existing rehabilitation	8.24
		Separation of discussion of NSW and Commonwealth matters in the EA document front section and Ecological Impact Assessment report for ease of assessment	8.15 & Appendix J
7	RMS meeting via phone on 29 November 2010 with Bret Leisemann and Tony Hendry	Identify locations and layout of Castlereagh Highway access and key intersections on road haulage route	4.8
		Outline measures to minimise use of external road network for coal haulage and other activities and any additional mitigation measures required for the Project	4.8
		Identify the location and configuration of the proposed conveyor, including any crossing points for public roads	Figure 19
		Operational hours required for the Project, staff numbers and shift times	Table 8
		Schedule of construction work and materials required to be transported by road for the life of the Project	4.13
		Complete a traffic study, in accordance with the RMS *Guide to Traffic Generating Developments*	8.16
	RMS letter dated 13 April 2011 providing general advice on the Castlereagh Highway overpass bridge	Design and construction of the overpass bridge must include: • Compliance with *AS 5100 Bridge Design*; • Minimum vertical clearance of 6.5 m from the highway centreline to the underside of bridge; • Minimum horizontal clearance of 14 m for a two-lane highway. The 14 m horizontal clearance must be increased by the width for any additional lanes and medians; and • At least 1.5 m back clearance between wire rope crash barriers to be used between the carriageway and bridge structure.	4.11.1

Ref	Details	Issue Raised	EA Section
8	ARTC meeting via phone with Bret Leisemann and Michael Irons	• Rail siding design and interaction mitigation • Rail overpass bridge to ARTC design guidelines / standards • Blasting adjacent to rail corridor (existing issue)	4.11 & 8.7
9	State Water meeting via phone on 13 December 2010 with Bret Leisemann and Mark Frost	Relocation of section of Fish River Pipeline	4.12

Table 17 Community Stakeholder Issues Raised

Ref	Issue Raised	EA Section
1	**Air Quality**	
	Dust monitoring including monitoring locations, responsibility and data availability	8.3
	Dust impacts to the Cullen Bullen township and surrounding landholders	
	Dust impact on livestock	
	Dust impacts on agricultural crops	
	Management of the underground fire and spontaneous combustion	8.4
	Cumulative air quality and dust impacts from surrounding mines	8.3
2	**Hazards**	
	Existing fire in abandoned Tyldesley Colliery underground workings	8.4
3	**Water Resources and Quality**	
	Risk of flooding from water contained in the existing mines	Figure 39
	Potential impact of dust on rainwater and surface water	8.3 & 8.9
	Impacts to groundwater levels and what area would be impacted	8.10
	Impacts to private water bores	
	Impacts to water resources due to sand quarrying of Marrangaroo Sandstone	
4	**Heritage**	
	Impacts to Cullen Bullen General Cemetery from visual amenity and blasting / vibration	8.7, 8.8 & 8.13
	Impacts to Carleon Coach House site on Tilley property	
5	**Visual**	
	Extent of mining along highway	8.7
	Extent of mining and time frame in which it will occur	4.4
6	**Traffic**	
	Speeding by mine contractors in the area	8.16.4
	Damage to phone lines by large machinery	8.14.4
	Interactions between Project and public traffic (Haul truck registration, fines tracking onto Castlereagh highway at Invincible Colliery Site Access)	8.16.4
	Access to Ben Bullen State Forest and existing tracks	4.12
	Red Springs Road access	4.10.3

Ref	Issue Raised	EA Section
	Impacts of amount of haul trucks on the town	8.16
	Increase of traffic on the Wallerawang – Gwabegar Railway Line	8.16
	Acquisition / joint usage of Baal Bone Colliery rail infrastructure	4.1
7	**Noise and Blasting**	
	Adequate notification of blasting occurrences	8.7
	Blasting impacts on gravestones, in particular at the Cullen Bullen General Cemetery	
	Blasting impacts on the town of Cullen Bullen	
	Blasting impacts on residences in the area	
	Where would the blasting occur and what areas would be impacted at the different stages of mine life depending on where blasting is taking place	
	Structural impacts to individual houses	
	Potential damage to White Wash Cliffs located immediately east of the village	
	Operational noise levels and noise minimisation techniques	8.6
	Noise levels at night particularly from crushing plant	
8	**Rehabilitation and Final Landform**	
	Timetable and extent of proposed rehabilitation	8.24
	What species will be used in the rehabilitation process – refer to wattle comment below.	8.24
	Will wattle species be included in seed mix as it is considered a weed by locals due to the ease of spread and may encourage pests hazardous to hazelnut operation	8.24
	Control of pest and feral species in particular culling of kangaroos and foxes	8.14
	Maintenance of Coalpac owned land for weeds and feral animals	
	Impacts of underground fire in Tyldesley Colliery underground on rehabilitation at Cullen Valley Mine	8.4
9	**Social and Economic**	
	Proximity to Cullen Bullen township	8.3 & 8.6
	Impact on rental properties in the surrounding area	8.21
	Impacts surrounding land uses	8.22 & 8.23
	Funding to the area, in particular Coalpac's contributions to the local community	8.21 & 8.22
	Employment opportunities generated in the Cullen Bullen area	8.21
	Impacts of mining on property values in the area	8.21
	Strategy used for acquisition	8.6
11	**Other**	
	What will be the impacts of extended operating hours	8
	Extent of mining	4.4
	Consultation with community throughout this EA process	6
	Concerns about Ben Bullen State Forest access	4.12
	Impacts to Ben Bullen State Forest and GoS2 proposal areas	8.8, 8.14, 8.15, 8.23, 8.24

Table 18 Community Comments on Final Land Use and VPA

Ref	Issue Raised
1	**Final Land Use**
	Reinstatement of landscape and vegetation in State Forest for conservation and recreation
	Rehabilitation of vegetation communities for forestry
	Rehabilitation of western areas in Project Boundary back to suitability for agricultural land
	Use of wattle species in Project rehabilitation
2	**Voluntary Planning Agreement**
	Continued support to Cullen Bullen Progress Association Hall
	Continued support to Cullen Bullen Primary School
	Contributions to maintenance of Cullen Bullen community infrastructure
	Development and maintenance of White Wash Cliffs / Caves walking track
	Contributions to Portland township and community groups

6.5 ABORIGINAL COMMUNITY CONSULTATION

The consultation for the Project with the Aboriginal community acknowledges the right of Aboriginal people to be involved, through direct participation, on matters that directly affect their heritage. Involving Aboriginal stakeholders in all facets of the assessment planning process ensures that they are given adequate opportunity to share information about cultural value, and to actively participate in the development of appropriate land use and management options. The successful identification, assessment and management of Aboriginal cultural heritage values are dependent on an inclusive and transparent consultation process.

Aboriginal cultural heritage consultation for the Project was conducted by Hansen Bailey in accordance with the OEH's '*Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*' (Aboriginal Consultation Requirements 2010). The following section has been collated by Hansen Bailey and outlines the key stages of the consultation process generally in accordance with the Aboriginal Consultation Requirements 2010.

6.5.1 Stage Notification and Registration

Correspondence

In accordance with the Aboriginal Consultation Requirements 2010, the following organisations were notified to assist in the identification, notification and registration of Aboriginal people who may hold cultural knowledge relevant to determining the cultural significance of the Project:

- OEH;
- NSW Department of Aboriginal Affairs – Office of the Registrar;
- National Native Title Tribunal and NSW Native Title Services;
- Bathurst Local Aboriginal Land Council (LALC);
- Central West CMA; and
- LCC.

Each of the above organisations was notified in writing informing them of the Project on 13 August 2010 and requesting information regarding the contact details of known Aboriginal stakeholder groups in the locality who may wish to be included in the consultation program for the Project (**Appendix K**).

OEH provided a list of the contact details for seven known Aboriginal stakeholder groups who may have an interest in the Project on 26 August 2010. The NSW Department of Aboriginal Affairs did not provide a list, noting however on 25 August 2010 that the Bathurst LALC may provide further information. Bathurst LALC was subsequently contacted and expressed an interest in being consulted for the Project.

The National Native Title Tribunal provided the details of four native title claimants' that may have an interest in the Project on 19 August 2010. LCC also provided a list of the contact details of five known Aboriginal stakeholder groups who may have an interest in the Project on 25 August 2010. Responses from NSW Native Title Services and Central West CMA were not received.

Newspaper Advertisement

Notification of the Project was provided in the Lithgow Mercury in order to identify Aboriginal stakeholders who wished to be consulted in regard to the Aboriginal Archaeological and Cultural Heritage Assessment. Coalpac placed a Public Notice in the Lithgow Mercury on the 14 August 2010 seeking registration of interest for participation in the consultation program (**Appendix K**). One Aboriginal stakeholder group, Bathurst LALC, registered their expression of interest in the Project via an emailed letter on 19 August 2010 in response to the newspaper advertisement.

Notification of Registration to the Community

A letter seeking expressions of interest in the Project was posted to the additional local Aboriginal stakeholder groups on 13 September 2010 (as identified by OEH, the National Native Title Tribunal and LCC), who had not already registered an expression of interest in the Project in response to the Public Notice placed in the Lithgow Mercury. This letter outlined the details of the Project and invited each stakeholder group to participate in the proposed archaeological survey and share any information they wished in relation to Aboriginal and Cultural Heritage matters.

In response to these letters, the following three groups noted they wished to be consulted in relation to the Aboriginal Archaeology and Cultural Heritage Impact Assessment (the Assessment) for the Project:

- Wellington Valley Wiradjuri People (WVWP);
- Dhuuluu-Yala Aboriginal Corporation (DYAC); and
- Wiradjuri Traditional Owners Central West Aboriginal Corporation (WTOCW) via their legal representation.

In addition to the groups who had initially expressed an interest in the Project, a further three groups made contact with Hansen Bailey requesting involvement in the Assessment during November 2010 following the notification and registration process and were included in the consultation process:

- North-East Wiradjuri Aboriginal Corporation (NEWAC);
- Warrabinga Native Title Claimants Aboriginal Corporation (WNTCAC); and
- Mingaan Aboriginal Corporation (MAC).

Each of the seven Aboriginal stakeholder groups who expressed an interest in the Project indicated that they would like to participate in both the Cultural Heritage Assessment and archaeological survey aspects of the Project, with the exception of MAC, who were unable to attend the survey fieldwork. MAC noted that they wished to be consulted further following completion of the fieldwork and would like to be provided the opportunity to comment on the draft Assessment report.

Notification of Registration to OEH and the Bathurst LALC

In accordance with Section 4.1.6 of the Aboriginal Consultation Requirements 2010, a copy of the following documentation was provided to OEH and the Bathurst LALC on 3 November 2010:

- Public notice of assessment in the Lithgow Mercury newspaper on 14 August 2010;
- Copies of the original letter sent to Aboriginal organisations notifying them of the Assessment; and
- A record of the Aboriginal parties who had registered an expression of interest for the Assessment.

An additional letter was sent to OEH and the Bathurst LALC on 29 November 2010 to notify them of the additional expressions of interest in the Project from MAC, NEWAC and WNTCAC.

As required by Section 4.1.5 of the *Aboriginal Consultation Requirements 2010*, each of the registered Aboriginal stakeholder groups was afforded the opportunity to withhold their information being provided to OEH and Bathurst LALC. No requests were made to withhold this information and as a result, OEH and Bathurst LALC were provided the names of all Aboriginal stakeholder groups who had registered an interest in the Project.

6.5.2 Stage 3 Consultation Regarding Survey Strategy and Conservation Values

All Aboriginal stakeholder groups that had initially provided an expression of interest in the Project were sent a hard copy of the proposed survey methodology developed by AECOM on 28 September 2010. A covering letter was also attached and described the proposed survey methodology, consultation and assessment process for the Project.

Aboriginal stakeholder group representatives were also encouraged to provide comments and raise any concerns they may have had in relation to the Project regarding cultural heritage or the proposed survey methodology. A request for a formal expression of interest in the Project fieldwork and the nomination of a proposed representative was also requested in the letter.

Aboriginal people are in the best position to provide comment on the cultural value(s) of the Project area and its associated archaeological record. Accordingly, throughout the assessment process, Coalpac has actively sought the opinions of Aboriginal stakeholders, both verbally and in writing.

As detailed in **Appendix K**, opportunities for the provision of cultural information have been provided at all stages of the assessment process, including:

- In the letters to all relevant Aboriginal community groups seeking registration of interest in the Project;
- During the review of the draft AECOM fieldwork methodology and survey strategy;
- During consultation and in presentations at the commencement of phase of Project fieldwork;
- Discussions during Project fieldwork; and
- Seeking comments on cultural heritage information and values during the review of the Project Aboriginal Archaeology and Cultural Heritage Impact Assessment by all community groups.

No cultural knowledge or information was shared by the Aboriginal community groups that contributed to the Aboriginal archaeological assessment and consultation process for the Project.

Summary of Responses

All seven Aboriginal groups who had expressed an interest in the Project provided comments on the proposed assessment methodology (see **Appendix K**).

Of these responses, six groups indicated that they accepted the proposed survey methodology and did not raise any issues regarding cultural heritage. WVWP provided a response via their legal representative that they did not agree with the proposed methodology but did not provide specific suggestions.

In their response via their legal representative, WVWP noted that they believed there were a number of deficiencies in the methodology proposed. The only deficiency defined by WVWP, however, related to the use of previous surveys completed in the area to provide a background to the Assessment which they indicated may not have involved Wiradjuri people.

Hansen Bailey provided letters on 27 October 2010 and 3 November 2010 in response to comments from WVWP seeking comment on the draft fieldwork methodology for the Assessment and requested that a representative provide input during the first stage of the archaeological fieldwork. WVWP did not provide any further response to the proposed survey methodology or provide a representative during the fieldwork component of the Assessment.

Fieldwork Consultation and Planning

Further to the correspondence provided to all stakeholder groups with the draft survey methodology (see above), a presentation of the proposed fieldwork program and ongoing consultation was provided to all Aboriginal representatives at the commencement of each stage of the fieldwork. No changes were requested nor made to the draft methodology. Information related to the Project and Assessment that was discussed at the fieldwork planning meetings included the following:

- Provision of background information on Coalpac and existing operations at Cullen Valley Mine and Invincible Colliery, including previous archaeological studies completed;
- Overview of the proposed Coalpac Consolidation Project including critical timelines and milestones;
- The Aboriginal Community Consultation process during and following the fieldwork, including:
  - The process to date and ongoing consultation;
  - Roles and responsibilities of all parties involved;
  - Confirmation of the field assessment and proposed methodology;
  - Anticipated timing for completion and review of the draft report by the Aboriginal community;
  - The processes available to communicate any cultural knowledge relevant to the Project; and
  - Safe work and induction procedures for the work.

Project Fieldwork

As noted in **Section 6.5.1**, five of the seven Aboriginal stakeholder groups who registered an interest in the Project were available to take part in the fieldwork component of the Assessment. Each group was contacted in advance of the fieldwork to further outline the process for the fieldwork, seek relevant documentation and confirm dates when representatives would be available to take part.

In accordance with the proposed survey methodology prepared by AECOM, the fieldwork was completed over 20 working days during the period 15 November to 10 December 2010. As noted in the survey methodology, the fieldwork was completed in two stages to allow all Aboriginal stakeholder groups an opportunity to take part in the process. The first stage was completed during the period 15 to 26 November 2010, with the second stage undertaken with the remaining groups on 29 November to 10 December 2010.

During and at the completion of each group's participation in the fieldwork, the two archaeologists from AECOM who were present outlined the key findings and sought comments or suggestions in relation to Cultural Heritage significance and management measures relevant to the areas surveyed. No further cultural heritage issues were identified as part of this process.

A summary of the groups who took part in the fieldwork component of the Assessment and the representatives who participated in the archaeological survey is presented in **Table 19**, with a discussion of the key findings of the Project field survey and management measures presented in **Section 8.12**.

Table 19 Registered Aboriginal Stakeholder Groups Represented During Fieldwork

Stakeholder Group	Fieldwork Representative(s)
Bathurst LALC	Tina Petford, Rick Peters
DYAC	John Phillips
WTOCW	Brian Grant
NEWAC	Lyn Syme, Kelly Menzies, Donna Whillock
WNTAC	Kevin Williams, Abby Whillock

6.5.3 Stage 4 Draft Aboriginal Archaeological Assessment Review

In accordance with the Aboriginal Consultation Guidelines 2010, a draft copy of this report was provided to all stakeholders who had expressed an interest in the Project on 10 February 2011. All groups were given a period of 28 days from the receipt of the report to review the document and provide written or oral comments in response.

Written reviews of the report were provided by five of the registered stakeholder groups during the review period, being Bathurst LALC, DYAC, WTOCW, NEWAC and WNTAC and incorporated into the final version of the Aboriginal Archaeological Assessment. A copy of comments received following the reviews of the report by the Aboriginal community are also provided in full in **Appendix K** and summarised below.

DYAC, Bathurst LALC and WTOCW all indicated that they agreed with the content of the draft report and were satisfied that the proposed management measures were appropriate.

NEWAC and WNTAC noted that they agreed with the overall content of the report, including the coverage and predictive model used. Further discussion was requested, however, in relation to the subsurface potential of site CV-AS4-10 (see **Section 8.12**).

NEWAC and WNTAC also indicated that they while they agreed with the proposed management strategy for artefacts as outlined in the draft report, arrangements should be put in place for the secure long term storage onsite of any collected material and that sites within the existing ecological offset areas for Invincible Colliery be preserved. NEWAC and WNTAC also noted that they would like to know how monitoring of the rock shelter for indirect impacts will be conducted and would like to be consulted regarding the ongoing monitoring arrangements. These comments have been noted by Coalpac and details on these matters will be included in the Aboriginal Heritage Management Plan (AHMP) proposed for the Project (see **Section 8.12**).

As noted above, MAC requested that a copy of the draft report be provided to their groups for comment, despite not being available to take part in the fieldwork. Following the receipt of the draft Aboriginal Archaeology and Cultural Heritage Impact Assessment, MAC requested a meeting on 16 February 2010 to discuss the key findings and management recommendations included in the draft report.

This meeting was held on 11 March 2011 and at this meeting, the MAC representatives indicated that they held cultural knowledge relating to the site and that there were additional sites present within the Project area that had not been identified during the fieldwork component.

A site visit was arranged on 21 March 2011, however this did not go ahead due to availability of the MAC representative. Despite follow up, MAC has not been able to attend the site. However, should this occur and additional sites be identified within the Project Boundary, these will be appropriately recorded and incorporated into the AHMP proposed for the Project (see **Section 8.12**). No written response was received from WVWMP.

6.5.4 Additional EA Fieldwork

DP&I requested additional survey of ridgelines to the north-east of current open cut operations at Invincible Colliery, with a particular emphasis to be placed on the identification of any rock shelters in that area. In response to the DP&I's request, a letter was sent to all registered Aboriginal stakeholder groups for the Project on 20 September 2011 informing them of the additional fieldwork requested and seeking their participation in a targeted archaeological field survey of the ridgelines in question. Each of the registered groups was given 14 days to respond to the request for their involvement.

Three of the registered groups (MAC, NEWAC and WNTCAC) indicated that they wished to be involved in the additional fieldwork.

Archaeological survey of the ridgelines was undertaken on 12 October 2011 by a combined field team of two AECOM archaeologists and three Aboriginal community representatives from MAC, WNTCAC and NEWAC. No new Aboriginal archaeological sites were identified during the additional survey.

On 18 October 2011, a letter confirming the outcome of the additional fieldwork undertaken was sent to all registered Aboriginal stakeholder groups.

6.6 ONGOING STAKEHOLDER ENGAGEMENT

Coalpac is committed to continuing its stakeholder engagement program throughout the life of the Project, in accordance with leading 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 this EA to provide an update on this EA process and where this EA may be viewed by the public.

Mechanisms that will be employed by Coalpac to ensure the effective engagement and communication with the Project stakeholders will include:

- Regular engagement with individual near neighbours;
- Combined Project CCC (to be established in consultation with the existing bodies and DP&I);
- Company representation on interested environmental and community groups;
- Regular community newsletters with local area distribution;
- Issue specific newsletters, as required;
- Participation at relevant key community events; and
- Community surveys.

Regular training of employees and contractors will be undertaken commensurate with job descriptions in relation to the commitments in this EA. In addition, an Annual Review (formerly AEMR) that summarises company activities and performance in the areas of environment and community will continue to be prepared and made available to the public in hard copy and on the Coalpac website.

SECTION 7
Risk Assessment

7

Risk Assessment

A preliminary risk assessment was undertaken as part of the PEA which accompanied the Major Projects Application to DP&I which identified potential environmental issues (in the absence of controls or mitigation) 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, 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 Coalpac Risk Assessment Matrix (which meets Standards Australia requirements) and is based on likelihood 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.

Table 20 summarises findings from the revised risk assessment which indicated several aspects associated with the Project potentially posed a high environmental risk, in the absence of controls. Many of the aspects were rated as significant to low risk, with no extreme risks identified.

Aspects identified throughout the risk assessment process as high, significant and low have each been assessed as part of this EA. Aspects identified as having a higher environmental impact risk formed the primary focus of this 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 20 Summary of Revised Environmental Risk Assessment

Category	Project Issue(s)
Extreme	None
High	Air quality, noise, blasting, ecology and surface water
Significant	Aboriginal archaeology and Cultural Heritage, Non-Aboriginal heritage, geochemical, visual and lighting, subsurface heating, rehabilitation and final landform and community concern
Moderate	Slope stability, Subsidence due to highwall mining, traffic and transportation, bushfire, greenhouse gas, groundwater, forestry, soils and land resources, social and economics
Low	Hazardous materials and waste

SECTION 8

Impacts, Management and Mitigation

8

Impacts, Management and Mitigation

This section provides a summary of potential environmental and social impacts from the Project and discusses the management and mitigation measures to be implemented, as appropriate. The issues have been prioritised in accordance with the EARs and the risk assessment (in consideration of stakeholder engagement) described in **Section 7**.

8.1 STABILITY AND SUBSIDENCE DUE TO HIGHWALL MINING

8.1.1 Background

Geonet Consulting Group has undertaken an Assessment of Stability and Subsidence in consideration of the highwall mining proposed for the Project which is included in **Appendix F**. The assessment investigated the potential subsidence and stability impacts associated with the highwall mining design to enable the extraction of selective coal reserves from the target coal seams proposed to be extracted as part of the Project. The assessment was undertaken on the basis of the intent detailed in the *'NSW Department of Mineral Resources Subsidence Management Plan 2003'* (DMRSMP 2003) and DTIRIS – MR Mine Safety Operations Guideline, *'Coal Technical Reference CTR-001'* (DPI 2008).

Based on current DTIRIS – MR criteria for preserving landscape features, mining induced subsidence must be limited to a maximum of 20 mm (DMRSMP 2003). The assessment completed for this EA provides a preliminary assessment for the purpose of determining the risk of subsidence to sensitive landscapes based on a specific highwall mining method to be employed for the Project.

Additionally, a peer review of the Geonet Consulting Group assessment was undertaken by Boyd Mining Ltd (an independent expert with more than 20 years of geotechnical experience in the field) which forms an addendum to **Appendix F**. A subsequent letter from Boyd Mining Ltd is also appended which confirms that the changes suggested as part of the peer review were made to the report.

8.1.2 Methodology

Mining Method

The Project consists of open cut mining down to the Lithgow Seam followed by highwall mining the highwall to extract additional coal reserves (see **Section 4**). Once the highwalls have been created, the highwall mining will extract from the target horizons. After completion of the mining via highwall mining methods, backfill will be placed against the highwall to the level of the next target horizon. Finally the open pit will be backfilled to final land form and rehabilitated.

An indicative highwall mining mine plan and subsidence and stability assessment zone for the most critical area of mining (Subsidence Study Area) was developed for the Project and is presented on **Figure 7**. This assessment could then be applied as a basis for other areas of highwall mining associated with the Project. The Subsidence Study Area was selected as it provided a worst case scenario with the maximum overburden thickness (highest load on pillars), occurrence of sandstone escarpments and the presence of existing underground workings within the Lithgow Seam. As such, the assessment presents the case for maximum potential subsidence within the Project Boundary.

A summary of local geology for the Project is provided in **Section 2.5**, with an indicative stratigraphic section for the region presented in **Figure 4**. The typical stratigraphy in the Project Boundary is located within the uppermost subgroup of the Illawarra Coal Measures and comprises coal, sandstone and shale. The overall dip of the strata is two to three degrees towards the north-east. The overburden sequence forms the prominent cliffs in the Blue Mountains.

Only rare isolated faults and fault zones have been encountered in local open cut mining operations. These were normal faults with the dips of the fault planes ranging from subvertical to low-angled.

The maximum displacement fault encountered in open cut operations was located in Mining Lease 1455 with a displacement of approximately 1.5 m, downthrown to the east and trended in a north-south direction.

Underlying the southern portion of the Subsidence Study Area assessed for the Project (see **Figure 7**) are the abandoned underground bord and pillar workings in the Lithgow Seam, the lower section of the Lithgow Seam was mined to an approximate height of 1.5 m. The remnant pillars are typically 25 m x 40 m long with roadways 4.5 m wide. These workings are located at mining depths between 100 m and 140 m below the surface. Recent geotechnical assessment of the pillars confirmed their stability with Factors of Safety in excess of five.

Highwall Mining and Coal Recovery

The Project proposes to highwall mine selective sections from the Katoomba, Middle River, Moolarben, Irondale and coalesced Lidsdale / Lithgow Seams, with the seam plies, mining heights and lateral extents of highwall mining to be varied across the Project Boundary, depending on geology and coal quality considerations. The estimated potential coal recovery of 1.9 Mt within the Subsidence Study Area was based on achieving the full penetration depth of 305 m, except in the eastern highwall where penetrations must be limited to 260 m to ensure that it does not intersect with entries from the western highwall. The selected seams for the Subsidence Study Area were the most prospective being the Katoomba, Moolarben, Irondale and Lithgow Seams.

The study showed that structural conditions in the overlying Irondale Seam have a potential to be affected by previous underground mining in the Lithgow Seam. As a result, highwall mining entries in overlying zones of higher stress in the Irondale Seam may experience conditions similar to the effect of mining stronger (harder) coal.

It was also shown that conditions in the Katoomba Seam may also be affected by previous underground mining in the Lithgow Seam. In addition, geotechnical modelling showed that a tensile zone may form in the Katoomba Seam located 50 m into the western highwall and 30 m into the eastern highwall and extending 100 m along the seam.

These changes in stress condition in the coal seam and interburden strata have the potential to affect highwall mining rates and overall stability of pillar sidewalls, roof and floor. This is considered normal rock mass behaviour and shall be taken into account when more detailed highwall mining design and geotechnical analysis is carried out for each highwall mining panel, as part of the evaluation and approval process by DTIRIS – MR. In addition, until the open cut areas have been excavated, the full extent of any impacts of previous mining operations will not be known, and further detailed analyses will include the as-mined conditions (from open cut mining) to effectively evaluate each highwall mining panel prior to mining.

Highwall Mining Modelling

The methodology for the assessment consisted of several components to ensure that all potential subsidence impacts associated with the Project were assessed. These included:

- Detailed review of existing information including existing topography over the Subsidence Study Area, geological surface profiles of the various coal seams and specification of cutting heights in sections of four different coal seams;
- Estimation of coal seam strengths for each of the proposed mining horizons;
- Pillar dimensions for single pass highwall mining in each of the target seams;
- Evaluation of highwall and overburden conditions that might affect safe and productive highwall mining operations;
- Simulation of abandoned underground mining (first workings only with no secondary pillar extraction) and proposed sequence of open cut and highwall mining;
- Estimation of likely subsidence over highwall mined panels; and
- Assessment of potential impact of subsidence on the integrity of local topography.

Assessment Assumptions

As a result of limited available geotechnical data, the analysis required several assumptions to be incorporated into the assessment. The assumptions included:

- Coal strength data and rock mass properties are based on the simulated behaviour of the logged geological profile using material properties established for the Ulan Seam (which essentially corresponds to the Lithgow / Lidsdale Seam) and successfully used for mining geotechnical analysis of previous highwall mining successfully completed at Cullen Valley Mine and Invincible Colliery;
- In the Subsidence Study Area, the Katoomba, Moolarben, Irondale and Lithgow Coal Seams are unweathered, are of uniform thickness, hold no groundwater and contain no structural disruption due to faulting, rolls, etc; and
- Dimensions of underground workings in Lithgow Seam shown on the mine plans are accurate and representative of the *'as-mined'* and present condition.

These assumptions have been reviewed and determined to be fit for the purposes of this assessment by the Peer Review undertaken.

Highwall Mining Layout

Material properties used in the modelling were based on previous experience with similar rock types at adjacent mines. The highwall mining layout was then calculated according to an established empirical design formulation whereby pillar width is calculated taking into account pillar strength, pillar stress and the desired operating Factor of Safety (FoS). This stage is followed up with further detailed numerical simulation of the mining sequence to confirm behaviour and to identify if there are specific geological conditions which may affect stability.

Characteristic highwall conditions of topography and seam thickness are variable within the Project Boundary. Where conditions vary across a face block or within a specific coal seam, the highwall mining layout (pillar width, set up dip and number of passes) may be changed in order to maximise production while maintaining a minimum design FoS of 1.3.

A FoS value of 1.3 generally provides an element of conservatism and allows for inevitable variations in pillar dimension as a result of the entry wandering from its path and also to cope with local variations in coal seam geology and material strength.

Based on the Project mine plans, the highwall design study was based on conditions over the proposed maximum penetration depth of 305 m to define the maximum overburden depth of cover. It is considered appropriate to use the maximum overburden load to estimate stable coal pillars, accepting the conservatism that the pillars will be overdesigned for much of their length.

Constraints will be incurred by virtue of the highwall mining machine's configuration and dimensions. The conventional cutting design is for a 3.5 m wide cutting span for excavation heights up to 3.0 m. Where seam excavation heights are to be limited to a maximum of 1.0 m, then the cutting span will be reduced to 3.0 m. Thus, for the Subsidence Study Area highwall mining spans of 3.5 m are likely to be made for mining in the Katoomba and Lithgow Seams and spans of 3.0 m will be designed for mining in the Moolarben and Irondale seams.

Geomechanical Assessment of Highwall Mining Pillars

In order to verify the empirically derived minimum pillar dimensions, a series of finite difference models were developed taking into account the interaction of specific local geology, in-situ stress, excavation sequence and relative strata strength properties.

The objectives for carrying out the highwall mining simulations were to:

- Verify that the pillar dimensions will be stable;
- Identify potential failure mechanisms in coal pillars and roof and / or floor strata; and
- Estimate the potential subsidence that may develop under overburden ridges.

Models were developed to simulate highwall mining under a range of overburden thicknesses based on the known geological cross section within the Subsidence Study Area.

In order to create long term stable barrier pillars with geometry of a width to height ratio of greater than or equal to five, at least one entry will be left unmined. The spacing of the barrier pillars depends on the overlying interburden thickness. By locating the barrier pillars at the sub-critical spans the intermediate highwall mining pillars in each sub-panel will be subject to reduced overburden stress loading conditions. An additional benefit of forming a stable stress arch in the overburden is that subsidence of the surface strata will be minimised.

8.1.3 Impact Assessment

Subsidence

The total subsidence of landscape ridges induced by highwall mining associated with the Project was predicted to be less than 20 mm. It is estimated that the maximum subsidence will be in the range 10 mm to 15 mm, in areas overlying previous underground mining in the Lithgow Seam. The maximum subsidence in rock mass previously unaffected by underground mining is predicted to be less than 15 mm.

The Subsidence Study Area modelling identified a potential for local exceptions to the subsidence criterion on the southern point of the western highwall where subsidence may increase to 40 mm associated with exposure of unconfined joints in the highwall. These are clearly located within the open cut highwalls and as such will be excluded from the landscape subsidence criterion. These areas of subsidence will be controlled by optimising the orientation and profiles of the final open pit highwalls in relation to the major joint sets during the design phase.

Following the Coalpac decision to standoff the final highwall position by a minimum of 50 m from pagodas and escarpments, the long term stability of pagoda and escarpment features has been further mitigated with a consequential reduction in risk and an increasing Factor of Safety.

The Project is located in an environmentally sensitive subsidence area, which demands that surface subsidence is limited to ensure the stability of the sandstone ridges. The modelling has indicated that the most critical factors in determining the long term stability of coal pillars are the pillar dimensions and stress level induced in the pillar with groundwater providing a possible additional factor in the Lithgow Seam (AGE 2011) concluded that groundwater was not present in the upper seams).

The presence of groundwater and flooding of workings was considered and was concluded to be unlikely to affect the long term stability of adequately designed pillars. The key criterion is to ensure that the pillars are designed not to exceed their limit of elastic stress level.

Surface subsidence can only be initiated if there is widespread collapse of the highwall mining pillars. Since the pillar design layout is based on achieving a minimum FoS of 1.3 under the maximum overburden height in any panel (and that the full length of the pillars is not subjected to maximum overburden height, thus resulting in a conservative assumption), most of the pillar lengths will be over-designed in this regard.

The width of the uniform barrier pillars for highwall mining panels in the various coal seams is calculated based on the seam interburden thickness, highwall mining span and pillar width. The estimated pillar dimension for each of the coal seams was shown to be stable, producing less than 20 mm of subsidence, showing that stable designs for highwall mining can be achieved when mining under a worst case scenario, that is, where highwall mining is undertaken in four separate coal seams under the largest overburden thickness that exists within the Project Boundary.

8.1.4 Peer Review of Assessment

An independent peer review of the Geonet Assessment of Stability and Subsidence Highwall was undertaken by Boyd Mining Pty Ltd. A copy of the peer review report is provided as an addendum to **Appendix F**.

The peer review concluded that the Geonet Report is a *"well structured coverage of the issues confronting the planned sequence of mining"* associated with the Project and that the process of analysis is appropriate and generally consistent with the scope of the assessment. The peer review highlighted a number of key environmental issues and listed a number of questions to provide additional detail in relation to the content of the report. In addition, the peer review acknowledged that the impact of full convergence of adjacent openings be analysed to demonstrate panel stability is well invested with the adoption of a FoS = 1.3.

In response to the peer review, Geonet revised their report and addressed all issues and concerns that the review raised (see **Appendix F**).

8.1.5 Mitigation and Management

Coalpac will prepare a detailed Mining, Rehabilitation and Environmental Management Plan (MREMP) for the Project in consultation with DTIRIS – MR and to the satisfaction of DP&I. The MREMP will contain information to address the requirement for specific design reports or an extraction plan giving scheduling each area prior to mining and geotechnical assessment of the highwall stability.

This information will be supplied in advance of highwall mining for DTIRIS – MR approval before the highwall mining operations in each area commences.

In addition, Coalpac will implement a number of mitigation and management measures to minimise subsidence associated with the Project remains below the relevant 20 mm criteria. These shall be incorporated into a Highwall Mining Management Plan for the Project and include:

- Final highwall positions and orientations being assessed to take structural geology into account to promote stability in the exposed jointed highwalls;
- Limiting designed surface subsidence to below the relevant 20 mm criteria;
- Design highwall mining panels to minimise the potential impact upon any nearby pagoda and escarpment formations;
- Design of pillars will take into account the likely entry azimuth deviations based on Original Equipment Manufacturer's advice;
- Groundwater modelling for the Project (**Section 8.10**) confirmed that minor water inflows are expected from the Lithgow seam. However, investigation is required of the groundwater table in the rock mass so as to be aware of potential releases that could occur in highwall mining drives and investigate the condition of the historic underground workings in the Lithgow Seam for their potential to have accumulated substantial groundwater volumes;
- Highwall mining drives in the Lithgow Seam will maintain a minimum 20 m offset from previous underground mining operations in order to avoid breaching any flooded workings or initiating instability from previously damaged rock mass conditions; Conduct gas measurements from exploration bore cores prior to highwall mining to establish the background levels of gas and to confirm negligible risk;
- Leave at least one entry unmined to create long term stable barrier pillars and locate barrier pillars at the sub-critical spans to reduce overburden stress loading conditions to form a stable stress arch in the overburden to minimise subsidence of the surface strata as part of the overall design methodology; and
- Conduct and document regular surveys and inspections associated with the highwall joint condition, joint orientations and overall stability of the highwalls, to be undertaken by appropriately qualified geotechnical specialists.

8.2 SLOPE STABILITY

8.2.1 Background

A desktop review of the topographic slope types within the Project Boundary was undertaken by SCT Operations (SCT 2011) to assess the risks to these areas that may be associated with the mining operations proposed for the Project. In particular, the review considered potential impacts that may result to the sandstone pagoda and escarpment features that are such a distinctive characteristic of the region. Over geological timescales, these features have been formed by the weathering-resistant sandstone remaining as a cap above the lower Illawarra Coal Measures, creating the prominent sandstone pagodas that commonly occur in the local area and throughout the Blue Mountains region.

8.2.2 Methodology

Topographic Analysis

The assessment was undertaken by analysis of the Project Boundary through a review of topographic maps and aerial photography. This allows the division of the Project Boundary into three distinct zones (cliff bound hills, talus slopes and valley floors) which identified the key escarpment features and potential scree and talus slopes within the Project Boundary.

Sensitive Areas

Cliff lines and pagoda rock formations were considered highly sensitive due to the steepness of the formations and weathering which has left some of these in a naturally occurring and potentially unstable state. The zone of talus and scree is an intermediate zone between the cliff faces and the valley floor. The talus and scree slopes are composed of unconsolidated material in repose and these slopes form a natural batter against the cliff and escarpment faces.

Previous fieldwork in the region shows that these talus deposits are not well developed, and are limited to the base of the steep slopes and cliff lines; the material viewed tends to be vegetated thin deposits of poorly developed soil and scree. Previous mining operations by Coalpac confirms this, particularly in the southern and western areas at Cullen Valley Mine adjacent to the Wallerawang – Gwabegar Rail Line. This area has shown very thin skeletal soils in the majority of final highwall positions, which were developed using blasting and are approximately 100 m from sandstone escarpments and pagodas. The absence of alluvial fans and thick scree deposits is indicative of the high energy weathering systems that operated during the formation of the topography and also demonstrates the rapid weathering of the bedrock (SCT 2011).

8.2.3 Impact Assessment

As noted above in **Section 3**, coal mining has been conducted using open cut mining methods in the vicinity of the Project Boundary since the 1950s, and this mining method has operated in close proximity to areas of sensitive terrain as identified in **Section 8.2.1**. Previous Coalpac operations at Cullen Valley Mine have also successfully mined in topography at a distance of 100 m from sandstone cliffs and pagodas, and as close as 170 m from a known Aboriginal heritage rock shelter site with no detrimental effects.

The following conclusions were drawn as a result of the review:

- The risk of slope instability to the steep terrain may increase due to the open cut operations proposed for the Project. Without adequate controls, vibration from blasting and potential slope failures from intersecting localised structures could increase the risk of instability to the escarpment and pagoda rock formations. Without adequate controls, highwall mining increases the risk of potentially destabilising cliff faces if subsidence related movement is initiated (see **Section 8.1** for the assessment of these impacts for the Project);
- To reduce the risk of affecting these sensitive sandstone features, a 100 m risk review buffer zone from the sandstone cliffs and pagodas will be implemented as a risk management measure, and planned highwall mining will be designed to be stable with minimal subsidence;
- Local variation in final distance of open cut mining from high risk cliff faces and rock formations within the 100 m risk review buffer zone will be accomplished by completion of a suitable risk analysis of slope stability at individual sites based on field investigation and performance of the adjoining areas of mining;
- The distribution of talus and scree slopes within the Project Boundary is restricted to the immediate base of most cliffs, with only thin scree deposits noted in previous site inspections. Talus and scree deposits forming much of the steep terrain are limited in extent and more detailed investigation is required at final highwall design stage in order to fully delineate these features and risk assess their stability; and
- The distribution of the cliff faces are largely joint controlled and this is typical of sandstone dominated terrain, mapping of joint distributions will therefore assist in the assessment of stability.

As there has been typically a 100 metre buffer zone between the cliff faces and the open cut areas from existing Coalpac operations with no detrimental effects on highwall stability (and therefore cliff and pagoda stability), that distance is considered to provide an appropriate buffer to risk manage the areas of sensitive terrain.

8.2.4 Mitigation and Management

A risk review buffer zone of 100 m will ensure potential risks from Project's mining operations are managed, based on previous Coalpac mining operations at Cullen Valley Mine and Invincible Colliery. This zone will be used to indicate if further monitoring or analysis of sensitive areas is required.

To ensure slope stability for the Project, the following management measure will be implemented:

- Photo documentation of all visible cliff faces to form a baseline of the existing conditions;
- Detailed photo documentation of the pagodas and other potentially unstable rock formations (utilising digital 3D photography where possible);
- Establishing an adequate survey methodology, either by direct measurement if access is possible (or otherwise by remote sensing tools) on selected cliffs and pagodas as Project mining operations progress with resurvey to be undertaken on a schedule based on the advance of mining. This is to monitor any creep or tilt of the cliffs or escarpments;
- Risk assess the cliff faces and pagodas to predict the impact of mining and reassess any specific areas as required to determine if any response is needed to minimise or control any impacts;
- Construct hazard management plans for any sensitive areas deemed unsafe due to natural or induced instability; and
- Active monitoring of highwall development which will incorporate a detailed slope monitoring system to protect the Project workforce and equipment, especially if instability is detected.

Coalpac will also continue to continue to monitoring and manage areas of potential slope risk in accordance with the *Slope Stability Major Hazard Management Plan* (2010c).

8.3 AIR QUALITY

8.3.1 Background

PAEHolmes conducted an air quality impact assessment for the Project which is presented in full in Appendix G. This assessment includes a dust assessment which is described below.

Air quality modelling for the assessment was prepared following the procedures outlined in the OEH *'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW'* (Approved Methods) (DEC 2005a).

The air quality assessment included a quantitative evaluation of the potential air quality impacts of the Project, including:

- Meteorological and climatic conditions and the existing air quality conditions within the region;
- The air quality criteria applicable to the Project;
- Methods used to estimate dust emissions from the Project for selected future years;
- Predicted dust dispersion patterns due to emissions from the Project and cumulative impacts from other sources;
- Comparison between the predicted dust concentrations and deposition levels to relevant criteria; and
- Management and mitigation measures, as required.

8.3.2 Methodology

Meteorological Data

Meteorological data was examined from a number of monitoring stations before being compiled for use in a meteorological monitoring program California Meteorological (CALMET) to provide a full year (2009) of representative data for the Project, for the purposes of modelling.

Meteorological monitoring data was obtained from the following locations:

- The Cullen Valley Mine meteorological station (a part of the existing Coalpac monitoring network);
- The Invincible Colliery meteorological station (a part of the existing Coalpac monitoring network);
- MPPS meteorological station (approximately 5 km south of the Project);
- BoM Bathurst Airport meteorological station (approximately 38 km south-west of the Project); and
- BoM Mount Boyce meteorological station (approximately 44 km south-east of the Project).

The BoM meteorological monitoring stations (with sufficient data required for cloud cover) are up to 44 km from the Project. To use these observed data for the generation of meteorological data files, a large computational grid domain is required. However, due to computational limitations, a coarse resolution would then be needed which may result in neglecting local terrain effects. As a result, CALMET was run in two stages, with the first stage model run over a large domain (75 km x 67.5 km) with a coarse resolution (1.5 km x 1.5 km grid), using the observations from the five surface meteorological stations listed above. Any gaps in the data (relative humidity and pressure) were generated utilising The Air Pollution Model (TAPM) package developed by CSIRO.

The second stage involved using the output from stage one as input for CALMET over a much smaller domain (20 km x 20 km) and finer resolution (100 m) with the Project at the centre. This finer resolution domain allowed any effects due to local terrain to be captured.

The finer resolution CALMET domain was then run for each mine location in each year in order to capture the specific terrain effects (e.g. pit terrain) in each proposed operational year. Further detail on the methodology used is provided in **Appendix G**.

Background Air Quality

Coalpac conducts air quality monitoring at the locations shown on **Figure 5** within the vicinity of the Project Boundary and consists of:

- PM_{10} measured every sixth day using two HVAS (one at Cullen Valley Mine and one at Invincible Colliery); and
- Deposited dust at 11 representative monitoring locations (five at Cullen Valley Mine and six at Invincible Colliery).

To assess impacts against all the relevant air quality standards and criteria, it is necessary to have information or estimates on existing background dust concentration and deposition levels in the area for which the Project is likely to contribute to these levels. A detailed review of all suitable monitoring data was completed for the Project and is provided in **Appendix G**. The review concluded that:

- 24-hour PM_{10} concentrations remain generally below the OEH air quality criterion of 50 $\mu g/m^3$, with the exception of periods where dust storms and bushfires occur across NSW;
- Annual average PM_{10} concentrations remain well below the OEH criterion of 30 $\mu g/m^3$;
- Total Suspended Particulates (TSP) concentrations (although not part of the existing monitoring program) can be estimated from the PM_{10} measurements by assuming that 40% of the TSP is PM_{10}. Estimated TSP concentrations remain well below the OEH criterion of 90 $\mu g/m^3$; and
- Annual average deposited dust levels at all monitoring locations remain well below the OEH criterion of 4 g/m^2/month.

Assessment Criteria

Table 21 and **Table 22** summarise the OEH 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.

As such, consideration of background levels needs to be made when using these criteria to assess impacts.

Table 21 Particulate Matter Assessment Criteria

Pollutant	Criteria ($\mu g/m^3$)	Averaging Period	Agency
TSP	90	Annual mean	National Health and Medical Research Council
PM_{10}	50	24-hour maximum*	OEH
	30	Annual mean	OEH long term reporting goal

Source: DEC, 2005

* Applies for each of i) Project alone and ii) Cumulative, provided the Project is implementing leading practice dust controls.

Table 22 Dust Deposition Assessment Criteria

Pollutant	Averaging Period	Maximum Increase in Deposited Dust Levels (g/m^2/month)	Maximum Total Deposited Dust Levels (g/m^2/month)
Deposited Dust	Annual mean	2	4

In addition to the consideration of possible health impacts, airborne dust also has the potential to cause nuisance impacts by depositing on surfaces. **Table 22** shows 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 on a cumulative basis from all dust sources (DEC 2005).

Air Quality Modelling

The air quality assessment utilised the Approved Methods (DEC 2005a), these being the most contemporary guidelines for the modelling and assessment of air pollution sources using dispersion models.

The air dispersion modelling conducted for this assessment was based on an advanced modelling system using the models TAPM and CALMET / CALPUFF. Conceptual worst-case mine plans for Years 2, 8, 14 and 20 of the Project (see **Figure 10** to **Figure 13**) were modelled. These mine plans represent potential worst case impacts arising from a range of coal and overburden production rates and mining activities in various locations within the Project Boundary.

The mine plans and operational schedules for the Project have been used to determine haul road distances and routes, the location of stockpile and pit areas, activity operating hours, truck sizes, blasting activities and other details that are necessary to predict dust emissions for each modelled year.

For assessment of the air quality impacts due to the Project, the general approach recommended by OEH is to add dispersion model predictions to existing background levels. The dispersion model CALPUFF was used to predict the maximum 24 hour PM_{10}, annual average PM_{10}, annual average TSP and annual average dust deposition.

As the monitoring data will represent the cumulative effect of all dust sources relevant to the monitoring locations, including Coalpac's existing operations, 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 Coalpac's existing operations.

The modelling exercise considered the potential cumulative impacts of neighbouring mining operations including the Ivanhoe North Colliery, Pine Dale Mine (Yarraboldy Extension) and the Baal Bone Colliery (as per the general locations shown on **Figure 1**). A review of current approvals for these operations found that Ivanhoe North Colliery will not be in operation during any of the modelled Project years and as a result it is not included in the cumulative assessment.

Further, it was determined that it will be unlikely that the Yarraboldy Extension of Pine Dale Mine could materially contribute to cumulative impacts due to that:

- The windroses presented in the '*Pine Dale Coal Mine Yarraboldy Extension Air Quality Assessment'* (Heggies 2010) illustrates prominent winds from the west and east and with few winds from the south-east (in the direction of Coalpac's operations and nearest sensitive receptors); and
- The Yarraboldy Extension area is located at least 6 km from the Project Boundary and is proposed to only operate simultaneously with Coalpac's operations in the first two years of the Project; should this extension be approved.

No further information was available at the time of preparing this EA in relation to future plans for Pine Dale Mine, although due to its distance, proximity on the southern side of the Great Dividing Range and predominant winds, it is unlikely that significant cumulative air quality impacts would occur.

The Baal Bone Colliery is approved to be in operation during Year 2 of the Project. As this is an underground operation it is anticipated that dust emissions from this site will be low and would comprise a minimal fraction of estimated annual dust emissions from the Project in Year 2. Therefore, the Baal Bone Colliery has not been included in the cumulative assessment for the Project.

8.3.3 Impact Assessment

Air Quality Predictions

Figure 24 illustrates the predicted worst case air quality contours (consolidating results from the modelled mine plans) for predicted annual average TSP concentrations, annual average PM_{10} concentrations, maximum 24 hour PM_{10} concentrations (Project alone) and annual average dust deposition in relation to neighbouring private receivers. The maximum 24 hour PM_{10} contour presents the maximum air quality levels predicted from the worst case operation of the Project.

With the proactive management of operations utilising real-time monitoring equipment, these maximum predicted levels are not likely to be experienced as a result of the Project alone.

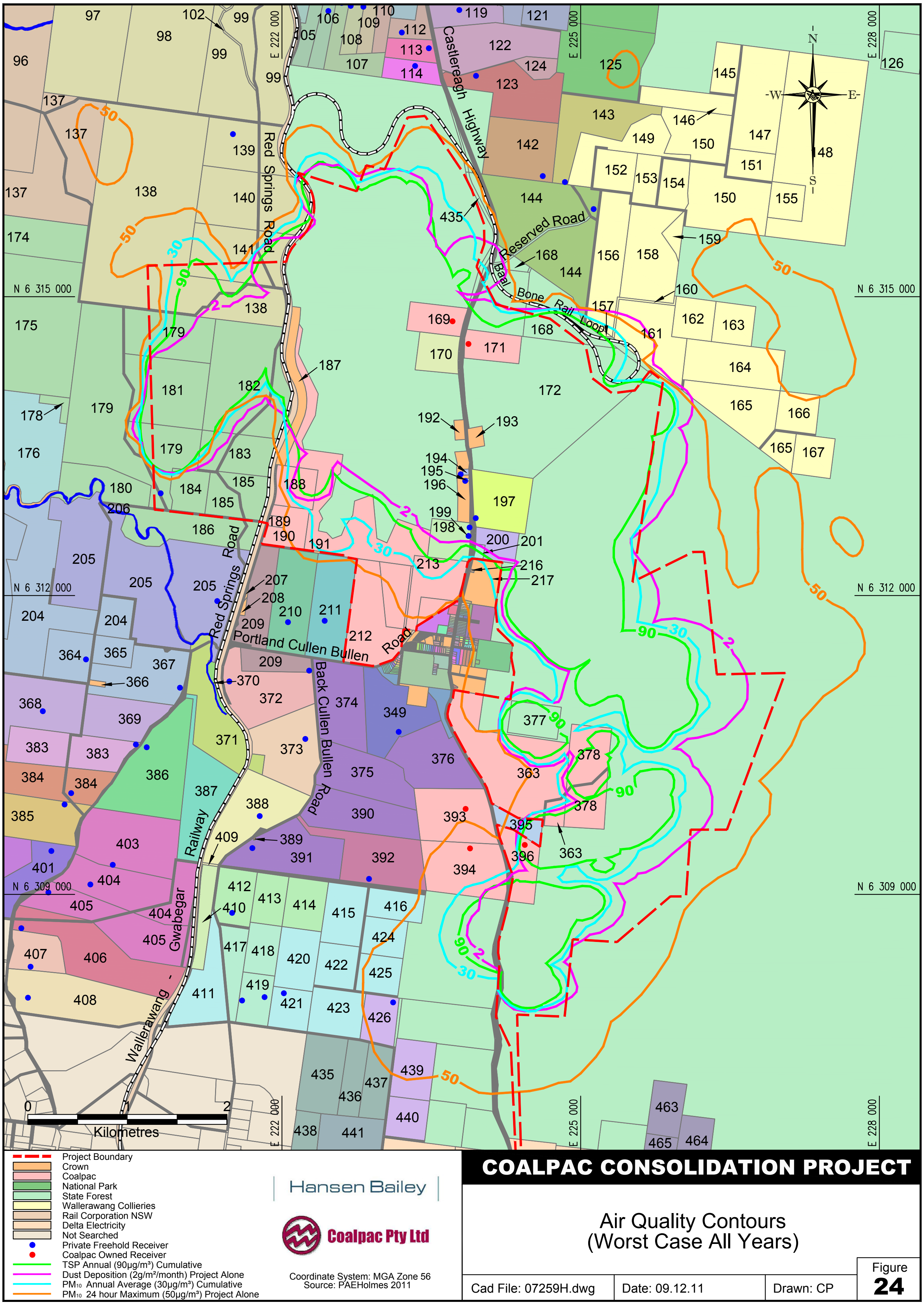
The worst case results from the dispersion modelling completed for key years indicate that the Project considered alone (and with other sources) is predicted to contribute to exceedances of air quality criteria at the privately owned receivers as summarised in **Table 23**.

This table also includes the assessment of those non-mine owned properties where contiguous lots are held by the same landholder. All of these receivers are also predicted to exceed the relevant noise criteria as described in **Section 8.6.2**. An analysis was also carried out to determine the probability of cumulative 24 hour average PM_{10} concentrations exceeding the 50 $\mu g/m^3$ criterion at neighbouring private receivers. The analysis indicated the receivers most likely to experience cumulative 24 hour PM_{10} impacts are those that are predicted to be impacted from the Project alone (as shown in **Table 23**).

Operational Discussion

There are three private receivers (195, 198 and 199) owned by two landholders with whom Coalpac does not have an agreement, which are predicted to experience air quality levels that exceed the OEH assessment criterion for annual average TSP, PM_{10} annual and depositional dust.

An additional five receivers (216, 258, 325, 327 and 426) with whom Coalpac does not have an agreement in place are predicted to experience 24 hour PM_{10} levels greater than the relevant criterion for up to 3 days a year. All but one are predicted within 8 $\mu g/m^3$ of the relevant criteria for only 1-2 days a year. These maximum impacts represent the worst case operation of the Project under adverse prevailing weather conditions and it is expected that the proactive management of operations (see **Section 8.3.4**) would result in modifications to operations and that these impacts would not be experienced at these receivers.


Castlereagh Highway
Red Springs Road
Reserved Road
Baal Bone Rail Loop
Portland Cullen Bullen Road
Back Cullen Bullen Road
Railway
Wallerawang - Gwabegar
N 6 315 000
N 6 312 000
N 6 309 000
E 222 000
E 225 000
E 228 000
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Kilometres
Project Boundary
Crown
Coalpac
National Park
State Forest
Wallerawang Collieries
Rail Corporation NSW
Delta Electricity
Not Searched
Private Freehold Receiver
Coalpac Owned Receiver
TSP Annual (90µg/m³) Cumulative
Dust Deposition (2g/m²/month) Project Alone
PM10 Annual Average (30µg/m³) Cumulative
PM10 24 hour Maximum (50µg/m³) Project Alone
Hansen Bailey
Coalpac Pty Ltd
Coordinate System: MGA Zone 56
Source: PAEHolmes 2011
COALPAC CONSOLIDATION PROJECT
Air Quality Contours
(Worst Case All Years)
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Figure
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Table 23 Summary of Predicted Air Quality Exceedances

ID	Receiver	PM_{10}		TSP	Dust Deposition	
		24 Hour	Annual	Annual	Annual	
		Maximum Project Alone (50 µg/m³) days per year above criteria	Project and other sources (30 µg/m³)	Project and other sources (90 µg/m³)	Project Alone (2 g/m²/month)	Project and other sources (g/m²/month)
RESIDENCES						
195	KJ Blackley *	**667** (246 days above criteria (Year 20))	**157 µg/m³** (Year 20)	**400 µg/m³** (Year 20)	**14.5** (Year 20)	**15.4** (Year 20)
197	BE & CE Leisemann & IL & KID Follington ***	**402** (189 days above criteria (Year 2))	**90 µg/m³** (Year 2)	**231 µg/m³** (Year 2)	**7.8** (Year 2)	**8.7** (Year 2)
198	DA Tilley *	**119** (115 days above criteria (Year 2))	**49 µg/m³** (Year 2)	**125 µg/m³** (Year 2)	**3.2** (Year 2)	**4.1** (Year 2)
199	DA Tilley *	**136** (71 days above criteria (Year 2))	**40 µg/m³** (Year 2)	**102 µg/m³** (Year 2)	**2.1** (Year 2)	No exceedance
216	BM Emmott	**56** (2 days above criteria (Year 20))	N/A	N/A	N/A	N/A
258	S & H Filla	**56** (1 day above criteria (Year 20))	N/A	N/A	N/A	N/A
325	SP & SA Duggan	**51** (1 day above criteria (Year 20))	N/A	N/A	N/A	N/A
327	J Playford	**58** (1 day above criteria (Year 20))	N/A	N/A	N/A	N/A
394	JGQ Nominees (formerly G Muenzer) ***	**90** (21 days above criteria (Year 2))	N/A	N/A	N/A	N/A
426	JWJ & SM Taylor	**62** (3 days above criteria (Year 2))	N/A	N/A	N/A	N/A
25% CONTIGUOUS PROPERTY						
170	B & E Nakhle (now owned by Coalpac)	N/A	**All Years**	N/A	N/A	N/A
194	JGQ Nominees (formerly J Knox) ***	N/A	N/A	N/A	N/A	N/A
200	BE & CE Leisemann & IL & KID Follington (formerly R Tilley) ***	N/A	**All Years**	N/A	N/A	N/A
201	KD & RL Kellam *	N/A	**Year 2**	N/A	N/A	N/A
216	BM Emmott	**All Years**	N/A	N/A	N/A	N/A
240, 246	DW & GJ McCann	**Year 20**	N/A	N/A	N/A	N/A
245	M Botfield	**Year 20**	N/A	N/A	N/A	N/A
258, 300	S & H Filla	**All Years**	N/A	N/A	N/A	N/A
310	SJ Bandiera	**Year 20**	N/A	N/A	N/A	N/A
311	WG Brown	**Year 20**	N/A	N/A	N/A	N/A
312	LM McDonald	**Year 20**	N/A	N/A	N/A	N/A
314	KR Waters	**Year 20**	N/A	N/A	N/A	N/A
394, 396	JGQ Nominees (formerly G Muenzer) ***	**Years 2, 8** & **14**	N/A	N/A	N/A	N/A

* Agreement being negotiated with landholder

*** Agreement in place with Coalpac.

N/A – Criteria not applicable

One additional private property (170) (now owned by Coalpac) is predicted to exceed PM_{10} annual criteria over 25% of vacant land in single, contiguous landownership. This property is also predicted to receive significant a noise impact as shown in **Section 8.6.3**. Private property 201 with whom Coalpac does not have an agreement is also predicted to exceed PM_{10} annual criteria over 25% of vacant land in single, contiguous landownership in Year 2 only.

A further eight non-mine owned properties with whom Coalpac does not have an agreement have been predicted to experience PM_{10} 24 hour maximum dust levels exceeding the relevant criteria over more than 25% of the property area. Six of these are predicted in Year 20 only.

No exceedances of the relevant air quality criteria have been predicted for any other private receivers.

Coal Haulage

The Project will involve construction and operation of a rail siding and an associated stockpile and loading area. Dust emissions from train loading have been included in the air quality impact assessment. Impacts due to fugitive dust emissions from coal wagons during rail transportation are discussed below.

PAEHolmes reviewed an assessment that was commissioned by Queensland Rail (QR) which provided an environmental evaluation of coal dust emissions from rail lines in the Central Queensland Coal Industry (Connell Hatch 2008). This study was based on results of monitoring and modelling predictions and showed that there appears to be minimal risk of adverse air quality impacts due to fugitive coal emissions from trains. The results of monitoring and modelling indicate that nuisance coal dust levels at the edge of the rail corridor are below levels that are known to cause adverse impacts on amenity.

PAEHolmes concluded that the findings of the QR study are generally applicable to NSW and that the observations from this study could be applied to the NSW network. On this basis, the potential for any environmental harm caused by the increased coal train movements generated by the Project is likely to be low, in terms of health and amenity impacts, beyond distances of approximately 15 m from the rail lines. There are no private receivers located along the proposed rail siding located and within 15 m of the rail line.

Worst Case Air Quality Impacts

Should the Ivanhoe North Colliery, Pine Dale Mine (located south of the Great Dividing Range) or the Baal Bone Colliery be further developed in the future, some cumulative air quality impacts to several receivers near these developments have some potential to occur if all four mining areas are in operation simultaneously. Adverse cumulative impacts are unlikely to occur due to predominant local wind directions and distance between these operations.

Construction Activities

As the Project is largely the continuation of an existing operation, limited construction will be required to develop the additional infrastructure required or to consolidate Coalpac's operations (see **Section 4.13**). Construction activities associated with the Project were considered within the air quality impact assessment, which found that with utilisation of standard operational management and mitigation techniques, the construction phase of the Project may have minimal short-term impacts on air quality.

Project Blasting

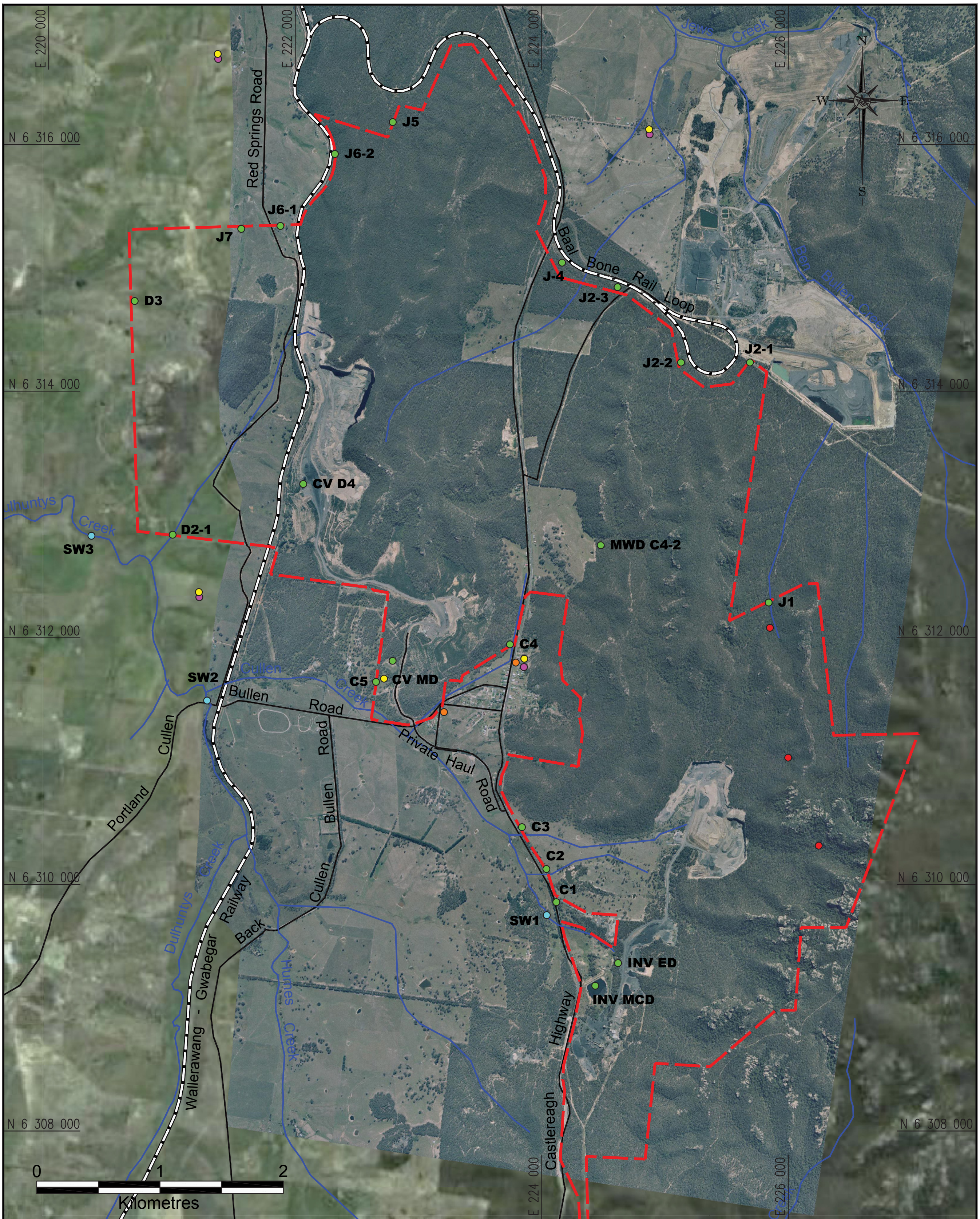
The potential for air quality impacts to arise as a result the continuation of blasting activities for the Project was also considered. Such impacts are generated by gaseous emissions released by blasting (or 'blast fumes'). Blasting events, when not appropriately managed, have the potential to produce pollutants such as CO, SO_2, NO and particularly NO_2 that can pose risks to human health, with direct exposure.

Prediction and analysis of overpressure and vibration impacts anticipated for Project blasting activities was undertaken as a component of the noise impact assessment. This is summarised in **Section 8.7**.

8.3.4 Mitigation and Management

Coalpac is committed to leading practice dust management for the Project through the use of a real-time and proactive air quality management system. This will enable Coalpac to proactively manage the short term impacts of the Project and prevent or minimise dust impacts at sensitive receptors to the greatest practical extent. Coalpac will develop an Air Quality Monitoring Program to monitor its operations for the Project which will incorporate reasonable and feasible dust minimisation management measures which will include (but not be limited to):

- Utilisation of a real-time air quality monitoring system (including predictive meteorological monitoring) to proactively and reactively manage operations in order to keep air quality emissions below the relevant criteria at those neighbouring receivers not predicted to exceed the relevant air quality criteria in **Table 23** above. This system would include a component to allow the prediction of meteorological conditions and air quality impacts to allow Project and surrounding operations to be proactively managed. Indicative air quality monitoring locations proposed for the Project are shown on **Figure 25**, however these will be finalised in consultation with OEH and may change over the life of the Project;
- Utilisation of the largest practical haul truck size for the Project fleet;



Project Boundary
Creeks
Background Surface Water Monitoring Location
Project SW Monitoring Location
HVAS Air Quality Monitoring Location
Real Time Noise Monitoring Location
Quarterly Noise Monitoring Location
Proposed Dewatering Bore

Hansen Bailey

Coalpac Pty Ltd

Coordinate System: MGA Zone 56
Source: AGE (2011), Coalpac (2011)

COALPAC CONSOLIDATION PROJECT

Indicative Project Monitoring Locations

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- Utilisation of the rail siding and the fully enclosed MPPS conveyor to reduce Project truck movements for product coal;
- Limiting the speed of all vehicles on internal roads and other exposed areas;
- Minimising drop heights from equipment for loading and dumping operations;
- Minimising overburden and ROM coal haul road haulage distances;
- Minimising disturbed surfaces and employing water carts in dust suppression activities during construction activities required for the Project;
- Utilising water to minimise dust impacts on all active areas where equipment is in operation;
- Implementation of dust suppression measures on all coal handling areas and stockpiles;
- Minimising disturbance ahead of mining and limiting the size of active OEAs;
- Rehabilitating disturbed areas as soon as practical following the completion of mining activities;
- Monitoring, management and reporting in the event of any incidences of spontaneous combustion for the Project in addition to those discussed in **Section 8.4**;
- Seeking a data sharing agreement with neighbouring industry to allow for the consideration of cumulative impacts and development of co-operative management responses if required; and
- Providing notification to all land holders listed in **Table 23** that are predicted to exceed the relevant assessment criteria for air quality impacts and that they have the right to be acquired by Coalpac upon written request.

To limit any potential for impacts associated with blast fumes, Coalpac will update the blast management documents in place for existing operations into a consolidated Blast Management Plan for the Project (see **Section 8.7.4**). Blast management measures already adopted by Coalpac to mitigate potential for blast fume impacts include:

- Blasting under favourable wind conditions when wind will transport fume away from the sensitive receptors;
- Blasts being delayed where possible during rainfall;
- Blast size and depth to be minimised;
- Bench heights to be reduced where practical; and
- Bench design to be constructed for effective water runoff.

The above air quality management and minimisation practices will be implemented to ensure that the Project does not exceed the relevant criteria at privately owned receivers (other than for those listed in **Table 23**).

8.4 HISTORICAL SUBSURFACE HEATING

8.4.1 Background

PAEHolmes conducted an air quality impact assessment for the Project which is presented in full in **Appendix G** which included an assessment of the historical heating as discussed below.

Historical heating has been associated with the abandoned underground workings of the Tyldesley Colliery at the Cullen Valley Mine since at least the 1970s. The heating was relatively dormant up until the abandoned underground workings were intersected by the open cut excavation in 2003. In addition to the heating in the abandoned underground workings, there also appear to be small pockets of carbonaceous material that are heating at other locations at Cullen Valley Mine. This is believed to be excavated burning material that was emplaced in spoil that has continued to smoulder over time.

8.4.2 Methodology

Coalpac completed a regular program of thermographic surveys of the areas prone to heating since August 2010 to identify and track the extent and condition of heating around the affected area. A program of works was then proposed to progressively clear the area of dead vegetation, to excavate out the venting and to emplace clay material to seal the vents. The intention is to limit the emission of fumes and also limit the ingress of air to fuel the heating process at depth. This process has stabilised the situation and limited the gases and odours that have previously been the source of complaints from near neighbours.

8.4.3 Impact Assessment

Coalpac has developed the '*Cullen Valley Mine Heating Response Plan*' (Coalpac 2010a) (Heating Response Plan) to ensure the adverse impacts from the heating upon the local community and the environment will be appropriately mitigated. The plan outlines procedures required to mitigate any adverse impacts through four response phases including preparation, excavation, monitoring and rehabilitation. The extent of known heating areas as at the end of 2010 at Cullen Valley Mine is described and shown in **Figure 39**.

The spontaneous combustion assessment completed for the Project aimed to review existing information to make a determination of the potential for spontaneous combustion to occur as a result of the Project.

Available background information was reviewed including the Heating Response Plan. Some localised areas within the Project Boundary (in the vicinity of the existing Cullen Valley Mine) may continue to be prone to heating resulting in odour and some impact to rehabilitation within this area.

8.4.4 Mitigation and Management

Coalpac will retain the Heating Response Plan for Cullen Valley Mine for the Project, with any modifications required to be made in consultation with DTIRIS – MR and to the satisfaction of DP&I.

The Plan will include the following mitigation and management measures:

- Development of permanent vehicular access to areas prone to heating issues (completed);
- Ensure that dead vegetated material is removed from any vents or heating areas (completed);
- Progressively excavate the venting along the interface between the crest of the old open cut highwall and the backfill. The area will then be backfilled and compacted in layers to restrict the ingress of oxygen and water (completed);
- The profile of the central heating area will be lifted to also limit the ingress of water and to raise and cover the whole area to provide a long term stable profile that will incorporate drainage channels (pending);
- Conduct regular thermographic imagery (ground and aerial) to monitor the lateral extent of the heating and the location of vents and hotspots (ongoing);
- Installation of thermal probes to monitor temperatures at depth in key locations. Research will be conducted to determine the most appropriate design configurations for the thermal probes in order to maximise operating life and reliability (complete);
- Continued monitoring of the water level in Tyldesley Colliery underground workings (ongoing);
- Conducting regular visual inspections and keeping records to detect and monitor any new vents (ongoing);
- Any areas found to produce any significant emissions indicating heating or elevated temperatures will be promptly addressed and subject to earthworks and progressively rehabilitated (ongoing);
- Heating areas will be rehabilitated, leaving access for ongoing monitoring and maintenance activities. The performance of vegetation development in rehabilitated heating areas will be surveyed regularly to monitor its performance and rate of regrowth (pending and ongoing).

8.5 GREENHOUSE GAS

8.5.1 Background

PAEHolmes conducted an air quality assessment for the Project which is presented in full in **Appendix G**. One of the components of this study was an assessment of greenhouse gas impacts, which are summarised below.

8.5.2 Methodology

The greenhouse gas assessment was based upon the methods outlined in the following documents:

- The World Resources Institute / World Business Council for Sustainable Development Greenhouse Gas Protocol;
- National Greenhouse and Energy Reporting (Measurement) Determination 2008; and
- The Australian Government Department of Climate Change and Energy Efficiency (DCCEE) National Greenhouse Accounts Factors 2010.

Consideration was also given to the *'Guidelines for Energy Savings Action Plans'* (DEUS 2005). Three *'scopes'* of emissions (scope 1, scope 2 and scope 3) are defined for greenhouse gas accounting and reporting purposes and were considered for the Project in relation to the following greenhouse gases:

- Carbon dioxide (CO_2);
- Methane (CH_4);
- Nitrous oxide (N_2O); and
- Synthetic gases (HFCs, SF_6, CF_4, C_2F_6).

Emission factors are standardised and expressed as a carbon dioxide equivalent (CO_{2}-$_{e}$) which is calculated by multiplying the individual gas emission factor by its respective Global Warming Potential (GWP).

8.5.3 Impact Assessment

The main sources of greenhouse gas emissions from the extraction and processing of coal for the Project have been identified as resulting from diesel usage, electricity consumption, fugitive emissions of CO_2 and CH_4 and the end use of the product coal. The average annual emissions from the key sources are summarised in **Table 24**. As shown below, emissions from the burning of product coal will be much greater than those associated with the extraction and processing of product coal for the Project.

When comparing greenhouse gas emissions from the Project, including the mining, transporting the coal to MPPS and other domestic users, Port Kembla and end usage of the coal (6,989,565 t of CO_2-e) with the estimated current global emissions (3,000 Giga t CO_{2-e}), it has been calculated that the average annual emissions of the Project are estimated to be approximately 0.0003% of the current global CO_2 emissions. The emissions estimated for the Project will not individually have any significant impact on global warming. Applying the principles of ESD, it is considered that there will be no increase or measurable impact on climate change as a result of the Project. As discussed in **Section 4.1**, the supply of coal to the MPPS by the Project will be a vital element in the operation of this facility to assist meeting Australia's energy demands for at least the next 21 years.

Given the predicted increase in demand for electricity generation within Australia (AEMO 2011), and alternative sources of energy either not being financially viable (in the short and medium term) or them being sufficiently certain to be relied upon for base load electricity, the burning of coal (Scope 3 emissions) at either the MPPS or in overseas electricity generation facilities will still be required should the Project not be approved.

Coal would still need to be sourced by the MPPS from other suppliers and as such the Project does not directly contribute to additional Scope 3 emissions. The supply of coal to the MPPS by the Project would result in a better environmental outcome in regard to greenhouse gas emissions when compared to sourcing coal from more distant operations, where greater transport emissions would be experienced.

Table 24 Annual Greenhouse Gas Emission Predictions for the Project

Activity	Emissions (t CO_{2-e})
Diesel usage	64,239
Electricity consumption	6,948
Explosives use	599
Fugitive emissions	2,962
Transport of coal and sand	11,739
End use of coal	6,902,977
Total (Annual)	**6,989,465**

8.5.4 Mitigation and Management

Reasonable and feasible measures that will be implemented onsite to minimise the greenhouse gas emissions of the Project and to ensure it is energy efficient include:

- Ensuring that there is a dedicated number of trucks for each digging unit (i.e. front-end-loader and excavator) to minimise truck wait time;
- Ensuring that dump trucks are fully loaded for each load prior to hauling to maximise productivity and efficiency with regard to the amount of fuel used per unit of material moved;
- Review haul road maintenance and materials used in main haul roads to reduce rolling resistance and decrease fuel consumption;
- Monitoring and improving energy use and efficiency procedures and reducing greenhouse gas emission from the mining, processing and transport of coal;
- Consideration of the use of alternative fuels where economically and practically feasible;
- A review of mining practices to minimise double handling of materials and ensuring that coal and overburden haulage is undertaken using the most efficient methods;
- Ongoing scheduled and preventative maintenance to ensure that diesel and electrically powered plant operate efficiently; and
- Develop targets for greenhouse gas emissions and energy use onsite.

The cost of these mitigation measures has been included in **Section 8.22**.

8.6 NOISE

8.6.1 Background

A noise and vibration impact assessment for the Project was completed by Bridges Acoustics and is presented in full in **Appendix H**. The noise assessment included consideration of operational mining noise, construction noise, road and rail noise, sleep disturbance and low frequency noise.

The noise assessment is summarised below and has been undertaken in accordance with the following policies and guidelines:

- The '*NSW Industrial Noise Policy*' (INP) (EPA 2000) for operational and construction noise;
- The '*NSW Road Noise Policy*' (RNP) (DECCW 2011) for road traffic noise and sleep disturbance criteria;

- The *Interim Construction Noise Guideline* (ICNG) (DECC 2009) provides criteria, recommended hours and methods for assessing noise from construction activities; and
- The *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* (DECC 2007) for noise from train movements on the Wallerawang – Gwabegar Rail Line.

8.6.2 Methodology

Introduction

Predicted noise levels at receivers for operations using indicative mine plans for Year 2, Year 8, Year 14 and Year 20 of the Project were calculated using RTA Technology's Environmental Noise Model (ENM). ENM is considered the most appropriate choice for situations involving complex terrain, a large number of noise sources and where a detailed assessment of the effect of weather conditions on noise propagation is required. It has previously been endorsed by OEH for assessing noise from Projects of this type.

The ENM model included operating scenarios for the four representative years which were chosen to represent reasonable worst case noise levels to all receivers surrounding the Project Boundary. All operating scenarios included normal mining activities, coal handling and processing activities, operation of the rail loading facility, idling locomotives and operation of the product conveyor to MPPS. Additional model scenarios were used to determine construction, rail spur and sleep disturbance noise levels to ensure these issues were comprehensively assessed.

Background Noise Levels

Results from quarterly noise monitoring results conducted between 2008 – 2009 and most recently, attended and unattended noise surveys in 2011, were utilised to determine appropriate background noise levels for the Project. The most recent background noise monitoring was completed at four representative receiver locations in the vicinity to the Project Boundary as shown on **Figure 5**, which included:

- **Location M1** – Adjacent to the Castlereagh Highway approximately 400 m north of Cullen Bullen, representing receivers close to the Castlereagh Highway within Cullen Bullen;
- **Location M2** – Approximately 100 m to the east of the Castlereagh Highway and 2.5 km north of Cullen Bullen, on Property 171 owned by Coalpac;
- **Location M3** – Approximately 550 m west of the Castlereagh Highway and 30 m north of Red Springs Road, on Property 104; and
- **Location M4** – Adjacent to Back Cullen Road approximately 740 m south of Portland Cullen Bullen Road and to the north east of Residence 373.

Some variations in the measured background noise levels was observed at most monitoring locations, with differences primarily due to weather conditions, seasonal variations in insect and bird activity and changes in mining activities. A substantial influence in the daytime background noise levels was evident at receivers within 500 m of the Castlereagh Highway, as a result of traffic noise. Highway traffic noise within 500 m of the road is not consistent enough to influence the background noise level during the evening and night periods.

Typically, the lower and most conservative background noise levels tend to be on or below 30 $L_{A90,15min}$ during evening and night time periods at some distance (>500 m) from the Castlereagh Highway. Background noise levels during the day within audible range of the Castlereagh Highway (<500 m) were measured at approximately 32 $L_{A90,15min}$.

Based on the measured background noise levels and the effects that traffic noise from the Castlereagh Highway has on background noise levels during the day period only, receivers were placed into two groups:

- **Group A** – within 500 m of the Castlereagh Highway, including Cullen Bullen township; and
- **Group B** – more than 500 m from the Castlereagh Highway.

Table 25 shows background levels adopted for this assessment for the two receiver groups. While a number of noise survey results have indicated higher background levels, the adopted levels are considered appropriately conservative for the assessment.

Noise Criteria

Project Operational Noise

The INP recommends two separate noise criteria be applied to operational noise, being an intrusive criterion 5 dBA above the background noise level and amenity criteria which depend on the nature of the receiver area and the existing level of industrial and mining noise in each time period. The adopted noise criteria (including cumulative noise impacts from other industrial or mining developments and construction noise criteria for the Project) for all receivers are shown in **Table 26**.

Cumulative Operational Noise

Cumulative noise impacts may potentially be caused by simultaneous operation of the Project, MPPS, Ivanhoe North Colliery until 2012 and Baal Bone Colliery until 2012. Cumulative noise levels have been assessed to the amenity criteria presented in **Table 25**.

Construction Noise

Construction noise levels have been assessed under the ICNG. Section 1.2 of the ICNG states it does not apply to industrial sources, including construction associated with quarrying and mining, and suggests this activity be assessed under the INP. As such the assessment for construction noise for the Project has been compared to the operational criteria discussed above and provided in **Table 25**.

Sleep Disturbance

Sleep disturbance can occur when a short, sharp noise is clearly audible over the background noise level within a bedroom. The RNP is the only current policy that addresses sleep disturbance.

It acknowledges the effects of noise on sleep disturbance have not yet been conclusively determined however it suggests a range of 50-55 dBA inside a bedroom which is approximately equivalent to an external noise level of 60-65 dBA assuming bedroom windows remain partly open. An external sleep disturbance criterion of 60 L_{Amax}, for the hours 10:00 pm to 7:00 am (or to 8:00 am on Sundays and public holidays), is therefore adopted for this assessment.

Road Traffic Noise

Relevant road traffic noise criteria are listed in Table 3 of the RNP. Noise criteria for Situation 3 *"Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments"*, which applies to road traffic on the Castlereagh Highway, are 60 $L_{Aeq,15hr}$ during the day and 55 $L_{Aeq,9hr}$ during the night for residential receivers. Recommended noise criteria apply to all traffic, including vehicles associated with the Project. The $L_{Aeq,15hr}$ and $L_{Aeq,9hr}$ parameters refers to the average traffic noise level over an entire 15 hour day or 9 hour night.

Rail Traffic Noise

Rail noise criteria are sourced from the Interim Rail Noise Guideline which recommends trigger levels of 65 $L_{Aeq,15hr}$ during the day, 60 $L_{Aeq,9hr}$ during the night and 85 L_{Amax} from existing rail lines such as the WGRL. Similarly, condition L6.1 of EPL 3142 issued to the ARTC, covering train movements on all railways controlled by ARTC, specifies noise level objectives of 65 $L_{Aeq,15hr}$ day, 60 $L_{Aeq,9hr}$ night and 85 L_{Amax} at 1 m from the façade of affected residential premises.

Table 25 Background Noise and Project Operational Noise Criteria

Noise Criteria	Time Period					
	Day		Evening		Night	
	Group A	Group B	Group A	Group B	Group A	Group B
Adopted background noise level $L_{A90,15min}$	32	30	30		30	
Intrusive Criteria $L_{Aeq,15min}$ (Background + 5 dBA)	37	35	35		35	
Amenity limit $L_{Aeq,period}$ (INP, rural category)	50	50	45		40	
Existing industrial noise level $L_{Aeq,period}$	<36	<36	<36		<36	
Amenity Criteria $L_{Aeq,period}$	50	50	45		38 – 40* ^	
Adopted Intrusive Noise Criteria $L_{Aeq,15min}$	37	35	35		35	

* The amenity criteria are used to assess potential cumulative noise impacts.

^ Night amenity criteria applied to the Project operating alone would be 38 $L_{Aeq,9hr}$ at properties 142, 143, 144 and 426 and 40 $L_{Aeq,9hr}$ at all other assessed receiver locations. Amenity criteria applied to cumulative noise impacts would be 40 $L_{Aeq,9hr}$ night at all residential receivers.

Table 26 Adopted Noise Assessment Meteorological Conditions

Atmospheric Parameter	Day and Evening			Night	
	Neutral	NE Wind	W Wind	Inversion	NE Wind
Temperature (°C)	20	20	20	10	10
Relative Humidity (%)	70	70	70	90	90
Wind Speed (m/s)	0	3	3	0	3
Wind Direction	-	North-east	West	-	North-east
Temp Gradient (°C/100 m)	-1	-1	-1	3	0

Low Frequency Noise

Section 4 of the INP recommends low frequency noise levels considered in the normal operational noise criteria by the addition of a 'modifying factor' to either a source sound power level or a received noise level. Any modifying factors that are relevant to the assessment, including low frequency penalties, have been applied to the adopted sound power levels for mining and transportation equipment. No additional assessment of low frequency noise levels is required.

Meteorology

As discussed in **Section 8.3**, analysis of the local weather conditions was carried out by PAEHolmes and resulted in a site representative meteorological data set being produced. Meteorological data were examined from a number of monitoring stations before being compiled for use in a meteorological monitoring program California Meteorological (CALMET) to provide a full year (2009) of representative data for the Project, for the purposes of modelling.

The meteorological dataset was analysed to determine the relevant meteorological parameters to be input into the noise model. The prevailing meteorological conditions which were subsequently included in the noise model are shown in **Table 26**.

A 3/100 m temperature inversion or a 3 m/s wind from the north-east has been included for night scenarios. A 3 m/s wind is equivalent to a 7.5°/100 m inversion for receivers downwind of the source and as a result, the night scenarios include an equivalent inversion of 7.5°/100 m for most receiver locations. This equivalent inversion is significantly stronger, and causes greater noise enhancement, than the INP default 3 /100 m inversion strength.

The approach adopted in this assessment therefore satisfies the recommendations in the INP while simultaneously assessing the effects of strong noise enhancement for potentially affected receivers.

8.6.3 Impact Assessment

Project Operational Noise

Figure 26 shows the combined worst case predicted noise levels for the Project for all modelled scenarios. Operational key assumptions utilised for the purposes of modelling and detailed predicted noise levels for all receivers are presented in **Appendix H**.

Predicted noise levels for both construction and operational activities include all feasible and reasonable noise management and mitigation measures (see **Section 8.6.4**) 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 levels.

A summary of the predicted worst case modelled noise levels during all conditions for the Project at private receivers is presented in **Table 27** and **Table 28**. **Table 27** shows predicted impacts on privately owned residences while **Table 28** identifies additional contiguous properties that are predicted to receive noise impacts over 25% of a contiguous property area in a single landownership. Properties presented in **Table 28** are additional to those shown in **Table 27** (i.e. where a higher noise level is predicted at the residence, the property has not been duplicated in **Table 28**).

Some residences and or properties are predicted to receive noise levels of 5 dBA or more over the intrusive noise criteria and are shown in bold to highlight potentially significant noise impacts from the Project. Residences predicted to receive 3 to 5 dBA over the intrusive noise criteria are expected to receive moderate noise impacts from the Project, while residences predicted to receive up to 2 dBA over the intrusive criteria are expected to receive mild noise impacts from the Project. A dash represents a prediction less than the intrusive criteria.

Operational Noise Discussion

Receivers

Table 27 indicates impacts at private receivers. It shows that a significant noise impact is predicted at two private residences (residence 195 and 205) where an agreement with Coalpac is not yet in place. Of the two, receiver 205 is predicted to significantly exceed the criteria by 0.6 dBA in a single modelled year (Year 2) only.

An additional 18 private residences (including one located on Crown land) owned by 16 landowners are predicted to receive moderate noise impacts from the Project under a worst-case noise modelling scenario.

14 private residences (owned by 13 landholders) have been predicted to experience mild noise impacts from the Project. Eight of these private residences are predicted to receive impacts within 1.5 dBA greater than intrusive noise criteria in one modelled year of the Project only.

Contiguous Land (no residence)

Table 28 lists noise level exceedances of the intrusive criterion at properties over 25% of land in a contiguous single private landownership. In addition to receivers, two properties (173-175 and 178-186 and 198-199) where an agreement with Coalpac is not yet in place are predicted to experience a significant noise impact from the Project in one or more modelled years over more than 25% of vacant land in a contiguous landownership.

An additional eight properties (Receiver 176, 201, 209, 216, 370, 371, 387 and 411, 415, 416, 420-425) are predicted to experience a moderate noise impact from the Project in one or more modelled years and time periods over more than 25% in a contiguous landownership.

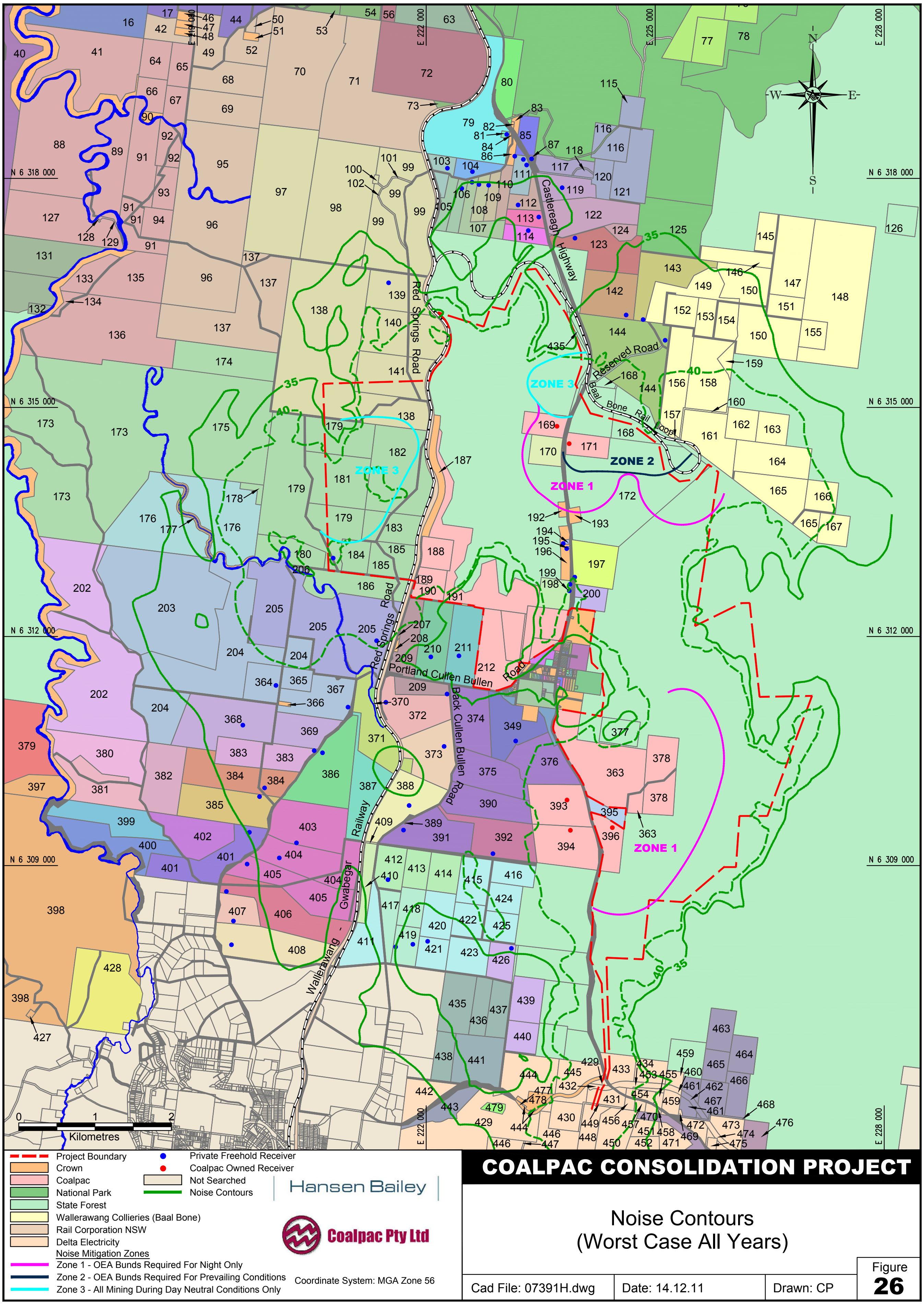

Project Boundary
Crown
Coalpac
National Park
State Forest
Wallerawang Collieries (Baal Bone)
Rail Corporation NSW
Delta Electricity
Private Freehold Receiver
Coalpac Owned Receiver
Not Searched
Noise Contours
Noise Mitigation Zones
Zone 1 - OEA Bunds Required For Night Only
Zone 2 - OEA Bunds Required For Prevailing Conditions
Zone 3 - All Mining During Day Neutral Conditions Only
Hansen Bailey
Coalpac Pty Ltd
Coordinate System: MGA Zone 56
COALPAC CONSOLIDATION PROJECT
Noise Contours
(Worst Case All Years)
Cad File: 07391H.dwg
Date: 14.12.11
Drawn: CP
Figure
26
Kilometres
ZONE 1
ZONE 2
ZONE 3
Castlereagh Highway
Red Springs Road
Portland Cullen Bullen Road
Back Cullen Bullen Road
Reserved Road
Baal Bone Rail Loop
Gwabegar - Wallerawang Railway
35
40
N 6 318 000
N 6 315 000
N 6 312 000
N 6 309 000
E 222 000
E 225 000
E 228 000

Table 27 Predicted Noise Level Exceedance of Intrusive Criteria at Private Residences

Receiver ID	Description	Intrusive Criteria Day/Night	Predicted Maximum Noise Level (dBA $L_{Aeq,15min}$)			
			Year 2	Year 8	Year 14	Year 20
SIGNIFICANT						
194	JGQ Nominees Pty Ltd ***	**37 / 35**	**45.3**	**40.5**	**41.1**	**43.6**
195	KJ Blackley **	**37 / 35**	**43.8**	39.0	**40.3**	**40.2**
197	BE & CE Leisemann & IL & KID Follington ***	**37 / 35**	**40.4**	36.2	36.0*	36.1*
205	D Dino & J Seraglio **	**35**	**40.6**	35.9	36.3	36.5
MODERATE						
139	RI & GM Larkin	**35 / 35**	-	37.7	35.7	-
142	PG Desch & KC Farrugia	**35**	35.7	37.3	-	38.1
143	DB Speirs	**35**	36.4	37.9	35.7	37.6
144	DA & DM Muldoon	**35**	38.0	38.7	36.6*	37.1
179	RK Dickens **	**35**	39.7	36.9	36.4	-
198	DA Tilley **	**37 / 35**	39.7	-	-	38.8*
199	DA Tilley **	**37 / 35**	39.5	-	-	39.8*
217N	Crown (includes residence)	**37 / 35**	37.2	-	-	-
349	RM Crane	**35**	37.8	38.4	35.8	37.7
364	JR Gracey	**35**	38.7	36.2	37.6	36.5
367	JR Gracey	**35**	38.9	36.8	37.2	37.2
368	RA Fuller	**35**	37.1	-	35.8	35.4
372	RE Gilmore	**35**	39.3	37.5	37.4	37.7
373	WF Fitzgerald	**35**	37.1	36.4	36.4	37.1
383	BS Bretherton & B Chandwick	**35**	37.7	35.9	37.0	36.6
386	TJ Griffiths	**35**	37.7	36.2	37.0	37.0
392	IG Palmer	**35**	38.4	39.0	39.0	39.5
412	V & F Fava, C Rositano, F Tedesco & E Todorello	**35**	38.4	36.8	36.5	36.9
MILD						
106	A & M Abou-Touma	**35**	-	35.2	-	-
108	PJ & CI DI Mauro	**35**	-	35.2	-	-
109	J, P, GG & CG Piccione	**35**	-	35.2	-	-
112	J Hannouche	**37 / 35**	-	35.9	-	-
113	MB & AM Ringin	**37 / 35**	-	36.5	-	-
114	PJ & EJ Isaacson	**37 / 35**	-	36.0	-	-
209	DJ Ryan	**35**	35.1	-	-	35.4
384	A Tabone	**35**	36.6	-	35.4	
385	Ceedive Pty Ltd	**35**	36.3	-	35.1	-
388	VA McFadden	**35**	35.8	35.2	35.6	35.2
391	MG Bulkeley	**35**	36.9	36.1	36.4	37.0
403	BR & E Brown	**35**	36.4	-	-	-
404	BR & E Brown	**35**	35.9	-	-	-
426	JWJ & SM Taylor	**35**	36.3	35.8	-	35.1

Bold text denotes noise levels exceeding criteria by more than 5 dBA.

* Denotes where exceedances are associated with day/evening prevailing condition only

** Agreement being negotiated with landholder.

*** Agreement in place.

A further 13 properties (owned by 11 landholders) are expected to receive a mild noise impact from the Project in one or more modelled years and time periods over more than 25% in a contiguous landownership. Nine of these are predicted to be mildly affected by noise in a single modelled year only.

All other private receivers and properties are predicted to receive impacts less than the intrusive criterion.

Table 28 Predicted Noise Level Exceedance of Intrusive Criteria Over 25% Contiguous Property

Receiver ID	Description	Intrusive Criteria	Predicted Maximum Noise Level (dBA $L_{Aeq,15min}$)			
			Year 2	Year 8	Year 14	Year 20
SIGNIFICANT						
170	Coalpac (formerly BE Nakhle)*	**37 / 35**	**61.3**	**63.1***	**59.2***	**60.3***
173-175, 178-186	RK Dickens ^ **	**35**	**41.1**	-	-	-
198, 199	DA Tilley ^ **	**37 / 35**	**46.6**	**43.2**	**43.2**	**43.9**
200	BE & CE Leisemann & IL & KID Follington ***	**37 / 35**	**49.6***	**44.2**	**43.8**	**44.7***
MODERATE						
176	GE Orellana	**35**	40.0	-	-	-
201	KD & RL Kellam **	**37 / 35**	39.4	-	-	35.8*
209	DJ Ryan	**35**	38.5	35.1	35.2	35.5
216	BM Emmott	**37 / 35**	37.6	-	-	-
370	JA, SE Byron & DC Hutton	**35**	39.1	37.0	37.1	37.3
371	MA & JL Taylor	**35**	38.1	36.3	36.5	37.0
411, 415,416,420-425	SJ & DS Taylor	**35**	39.0	39.4	38.6	39.1
387	JR Embleton & KJ Kelly	**35**	37.1	36.0	36.6	37.0
MILD						
107	G & M Gebrael	**35**	-	36.9	-	-
111	A & R Salman	**37 / 35**	-	35.2	-	-
119	LN Goldspink	**37 / 35**	-	35.3	-	-
122	JL Macphee	**37 / 35**	-	35.1	-	-
210	FC & K Tilley	**35**	36.1	-	-	-
220	KL Bunyon	**37 / 35**	-	-	-	35.9*
348	RE Gilmore & MG & PJ Bulkeley	**37 / 35**	35.2	35.3	-	-
350	Tanwind Pty Ltd	**37 / 35**	35.2	-	-	-
362	RE Gilmore & MG & PJ Bulkeley	**37 / 35**	37.0	37.0	35.6	36.0
406	P W Griffiths	**35**	36.2	-	-	-
408	RH Griffiths	**35**	35.4	-	-	-
410	PJ & SL McFadden	**35**	36.4	35.6	35.7	36.1
417-419	AP & KA Brown	**35**	36.7	35.7	-	35.5

Bold text denotes noise levels exceeding criteria by more than 5dBA.

* Denotes where exceedances are associated with day/evening prevailing conditions.

^ Predicted to exceed a higher criteria at private residence presented in **Table 27**.

** Agreement being negotiated with landholder

*** Agreement in place.

Cumulative Operational Noise

Cumulative noise impacts would potentially be caused by simultaneous operation of the Project and other nearby industrial developments including:

- Baal Bone Colliery (until 2012) to the north east;
- Ivanhoe North Colliery (until 2012) to the south west;
- The existing MPPS and the MPPS Extension Project to the south; and
- The approved but unconstructed Western Rail Coal Unloader to the south of MPPS.

Cumulative noise levels have been assessed at potentially affected residences during the most sensitive night period, as predicted noise levels are generally higher and the amenity criterion is lower during the night period. For the purposes of this assessment, average noise levels over an entire night period ($L_{Aeq,9hr}$) from the Project are estimated at 3 dBA lower than the predicted $L_{Aeq,15min}$ level listed in **Table 27** due to typical variation in open cut mine operations and weather conditions during a typical night.

The combined noise levels from the Project and other industrial developments would meet the 40 $L_{Aeq,9hr}$ night amenity criterion at the closest representative receivers, with the exception of receivers 194 and 195 which are predicted to be significantly affected by the Project alone. All other residences would receive acceptable cumulative levels as they are further from the Project and from the other industrial developments so do not require separate assessment.

Construction Noise

Noise levels for the worst case construction scenario have been calculated using the Project noise model, based on Year 2 terrain and proposed construction noise sources for the loudest construction phases. Predicted noise contours for this theoretical worst case situation were considered under both neutral and prevailing weather conditions during the day. The construction noise contours indicate:

- Predicted noise levels due to rail siding construction work, and in particular construction of the noise bund adjacent to the rail siding, would produce up to 42 $L_{Aeq,15min}$ at Receiver 139 under both neutral and prevailing weather conditions. As at January 2012, this bund has largely been constructed to a height of 6 m – 10 m (under favourable weather conditions) under existing approvals;
- Predicted worst case noise levels during construction of a bridge over the Castlereagh Highway and associated haul road would produce up to 38 $L_{Aeq,15min}$ under neutral conditions and up to 46 $L_{Aeq,15min}$ under prevailing weather conditions at Residence 144. Noise levels at Residences 142 and 143 would be approximately 4 to 5 dBA lower.

More typical construction noise levels, with equipment more evenly distributed over the length of the haul road, would be at least 3 dBA lower than the predicted worst case levels at these three residences;

- Predicted noise levels during construction of the ETCPP would be similar to, or lower than, mining noise levels at all receivers; and
- Predicted noise levels during reconstruction of the Invincible CHPP and construction of the conveyor to MPPS would be lower than predicted mining and Invincible CHPP operational noise levels at all residences.

Sleep Disturbance

Sleep disturbance noise associated with mining operations consists of dozer tracks and train wheel squeal and wagon stretching and bunching. Maximum noise levels are predicted to reach:

- 56 L_{Amax} at Residence 139, primarily due to dozer track noise from mining areas north of the rail siding;
- 52 to 53 L_{Amax} at Residences 114 and 144;
- 50 L_{Amax} at Residences 112, 113, 123, 142 and 143;
- 45 to 46 L_{Amax} at Residences 86, 87, 103, 104, 111, 119, 184, 367, 372 and 426; and
- Less than 45 L_{Amax} in Cullen Bullen and at all other residences.

Compared to the 60 L_{Amax} sleep disturbance criterion, and with proposed management measures in place to avoid loud dozer track noise which would make the predicted noise levels occur rarely, maximum noise levels from the Project are considered acceptable.

Road Traffic Noise

An assessment of road traffic noise during proposed construction and operational phases of the Project has predicted that the 60 $L_{Aeq,15hr}$ traffic noise criterion would be met at any residence at least 50 m from the Castlereagh Highway and additional traffic associated with the Project construction program would make an insignificant difference to existing traffic noise levels.

The operational situation for the Project once the construction of the overpass bridge is completed in Year 2, with some existing truck traffic replaced by the proposed conveyor and rail siding, would result in a traffic noise decrease of approximately 0.6 dBA.

The closest residence to the Castlereagh Highway between Invincible Colliery and MPPS (excluding those owned by Coalpac) is Receiver 426, located approximately 1 km from the Highway. Traffic noise associated with the Project is therefore expected to be acceptable at all receivers.

Rail Traffic Noise

As various trains including coal, general freight and passenger services already use the WGRL and the proposed coal train movements would produce a similar maximum noise level as current train movements, no increase in maximum noise levels is anticipated.

Calculations indicate the proposed maximum of eight train movements per day for the Project would increase the existing average train noise levels by 2 dBA. The maximum noise levels (L_{Amax}) are not anticipated to change from the current levels as a result of the Project.

Low Frequency Noise

Low frequency noise levels from the Project are implicitly controlled by the intrusive noise criteria, as intended by the INP, so unreasonable low frequency noise impacts are unlikely to occur at any privately owned receiver.

8.6.4 Mitigation and Management

Feasible and Reasonable Noise Control

Numerous noise modelling investigations have been undertaken during the initial planning and mine plan development stages of the Project. These investigations looked at the application of various levels of noise management and control to the Project in order to minimise adverse noise impacts on neighbouring receivers.

A number of additional noise management measures relating to various 'management zones' as presented on **Figure 26** have been adopted for the Project.

Mitigation and management measures will be implemented by Coalpac to ensure noise levels remain consistent with results presented in **Section 8.6.3** which are summarised below for each of the construction and operation phases.

Construction

- Construction of the large bund near the rail siding will be undertaken using quieter, noise controlled mining machines rather than more typical construction machines supplied by a general contractor;
- Construction work associated with the rail siding and associated facilities will occur after completion of the adjacent noise bund to maximise the effectiveness of the bund;
- Pile driving associated with bridge construction will be minimised where possible. Alternatives to driven piles, such as vibrated piles or mass concrete foundations will be used if possible and practical. Pile driving would be completed during the hours 8:00 am to 4:00 pm Monday to Friday to minimise noise impacts to residences. Prior discussion with the owners of Properties 142 to 144 will be undertaken to advise of the intended work program, likely construction noise levels and anticipated working hours and to receive feedback from residents regarding any particularly sensitive dates or times that may be avoided;
- Construction of the bridge over the Castlereagh Highway and associated haul roads will occur as early in the construction program as possible to allow all future construction related traffic on the Cullen Valley Mine to use the Invincible Colliery access road rather than the Cullen Valley Private Haul Road or the Castlereagh Highway through Cullen Bullen;
- Construction of all noise bunds and other earthworks components will be undertaken using noise controlled mining machines, rather than using standard construction machines; and
- Where possible, noise bunds will be progressively constructed early in the construction program to control noise from future construction and mining activities.

Operation

- **Zone 1:** Mining activity within approximately 2,400 m from a receiver will include shielded OEAs for use at night, where the shielded areas are generally behind the OEA bunds. More exposed OEAs will be used during the day or only under favourable weather conditions during the night. Provision of suitably shielded overburden emplacement areas and bunds will be considered as each pit is developed and mined;
- **Zone 2:** Mining within approximately 1,800 m from a receiver will include shielded OEA areas for use under all except neutral weather conditions during the day. Initial construction of a bund, and raising or extending the bund to keep up with the advancing pit, will occur only under neutral weather conditions during the day;
- **Zone 3:** Mining within approximately 1,800 m from a residence where shielded operating areas cannot reasonably be provided due to unfavourable terrain will only occur under neutral weather conditions in the day;

- Real time weather monitoring will occur while mining is being completed in Zones 2 and 3 to indicate the potential for noise enhancing weather conditions, while real time noise monitoring at representative receivers will be used to confirm mining noise levels during all years of operation;

Operation of the highwall miner will occur at any time and under any weather conditions, provided the miner is located in a suitably shielded area of the pit when working in Zones 2 and 3. The highwall miner is therefore generally exempt from the management measures recommended for each Zone, however coal trucks associated with the highwall miner will comply with the noise management recommendations for each Zone;

- Sand extraction, processing and haulage would only occur during the day (i.e. 7:00 am to 6:00 pm); and
- Sand haul trucks would travel via internal haul roads, including the Highway Bridge, and access the site via the existing Invincible Colliery access road.

Noise Monitoring Program

Coalpac will develop a leading practice noise monitoring network surrounding the site which is representative of the closest sensitive receivers; which shall include:

- Quarterly attended real time noise monitoring (including a permanent directional noise monitoring system at a representative sensitive receiver);
- Regular correlation of real time noise monitoring results with the meteorological station to proactively manage operations during noise enhancing conditions when mining activities are approaching the intrusive criterion; and
- A network of real time noise monitors.

Similar to the air quality monitoring system, trigger levels will be developed to generate alarms to notify the site Supervisors of noisy operations that may require attention.

Noise Management Plan

Coalpac will develop a comprehensive Noise Management Plan (NMP) that will incorporate practical noise minimisation, monitoring and management measures to the approval of DP&I for the construction and operation of the Project including:

- Mining trucks and water carts will be fitted with leading practice exhaust silencers to reduce noise emissions;
- The mobile overburden fleet will be directed to higher, exposed areas during favourable weather conditions (generally during the day) and to lower, more shielded areas during noise enhancing weather conditions (shown in **Table 26**);
- Tracked dozers will be operated at slow speed, particularly in reverse in exposed areas of the site during noise enhancing weather conditions to minimise audible track noise;
- Vehicle warning devices (e.g. reverse alarms, horns and start alarms) will be selected and installed to produce the lowest possible noise levels consistent with safe operation;
- Mobile and coal handling equipment will be maintained in good condition to minimise unnecessary noise;
- Noise suppression will be included on the conveyor system and transfer points, where practical;
- Specific measures for the rail loadout system to minimise noise from this activity, including measures to minimise or avoid train wagon bunching noise during train movements;
- A real time noise monitoring system will be installed to assist with the proactive management of operations to minimise adverse noise impacts on neighbouring receivers. Indicative monitoring locations proposed during the life of the Project are shown in **Figure 25**; and
- Notification will be provided to all land holders listed in **Table 27** that are predicted to exceed the relevant assessment criteria and their rights under the Project Approval.

Upon receipt of a written request from a private landholder of a receiver shown in **Table 27** predicted as receiving moderate noise impacts (where no Private Agreement is in place), Coalpac will install noise mitigation measures at the receiver in consultation with the landholder in accordance with the conditions of Project Approval.

For all other privately owned receivers not listed in **Table 27**, proactive and reactive noise minimisation practices will be implemented to ensure that the Project does not exceed the intrusive criteria.

8.7 BLASTING

8.7.1 Background

A noise and vibration impact assessment for the Project was completed by Bridges Acoustics and is presented in full in **Appendix H**. The blasting assessment is summarised below and has been undertaken in accordance with the following policies and guidelines:

- The *'Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration, Australian and New Zealand Environment Council'* (ANZEC Guidelines) (ANZEC 1990) for ground vibration and overpressure limits and time restrictions for blasting;

- *'Australian Standard 2187.2 – 2006: Explosives – Storage and Use, Part 2:Use of Explosives'* (AS 2187.2);
- *'Assessing Vibration – a Technical Guide'* (DEC 2006) for assessing construction vibration; and
- *'DIN 4150 Part 3 – Structural Vibration: effects of vibration on structures'* (ISO 1999).

A summary of the blasting impact assessment undertaken is provided in the following sections.

8.7.2 Methodology

Introduction

The assessment calculated the likely ground vibration and overpressure levels generated by blasting required for the Project for each of the nearby receivers and sensitive features for comparison with the relevant criteria. As described in **Section 4.4.4**, the Project is likely to require an average of up to 20 blast events per month to prepare overburden for removal and for coal recovery. As a reduction in blast sizes (MIC) will be required in areas of the site closest to receivers and sensitive structures, an increased frequency when in proximity to these locations will be required for limited time periods (see below).

Blasting effects to neighbouring receivers depend on the following factors:

- Ground conditions including rock types, groundwater and layers;
- Distance from the blasting site to a receiver;
- Maximum Instantaneous Charge (MIC) for the blast event;
- Topography between the blast site and receivers; and
- Atmospheric conditions including wind speed, wind direction and vertical temperature gradient.

A database of previous blast events was supplied by Coalpac for analysis. The database included the location, MIC and measured vibration and overpressure levels at various receiver locations for all blast events that have occurred at Cullen Valley Mine and Invincible Colliery during the period January 2010 to April 2011.

Analysis of the data indicated the Australian Standard (AS 2187.2) vibration and overpressure equations are appropriate for the Project, based on commonly adopted values of K=1140 and B=1.6 for the ground vibration coefficients. Air blast overpressure and ground vibration levels for blast events closest to the receiver locations were calculated utilising the methods set out in AS 2187.2 for comparison with the relevant criteria.

Blasting Criteria

Current noise and vibration criteria are recommended in the ANZEC Guidelines and are reproduced in **Table 29**. Appropriate criteria for sensitive structures relevant to the Project are shown in **Table 30**.

Table 29 Blasting Amenity Criteria

Criteria	Overpressure (dBL)	Ground Vibration (mm/s)
Less than 5% of total blasts to exceed	115	5
No blasts to exceed	120	10

8.7.3 Impact Assessment

The results of the vibration and overpressure assessment for each of the closest receivers are provided in **Table 30**, which shows calculated ground vibration and overpressure levels for closest blast events to each receiver location, taking into account topographical or other shielding between the blast site and the receiver where relevant.

Results have been calculated in the absence of mitigation measures and should be compared with the criteria in **Table 29** for residences and **Table 30** for sensitive Aboriginal and Non Aboriginal heritage items. Calculated overpressure levels assume a typical well confined bench blast. Predicted levels over the criteria are highlighted in bold font. These results indicate that blasting associated with the Project in the absence of any mitigation is predicted to produce ground vibration and overpressure levels well below the relevant amenity criteria at the majority of privately owned residences in the absence of noise enhancing weather conditions.

All of the private residences identified in **Table 30** as being the closest receivers to blast locations have also been predicted to be impacted by noise levels greater than the relevant noise criteria as discussed in **Section 8.6.3**.

Buildings

Criteria in *DIN 4150 Part 3* ensure blasting activities result in a minimal chance of building and structural damage with an acceptable level of personal comfort for residents. Blasting associated with the Project has been predicted to produce ground vibration and overpressure levels below relevant amenity criteria at all privately owned residences, provided the MIC is controlled for potentially sensitive locations as indicated in **Table 30**.

Under the proposed blasting program, the Project was assessed to have an extremely low likelihood of superficial or cosmetic damage to any privately owned residence or other structures such as outbuildings or buried pipelines.

Table 30 Blast Impact Assessment

ID (Distance to Blast)	Description	Adopted Impact Criteria	Ground Vibration (mm/s)				Overpressure (dBL)			
			MIC (kg)				MIC (kg)			
		Ground Vibration (mm/s) / Overpressure (dBL)	75	150	300	600	75	150	300	600
205 (1,540 m)	D Dino & J Seraglio*	5 / 115	0.3	0.5	0.9	1.5	101	103	106	109
179 (500 m)	RK Dickens* #		1.7	3.0	**5.2**	**9.1**	115	**118**	**121**	**123**
139 (1,350 m)	RI & GM Larkin*		0.4	0.6	1.1	1.9	102	105	108	111
114 (1,300 m)	PJ & EJ Isaacson*		0.4	0.7	1.1	2.0	103	106	108	111
142 (960 m)	PG Desch & KC Farrugia*		0.6	1.1	1.9	3.2	106	109	112	115
144 (1,200 m)	DA & DM Muldoon*		0.4	0.7	1.3	2.3	104	107	110	112
426, 392 (1,450 m)	JWJ & SM Taylor* & IG Palmer*		0.3	0.6	1.0	1.7	101	104	107	110
217N (600 m)	*Crown		1.3	2.2	3.9	**6.8**	107^	110^	113^	**116^**
199 (500 m)	DA Tilley		1.7	3.0	**5.2**	**9.1**	110^	113^	**116^**	**118^**
Cullen Bullen (>840 m)	Cullen Bullen Village		0.8	1.3	2.3	4.0	103^	106^	109^	112^
198	Carleon Coach House (DA Tilley)* #		3.4	**5.9**	**10.2**	**17.8**	115^	**118^**	**121^**	**124^**
Rock shelter (140 m)	RCK1-10	20 / -	13.3	**23.1**	**40.2**	**70.1**	-	-	-	-
Rock shelter (130 m)	RCK2-10	20 / -	14.9	**26.0**	**45.3**	**78.9**	-	-	-	-
Rock shelter (190 m)	RCKPAD1-10	50 / -	8.2	14.2	24.7	43.0	-	-	-	-
Rock shelter (200 m)	RCKPAD2-10	100 / -	7.5	13.1	22.8	39.6	-	-	-	-
Cemetery (200 m)	Cullen Bullen General Cemetery	50 / -	7.5	13.1	22.8	39.6	-	-	-	-

Bold text denotes exceedance in criteria.

* Predicted to exceed noise criteria as shown in and **Table 27**.

^ Overpressure level reduced by 5 dBL due to significant topographical shielding

\# Agreement being negotiated with landholder.

Heritage Structures

Aboriginal and Non Aboriginal heritage items exist in the vicinity of the Project Boundary as discussed in **Section 8.12** and **Section 8.13** respectively. Vibration criteria were suggested for the known Aboriginal heritage rock shelter sites by Bridges Acoustics (see **Appendix H**) and reviewed by SCT Operations (2011) to confirm their appropriateness and any additional monitoring and management measures required. This review included a field inspection of the Aboriginal rock shelter sites by SCT Operations to confirm the overall geometry of each site and consider any geological weaknesses such as faults, cracks or similar features to determine the risk to each site that may occur due to blasting activities for the Project.

The sites inspected in the SCT Operations review were found to have varying degrees of natural instability, due to the nature of all rock shelters presenting an unstable geometry for a rock body and each site exhibited evidence of active rock movements in the form of caving activity. Following the field assessment, a specific risk ranking was determined for each site by considering a range of geotechnical variables. This risk review determined that one site (CV_RCKPAD2-10) had a relatively low risk potential, three sites (C-S-1, CVRCK1-10 and CVRCKPAD1-10) had a moderate risk potential and one site (CV-RCK2-10) had a high risk potential due to natural instability.

SCT stated the preliminary blast criteria suggested by Bridges Acoustics would be appropriate to limit any potential for blasting impacts, provided that additional management measures were put in place, with the exception of CV-RCK2-10, which was found to be naturally unstable, even in the absence of blast impacts from the Project.

While the limiting of blast MIC within the projected risk areas for the remaining Aboriginal rock shelter sites was considered to adequately minimise impacts, a number of additional monitoring measures will be established for the Project to ensure that these sites are appropriately managed (see **Section 8.7.4**).

Further discussion of the archaeological and cultural significance of the five Aboriginal rock shelter sites relevant to the Project is provided in **Section 8.12**.

Table 30 shows calculated ground vibration and overpressure levels for residences and ground vibration results alone for Aboriginal heritage sites and the Cullen Bullen General Cemetery.

All other heritage sites are located at greater distances from proposed blasting activities and are unlikely to be affected by the Project.

8.7.4 Mitigation and Management

Coalpac will compile a Blast Management Plan for the implementation of the following management procedures:

- No blasting will occur on days when services are scheduled at Cullen Bullen General Cemetery;
- No mining or coal haulage within a 1,500 m radius will occur within two hours of services at Cullen Bullen General Cemetery;
- Commitment to limit blasting to 20 blast events per month (except for those areas of the site closest to receivers and sensitive structures (see **Table 30**), where a greater number of smaller blasts with limited MIC as presented in **Table 30** may be required for limited time periods);
- Personnel with experience in vibration and overpressure control and management will be engaged to design and implement any blast events that may threaten the safety of people, property and livestock and to minimise the potential for dust and fume emissions;
- Weather conditions will be reviewed before each blast event. Weather conditions that are likely to enhance overpressure levels would be identified and the level of enhancement taken into account when predicting blast effects;
- Ground vibration and overpressure monitoring will occur at one or more privately owned receivers or sensitive receptor (or a representative location) within 1,500 m of a blast. This will also include the consideration of potential blasting impacts on the Wallerawang – Gwabegar Rail Line and Baal Bone Colliery Rail Loop.

Monitoring results will be correlated with blast, weather and other relevant parameters to assist in identifying trends, predicting future blast effects and controlling future blasts;

- The MIC of each blast will be controlled where necessary to meet relevant criteria at all occupied or sensitive properties;
- A qualified geotechnical/blasting expert will inspect and assess each of the identified buildings or structures with heritage significance, to recommend appropriate ground vibration and overpressure limits for inclusion within the Blast Management Plan;
- Blasts will be designed to achieve a vibration level at half of the recommended limit and an overpressure level 3 dB below the recommended overpressure limit, for each heritage site;
- Blasting in new mining areas in close proximity to heritage sites and residences (receivers) will commence furthest from the receiver (where possible) and advance towards the receiver to enable a history of monitoring results to be established for that receiver and ensure no exceedances of blast criteria;
- Electronic detonators will be used where necessary to provide accurate timing and firing patterns to minimise the chance of excessive ground vibration, consistent with recent practice in mining areas close to receivers;
- A regular review of suggested vibration criteria for the sensitive Aboriginal heritage sites listed in **Table 30** and the Cullen Bullen General Cemetery will be carried out by a suitably qualified person;
- Prior to the commencement of blasting within 200 m of any sandstone formation (pagoda), a geotechnical survey of the formations will be undertaken by an appropriate specialist, with the exception of the four sensitive Aboriginal heritage sites listed in **Table 30**. A geotechnical survey of the formations present at the four sensitive Aboriginal Heritage sites will be undertaken prior to the commencement of blasting within 400 m;
- No open cut mining will occur within 100 m of a sandstone formation (pagodas and escarpments) without geotechnical input to final highwall design;
- Regular monitoring of the sandstone formations will be undertaken following blasting to ensure no impacts from the Project have occurred;
- Aboriginal Heritage sites listed in **Table 30** and the Cullen Bullen General Cemetery will be subject to the appropriate vibration criteria and blast controls recommended by a suitably qualified person and Coalpac will implement appropriate management measures to meet these criteria;

- Ongoing monitoring and management of Aboriginal rock shelter sites (see **Section 8.12**) with the potential to be impacted, including:
  - Detailed photographic documentation of each rock shelter site prior to any potential blast impacts for the Project, preferably utilising digital 3D imagery;
  - Procedures for the regular re-assessment of each site with new images during the period where impacts may occur to determine any required management actions; and
  - Development of a Hazard Management Plan for site CV-RCK2-10 due to the natural instability of the site, the risk that this site may topple and the likelihood for the Project to increase the potential for this to occur. Should the Hazard Management Plan recommend any works to the site, prior consultation with the local Aboriginal community and OEH will occur;
- Notification of blast events to sensitive receivers will occur prior to the blast event;
- Blasting will not occur within 500 m of private land unless adequate controls are implemented to minimise the risk of fly rock;
- Road closures will be put in place for blasts within 500 m of a public road, as currently practiced at Invincible Colliery using the Road Closure Management Plan. This procedure will be developed to the satisfaction of RMS, LCC and DTIRIS - MR; and
- Blast events will be designed to meet the relevant overpressure and ground vibration criteria.

Coalpac will include the blast management plan in an EMP for the approval of DP&I.

8.8 VISUAL AND LIGHTING

Integral Landscape Architecture and Visual Planning Pty Ltd (Integral) was commissioned to complete an assessment of the potential visual and lighting impacts of the Project. This assessment was undertaken to identify the character of the existing surrounding visual landscape and determined management and mitigation measures to address the visual impacts predicted for the Project. A summary of this assessment is provided below and presented in full in **Appendix I**.

8.8.1 Background

The existing Cullen Valley Mine and Invincible Colliery operations are located approximately 25 km north-west of Lithgow on lands surrounding the township of Cullen Bullen, which are approximately 1 km to the north-west and 1 km to the south-east from each operation respectively. Cullen Valley is located to the west and Invincible Colliery directly to the east of the Castlereagh Highway, which is the main highway linking Lithgow and Mudgee. The existing environment within and surrounding the Project Boundary is discussed above in **Section 2.2**.

The Primary Viewing Catchment (PVC) is, for the greater part, determined by the potential visibility of the Project in the area surrounding the Project Boundary as shown on **Figure 27**. The visual settings surrounding the Project are created by a range of different landscapes which vary as a result of topography, vegetation cover and land use types. In regards to the Project, this can create screening and visual buffers or alternatively, provide viewing corridors to specific areas within the Project Boundary. The landscapes surrounding the Project Boundary are quite diverse and range from steep forested lands, pagodas and escarpment formations within and adjacent to the Ben Bullen State Forest to adjoining by rural grazing lands on gentle to moderately sloping terrain and surrounding industries. The PVC also includes the village of Cullen Bullen adjacent to the Project Boundary and the larger township of Portland, located approximately 8 km to the south-west. The scenic amenity and key components of each aspect of the landscape was considered in the visual impact assessment methodology outlined below in **Section 8.8.2**.

The Ben Bullen State Forest is located within the Project Boundary and extends some distance to the east. This landscape is dominated by open sclerophyll forest communities, moderate to steep lower and middle slopes, with upper slopes and ridges often consisting of sandstone escarpments. The area to the north of the Project Boundary is similar in landscape characteristics; however it generally consists of more moderate sloping land with no overtopping sandstone geological features. A number of rural properties are located in this area. Baal Bone Colliery is also a feature of the existing visual landscape north of the Project Boundary. Rural lands and their associated residences also dominate some areas to the west and south-west of the Project Boundary. This landscape is dominated by gentle, moderate slopes with some hilly areas and scattered tree cover.

8.8.2 Methodology

The visual impact assessment considered the existing visual landscape setting, including how it is seen from various viewing locations to establish the predicted visual character of the Project. The visual impact of the Project was then determined by considering the visual characteristics of its various components in the context of the landscape in which it is located.

The overall visual impact of the Project was then determined by assessing visual sensitivity and visual effects (and the interaction between these factors as shown in **Table 31**) to direct any required mitigation and management strategies for key viewing locations.

Existing Visual Environment

The evaluation of the existing visual environment consists of an assessment of both the landscape and specific viewing locations within it that may be impacted by the Project. The landscape setting of the Project is defined in terms of topography, vegetation, hydrology and land use features. These elements define the existing visual character of the landscape that the Project is located in and interacts with. Within any landscape there are areas of similar visual features, which were defined as Visual Character Units (VCU) for the purposes of the impact assessment undertaken. Based on visual differences created by these landscape elements, six VCUs were identified for the Project, including:

- Forested Slopes and Ridges VCU, generally within the Ben Bullen State Forest and the Sunny Corner State Forest;
- Rural Lands VCU, generally represented by cleared agricultural lands to the west of the Project Boundary;
- Woodland Hills VCU, which relates to rural lands which have maintained some open forest and are surrounded by grasslands;
- Villages VCU, including Cullen Bullen on the Castlereagh Highway and Portland to the south-west of the Project Boundary;
- Cullen Bullen General Cemetery VCU, approximately 1.5 km north of township of Cullen Bullen; and
- Mining Areas VCU, including the lands occupied by the approved Cullen Valley Mine, Invincible Colliery and Baal Bone Colliery operations.

The various VCUs surrounding the Project Boundary create a range of visual settings. The open rural lands that adjoin many viewing locations allow for long distant views toward the Project, while also creating the foreground and middle ground in many views from other VCUs. The sandstone escarpments and pagoda landscapes within the Forested Slopes and Ridges VCU within the Ben Bullen State Forest also create backgrounds and horizons to many viewing locations in the region.

The existing Cullen Valley Mine and Invincible Colliery and the supporting infrastructure of each are also a visible part of the landscapes in this locality. All of the six VCUs interact to create various landscape settings, which vary as they are seen from different viewpoints in the area. This interaction creates the total view from any given location, as well as defining any screening or view corridors to the Project Boundary and operations within it.

Representative Viewing Locations

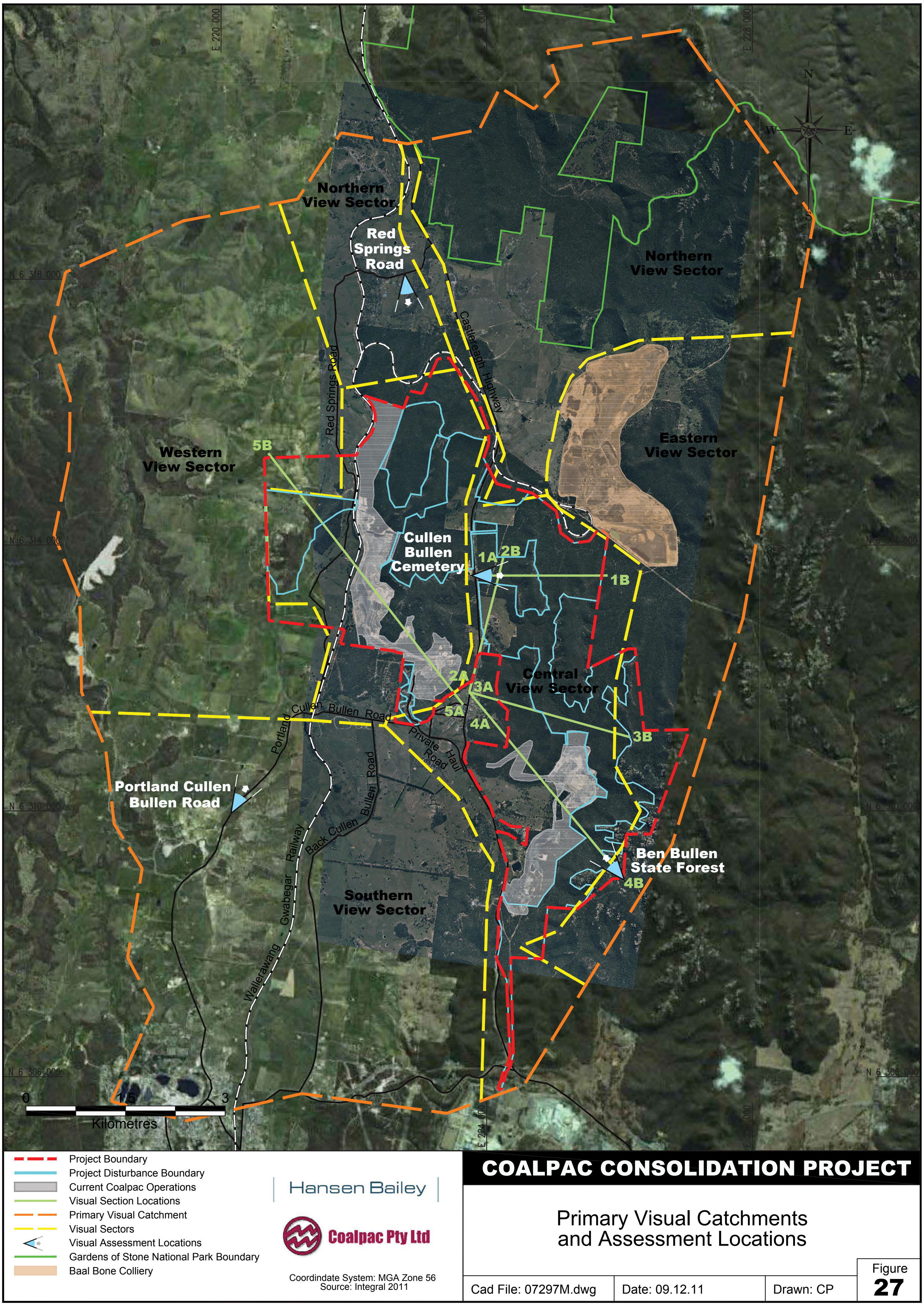
The PVC was divided into five distinct viewing sectors as detailed on **Figure 27** which included:

- Northern View Sector;
- Eastern View Sector;
- Southern View Sector;
- Western View Sector; and
- Central View Sector.

To illustrate the worst case views of the Project from various external locations, six representative viewing locations were chosen, where either photomontages or cross sections were created. Photomontages were completed for the Cullen Bullen General Cemetery (within the Central View Sector), Red Springs Road (within the Northern View Sector), the Ben Bullen State Forest escarpment (within the Eastern View Sector) and the Portland – Cullen Bullen Road (from the Southern View Sector).

Table 31 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



COALPAC CONSOLIDATION PROJECT

Primary Visual Catchments and Assessment Locations

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At each of the representative viewing locations, photographs of views oriented towards the Project Boundary were taken to illustrate the existing environment and to develop projected photomontages during Year 2, Year 8, Year 14 and Year 20 as representative phases of the Project mine life.

In addition to the preparation of photomontages at these three viewing locations, a number of cross sections were also prepared for the representative phases of the Project mine life to illustrate predicted visual impacts from other locations (see **Figure 27**). These are discussed further in **Section 8.8.3**.

Visual Effect

Visual effect relates to the level of visual contrast and integration of the Project with the existing landscape. The magnitude of the visual effect of the Project is determined by a balanced analysis of the contrast and integration of the Project (such as form, shape, pattern, line, colour and texture) and the proportion of the view that includes Project elements.

A mining development such as the Project has different visual characteristics that will create contrast with the existing landscape. The visual effects within the PVC were assessed by considering the predicted landscape within the Project Boundary over the life of the mine and how these changes will impact on existing views, as discussed below.

Visual Sensitivity

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

For any area to be given a sensitivity score, it must have visibility to a component of the Project. The assessment of visibility for the purpose of scoring visual sensitivity was assessed based on field assessments, the evaluation of topographic information, aerial photographs to determine orientation, vegetation data and 3D modelling.

The visual sensitivity of individual receivers may range from high to low, depending on additional factors which are particularly relevant to this Project given the diverse viewing locations and complex topography. These factors include:

- Screening effects of topography, buildings or vegetation;
- Viewing distance from the receiver to visible areas of the Project; and
- General orientation of receivers to landscape areas affected by the Project (for example those with verandas, decks or living room windows overlooking the Project).

Visual Impact

The visual impact of the Project was determined by considering both visual effect and visual sensitivity, which, when considered together, determine visual impact levels. The way in which visual parameters of visual sensitivity and visual effect are cross referenced and resultant impacts is shown in **Table 31**. The visual impact assessment methodology described above was implemented through a combination of different evaluation processes and analyses. These are outlined below and included:

- Evaluation of Project plans and existing topographic maps, aerial photography and reports;
- Field assessment of key areas of the landscape, both within and surrounding the Project Boundary; and
- Computer analysis, to determined potential zones of visual influence and to model predictions of Project impact through the development of photomontages from key viewing locations.

Lighting Impact

The commencement of night operations proposed for the Project has the potential to result in a range of additional lighting impacts on surrounding receivers. These impacts will be influenced by the location of operations during the night within the Project Boundary, the relative level at which the viewing locations are situated and the presence of any offsite barriers such as topographic features and / or screening vegetation.

Night lighting impacts were evaluated qualitatively and considered both direct and indirect lighting effects of the Project. Direct lighting includes all lights that may have a line of sight exposure to viewing locations beyond the Project Boundary and may not be screened by topography or vegetation. Indirect lighting was considered in terms of contribution to diffuse lighting effects whereby all lights associated with the Project contribute to the *'glow'* effect that will be visible in a dark night sky.

The existing PVC of the Project generally has very low ambient night light levels that are generated by Cullen Bullen and Portland, and the more dispersed rural residences and vehicles travelling on local roads. The cumulative effect of these existing light sources will generally be unperceivable. There will be some ambient light created by existing mining lighting adjacent to the Cullen Bullen township, however these effects are considered to be minimal (see **Section 8.8.3**).

8.8.3 Impact Assessment

The Project will result in a number of visual impacts, which will vary in each sector and over the life of the Project. A review of Project mine plans, aerial photography and the photomontages was used to determine the visual impacts discussed below and shown in **Figure 27** to **Figure 37**.

Northern View Sector

The Northern View Sector is dominated by rural lands with flanking forest areas and National Parks and State Forest areas to the north-east. The View Sector also includes residences located along the Castlereagh Highway, Red Springs Road and Reserved Road.

The visual effects in the Northern View Sector are illustrated in a photomontage from Red Springs Road for the existing environment and Year 2 (provided in **Figure 29**) and Year 8 to Year 20 (provided in **Figure 30**). Visual effects will be created in this location by the following operations:

- Views of the northern extent of the Cullen Valley mining areas;
- Views of the East Tyldesley mining areas;
- Initial views of the pre-rehabilitation noise bund at the north of the Cullen Valley mining area; and
- Views of the East Tyldesley OEA prior to rehabilitation.

In the Cullen Valley mining areas, there will be high visual effects on the Northern View Sector receptors for around a two year period from commencement of the Project, after which the rehabilitation of the northern bund in this area will reduce the high / moderate visual effects to low. Some mining areas will remain periodically exposed over the top of the noise bund at some viewing locations from time to time, however these will be less than 2.5% of a Primary Viewing Zone (PVZ) and will create a moderate to low visual effect.

The residences in the Northern View Sector have been ascribed a high visual sensitivity, as all are within 7.5 km of the Project Boundary. Most residences have open views of surrounding areas, which therefore increases the likelihood of open views to the Project. The roads in the locality are minor roads but have been ascribed a moderate visual sensitivity, being located within 2.5 km of the Project Boundary. On the basis of land use, all rural lands in this sector will have a low sensitivity.

Parts of the Northern View Sector will experience significant visual impacts for a limited time until a bund is built in the north to screen mining in the Cullen Valley area as it progresses to the south. Operations in the northern Cullen Valley mining areas will have a high visual effect for a one to two year period from commencement of the Project, which when combined with the high sensitivity of the rural residences in this sector will create a high visual impact. This impact will be minimised through early, progressive rehabilitation of the noise bund required to be constructed in this area. Due to the forested setting surrounding these operational areas, rehabilitation activities will require the establishment of more mature tree cover to reduce visual effects and impacts to low.

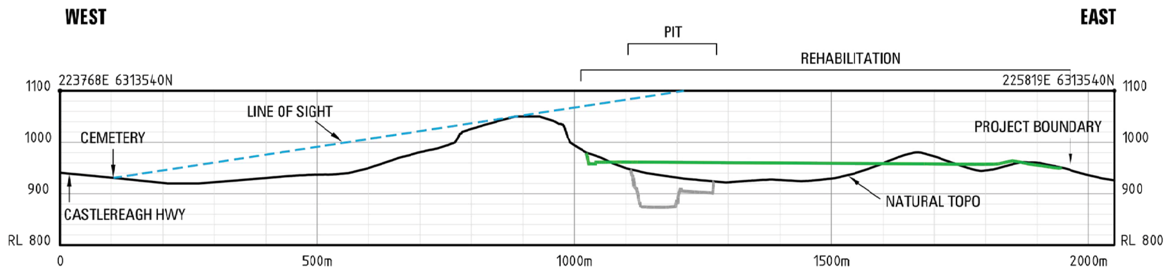
Operations in the East Tyldesley mining area will have a high visual effect on northern residential viewing locations for a period of two to 10 years during mining in this area. Similar visual effects will also be experienced by recreational users of the Gardens of Stone National Park areas, although these will be reduced by increased viewing distance and the neighbouring Baal Bone Colliery which is located in this view shed.

There is potential for high visual impacts in relation to these areas, particularly for receivers in the Gardens of Stone National Park; however this is greatly reduced in many areas by the restriction of views from forested areas located between key viewing locations and the Project Boundary, the Baal Bone Colliery and the viewing distance.

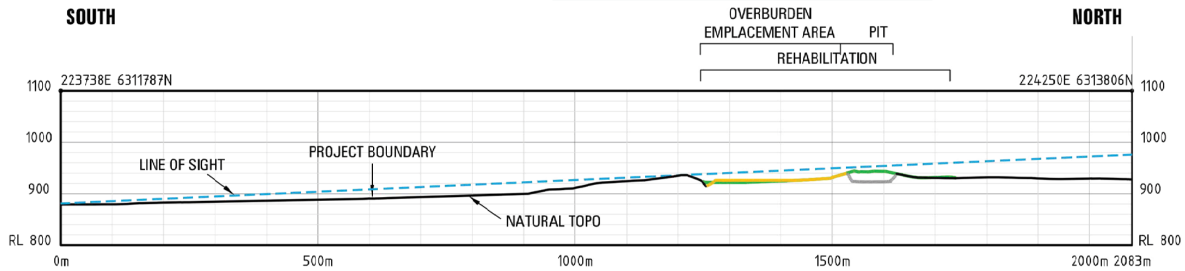
While visual sensitivity and impacts to receptors in this area with views toward the Project would vary with the type of recreational activities undertaken, sensitivity would generally be high where the Cullen Valley and East Tyldesley mining areas can be seen from access trails, walking tracks or adjacent exposed pagodas and escarpments with a southerly or westerly aspect. Views from natural heritage sites in this sector associated with the significant sandstone escarpment and pagoda formations in the Gardens of Stone National Park and Wolgan State Forest are also similarly limited to rocky escarpment edges, with elevated views toward the Project. Apart from such exposed edges created by these geological formations, such sites are generally screened by mature forest and woodland vegetation.

Impacts to recreational users of the Gardens of Stone National Park and State Forests in this sector will decrease after initial rehabilitation occurs, but will only become low when tree cover becomes more established.

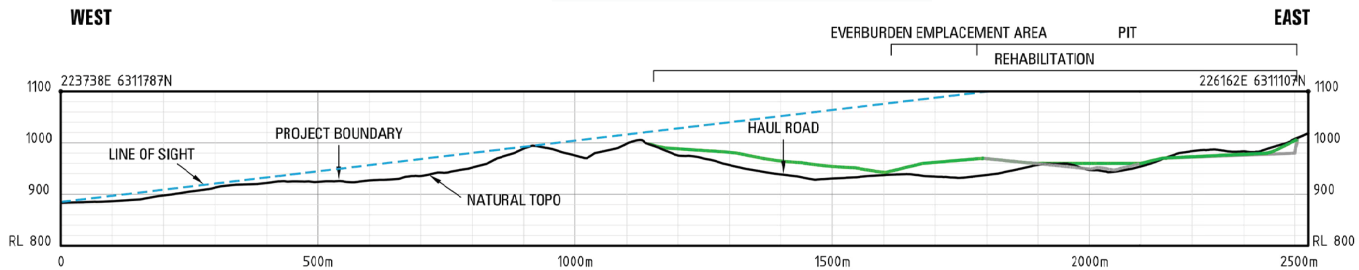
1 CEMETERY SECTION 1A - 1B



2 CULLEN BULLEN SECTION 2A - 2B



3 CULLEN BULLEN SECTION 3A - 3B



Natural Topography
Line of Sight
Active Mining
Overburden Emplacement
Rehabilitated Topography

Hansen Bailey

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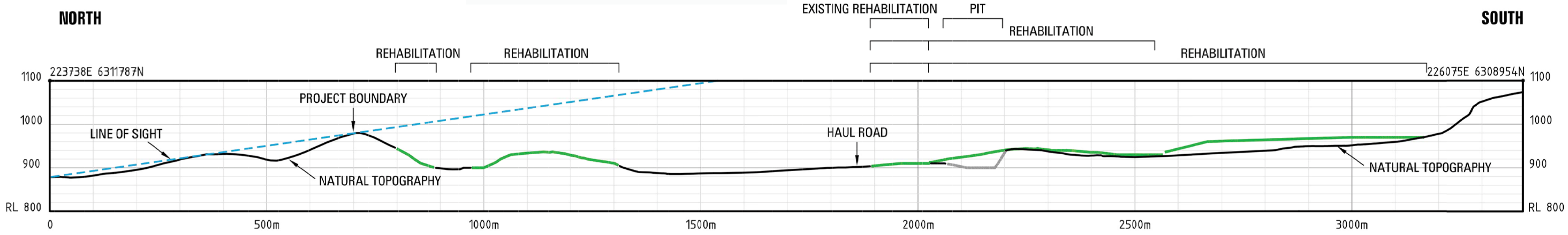
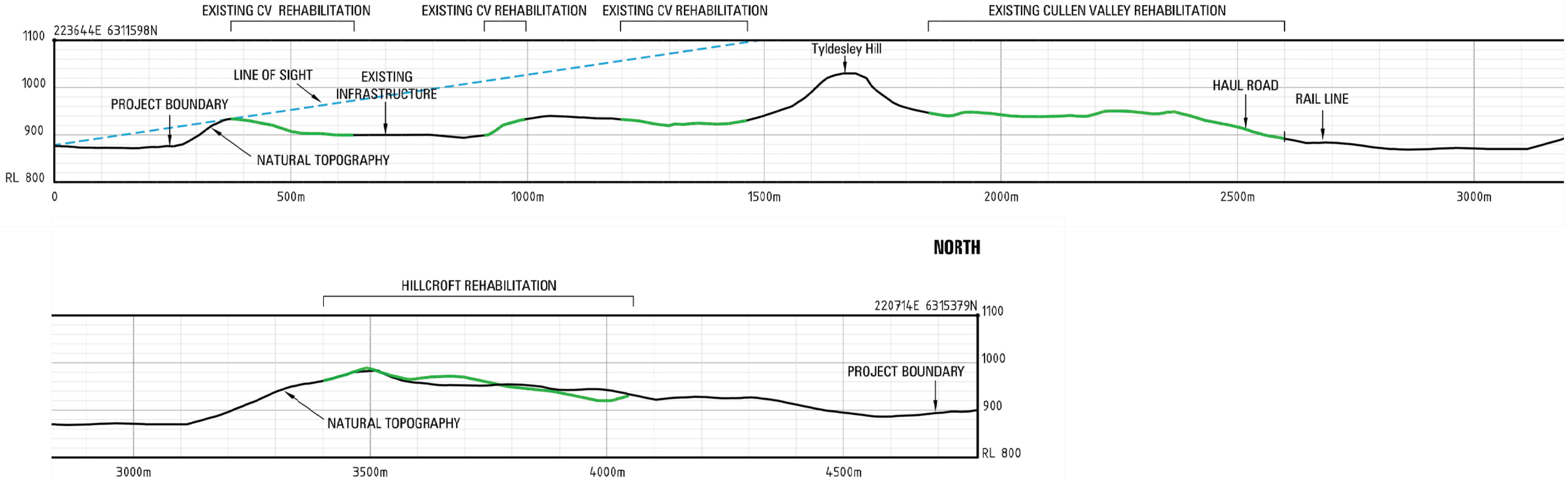
Visual Cross Sections 1 - 3

Cad File: 07298I.dwg	Date: 13.12.11	Drawn: CP	Figure 28A

4 CULLEN BULLEN SECTION 4A - 4B



5 CULLEN BULLEN SECTION 5A - 5B



- Natural Topography
- Line of Sight
- Active Mining
- Overburden Emplacement
- Rehabilitated Topography

Hansen Bailey

Coalpac Pty Ltd

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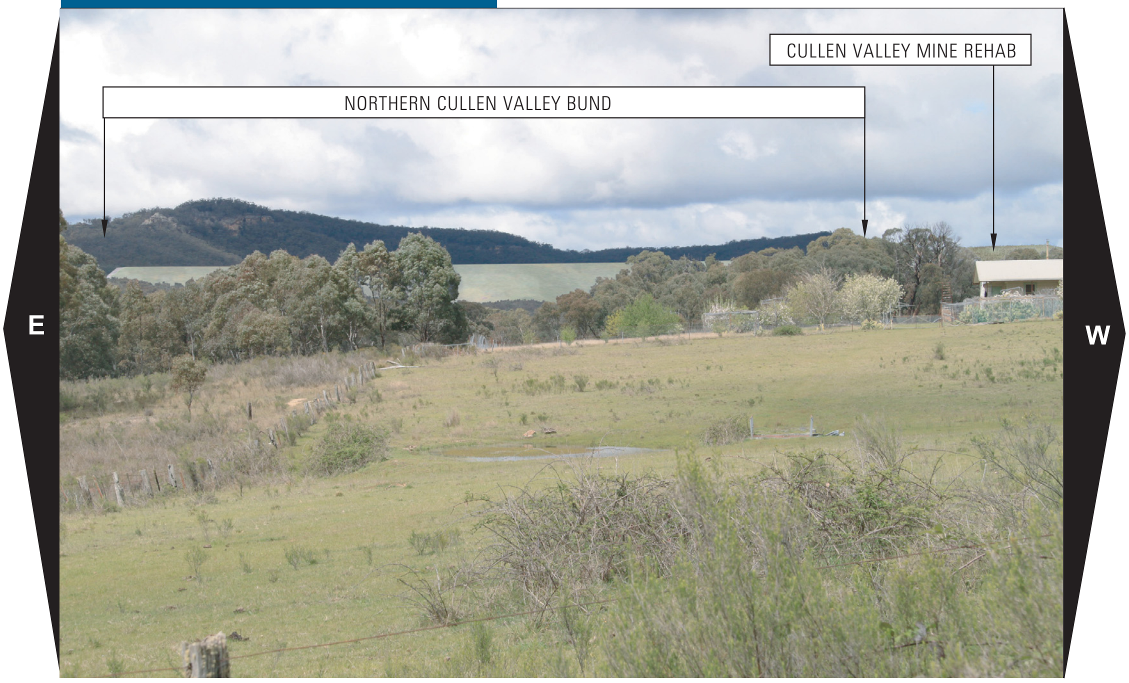
Visual Cross Sections 4 - 5

Cad File: 07298I.dwg	Date: 13.12.11	Drawn: CP	Figure 28B

RED SPRINGS ROAD - EXISTING

RED SPRINGS ROAD - YEAR 2



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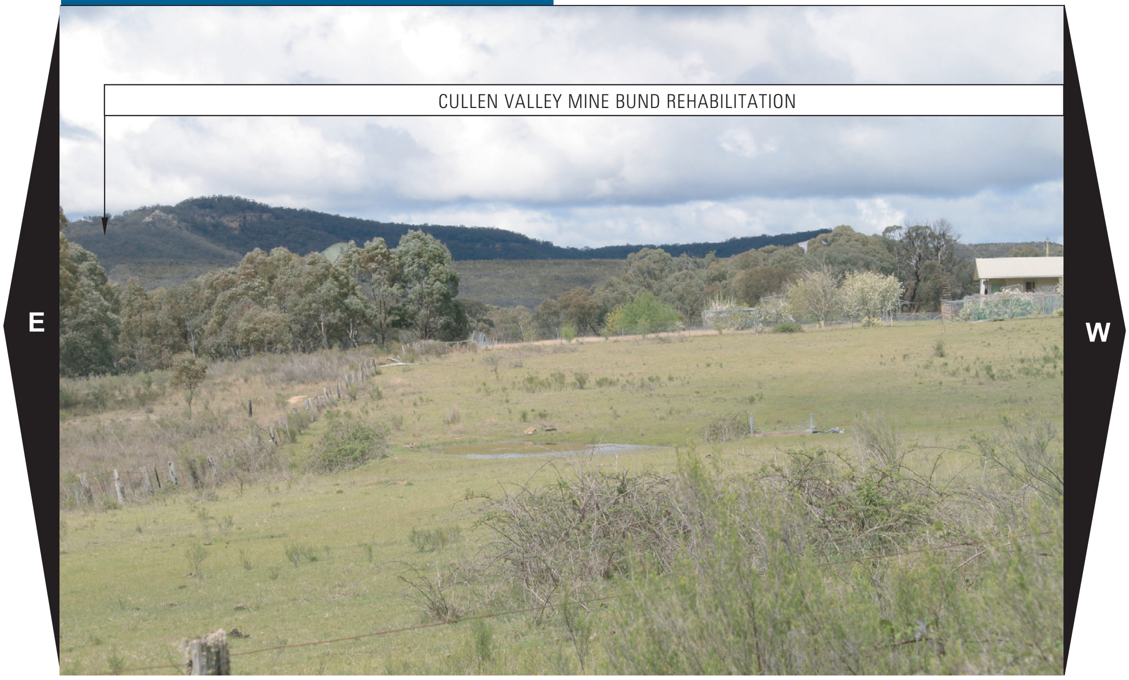
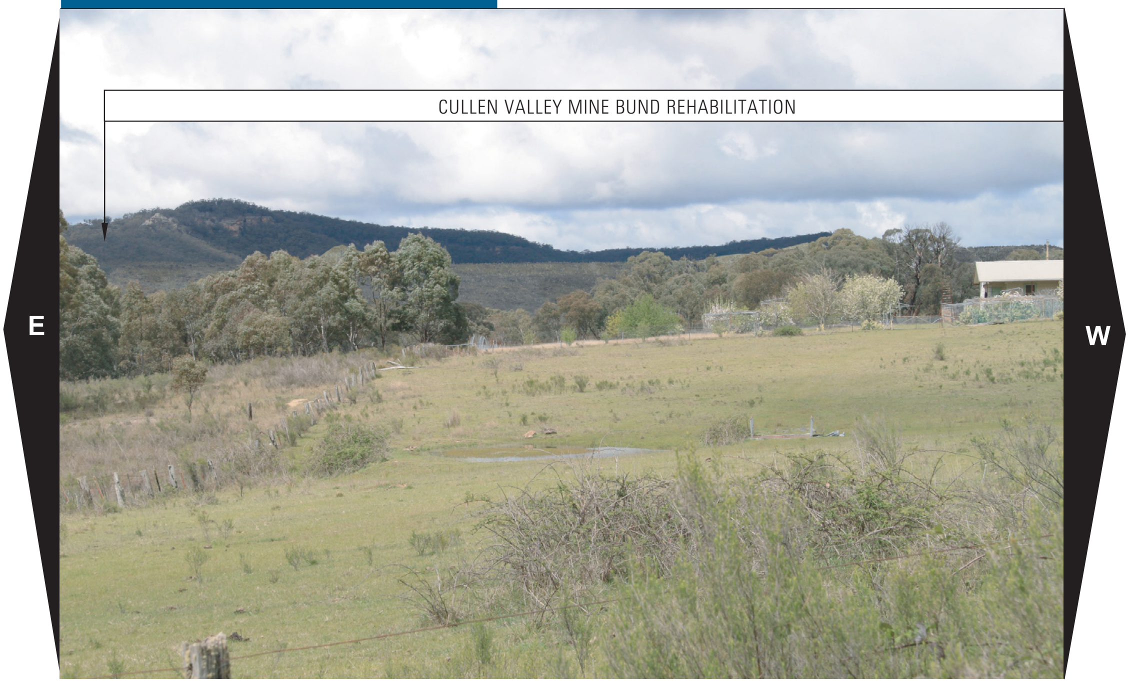
Photomontage Location 1
Red Springs Road (Existing and Year 2)

File: CP002- MONTAGES LOC 01 - RED SPRINGS ROAD.ai	Date: 12.12.11	Drawn: DP	Figure 29

RED SPRINGS ROAD - YEAR 8 - 14



RED SPRINGS ROAD - YEAR 20



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Photomontage Location 1
Red Springs Road (Year 8 to Year 20)

File: CP002- MONTAGES LOC 01 - RED SPRINGS ROAD.ai	Date: 12.12.11	Drawn: DP	Figure 30

Eastern View Sector

The Eastern View Sector is dominated by forestry land uses within the Ben Bullen State Forest that have a low visual sensitivity. The more distant National Park areas in this sector are generally screened from views to the operations within the Project Boundary. As shown on **Figure 27** a photomontage has been prepared to provide a representative assessment of areas where views of the Project are available from the edges of the south-eastern sandstone escarpments within the Ben Bullen State Forest. Such views will also be available in the eastern sector to the East Tyldesley mining areas from exposed escarpment edges in the Ben Bullen State Forest and some areas of the Wolgan State Forest over the existing surface facilities of Baal Bone Colliery.

From these elevated viewing locations on the western escarpment edge, the existing operations of Invincible Colliery operations are visible (see **Figure 31**). The visual effect of these existing mining areas will be reduced by Year 2 of the Project as rehabilitation is developed; however as open cut mining for the Project progresses northward, views to active mining areas will continue, maintaining a high visual effect (see **Figure 32**). Over time, visual effect levels will decrease as Project open cut mining areas are progressively rehabilitated and develop into forest communities, reducing impacts due to the contrast created with the existing forested environment (**Figure 33**).

There is also limited visibility from this View Sector to operations within the Project Boundary. For these reasons, there is little to no visual impact on this View Sector.

Southern View Sector

The Southern View Sector is dominated by low sensitivity rural land uses. However, it contains several sensitive rural residences and, of less significance, several local roads. The visual effects of the Project on the Southern View Sector relate to the mining areas of both Cullen Valley Mine and Invincible Colliery. The visual effects in the Southern View Sector are illustrated in a photomontage from Location 1 for the existing case and Year 2, as provided in **Figure 34**, with Year 8 to Year 20 provided in **Figure 35**. This Southern View Sector is likely to have a moderate to low visual effect due to the longer distances to the mining areas and the fact that mining will occupy a limited portion of a PVZ. The most significant types of visual effects experienced from this viewing location may include:

- Active mining areas for the Project until Year 2;
- Views of the faces of the OEAs, particularly prior to rehabilitation establishment; and
- Views of the Hillcroft mining area (west of the Wallerawang – Gwabegar Railway Line) prior to rehabilitation.

In relation to the Cullen Valley mining areas, these visual effects will be reduced after a two year time period of mining activities west of the Wallerawang – Gwabegar Railway line when rehabilitation will be initiated. The rehabilitation of mining areas west of the Wallerawang – Gwabegar Railway Line can borrow visual aspects of the existing Rural Lands VCU and will simulate the surrounding visual character, which will reduce the visual effect.

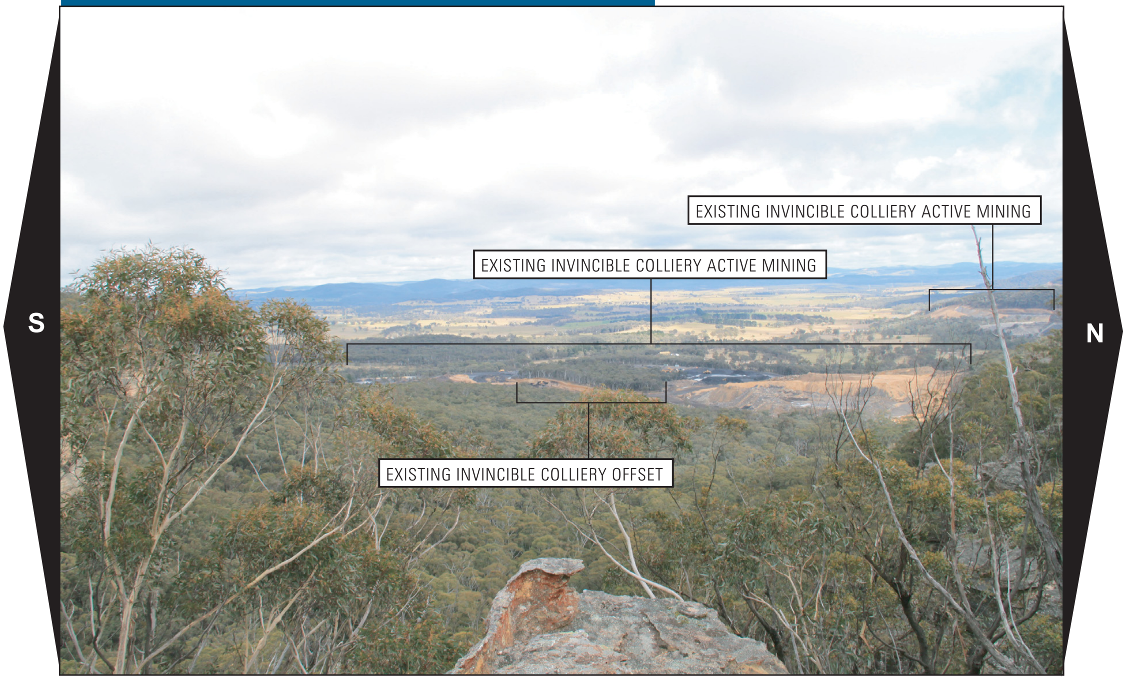
The higher visual effects experienced due to the Invincible Colliery mining areas in the south of the Project Boundary will generally be for short time periods; however there are many such areas within the PVZ that will be seen during the life of the Project. More significant is the extent of OEAs that will be visible above foreground landscape elements in early stages of rehabilitation of these areas. Following initial rehabilitation activities, grassed areas will continue to contrast with the existing vegetation at higher elevations within the Ben Bullen State Forest, creating moderate visual effects. Further reductions in visual effects will only result once tree plantings within these rehabilitation areas develop.

There are approximately 24 residences as well as two rural-residential areas located to the south-west of the Project Boundary. Part of Portland township is also in the Southern View Sector. The visual sensitivity of residences in this Sector would generally be high, as all residences are generally located within 7.5 km of the Project Boundary. However the level of sensitivity would depend on there being visibility and visual orientation from these residences towards the Project. The visual sensitivity of the Portland – Cullen Bullen Road and the Back Cullen Bullen Road is low. Similarly, the sensitivity of unoccupied rural lands is low.

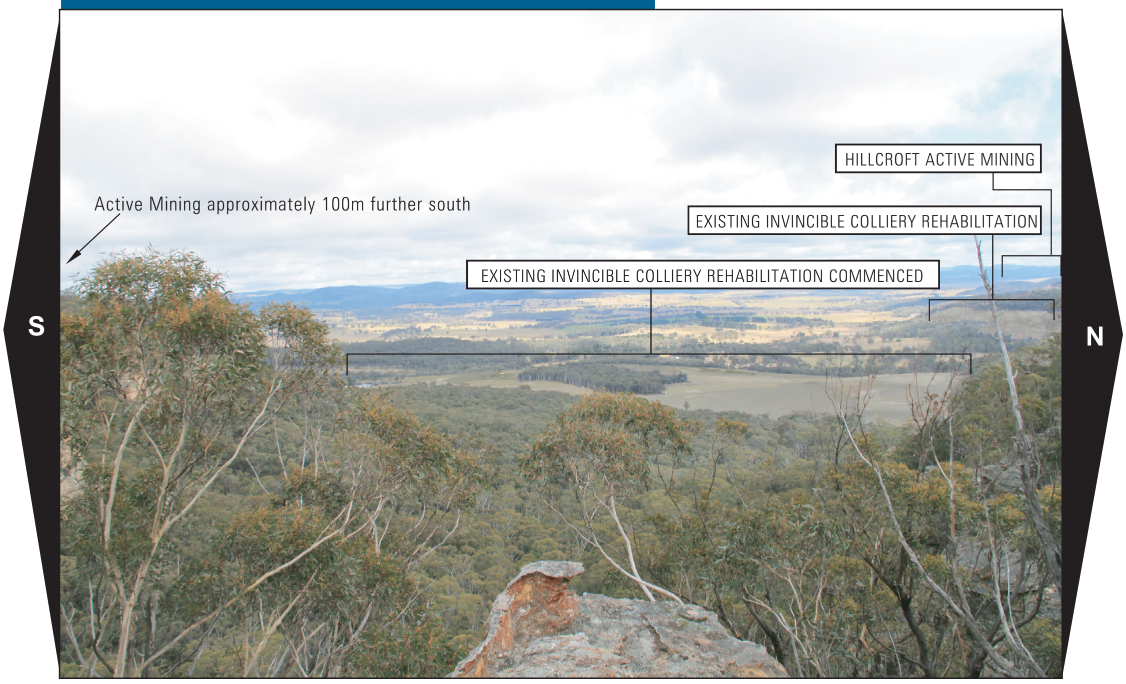
Visual impacts in the Southern View Sector relate to both Cullen Valley Mine and Invincible Colliery mining areas, both of which have the potential for high impact levels. However, if pre-rehabilitation mining disturbance can be kept below 2.5% of a PVZ, then visual effects and impacts can be maintained at a lower level. Residences that may have a strong visual orientation towards the Cullen Valley Mine mining areas such as those to the west of the Wallerawang – Gwabegar Railway Line will have a high visual effect, however this will be reduced to moderate and low once initial rehabilitation activities have been undertaken. Residences with less prominent orientation towards the Project mining areas will experience a moderate to low impact in the first instance during mining operations, and would decrease to low following rehabilitation establishment. Visual impacts on roads and rural lands in this View Sector will be low.

The Invincible Colliery mining areas, and specifically the active mining areas and OEAs in the pre-rehabilitation phase, will create a high impact if the view is not kept below 2.5% of a PVZ. The visual impact would be high for some residences if they are orientated toward Invincible Colliery mining areas proposed for the Project.

BEN BULLEN STATE FOREST - EXISTING



BEN BULLEN STATE FOREST - YEAR 2



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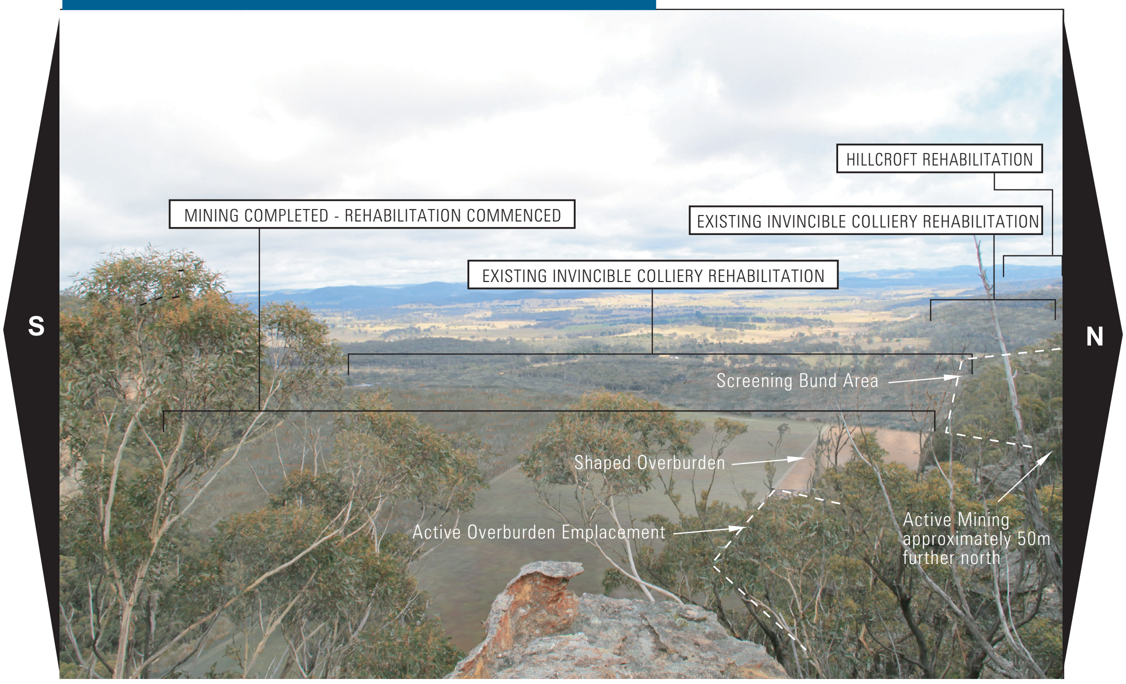
Photomontage Ben Bullen State Forest
(Existing to Year 2)

File: CP005 - MONTAGES LOC 07 ESCARPMENT.ai | Date: 12.12.11 | Drawn: DP | Figure **31**

BEN BULLEN STATE FOREST - MINING AREAS YEAR 2 TO YEAR 8

BEN BULLEN STATE FOREST - YEAR 8



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COALPAC CONSOLIDATION PROJECT

Photomontage Ben Bullen State Forest (Year 2 to Year 8)

File: CP005 - MONTAGES LOC 07 ESCARPMENT.ai | Date: 12.12.11 | Drawn: DP | Figure 32

BEN BULLEN STATE FOREST - FINAL YEAR 20

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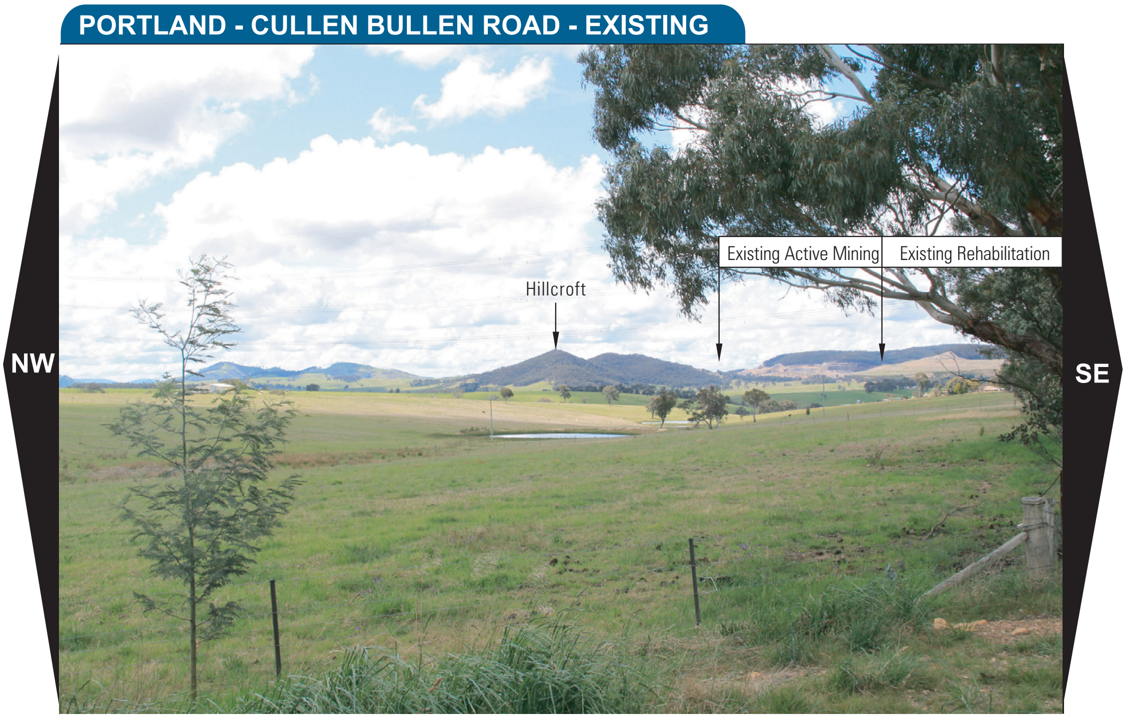
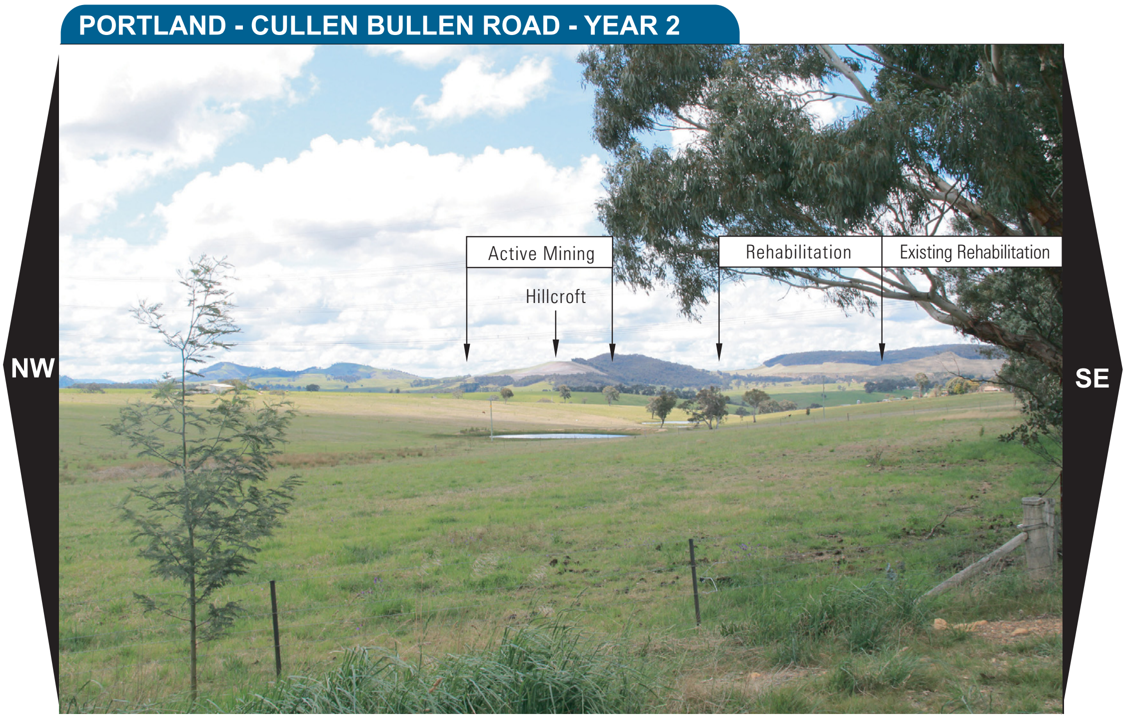
Photomontage Ben Bullen State Forest
(Year 20 Final)

File: CP005 - MONTAGES LOC 07 ESCARPMENT.ai | Date: 12.12.11 | Drawn: DP | Figure 33

PORTLAND - CULLEN BULLEN ROAD - EXISTING



PORTLAND - CULLEN BULLEN ROAD - YEAR 2



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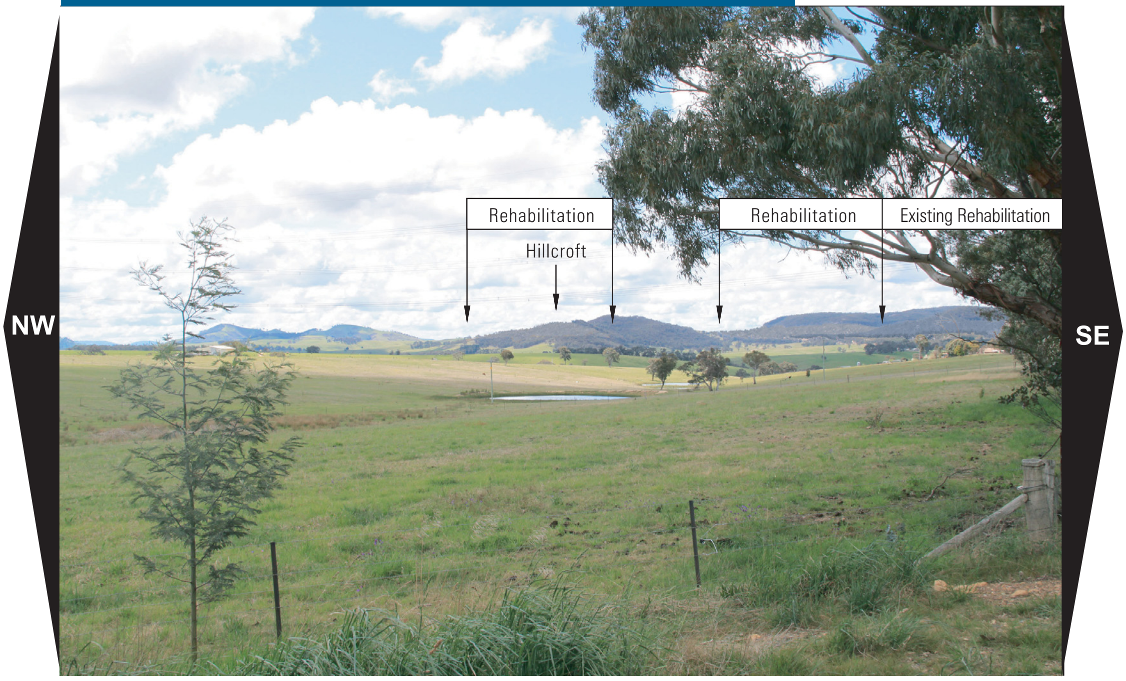
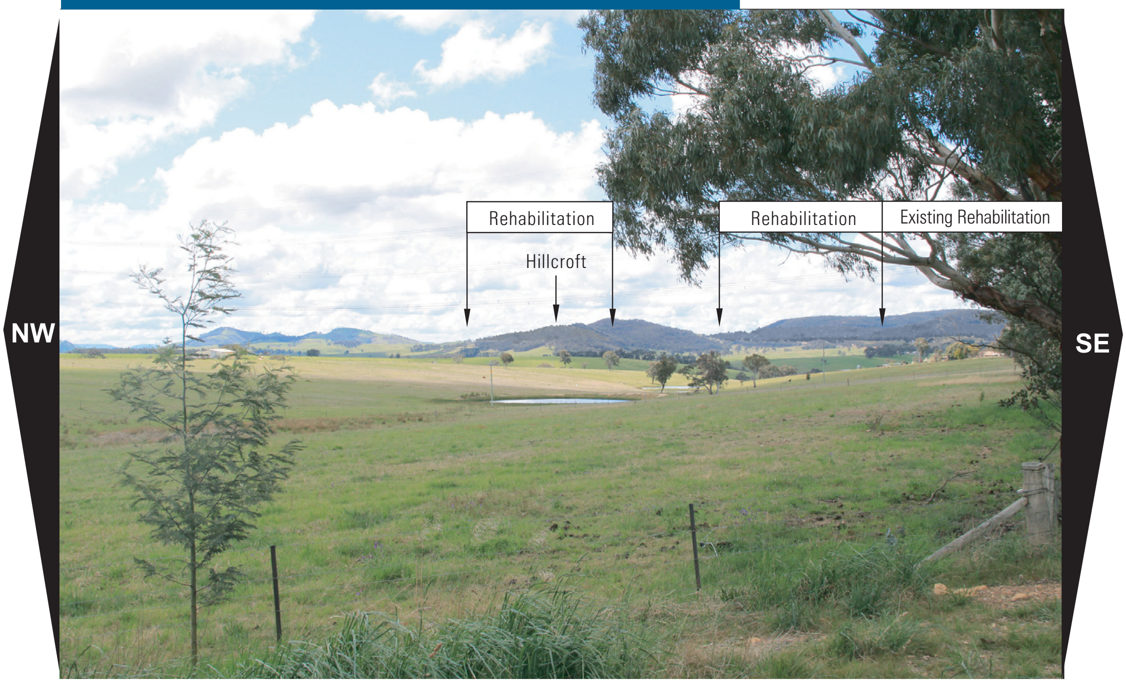
Photomontage Location 2
Portland - Cullen Bullen Road (Existing and Year 2)

File: CP002- MONTAGES LOC 02 - CULLEN-BULLEN.ai	Date: 12.12.11	Drawn: DP	Figure 34

PORTLAND - CULLEN BULLEN ROAD - YEAR 8 - 14



PORTLAND - CULLEN BULLEN ROAD - YEAR 20



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Photomontage Location 2
Portland - Cullen Bullen Road (Year 8 to Year 20)

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This could be the case for houses with easterly aspects on Back Cullen Bullen Road and on Portland – Cullen Bullen Road. Houses that are not orientated to this view would experience lower visual impact levels.

Western View Sector

The Western View Sector is dominated by rural lands. It contains only two rural residences and a section of Red Springs Road that has very limited public use (in this Sector). The most significant types of visual effects experienced from this viewing location may include:

- Views of the face of the mining operations within the existing footprint of Cullen Valley Mine; and
- Views of mining areas to the west of the Wallerawang – Gwabegar Railway Line prior to rehabilitation (see **Figure 28A** and **Figure 28B**).

In the first two years of the Project, a high visual effect will occur and would continue until rehabilitation develops sufficiently to reduce contrast with the existing forested ridgelines in the background of these views (by approximately Year 8 of the Project). From this time, moderate visual effects will occur, reducing to low when more mature tree rehabilitation is achieved.

The visual sensitivity of the broad rural landscape in this View Sector will be low. A low visual sensitivity on the section of Red Springs Road located in the Sector is likely due to limited public usage. The sensitivity of the Wallerawang – Gwabegar Railway line that is mainly used for haulage of freight would be low.

As stated above, there are two rural residences in this View Sector, located in close proximity to the western Cullen Valley Mine mining areas and approximately 500 m from the Project Boundary.

These residences would have a high sensitivity to operations within the Cullen Valley mining areas for the Project. The residences will be partially screened from the mining operations by intervening topography but will be exposed as operations west of the Wallerawang – Gwabegar Railway line develop in Years 1 and 2.

There will be a high visual impact experienced by the two residences for a period of up to 2 - 3 years from Project commencement, as operations in close proximity create high visual effects. These impacts will continue until rehabilitation is established creating moderate / high impacts. This will reduce to moderate / low when tree cover is established in rehabilitation areas and to low when such cover achieves some level of maturity. A moderate to low visual impact will be experienced on the broader View Sector within its rural lands and on the portion of Red Springs Road within the Western View Sector. This will decrease to a low impact when rehabilitation is completed.

Central View Sector

The Central View Sector is dominated by visually sensitive land uses. The Castlereagh Highway runs down the centre of the spine of the Sector, which also includes the township of Cullen Bullen. Further to the north of Cullen Bullen and adjacent to the highway, there are a number of individual residences that adjoin or are located within mining areas proposed for the Project, along with the Cullen Bullen General Cemetery.

The most significant types of visual effects experienced from this viewing location may include:

- Views of the active face of the mining operations whilst the OEAs are under construction;
- Mining activities as they develop adjacent to the Castlereagh Highway; and
- Views of the mitigation bunds prior to rehabilitation.

These high visual effects will persist until rehabilitation with more mature tree cover is achieved.

The extent of pre-rehabilitated OEA visible at any one time needs to be less than 2.5% of the PVZ of sensitive receptors to lower visual effect levels to moderate during this period. Similarly, those Cullen Valley Mine and East Tyldesley mining areas immediately adjacent to the highway will experience high visual effects as OEAs and mitigation bunds are constructed. Within these areas, there will also be high visual effects from active mine faces at higher elevations that are in direct line of sight to receivers and in relatively close proximity to the Castlereagh Highway.

The whole of the Central View Sector has high sensitivity. At certain key points, various residences have a high sensitivity due to the close proximity of these residences to proposed mining areas. This occurs for the greater part for those individual residences located to the north of Cullen Bullen, but there are also some residences north-west of Invincible Colliery that may experience high sensitivity as well. Given the sensitivity of the Central Sector, the number of receptors within the township of Cullen Bullen and the location of the Cullen Bullen General Cemetery, cross sections have been prepared to illustrate predicted visual impacts from six key areas (see **Figure 28A** and **Figure 28B**).

The highest level of visual impact will be experienced in the Central View Sector. Given the high visual sensitivity of the residences, Castlereagh Highway and the close proximity of mining areas and OEAs, the high visual effects created by these elements will result in high visual impacts being experienced in a number of locations.

Cullen Bullen Township

The township of Cullen Bullen retains a high visual sensitivity but is generally screened from views to the proposed Project mining areas by vegetated ridges and spurs adjoining the town. There is a narrow view corridor north along the Castlereagh Highway to a sliver of the south-west corner of the East Tyldesley mining areas; however this view is more related to highway users than elements of the Project visible to receptors located in Cullen Bullen. As illustrated by the cross sections from various key points around the town provided on **Figure 28A** and **Figure 28B**, the potential for views to the Project from Cullen Bullen are generally screened by surrounding topography and the township therefore experiences low visual impacts. On **Figure 28A** and **Figure 28B**, the natural topography is shown as a black line, with the proposed mining for the Project grey and final rehabilitation green. The line of sight along the section line for each location is illustrated by the dashed blue line.

One small area of residences at Cullen Bullen (in a 'triangle' of land enclosed by Farley Street to the east, Portland – Cullen Bullen Road to the west and the Cullen Valley Private Haul Road to the south) will have potential views past the intervening ridges to the southern extent of the Invincible mining area. An evaluation of houses in this location indicates that they generally do not have a strong viewing orientation toward the Invincible Colliery site. However, a strong orientation would create a high sensitivity.

Other areas within Cullen Bullen to the north and south of this narrow view corridor will be screened by existing vegetated ridgelines.

Cullen Bullen General Cemetery

The Cullen Bullen General Cemetery has a high sensitivity and the potential for views of active mining areas within the Project Disturbance Boundary when the East Tyldesley mining area becomes visible from Year 2. This effect is then expected to increase from approximately Year 15, with the progression of open cut mining on the elevated ridgeline adjacent to the cemetery. However, a redesign of the mine plan to reduce the areas subject to open cut mining has limited this visibility. A photomontage has therefore been developed showing the progression of the mine adjacent to this area from existing, Year 2, Year 20 and 10 years following the completion of mining, when the woodland vegetation communities to be developed during rehabilitation will be established (see **Figure 36** and **Figure 37**).

A section of the East Tyldesley mining area located to the east of the cemetery was initially planned to be mined via open cut methods under the maximum resource case or 'Optimal Mine Plan Layout' described in **Section 4.2.1**.

Following an assessment of the visual impacts from open cut mining that were predicted at the site due to surface disturbance from open cut operations, coal extraction methods in this area were modified to highwall mining (see **Figure 6**). These changes in mining methodology adopted for the Project in the East Tyldesley area will reduce the visual impacts at the cemetery due to the significant reduction in the surface disturbance visible at the site and through retaining remnant vegetation in this area.

The cemetery will, however, still have some potential for views over the more elevated cut mining operations in the Cullen Valley and East Tyldesley areas that will not be screened by remnant vegetation, creating high impacts. Specific management measures have therefore been developed to minimise visual impacts at the Cullen Bullen General Cemetery site as outlined in **Section 8.8.4**.

Castlereagh Highway

Trips both in a northerly and southerly direction along the Castlereagh Highway would experience high visual impacts as views to the more elevated active open cut mining areas and newly constructed OEAs are available. The residences located to the north of Cullen Bullen along the Castlereagh Highway are also generally oriented toward Project mining areas. **Section 8.8.4** provides a summary of the measures to be implemented to reduce the potential for high visual impacts from these areas.

Cumulative Visual Impacts

While there has been a long history of coal mining operations in the lands within and surrounding the Project Boundary, the continuation of mining for the Project will include areas that have not previously experienced views of this kind.

The northern most mining areas of Cullen Valley and East Tyldesley impact on the Northern View Sector. The Invincible Colliery mining areas proposed for the Project will create impacts to the east of currently approved areas and operations to the west of the Wallerawang – Gwabegar Railway line in the Hillcroft area of Cullen Valley Mine impact on the Southern View Sector to varying degrees. The Hillcroft area is also the main component of the Project impacting on sensitive receptors in the Western View Sector.

The Central View Sector and especially the Castlereagh Highway is affected by most proposed mining areas for the Project and experiences the greatest cumulative visual impact.

The initial views of mining areas within Invincible Colliery are extended east and north as areas of mining activities will also be visible immediately east and west of the Castlereagh Highway within the East Tyldesley and Cullen Valley Mine during the life of the Project.

CEMETERY - EXISTING, YEAR 2 and YEAR 8

CEMETERY - YEAR 14

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Photomontage Cemetery
(Existing to Year 14)

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CEMETERY - YEAR 20

CEMETERY - END OF PROJECT LIFE

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Photomontage Cullen Bullen General Cemetery (Year 14 to Year 20 and End of Project Life)

File: CP002- MONTAGES LOCATION CEMETERY.ai	Date: 12.12.11	Drawn: DP	Figure 37

While there is some potential for cumulative visual impacts as a result of the Project, the breakup of the Project Boundary into distinct visual catchments by natural topography significantly lessens this cumulative visual impact at individual viewing locations. These impacts will be further lessened by successful rehabilitation and re-foresting of OEAs in the various locations where mining is proposed (see **Section 8.8.4**).

Lighting Impacts

A range of lighting impacts will be created by the commencement of night operations proposed for the Project.

Direct light effects are generally restricted to vehicle and train lights and lighting of active mining areas, as other operational lighting would generally be hooded, directed downwards and / or away from receivers. There are two sensitive receptors which may potentially be within this zone of influence and experience minor additional direct lighting effects, however these will be screened by topography from direct lighting effects.

Most truck and vehicle direct lighting will be screened by topography, vegetation and by established OEA areas and haul road bunds. During the initial period of bund construction, night lighting from mobile equipment could impact residences; however this activity will not be conducted after 6:00 pm. Impacts from train movements are unlikely to be significant as lights are pointed directly onto the rail track, which will be screened by bunding to the west and south of the proposed rail siding.

Direct lighting effects will also continue to be experienced in and around the ICPP infrastructure at an increased intensity; however this will only affect sections of the Castlereagh Highway due to screening to nearby residences provided by surrounding ridges. The location proposed for the ETCPP means that any potential for direct lighting impacts would be minimised by topography.

The lighting of the existing ICPP and the proposed ETCPP will continue to collectively create diffuse lighting impacts causing a glow of light that will be seen in the ambient dark night. The area most affected by diffuse light will be those residences presently impacted, approximately 1 km to the west of the proposed ETCPP site adjacent to the Castlereagh Highway. This glow will continue to represent the indirect lighting effects of all the lights in these areas (including machinery lights as well as those around work areas and infrastructure elements) that will be in place to allow night operations to safely occur.

Generally, this glow will not create a significant visual effect, however may be significant from time to time. This will particularly be the case for the residences north of Cullen Bullen on the Castlereagh Highway located close to the south-western corner of mining activities within the East Tyldesley area.

8.8.4 Mitigation and Management

Mitigation measures proposed in relation to reducing visual impacts created by the Project include:

- Onsite treatments to reduce visual effects; and
- Offsite treatments at viewer locations to reduce visual sensitivity.

Onsite treatments will involve rehabilitation of landforms while offsite treatments could involve a range of treatments to screen views, filter views and / or reorientate primary views should this be needed. Onsite treatments are already incorporated in the design and operating plans for the Project as they relate to the OEA establishment and progressive rehabilitation.

Onsite Treatments

A number of onsite treatments will be maintained or implemented to mitigate visual impacts of the Project, including:

- Designing of outer faces of the OEAs and associated drainage structures in accordance with surrounding landscape;
- Retaining a tree screen of existing vegetation between the Castlereagh Highway and all mining areas where possible, to supplement the visual bunds described below, up to 30 m in width, where practical;
- The early establishment and rehabilitation of the outer faces of the bunds and OEAs, especially in the eastern Cullen Valley Mine areas and the western mining areas of East Tyldesley and Invincible Colliery. Key locations where bunds will be developed to reduce visual effects are shown on **Figure 10** to **Figure 17** and include:
  - Immediately west of the Project rail siding, at least 9 m in height above the level of the railway siding track and extending to the north and south of the loading area to form an effective visual planted bund from receptors to the west;
  - Along the western side of the Cullen Valley Mine area infrastructure, at least 6 m in height above the main haul road;
  - Along the western side of the southern half of the haul road from the ETCPP to the ICPP at a height of 5 m where it may be exposed to views;

  - Along both the eastern and western sides of the Castlereagh Highway at the edges of the Project Disturbance Boundary in closest proximity to receivers;
  - Commencing south of the Cullen Bullen General Cemetery and oriented parallel to the Castlereagh Highway, for further shielding of views to open cut mining areas;
  - On the western side of all OEAs to be established in the south south-east of the Invincible Colliery mining areas where active operations may be visible; and
  - Along the northern extent of the OEAs in the East Tyldesley and eastern Cullen Valley mining areas, at a height of approximately 6 m;
- Ensure progressive rehabilitation is undertaken to reduce impacts to sensitive receptors;
- Establishment of visual and ecological forest planting patterns in rehabilitation areas to achieve landscape patterns that emulate existing forest colour and texture continuums in the surrounding environment of the Ben Bullen State Forest;
- Infrastructure for the ETCPP area and MPPS conveyor to be clad in natural tones (i.e. olive green, grey, etc) to blend with the surrounding forest environment as far as possible;
- A simple bridge design for the Castlereagh Highway and Wallerawang – Gwabegar Railway line overpasses to maintain visual clarity in the setting of the overpass;
- Establishing significant forest plantings to the adjoining approach roads to the bridge, providing screening to truck movement and lights; and
- Where possible and consistent with health and safety requirements, ensure lights are hooded or directed away from sensitive receptors to avoid direct light spillage from the ETCPP site.

Offsite Treatments

Offsite treatments will be implemented to mitigate visual impacts of the Project at specific external locations, and would include:

- Preparation and early implementation of a specific Landscape Management Plan for the Cullen Bullen General Cemetery in consultation with LCC and to the approval of DP&I which implements a plan for the establishment of additional plantings of suitable cultural vegetation within the vicinity of the cemetery as soon as possible following approval;
- Preparation and implementation of a consolidated Rehabilitation and Landscape Management Plan for the Project. This plan will be prepared to consider specific impact mitigation strategies for sensitive viewing locations, including:
  - Completing a site inspection at neighbouring residences upon request and where required, preparing reasonable landscape strategies for specific private receptors that will experience prolonged high levels of visual impact from the Project; and
  - Implementing landscape plantings to achieve visual screening of residences with a high visual impact in accordance with plans prepared and as agreed in consultation with the landholder.

8.9 SURFACE WATER

8.9.1 Background

A surface water impact assessment has been undertaken for the Project by WRM Water & Environment Pty Ltd (WRM) and is included in full in **Appendix N**.

The assessment included a review of the existing catchments, the layout of the proposed Water Management System, consideration of the proposed infrastructure and an overall water balance for the various years of the Project. A summary of this assessment is provided in the following sections.

Catchment Description

The Project is located on the western foothills of the Great Dividing Range and is located wholly within the upper catchment area of the Turon River which is part of the Central West CMA. The Turon River flows in a general westerly direction before draining into the Macquarie River approximately 35 km north-east of Orange.

The majority of the Project Boundary is drained by a number of minor unnamed tributaries which flow into either Cullen Creek, Dulhuntys Creek or Jews Creek which are located adjacent to the Project Boundary (see **Figure 7**). Jews Creek drains along the northern part of the Project Boundary and collects runoff from the Ben Bullen Creek that drains the catchment from the existing Baal Bone Colliery. Cullen Creek drains along the southern part of the Project Boundary and includes runoff from tributaries within the existing Invincible Colliery. Cullen Creek drains into Dulhuntys Creek, which in turn drains into Williwa Creek, which joins Jews Creek to form the Turon River. The southern extent of the Project Boundary for the MPPS conveyor corridor drains south to Wangcol Creek, which is a tributary of Coxs River.

Existing Water Management System

The surface Water Management Systems within the Project Boundary for existing operations are designed to ensure that the following objectives are met:

- To ensure all current legislative requirements with respect to water management within the Project Boundary are met; including approval and EPL conditions;
- To maintain the segregation of clean and dirty water, and install and maintain appropriate pollution control measures to comply with water quality criteria; and
- Implement leading practice water management procedures to ensure that any environmental impacts related to surface water and groundwater are minimised.

Water management at Cullen Valley Mine and Invincible Colliery is centred on the separation of clean and dirty water. Wherever possible, clean water runoff is diverted around the sites to avoid contamination and reduce the load on the dirty Water Management Systems.

A description of the existing Water Management System at the Cullen Valley Mine and Invincible Colliery is provided in the following sections.

Invincible Colliery

The surface Water Management System at the Invincible Colliery is managed generally in accordance with the existing *'Water Management Plan'* (Coalpac 2009b), and is designed to avoid the discharge of dirty water from the site. Surface water runoff at the Invincible Colliery is primarily managed via a number of sediment dams along with in-pit and roadside sumps, one mine water storage dam (Main Colliery Dam) and a tailings water storage dam (Environmental Dam). There are also three active and four inactive fine reject dams located onsite.

Due to the permeable nature of the underlying geology and proximity to abandoned underground workings, the majority of surface water runoff collected in pit sumps, fine reject dams and coal stockpile areas seeps into the abandoned underground workings shortly after a runoff event occurs (AGE 2011).

A number of sumps are located across the site where dirty water from mining activities is collected for use as dust suppression or seeps into the abandoned underground workings. Runoff from rehabilitated areas is collected in a series of sediment ponds and is retained for reuse in the Site Water Management System.

Dirty water runoff from the mine infrastructure area and from upstream undisturbed catchments drains by gravity to the Main Colliery Dam.

Water stored in the Main Colliery Dam is used to supply processing water for the ICPP and also for use in dust suppression. The Environmental Dam is located on the western side of the haul road downstream of the fine rejects storage dams and coal stockpile area and collects seepage from the fine rejects storage dams and runoff from a minor undisturbed catchment. Water stored in the Environmental Dam is pumped to the Main Colliery Dam for use in the Water Management System. The Invincible Colliery Water Management System has a capacity of approximately 185 Mega Litres (ML). The Invincible Colliery surface Water Management System operates under EPL 1095, which regulates the licensed discharge points, provides discharge water quality criteria and surface water monitoring requirements for the site. The spillway of the Main Colliery Dam is listed as a licensed discharge point for the Invincible Colliery (LD002).

A second licensed discharge point (LD001) exists in the Ben Bullen State Forest at Long Swamp Gully (a tributary of Coxs River). Water has not been released at this location since June 2008. There is a discharge volume limit of 2,000 kL/day at LD001, however the LD002 (Main Colliery Dam) is a wet weather discharge point, and does not have a volume limit. The location of both Invincible Colliery LD001 and LD002 is presented on **Figure 5**.

Cullen Valley Mine

Surface water management at the Cullen Valley Mine is undertaken in accordance with the existing Water Management Plan. The Cullen Valley Mine surface Water Management System operates under EPL 10341, which provides licensed discharge points, discharge water quality criteria and surface water monitoring requirements for the site. The spillways of Main Dam (LD001) and Dam 4 (LD004) are licensed discharge points for the site. Both LD001 and LD004 are wet weather discharge points and do not have discharge volume limits.

Similar to the measures in place for the Invincible Colliery, a number of sumps are located across the site where dirty water from mining activities is collected for use as dust suppression.

Water collected in the open cut pit sumps is periodically pumped to Dam 4 for reuse. Runoff from rehabilitated infrastructure areas, coal stockpile areas and shaped spoil dumps at the northern end of the Project Boundary is collected in a series of contour banks and drained to Dam 4 for reuse in the Water Management System. Runoff from rehabilitated areas and undisturbed catchments above the rehabilitation is diverted into Dam 4 to be treated for sediment prior to reuse in the Water Management System.

The existing Water Management System at the Cullen Valley Mine is designed so that water can be transferred between all of the dams within the site. Overflows from upstream catchment dams onsite drain to the Main Dam.

The Cullen Valley Mine Water Management System has a capacity of approximately 80 ML. During dry years, shortfalls in dust suppression water are made up using water obtained from a bore connected to the flooded Tyldesley Colliery underground workings which underlie the site, in accordance with groundwater bore licence 80BL244942.

Existing Water Quality

Invincible Colliery

Coalpac has an extensive surface Water Monitoring Program that has been in place since 2001. Water quality is monitored at Main Colliery Dam (LD002), the Environmental Dam and Statistical Division (SD) C3-5 on a monthly basis, and tested for oils and grease, pH and Total Suspended Solids (TSS). Water quality samples were also taken from LD001 until May 2008, when mine water discharges ceased at this location. Results from the existing water monitoring results indicate that water quality is generally within the relevant criteria, however is variable across the site. TSS results indicated some elevated results and pH in the Environmental Dam is often relatively low due to acid seepage from the fine rejects storage dams.

No exceedances of water quality criteria have occurred during discharge from either LD001 or LD002.

Cullen Valley Mine

Water quality samples from the Main Dam (LD001) and Dam 4 (LD004) are taken on a monthly basis, and tested for oils and grease, pH and TSS. Results indicate that water quality in the storages at the Cullen Valley Mine is generally within the discharge water quality criteria. However periods of high TSS have occurred following runoff events or transferral of water between storages, as occurred with the Main Dam (LD001). Periods of low pH have typically been recorded following extended dry periods and increased retention times in the storages. Low pH levels have also been experienced during runoff events from the Environment Dam.

A full analysis of baseline water quality data from Coalpac surface Water Monitoring Program is included in **Appendix N**.

Regional Surface Water Quality

As no Coalpac surface water quality data was available for the watercourses which drain the Project Site (Cullen Creek, Dulhunty's Creek and Jews Creek), data for Wangcol Creek was obtained from the Pine Dale Mine as this catchment is characterised by similar topography, geology, and land use to those in the Project Boundary.

It is considered that the water quality data collected for Wangcol Creek is representative of water quality data in Cullen and Dulhunty's creeks. A background water quality monitoring program to gather data from those watercourses that drain the Project Boundary was also initiated in October 2011 at the three locations shown on **Figure 5**.

Proposed Water Management Infrastructure

The main components of water management infrastructure required for the Project include:

- Existing sediment and water management dams at Cullen Valley Mine and Invincible Colliery;
- Sediment dams to collect and treat runoff from Project OEAs and rehabilitation areas (see **Figure 10** to **Figure 13**);
- Dirty water drains to divert sediment-laden runoff from overburden emplacements, infrastructure areas and rehabilitation areas to sediment dams;
- Pumping infrastructure to enable water to be transferred between storages within the Project Boundary;
- Clean water drains to divert runoff from undisturbed catchments around areas disturbed by mining; and
- Sumps to store dirty water from active mining areas.

8.9.2 Modelling Methodology

Site Water Balance

An Australian Water Balance Model (AWBM) (Boughton 2003) rainfall runoff model was developed to determine runoff volumes from pit, stockpile, rehabilitation and natural undisturbed catchment areas for the Project.

The GoldSim software (developed by GoldSim Technology Group) was used to simulate the water balance of the mine on a daily basis over the life of the Project. The model was configured to represent the inflows to and outflows from the mine Water Management System (as shown in **Figure 38**) and transfers of water between the various mine site storages.

The model was run over a 121 year (from 1 January 1889 to 1 January 2011) period of daily rainfall data obtained from the BoM SILO Data Drill (Jeffrey *et al* 2001). The use of such a long period of continuous data provides a good indication of the behaviour of the system over extended dry and wet periods.

To assess the performance of the Water Management System throughout the life of the mine, water balance modelling was undertaken for five modelled stages Year 0 (existing conditions), Year 2, Year 8, Year 14 and Year 20 using the 121 year daily SILO Data Drill climate data set.

The water balance model was configured to represent the changing characteristics of the conceptual Water Management System over the 20 year modelled mine life, including the addition of new storages and changes in contributing catchment areas and catchment types. In addition, the inflows to and outflows from the mine Water Management System shown in **Table 32** were also considered, as transfers of water between mine site storages. **Figure 38** also provides a conceptualisation of the water balance model and outlines the storage details adopted.

Key water balance modelling assumptions included:

- Runoff that reports to open cut pits or storages that are located above the Invincible Colliery and Old Invincible Colliery underground workings will infiltrate to the workings and is lost to the water management system. This assumption is based on observations made by Coalpac under existing operations. It should be noted that all Invincible Colliery open cut mining operations are located above abandoned underground workings;
- There is 100% reliability for make-up water supply from the Invincible Colliery and Old Invincible Colliery undergrounds;
- On site pumps for transfer of water between open cut pit sumps and mine water storages have a capacity of 7 ML/day (approximately 80 L/s); and
- Groundwater seepage into pits and mine site storages is negligible (AGE 2011).

Table 32 Simulated Inflows and Outflows to Mine Water Management System

Inflows	Outflows
Direct rainfall on water surface of storages	Evaporation from water surface of storages
Direct rainfall into pits and active mining areas	CHPP demands
Make-up water supply from underground workings	Dust suppression demands
Catchment runoff from natural and disturbed catchments entering storages	Sand quarrying demands
Catchment runoff from natural and disturbed catchments entering pits and active mining areas	Pumped transfers to Old Tyldesley underground
Groundwater seepage into open cut pits and storages is likely to be negligible	Runoff entering Invincible and Old Invincible Colliery underground workings
	Off site spills from storages

Separate AWBM model parameters were developed for the following catchment types:

- Natural (undisturbed catchments and fully rehabilitated spoil);
- Moderately Disturbed (unestablished rehabilitation);
- Disturbed / Compacted areas (haul roads, overburden emplacements, pit floor and mine infrastructure areas); and
- Potentially Contaminated areas (small areas that may potentially contain chemicals of various types used in Project operations).

A summary of estimated water demands for the Project is discussed further below, with further detail of modelling assumptions and calibration included in **Appendix N**.

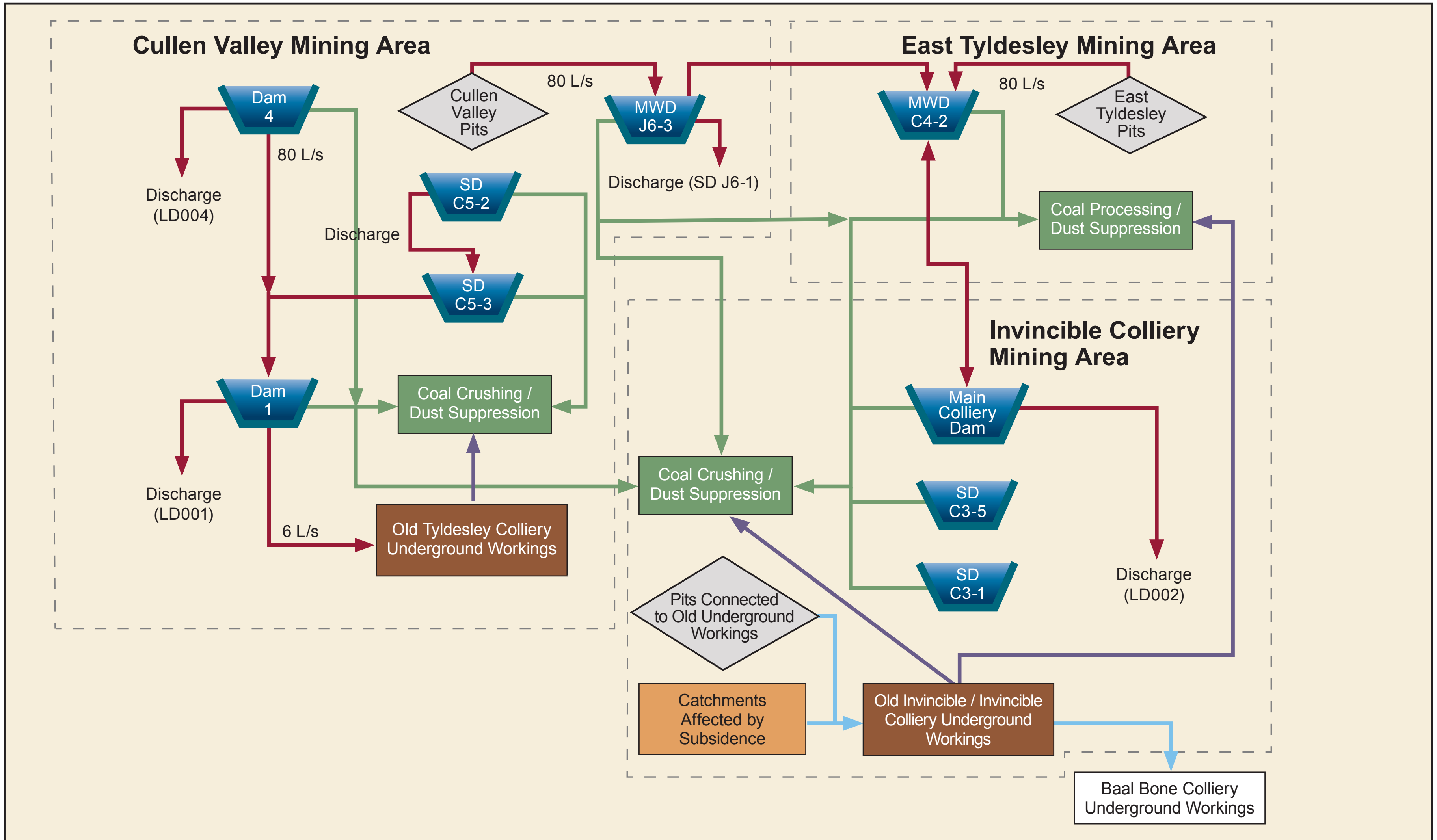
8.9.3 Impact Assessment

The potential impacts of the Project on the local and regional surface water resources include:

- Potential shortfalls in meeting Project water requirements, affecting water available for dust suppression;
- Adverse impacts on the quality of surface runoff draining from the Project Boundary to surrounding lands, including the catchments of Cullen Creek, Dulhuntys Creek and Jews Creek;
- Potential subsidence impacts and loss of catchment area during highwall mining activities;
- Adverse impacts on downstream water quality associated with possible overflows from the mine water dams affected by runoff from disturbed catchments;
- Loss of catchment area draining to Cullen Creek, Dulhuntys Creek and Jews Creek due to the capture of runoff within Project water storages or open cut pit areas. This could potentially reduce runoff volumes to the above watercourses; and
- Potential flooding impacts from minor tributaries and watercourses draining the Project.

Simulated Water Balance

Table 33 provides a breakdown of the modelled process water demands for each stage of mining. The maximum annual process water demand during the life of the Project, including water for coal processing and dust suppression, is approximately 926 ML per year. A detailed description of water requirements for each component of the Project is provided in **Appendix N**.



Mine Site Storage
Open Cut Pit
Demand
Abandoned Underground Workings
Subsidence Affected Catchment

Seepage / Sinkholes Flows
Pumped Flows
Reuse Flows
Reuse Flows from Underground Bores

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Conceptual Water Balance Model Configuration

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Table 33 Predicted Water Demand

Detail	Mine Site Water Demands				
	Existing	Year 2	Year 8	Year 14	Year 20
Coal Processing Demand (ML/Year)					
Cullen Valley / Hillcroft	5	5	0	0	0
Invincible	144	242	55	55	55
East Tyldesley	0	242	491	491	491
Sand Quarrying Demand (ML/Year)					
Cullen Valley Sand Operation	0	50	50	50	0
Dust Suppression Demand (ML/Year)					
Cullen Valley / Hillcroft	100	100	100	100	100
Invincible	130	130	130	130	130
East Tyldesley	0	100	100	100	100
Total Process Water Demand (ML/Year)	**379**	**869**	**926**	**926**	**876**

Catchment Changes

Alteration to the natural drainage system will occur within the Project Boundary as the mine Water Management System will capture runoff which would have previously flowed to Cullen, Dulhuntys and Jews Creeks. The captured catchment area will change during the life of the Project as open cut mining progresses over time.

Table 34 shows the catchment area captured within the mine Water Management System for various modelled stages of the Project. The maximum catchment area draining to the mine Water Management System is approximately 851 ha during existing operations (Year 0), which represents about 13% of the catchment area of Dulhuntys Creek upstream of the Turon River. The captured catchment area in Cullen and Dulhuntys creeks reduces substantially by Year 2. Jews Creek catchment area to Turon River is not reduced in Year 0, and a maximum of 165 ha, or 2.5% of the Jews Creek catchment would be captured during Year 8 of mining operations for the Project. The loss of total catchment from the Turon River, which has a total catchment area of some 6,500 km^2, is negligible.

Water balance modelling undertaken for the Project assumes that water would be pumped out of open cut pit sumps and into a mine water dam as soon as the receiving dam has any capacity. By managing pumped inflows to mine water dams from open cut areas, the volume of spills could be reduced. Although this is also likely to affect the ability of the mine water dams to supply process water demands for the Project.

Based on available water quality data and the proportion of undisturbed catchment area draining to each mine water storage, it is expected that water stored in the mine water dams for the Project would generally meet water quality criteria for release.

Table 34 Catchment Area within Mine Water Management System

Project Year	Captured Catchment Area (ha)			Proportion of Total Creek Catchment
	Open Cut Pit	Mine Water Dams	Total	
Cullen Creek				
0	407	277	**684**	39.7%
2	137	219	**356**	20.7%
8	43	351	**394**	22.9%
14	69	351	**420**	24.4%
20	0	351	**351**	20.4%
Dulhuntys Creek (includes Cullen Creek)				
0	459	392	**851**	12.9%
2	144	247	**391**	5.9%
8	43	443	**486**	7.4%
14	69	443	**512**	7.8%
20	0	443	**443**	6.7%
Jews Creek				
0	0	0	**0**	0.0%
2	44	17	**61**	0.8%
8	81	17	**98**	1.3%
14	103	17	**120**	1.7%
20	105	17	**122**	1.7%

The two new mine water dams proposed for the Project have been sized to prevent spills occurring, except during severe extended wet periods. The only spills predicted to occur from these storages occur in Year 2 (from MWD J6-3). These infrequent spill events are predicted to have both a low probability of occurrence (one spill per 40 - 120 years) and volume.

Although no discharges are predicted to occur from MWD C4-2, an additional licensed discharge point may be required downstream of this storage at the Project Boundary due to the potential for overflows from this storage.

These infrequent spills are expected to meet water quality criteria given that they only occur during severe storm events when water quality in mine storages would be heavily diluted with clean runoff which is generally supported by existing water quality monitoring data collected for existing Coalpac operations.

The modelled inflows and extractions from the abandoned underground workings which underlie the Project Boundary (see **Table 33**) indicate that inflows to the underground workings are likely to exceed extractions for all Project years. Extraction of water stored in the underground is likely to increase substantially between Year 0 and Year 8 as the mine process water demands increase, before decreasing again once the ETCPP and associated mine water dam become operational, and the volume of runoff capture from disturbed catchments increases.

By Year 20 of the Project, extraction from the abandoned underground workings will be equal to approximately 55% of inflows from Invincible Colliery area pits and surface water flows from existing subsidence areas. As the Invincible Colliery mining area is progressively rehabilitated, flows to the underground will decline as subsidence affected areas are rehabilitated and open cut mining is completed.

The first source of water to be used to satisfy process water demands will, however, be from that stored in the licenced discharge dams (Invincible Main Colliery Dam, Cullen Valley Main Dam, Cullen Valley Dam 4 and proposed MWD C4-2 and MWD J6-2). These dams are likely to contain the poorest quality water, as they receive runoff from coal stockpiles and processing areas, as well as pumped flows from open cut pit sumps. Water collected in sediment dams may also be used for dust suppression. By maximising the recycling of water on the site, the requirements for make-up water from external sources will be minimised.

Water demand that cannot be supplied by utilising recycled water from Project surface water storages will be sourced from the abandoned Invincible Colliery and Old Invincible Colliery underground workings via a new bore and pump.

Limited make-up water will be extracted from the existing flooded Tyldesley Colliery underground workings via the existing bore and pump. The estimated volume of water stored in the flooded underground workings exceeds 6,000 ML (AGE 2011) of which approximately: 706 ML is held in the flooded Tyldesley Colliery underground workings; 4,790 ML in the flooded Invincible Colliery underground; and 747 ML of water is stored in the Old Invincible Colliery underground workings.

Water Quality

Land disturbance associated with mining operations has the potential to adversely affect the quality of surface runoff in downstream receiving waters through increased sediment loads. In addition, runoff from active mining areas, infrastructure areas and coal processing areas (pits, roads and coal stockpiles) may have increased concentrations of salts and other pollutants compared to natural runoff. The surface water generated from catchments within the Project Boundary is categorised into four types, based on water quality:

- Clean – surface runoff from areas where water quality is unaffected by mining operations, including runoff from undisturbed areas and any areas where rehabilitation has been established;
- Dirty – surface runoff water from areas that are disturbed by mining operations (including spoil dumps, undeveloped rehabilitation areas and haul roads);
- Mine water – surface water that has come in contact with coal material such as in the pit, from the ROM coal stockpiles or infrastructure and coal processing areas; and
- Contaminated – surface water from areas potentially containing chemicals of various types used in the mining operations.

Based on water quality monitoring records undertaken at the Cullen Valley Mine and Invincible Colliery, water runoff from areas disturbed by mining is generally of suitable quality for release. As such, the ongoing treatment of runoff from undeveloped rehabilitation and spoil dumps via appropriately designed sediment ponds is considered suitable for the Project.

Water quality monitoring data also suggests that water quality in the existing Invincible Colliery Main Colliery Dam and the licensed discharge dams at Cullen Valley Mine (Main Dam and Dam 4) is typically suitable for release and it is expected that any future releases from these storages, as well as the proposed MWD C4-2, would generally meet water quality criteria for release from the Project Boundary.

The need for releases from these storages would be limited by transferring water into the Tyldesley Colliery underground workings, and reusing as much water from these storages as possible to satisfy process water demands.

The catchment areas draining to the Invincible Colliery Main Colliery Dam and the Cullen Valley Mine licensed discharge dams will be progressively rehabilitated during Project mining operations and the amount of coal handling and processing undertaken in these catchments will decrease when the ETCPP becomes operational. As such, it would be expected that the quality of water in these storages is likely to improve over time once the rehabilitation becomes established and that future discharges from these storages would not exceed discharge water quality criteria.

Water balance modelling has been undertaken to demonstrate that the operation of the mine Water Management System will ensure that uncontrolled releases of mine water are avoided. Hence, the Project will not adversely affect surface water quality in downstream receiving waters.

Highwall Mining

Highwall mining activities will be carried out from benches within the open cut mining areas proposed for the Project which has the potential to result in subsidence impacts and loss of catchment impacts on drainage in upstream undisturbed areas if not managed appropriately. An assessment of highwall mining stability and subsidence associated with the Project was prepared by Geonet Consulting Group (Geonet 2011), that indicates that potential subsidence from highwall mining activities will be insignificant (less than 20 mm). It can therefore be assumed drainage in undisturbed catchments upstream of highwall mining areas will not be impacted (see **Section 8.1**).

Runoff draining towards the highwall mining areas from such catchments will be diverted around and away from active mining and disturbed areas. If this is not possible, runoff from upstream areas within the open cut pits will be diverted around highwall working areas and collected in sumps for reuse.

Final Landform

The proposed final landform for the Project is discussed in **Section 8.24**. All rehabilitated areas in the Project final landform would drain to the sediment dam locations as shown on **Figure 14**. All sediment dams and drainage structures within the final landform would be regularly reviewed and maintained as required until rehabilitation is fully established to the satisfaction of the relevant regulators and sediment transport loads reduced.

Flooding

The flood assessment undertaken determined that the flooding of the minor tributaries and creek lines draining the Project Boundary is not considered to be of concern to the Project due to the local topography and landscape characteristics.

8.9.4 Mitigation and Management

Coalpac will mitigate the potential impacts of the Project on surface water resources through the implementation of the development of the following:

- Site Water Management System to control the flow and storage of water of varying qualities across the site;
- Erosion and Sediment Control Plan to manage and reduce potential sediment loads from disturbed areas; and
- Surface Water Monitoring Program to ensure that the Site Water Management System is meeting its objectives of no adverse impacts on receiving waters.

An overview of the proposed mitigation and management measures are provided in the following sections.

Water Management System

A key objective of the integrated mine Water Management System for the Project will be to minimise the risk of any uncontrolled discharges from mine site storages.

To achieve this objective, operation of the Project Water Management System will continue to be based on the following principles:

- Diversion of clean surface water runoff away from any areas disturbed by mining activities, where possible;
- Collection of dirty water runoff in sediment dams for the control of suspended sediment prior to discharge from the Project Boundary or reuse in the mine Water Management System. All sediment dams and water management systems will be designed in accordance with relevant standards (Landcom 2004). The water quality of runoff will be regularly tested to ensure that it meets relevant standards prior to release from the site. If the quality of runoff from disturbed areas is not suitable for release, this water will be pumped into the mine water management system;
- Transfer of mine water (groundwater inflows and surface runoff) from within the open cut mining areas to the mine water storage dams for reuse as process water supply;
- Collection of any contaminated water from infrastructure areas for treatment in an oil and grease separator prior to recycling in the mine Water Management System;

- Minimisation of water usage by recycling water from the mine Water Management System before taking additional water from the abandoned underground workings of Tyldesley Colliery or Old Invincible Colliery;
- No runoff from disturbed areas will be allowed to flow from the Project Boundary without treatment via a sediment dam; it will otherwise be collected and reused on site; and
- Release of runoff from rehabilitated catchments once rehabilitation is fully established to the satisfaction of DTIRIS – MR.

Strategies to avoid discharges from the two new mine water dams proposed for the Project (MWD J6-3 and MWD C4-2) include the following:

- Ceasing to pump mine water from active mining areas and open cut pits into MWD J6-3 when the volume of water stored in MWD J6-3 exceeds 35 ML (total proposed dam volume is 75 ML);
- Ceasing to pump mine water from active mining areas and open cut pits into MWD C4-2 when the volume of water stored in MWD J6-3 exceeds 130 ML (total proposed dam volume is 250 ML);
- Excess mine water will be stored in open cut sumps until capacity is available in MWD J6-3 and MWD C4-2 for transfer. The transfer limit volume for each storage outlined above were adopted based on the water balance modelling for the Project, which identified the amount of freeboard required to prevent discharge from these storages, based on 121 years of climate data; and
- In emergency situations, water may be pumped from MWD J6-3 to Cullen Valley Mine Dam 4 (LD004) and from MWD C4-2 to the Invincible Colliery Main Dam (LD002) for discharge, provided it meets the appropriate EPL water quality limits.

Strategies for minimising the potential for releases of water from existing discharge points will also include:

- Increasing the capacity of the existing bore and pump connecting the Cullen Valley Mine Main Dam to the flooded Tyldesley Colliery. This may reduce future releases from Cullen Valley Mine licensed discharge points LD001 and LD004;
- Obtaining approval and installing pumping equipment to allow the transfer of water from the Invincible Colliery Main Colliery Dam into the flooded Invincible Colliery and Old Invincible Colliery workings; and
- Constructing a second storage upstream of the Invincible Colliery Main Dam following the completion of active open cut mining in this area between Years 2 and 8 of the Project. The open cut pit area immediately upstream of the Invincible Colliery infrastructure area will be retained and used as buffer storage, with captured runoff from the upstream rehabilitation areas seeping into the abandoned underground workings.

The proposed final water storages of the Site Water Management System are conceptually illustrated in **Figure 50**, with the water management infrastructure for each of the four modelled years detailed in **Appendix N**.

Through the development and management of a consolidated Water Management System for the Project, discharges of surface water from the Project Boundary are predicted to occur only in the following ways:

- As clean runoff, occurring from areas within the Project Boundary that are undisturbed by mining activities;
- Overflows from sediment dams. Sediment dams will be designed in accordance with Landcom (2004) and will spill regularly. Spills from appropriately designed sediment dams are considered to be clean runoff; and
- Discharge of mine water from the existing licensed discharge points at Invincible Colliery and Cullen Valley Mine. Mine water storages will be managed to limit the discharge of mine water from the Project Boundary. No additional licensed discharge points are proposed as part of the Project. The two new proposed mine water dams, MWD C4-2 and MWD J6-2 will be designed as 'zero-release' storages, and hence will not require additional licensed discharge points.

Erosion and Sediment Control

Coalpac will develop an Erosion and Sediment Control Plan for the Project to the approval of DP&I that will be based on existing management measures and the principle of ensuring that runoff from disturbed areas is separated from clean area runoff and collected in sediment dams for treatment.

Design of the erosion and sediment control measures will be based on the recommended design standards in *'Managing Urban Stormwater, Soils and Construction'* (Landcom 2004) and *'Managing Urban Stormwater, Soils and Construction, Volume 2E Mines and Quarries'* (DECC 2008a).

A number of sediment and erosion control measures are proposed within the Project Boundary, including sediment dams, dirty water drains and clean water diversions for each stage of mining. The size of the proposed sediment control structures assessed for the Project is outlined in **Table 35** and shown conceptually above in **Figure 38**.

Table 35 Indicative Water Storages for Modelling

Storage	Capacity (ML)	Maximum Surface Area (ha)
Main Colliery Dam	115	3.4
SD C3-1	10	0.5
SD C3-5	60	3.0
SD C5-2	5	0.2
SD C5-3	30	0.5
CV Main Dam	7	0.4
CV Dam 4	38	0.5
MWD C4-2	250	3.0
MWD J6-3	75	1.5

The ultimate sizing of these structures will be determined during the detailed design and will be undertaken in accordance with Landcom (2004).

Where TSS concentration in sediment dams after a runoff event is less than the selected water quality objective, sediment dams may be dewatered to receiving waters outside the Project Boundary. Should TSS exceed the required water quality objective, the following management measures may be implemented in water storages should discharge of this water be required:

- Pumped to another Project water storage with available capacity;
- Flocculated to reduce TSS to less than the water quality objective; or
- Pumped into the mine Water Management System.

Surface Water Monitoring

Coalpac will develop a Surface Water Monitoring Program for the Project to the approval of DP&I which shall include monitoring at sites upstream, onsite and downstream of mining operations and within sediment dams and mine water storages. Monitoring of surface water quality both immediately adjacent and within the Project Boundary will form a key component of the Surface Water Management System. The monitoring regime will be developed in consultation with OEH and undertaken in accordance with the *'Approved Method for Sampling and Analysis of Water Pollutants in NSW'* (DEC 2004) and relevant licence conditions for parameters including pH, Electrical Conductivity (EC), TSS, Total Dissolved Solids (TDS) turbidity, major anions, major cations, alkalinity and metals.

Figure 25 shows proposed surface water monitoring locations and the currently approved licensed discharge points to be retained for the Project. Under the proposed Surface Water Monitoring Program, it should also be noted that:

- Water quality will be monitored at locations where releases from proposed sediment dams may drain across the Project Boundary in order to identify locations where further sediment control measures may be required. Monitoring at these locations will only be undertaken during runoff events (>20 mm rainfall in 24 hours), as most of these drainage lines are ephemeral and only flow in the period immediately following a rainfall event;
- Monitoring of discharge points in sediment dam catchments will only be required once the catchment has been disturbed by Project operations;
- Sediment dam catchments that do not contain any disturbed areas (i.e. all completed rehabilitation areas within the catchment have been signed off by relevant regulators against the agreed rehabilitation criteria) will not require water quality monitoring;
- The water quality monitoring program for Cullen Creek and Dulhuntys Creek established in October 2011 will be continued to gather background data on downstream water quality and allow the impact of any releases from existing licensed discharge points to be quantified;
- Water quality monitoring will continue on a monthly basis (and during release events) for the existing licensed discharge points (LD001, LD002 and LD004) and Invincible Environmental Dam; and
- Water quality will also be monitored in the two new proposed mine water dams (MWD J6-2 and MWD C4-2) on a monthly basis. These dams will be operated such that no releases occur during the life of the Project.

8.10 GROUNDWATER

8.10.1 Background

A groundwater impact assessment was undertaken for the Project by Australasian Groundwater and Environmental Consultants (AGE), with a full copy of this report provided in **Appendix O**. The objective of the study was to assess the impact of the Project on the groundwater regime and water users and to quantify predicted inflows into the mining area throughout the life of the Project.

In order to adequately assess the potential impacts of the Project on the regional 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 Project Boundary is provided in the following sections.

Previous Groundwater Investigations

A literature review of existing groundwater assessments and other available information was conducted in order to obtain an understanding of the groundwater system in the vicinity of the Project Boundary.

The literature review included EAs compiled for the Invincible Colliery (RW Corkery 2008) and Cullen Valley Mine, and a number of publicly available documents such as AEMRs and EAs for Coalpac and those surrounding mining operations.

This review included the consideration of a number of other recent groundwater investigations have been prepared for neighbouring mining operations and were utilised to understand details about the groundwater regime in the vicinity of the Project Boundary. This included the *'Baal Bone Colliery Longwalls 29 to 31 SMP Hydrogeological Assessment'* (Connell Wagner 2006), *'Pine Dale Mine Extension Groundwater Assessment'* (Aquaterra 2010) and *'Assessment of Hydrogeological Impacts – Angus Place Project Modification'* (Aurecon Australia 2010).

Existing groundwater monitoring locations in the vicinity of the Project Boundary are shown on **Figure 5**.

Existing Groundwater System

The regional groundwater system within the vicinity of the Project Boundary broadly consists of four aquifer systems:

- Quaternary alluvium (alluvial aquifer);
- Triassic overburden sediments (sandstone) of the Narrabeen Group which contain perched aquifers above low permeability layers;
- Coal Seams within the Permian Illawarra Coal Measures that are separated by Permian interburden sediments which act as aquitards (e.g. claystone, mudstone, siltstone and sandstone bands present between the coal seams); and
- The underlying Marrangaroo Formation.

Every groundwater assessment requires a conceptual model to be developed to gain an understanding of how the existing groundwater system operates and is an idealised and simplified representation of the natural system.

The conceptual groundwater model of the Project was developed based on geological and topographical maps of the area, geological information supplied by Coalpac, from Hydrogeological data sourced from the Project site, and from the results obtained from the previous studies in the local area described above.

The local groundwater regime can be considered as an independent system, encompassing the area primarily associated with the localised Illawarra Coal Measures. Alluvial deposits within this area are present along Coxs River and Neubecks Creek; however, these deposits are limited in extent and thickness. Furthermore, investigation of the alluvial groundwater systems was not considered necessary owing to their distance from the Project Boundary (approximately 2 km and 3.5 km outside the Project Boundary, respectively), their isolated nature and minimal thickness.

Previous hydrogeological assessments undertaken by Aquaterra (2009) and Aurecon Australia (2010) concluded that mining operations located within the immediate vicinity of each of the two alluvial areas identified would not result in adverse groundwater impacts, and therefore these aquifers are not considered further in this assessment.

The Triassic Narrabeen Group (previously identified to contain groundwater in areas adjacent to the Project Boundary) is present; however this is limited in extent within the Project Boundary as these units have been largely removed from the stratigraphic profile by historical erosion.

The Triassic overburden sediment aquifer is associated with the Narrabeen Group and is the dominant geological unit that outcrops within the Western Coal Fields. However within the Project Boundary, it occurs predominantly as ridge tops. The Narrabeen Group contains multiple layered water-bearing zones contained within the Banks Wall Sandstone and the Burra-Moko Head Sandstone underlain by fine grained aquicludes. The water-bearing zones of the Banks Wall Sandstone have been intersected in exploration bores drilled at the Baal Bone Colliery to the east of the Project Boundary, however these units are largely absent within the Project Boundary.

The groundwater systems within the Narrabeen Group of sediments are complex, with perched water tables and semi-confined leaky aquifers separated by relatively impermeable claystone layers (Bish 1999).

Underlying the Narrabeen Group are the Permian Illawarra Coal Measures. The coal measures are not considered to be a significant water producing aquifer. Similar to that of the Narrabeen Group, the upper sections of the Illawarra Coal Measures have also been largely removed by historical erosion within the Project Boundary. Hydraulic connectivity between the local creeks and underlying Permian strata is considered limited where siltstone and shales are present and higher if directly in contact with minor coal seams or sandstones.

Occurrence and flow of groundwater within the coal seams are governed by the aperture and the degree of interconnection in the cleat network.

Groundwater flow in the interburden is controlled by the presence of micro faults, joints, fractures and bedding planes which are often locally discontinuous. Zones of low strength porous sandstones can also occur in the underlying Marrangaroo Formation.

Recharge to the groundwater system is from rainfall on areas of outcrop. Although groundwater levels are sustained by recharge, they are controlled by surface topography and aquifer permeability. Groundwater mounds are most likely to be present beneath the ridge areas, with a hydraulic gradient towards the lower lying areas located to the north-east. Groundwater flow is from these elevated areas with discharge occurring (pre-mining) at the Wolgan Valley escarpment located approximately 4.5 km to the north-east of the Project Boundary.

In places where underground mining has previously occurred, groundwater discharge is expected to be via the mined seam and from the strata above and below at a rate related to the permeability, the hydraulic gradient and the degree (and height) of fracturing above underground workings.

Existing Groundwater Users

In the vicinity of the Project Boundary, there are a number of land uses including agriculture (primarily livestock grazing) and mining.

There are 27 registered bores within 3 km of the Project Boundary, including 10 groundwater monitoring bores, eight bores for mining / industrial activities and nine bores licensed for domestic stock / irrigation which utilise water from the alluvial aquifers. In addition, neighbouring mines (Pine Dale Mine, Ivanhoe North Colliery and Baal Bone Colliery) utilise groundwater for various activities in mining processes such as dust suppression.

Irrigation, stock and domestic bores remove an insignificant amount of water from the Permian coal measure aquifers. Perennial swamps occur where perched groundwater is fed to lower lying areas.

Usage of groundwater from the Permian strata via bores is generally limited, due to poor yields. The yields recorded from domestic / stock / irrigation bores range from less than 1 Litres per second (L/s) to 3 L/s and generally contain low levels of salinity.

8.10.2 Methodology

The key objectives of the groundwater impact study were to:

- Determine the existing groundwater environment with the development of an accurate conceptual model, and to identify any existing users and GDEs;
- Provide an assessment of potential groundwater impacts;
- Interpret data and report on groundwater seepage, drawdown and other impacts on connected groundwater associated with the Permian aquifer;
- Estimate groundwater discharge from the flooded underground workings of the Tyldesley Colliery, Invincible Colliery and Old Invincible Colliery into the adjacent (down hydraulic gradient) Baal Bone Colliery;
- Estimate groundwater inflow rates to the open pit developed during quarrying of the Marrangaroo Formation for the Project;
- Describe any measures that would need to 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.

8.10.3 Impact Assessment

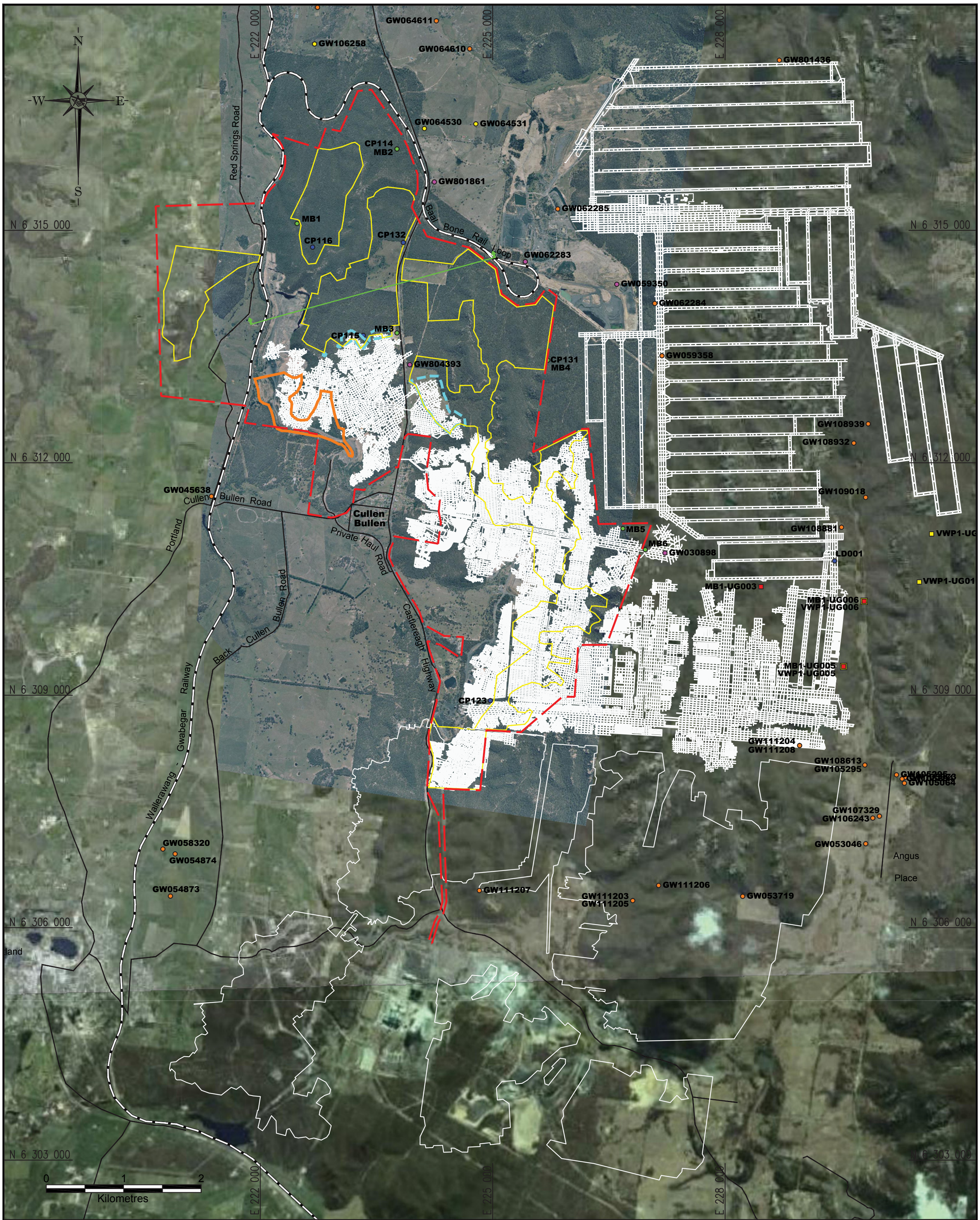
A predictive analytical assessment was undertaken to assess the impact of the Project on the surrounding groundwater regime.

Groundwater Discharge to Adjacent Mines

Under current conditions, a large volume of water is held within the abandoned underground workings of the Tyldesley Colliery, the Old Invincible Colliery and the Invincible Colliery. **Figure 39** presents the location of historical longwall and bord and pillar mining activities within and adjacent to the Project Boundary. The majority of the Tyldesley Colliery and the Invincible Colliery underground workings are saturated. However, the abandoned workings of the Old Invincible Colliery are partially saturated. The total volume of water stored within the flooded workings is estimated at 6,245 ML.

Water stored within the underground workings has the potential to seep through the remaining coal separating the adjoining mine down gradient, this being Baal Bone Colliery (Connell Wagner 2006 and Bish 1999). Groundwater is currently being pumped from both the southern area and northern areas of the Baal Bone Colliery at a rate of about 2.4 ML/day (876 ML/year) and 1.85 ML/day from each area, respectively. Previous studies have suggested that the large proportion of extracted water from the Baal Bone Colliery is sourced from the overlying coal seam aquifers in the upper coal measure strata (Connell Wagner, 2006). However, neither the quantity of water nor the proportion of the contribution derived from seepage from adjacent flooded underground workings has previously been estimated.

It is proposed that Coalpac will continue to utilise the water stored underground within the Invincible Colliery, Old Invincible Colliery and Tyldesley Colliery to augment surface water supplies to meet the water requirements of the Project.



Project Boundary
Project Open Cut Coal Mining
Subsurface Heating Control Area
No Open Cut Mining of the Lithgow Seam
Lithgow Seam Limit of Mining
Baal Bone Longwall Existing Workings
Bord and Pillar Existing Workings
Groundwater Monitoring Location
NOW Registered Bores
Private Bores
Mining Bores
Proposed Water Management Bores
Monitoring Bore Location
Vibrating Wire Piezometers

Hansen Bailey

Coalpac Pty Ltd

Coordinate System: MGA Zone 56
Source: AGE 2011, Coalpac 2010

COALPAC CONSOLIDATION PROJECT

Existing Underground Workings

Cad File: 06985T.dwg | Date: 12.01.12 | Drawn: CP | Figure 39

Anecdotal evidence suggests that the water level within the voids has little temporal variation. This observation is supported by water level records taken from a bore (GW804393) that intercepts the Tyldesley Colliery workings. The water levels within GW804393 have been periodically monitored since 2000 and range from 7.5 m below ground level (mbgl) to 11.5 mbgl.

Groundwater levels have on occasion also been recorded within LD001. This bore intercepts the underground mine workings of the Invincible Colliery. Three water level readings taken in 2011 indicate that the water level within the Invincible Colliery underground void is approximately Reduced Level (RL) 883 m. The water level elevation recorded within LD001 is higher than the water level recorded within the flooded Tyldesley Colliery. The elevated water level within LD001 may represent an area with a higher recharge rate resulting from fracturing above the longwall panels within the adjacent Baal Bone Colliery and to a lesser extent the Invincible Colliery.

Owing to anecdotal evidence and the relatively static water level within GW804393, it is therefore assumed that the water level within the flooded workings has reached steady state equilibrium where water seepage (outflow) is approximately equalled by recharge (inflow). Therefore, the amount of recharge to the mine workings may be back-calculated by estimating the amount of seepage from the workings. The estimated seepage inflows from the flooded workings into the Baal Bone Colliery are summarised in **Table 36**. The data indicates that groundwater seepage rates are sensitive to the width of the coal seam pillar separating the flooded and dry mine workings, and is also sensitive to coal seam hydraulic conductivity.

The total seepage rates into the Baal Bone Colliery appear to be predominantly sourced from the Old Invincible Colliery and the Invincible Colliery underground workings. The seepage rate from the Old Invincible Colliery ranges from about 20 ML/annum to 56 ML/annum (0.05 ML/day to 0.15 ML/day) and the seepage rate from the Invincible Colliery ranges from about 89 ML/annum to 254 ML/annum (0.24 ML/day to 0.69 ML/day). The total combined outflow from the flooded workings into the Baal Bone Colliery is therefore likely to range between 111 ML/annum to 317 ML/annum (0.3 ML/day to 1 ML/day) depending upon the hydraulic conductivity of the coal seam pillar. This range of combined seepage to the Baal Bone Colliery is equivalent to between 13% and 36% of the total water volume pumped from the southern Baal Bone Colliery area and between 7% and 21% of the total water volume pumped from both the southern and northern Baal Bone Colliery, respectively.

Predicted Groundwater Inflows into Open Cut Mining Areas

The rate at which groundwater seeps from the coal face is governed by the permeability of the coal (hydraulic conductivity), as well as the hydraulic gradient. As open cut mining progresses to the east of the Project Boundary and the coal seam is mined out, groundwater seepage to the highwall face is primarily derived from storage within the coal seam. The estimated flow from the Lithgow Coal Seam to the open cut mining areas proposed for the Project was also calculated. When seepage rates from the coal face are relatively low, evaporation can remove the seepage before it collects at the toe of the highwall and as the pit is dry, it is often concluded there is no groundwater seepage occurring.

Table 36 Groundwater Seepage into Baal Bone Colliery from Flooded Workings

Zone	Range	Hydraulic Conductivity (K) (m/day)	Coal Seam Barrier Width (m)	Lithgow Coal Seam Seepage (m^3/day)	Lithgow Coal Seam Seepage (ML/year)
Tyldesley Colliery	Upper limit	0.2	1,800	21	8
	Representative Limit	0.09		9	3
	Lower Limit	0.07		7	3
Old Invincible Colliery	Upper limit	0.2	100 - 330	153	56
	Representative Limit	0.09		69	25
	Lower Limit	0.07		54	20
Invincible Colliery	Upper limit	0.2	50 - 700	695	254
	Representative Limit	0.09		313	114
	Lower Limit	0.07		243	89
Total Combined	**Upper limit**	**0.2**	**-**	**978**	**317**
	Representative Limit	**0.09**		**440**	**143**
	Lower Limit	**0.07**		**342**	**111**

The estimated groundwater seepage range from the Lithgow Coal Seam to the open cut mine pits is summarised in **Table 37**.

These results indicate seepage rates from the Lithgow Seam will be minor and this correlates with current observations from the existing open cut pits at both the Cullen Valley Mine and the Invincible Colliery that have not recorded any significant rate of groundwater seepage to date.

Predicted Groundwater Inflows into Open Pits Near Flooded Workings

The proposed open cut mine plan for the Cullen Valley and East Tyldesley mining areas are located proximal and down-hydraulic-gradient from the flooded underground workings of Tyldesley Colliery. The Project has been designed such that mining of the Lithgow Coal Seam will not intersect the flooded underground workings and a barrier of solid coal of a specified width will be left in place between the flooded underground mine and the open cut pits. The open cut pit will be further developed above the flooded underground workings where the upper coal seams will be targeted.

The potential exists for water stored within flooded underground mine workings to seep through the coal seam barrier separating the flooded underground mine and into the adjacent open cut mining areas proposed for the Project. The width of the coal seam barrier will be managed such that coal seam extraction from Project open cut areas will be maximised, whilst still providing a barrier of sufficient width to retard seepage from the underground workings into the open cut pits.

The width of the coal seam barrier will influence the hydraulic gradient between the saturated underground mine workings and the Project open cut pits such that a wider coal seam barrier will result in a lower hydraulic gradient, which in turn shall result in lower seepage rates.

The assessed inflow of seepage from the flooded underground workings into the Cullen Valley Mine and East Tyldesley open cut areas for the Project for varying barrier widths is summarised in **Table 38**.

Based on the Project mine plans for the proposed Cullen Valley and East Tyldesley mining areas, open cut operations are anticipated to be separated from the flooded Tyldesley Colliery workings by a coal seam barrier of approximately 50 m.

Table 37 Groundwater Seepage into the Open Cut Highwall from the Lithgow Seam

Range	Hydraulic Conductivity (K) (m/day)	Radius of Influence (m)	Gross Groundwater Inflow from Seepage Face / Metre (m^3/day/m)	Evaporation from Seepage Face / Metre (m^3/day/m)	Net Face Seepage / Metre (m^3/day/m)	Net Face Seepage / Metre (ML/year/m)	Net Face Seepage of 1,000 m (ML/year)
Upper limit	0.2	250	0.04	0.013	0.03	0.01	10
Representative Limit	0.09		0.019		0.006	0.002	2
Lower Limit	0.07		0.015		0.002	0.001	1

Table 38 Groundwater Seepage from Flooded Workings

Range	Hydraulic Conductivity (K) (m/day)	Barrier Width (m)	Gross Groundwater Inflow from Exposed Face / Metre (m^3/day/m)	Evaporation from Seepage Face / Metre (m^3/day/m)	Face Seepage / Metre (m^3/day/m)	Face Seepage / Metre (ML/year/m)	Face Seepage of 1,000 m (ML/year)
Upper limit	0.2	25	0.14	0.013	0.13	0.05	42
Representative Limit	0.09		0.06		0.05	0.02	17
Lower Limit	0.07		0.05		0.04	0.01	12
Upper limit	0.2	50	0.07		0.06	0.02	19
Representative Limit	0.09		0.03		0.02	0.01	6
Lower Limit	0.07		0.025		0.01	0.004	4
Upper limit	0.2	75	0.05		0.03	0.01	11
Representative Limit	0.09		0.02		0.01	0.003	3
Lower Limit	0.07		0.016		0.004	0.001	1

The results in **Table 38** indicate that a coal seam barrier of this width would result in a range of seepage from the flooded underground workings from 0.025 m^3/day/m up to about 0.07 m^3/day/m, over a range of coal seam hydraulic conductivity (0.07 m/day to 0.2 m/day).

Evaporation has been modelled at 0.013 m^3/day/m and will reduce the amount of seepage that ultimately accumulates at the open cut pit face. Where the mine plan incorporates a coal seam barrier width of 50 m, the rate at which water will potentially seep into the pit ranges from 0.01 m^3/day/m to 0.06 m^3/day/m.

Groundwater Inflow to Highwall Mining Areas

The Project will involve highwall mining within the areas identified in **Figure 7** and is discussed in detail in **Section 8.1**. No highwall mining of the Lithgow Coal Seam will be undertaken in areas of flooded underground workings. Therefore, highwall mining will not occur within the Invincible Colliery mining area or the East Tyldesley mining area in the Tyldesley Colliery underground workings. At these locations, only the overlying coal seams will be highwall mined. It is anticipated that negligible groundwater inflows will occur into the highwall mining drives within the overlying seams owing to the unsaturated state of the overlying coal seams.

Seepage into Lithgow Coal Seam highwall mining drives is only anticipated to occur within the East Tyldesley highwall mining area where no open cut mining will be undertaken to the east.

An analytical assessment of the highwall mining impacts was undertaken for the following two scenarios:

- The groundwater inflow rate to a single highwall mining drive; and
- The groundwater inflow rate to a series of highwall mining drives that have been simultaneously developed.

The examples below illustrate the short term (single highwall drive) and long term (simultaneous highwall drive development) scenarios.

Analysis of a single highwall drive with a height of 2.5 m, width of 3 m, a length of approximately 300 m and the surrounding coal seam has a hydraulic conductivity of about 0.09 m/day indicates the groundwater inflow is about 6.5 m^3/day. Based on the dimensions described above, a single highwall drive will have a void volume of about 2.25 ML and will fill by groundwater seepage from the coal seam in approximately one year, assuming a constant seepage rate of 6.5 m^3/day.

The rate of groundwater seepage to each highwall drive will be reduced by the progressive development of adjacent highwall drives.

Owing to the progressive nature, each highwall drive length will have only a short period of time (perhaps a few days) to receive groundwater inflow prior to the next drive in the series being developed. Development of the adjacent highwall drive dewaters the aquifer, reducing the seepage rate to the adjacent previous drive.

The groundwater inflow to the highwall drives has been assessed in a single *"snap-shot"*, that is, a worst case hypothetical situation where all highwall drives have been developed simultaneously. In this case, groundwater will seep through the end-face of each highwall mine drive and also through the length of the outermost drives. However, much less seepage will occur through the outermost drive lengths as the Lithgow Coal Seam will be removed by open cut mining in the north and south.

The length of the East Tyldesley highwall mining area that is assumed to receive groundwater seepage has a length of about 1,000 m. Each highwall drive is anticipated to be about 3 m wide and be separated from the next drive by about 3 m. Approximately 167 highwall mining drives are anticipated to be developed within the available area. Based on the described highwall mining layout, the total groundwater inflow for all highwall drives is approximately 12 m^3/day (assuming a hydraulic conductivity of about 0.09 m/day).

Assuming a total of 167 highwall mine drives, this series will have a void volume of about 375 ML. The total volume will therefore fill by groundwater seepage from the Lithgow Coal Seam in approximately 86 years.

Groundwater Inflows into the Sand Quarry Operation

An analytical method was used to assess the zone of depressurisation in the Marrangaroo Formation and the seepage rate to the sand extraction areas. Steady state groundwater inflow into the quarry pits is likely to be sourced only from the east, owing to the outcrop of the Marrangaroo Formation in the west.

As a result, only half of the exposed perimeter (i.e. 628 m) of the quarry pit wall is anticipated to receive groundwater inflow.

Results from the analysis are presented in **Table 39** and indicate that the long term additional steady-state inflow to the quarry pits from the Marrangaroo Formation (from the eastern pit walls only) ranges from 0.004 m^3/day/m up to 0.058 m^3/day/m. Assuming a quarry pit radius of about 200 m each year (equalling a seepage face of approximately 630 m in length), groundwater inflow to the pit may range between 0.8 ML/year up to about 13 ML/year depending upon the value of hydraulic conductivity and recharge rate.

Table 39 Groundwater Seepage from Marrangaroo Formation

Range	Hydraulic Conductivity (K) (m/day)	Recharge Rate %	Gross Groundwater from Exposed Face / Metre (m^3/day/m)	Evaporation from Exposed Face / Metre (m^3/day/m)	Face Seepage / Metre (m^3/day/m)	Face Seepage / Metre (ML/year/m)	Face Seepage of 628 m (ML/year)
Upper limit	0.1	1	0.027	0.0025	0.025	0.009	6
Representative Limit	0.05		0.017		0.014	0.005	3
	0.02		0.009		0.007	0.002	2
Lower Limit	0.01		0.006		0.004	0.001	1
Upper limit	0.1	5	0.047		0.045	0.016	10
Representative Limit	0.05		0.030		0.028	0.010	6
	0.02		0.017		0.015	0.005	3
Lower Limit	0.01		0.012		0.009	0.003	2
Upper limit	0.1	10	0.061		0.058	0.021	13
Representative Limit	0.05		0.040		0.037	0.014	9
	0.02		0.023		0.021	0.008	5
Lower Limit	0.01		0.016		0.014	0.005	3

Predicted Project Impacts on the Groundwater System

The impact of the Project on groundwater levels is expected to be localised, and limited largely to the northern areas of the Project Boundary.

The mining operation will therefore generate a localised zone of depressurisation in the coal seams, but this is not expected to impact on adjacent landholders' bores or the alluvial aquifers in the vicinity of the Project Boundary.

Pressure reductions from open cut and highwall mining are predicted to have a localised impact arising from the Project. The limited extent of impact is due to the pre-existing shallow hydraulic gradient and the low hydraulic conductivity of the coal seam and sandstone aquifers. The assessment anticipated that the radius of groundwater depressurisation would extend up to 500 m from the Project Boundary within the Marrangaroo Formation.

The zone of depressurisation within the Lithgow Coal Seam was assessed to be negligible to the east of the Invincible Colliery mining areas proposed, owing to the proximity to and the dewatering undertaken at the Baal Bone Colliery.

The zone of depressurisation within the Lithgow Coal Seam associated with the Cullen Valley and the East Tyldesley mining areas may result in a localised zone of depressurisation from the Project mining areas and may potentially cover small areas of surrounding properties. However, the resultant drawdown within the Lithgow Coal Seam is expected to be limited, as the mining is not extending far into the saturated zone and the zone of depressurisation will be further restricted by areas where the coal seam outcrops at the ground surface and by the shallow hydraulic gradient.

Impact on groundwater levels will not occur to the west of the Project Boundary owing to the outcrop of the Permian aquifers along the western portion of the Project Boundary. In addition, groundwater levels to the east of the Project Boundary have been noted by other studies to have been significantly affected by historical operations at the Baal Bone Colliery. The proximity of the neighbouring Baal Bone Colliery will result in minor cumulative impacts on groundwater levels; however, the Project will not produce any further significant impact on the groundwater regime.

The Project is predicted to experience low volumes of seepage from the coal seams and Marrangaroo sandstones. However, the depressurisation within the Lithgow Coal Seam and the Marrangaroo Formation will have no direct impact on the groundwater resources within the vicinity of the Project Boundary.

Impacts on Existing Registered Bores

As shown on **Figure 39**, eight of the registered bores constructed within a 1 km radius of the Project Boundary are located in the Permian strata. Of these bores, five are registered for industrial and mining use (of which three of these bores have had their licence cancelled or lapsed) with the remaining three bores (GW106258, GW064530 and GW064531) registered for stock and domestic purposes. To assess any impacts to registered bores as a result of the Project, Coalpac proposes to install three additional monitoring bores on private land (see **Section 8.10.4**).

The depth of these registered stock and domestic bores ranges between 48.8 mbgl up to 122 mbgl, indicating these bores access water at least 50 m beneath the Lithgow Coal Seam and the Marrangaroo Formation. As a result, the Project is not predicted to impact on any private groundwater users in the area.

Impacts on Abandoned Flooded Workings

It is anticipated that the volume of water stored within the flooded workings of the Old Invincible Colliery will remain unaffected by the Project. Notwithstanding this, the water stored within the underground workings of the Old Invincible Colliery is likely to continue to be utilised to augment surface water supplies to meet the Project's water requirements. Indicative locations that could potentially be used for dewatering are shown on **Figure 25**. This practice may also be used to dewater the underground workings within the immediate vicinity of Invincible Colliery open cut mining areas to ensure safe operations.

The proposed open cut mine plan for the Cullen and the East Tyldesley mining areas are located proximal and down-hydraulic-gradient from the flooded underground Tyldesley Colliery. The potential seepage rates indicates that when a coal seam barrier of 50 m is incorporated into the mine design, the seepage from the flooded underground workings into open pits is up to 11.5 ML/year over an exposed coal seam face of 1,000 m for an average coal seam hydraulic conductivity of 0.09 m/day.

Seepage of water from the flooded underground workings of the Tyldesley Colliery was determined to be currently between 3 ML/year and 8 ML/year (over a seepage face of approximately 1,800 m) based on a hydraulic gradient towards Baal Bone Colliery. The water level within the flooded workings has been shown to be static and as a result suggests a balance exists between recharge inflow and discharge seepage. Based on the assessment undertaken for the Project, an average recharge rate of water into the Tyldesley Colliery is approximately 5.5 ML/year.

The rate of groundwater recovery will depend on the recharge and natural discharge rates, as well as the specific yield of the backfill material. Following emplacement of the spoil, groundwater recharge has been calculated at 5% of average rainfall.

At this rate, it would take approximately eight years for the groundwater levels within the spoil material to recover about 3 m, this being about the top of the Lithgow Coal Seam.

Once the groundwater level within the spoil has recovered about 3 m, it is anticipated that seepage from the flooded workings of the Tyldesley Colliery will return to about pre-mining rates. The cumulative loss of water from the flooded workings will therefore be about 10% of the total water stored in the flooded workings (i.e. about 70 ML).

Water Quality

Based on geochemical assessment conducted by RGS Environmental (2011) (see **Section 8.11**), it is considered unlikely that leachate generated from these materials will adversely impact upon regional groundwater quality. Following rehabilitation, the quality of the groundwater recharge is expected to be similar to that determined by RGS (2011) and will have a relatively low salinity.

There is some potential for spills and contamination by metals and hydrocarbons from the mine infrastructure, waste disposal and fuel storage areas. However, adequate bunding and waste management measures should prevent contamination of the shallow groundwater system. Any spills from these areas are typically localised and not regionally significant.

Post-Mining Recovery of Groundwater Levels

The final landform post-mining will consist of rehabilitated areas similar to the existing pre-mining landform. Once the overburden has been emplaced within the open cut mining areas, groundwater levels will steadily recover and eventually return to equilibrium. During this stage of the Project, it is anticipated there will be no dewatering required for the Baal Bone Colliery (the site being closed) and therefore no discharge of groundwater will occur.

It is anticipated that the Baal Bone Colliery will cease operations early in the Project life.

This will result in the underground workings of Baal Bone Colliery slowly flooding with groundwater and it is anticipated that an equilibrium water pressure in the coal seams will eventually be reached over time. The rate of groundwater transfer from the flooded Invincible Colliery underground workings into the flooded Baal Bone Colliery workings will likely be reduced by this increased water pressure. The impact on the Project will likely be to increase the availability of groundwater within the flooded workings of the Invincible Colliery and Old Invincible Colliery.

Groundwater Dependant Ecosystems

Previous groundwater assessments have identified that although groundwater is likely to supply a minor percentage of the total water input to the local swamps, the groundwater contribution is important in that it may sustain the swamp vegetation in times of prolonged drought (Connell Wagner 2006). The monitoring data presented by Connell Wagner (2006) indicated that there has been no impact on groundwater due to underground mining activities at Baal Bone Colliery in either the Coxs River Swamp or the Jews Creek Swamp.

No GDEs have been identified within the Project Boundary and there are no known springs within the Project Boundary that are fed by groundwater around which GDEs may have developed. The Coxs River Swamp and Jews Creek Swamp are likely to constitute the GDEs in closest proximity to the Project and are located approximately 2 km and 3.5 km outside the Project Boundary, respectively.

Any potential for impacts to these GDEs will be further reduced due to the hydraulic disconnection between the Triassic aquifers and the Permian coal measures, the distance between the Project and the GDEs, and the low volumes of groundwater extracted by the Project.

8.10.4 Mitigation and Management

Coalpac will develop a consolidated Water Management Plan in consultation with relevant Government departments and to the satisfaction of DP&I. The Water Management Plan will assist in ensuring that the existing groundwater monitoring network is enhanced and is well maintained so that the modelled predictions and assumptions can be verified and any potential unforeseen groundwater impacts can be quickly identified and managed.

The consolidated Water Management Plan will incorporate the following management and mitigation measures:

- The existing water monitoring bores that are not within the footprint of the Project will remain in place and will not be disturbed during the life of the mine to monitor for depressurisation, principally in the Lithgow Coal Seam and the Marrangaroo Formation on an ongoing basis;
- The existing Coalpac monitoring bores will be supplemented with an additional two bores and the replacement of a further four bores during the life of the Project (as these are predicted to be depressurised or impacted by mining). These bores will continue to monitor for depressurisation, principally within the Lithgow Coal Seam and the Marrangaroo Formation, in accordance with the Australian Guidelines;
- Four private bores registered with NOW (GW106258, GW064530, GW064531 and GW062283) are predicted to be impacted by the Project. The landholders will be consulted in relation to the installation of automatic water level pressure transducers at these locations and if agreed, they will be installed. These water level pressure sensors will be set to record water levels on an ongoing basis and any groundwater level data collected from private bores will be assessed annually;
- Coalpac will seek a data sharing agreement with Xstrata to access monitoring data from the monitoring bores for Baal Bone Colliery located along the Cox River Swamp. Other groundwater monitoring data will be sought from other surrounding industry, if available;
- An application for a water licence under the WM Act to account for the predicted seepage rates from the coal seam and Marrangaroo sandstone will be made in accordance with the relevant WSPs;
- Annual monitoring of water samples from all monitored bores for major cations and anions, ammonia, nitrate, nitrite along with heavy metals including iron, lead, chromium, cadmium, zinc, arsenic, copper and nickel. ANZECC water quality guideline trigger values for stock watering will be utilised until site specific trigger values are available;
- Implementation of an appropriate method for the calculation of groundwater seepage rates into the open cut mining areas for the Project; and
- An annual review of groundwater monitoring data to identify trends and any adverse impacts in addition to those predicted for the Project and the implementation of further monitoring and mitigation actions, if required.

8.11 GEOCHEMICAL

8.11.1 Background

RGS Environmental Pty Ltd (RGS) conducted a geochemical impact assessment for the Project which is presented in full in **Appendix P**, with a summary provided below. This assessment involved a geochemical characterisation process and the assessment of overburden and potential coal reject materials associated with the open cut and highwall mining of the target coal seams for the Project.

In addition, the geochemical assessment of the basal Marrangaroo Formation underlying the Lithgow Coal Seam was included to confirm its suitability for extraction. The results of the characterisation have been used to develop additional environmental management measures related to overburden and coal reject emplacement for the Project, in addition to those procedures already put in place by Coalpac for their existing operations.

8.11.2 Methodology

RGS completed a review of available geochemical and geological data, surface water and groundwater quality data and existing drill hole information associated to assist in the formation of a suitable overburden and coal reject sampling and testing program. Technical guidelines for the geochemical assessment of mine waste in Australia (AMIRA 2002; DITR 2007) and worldwide (INAP 2009) were used as the framework for developing the sampling (and geochemical testing) program for the Project.

Drill core materials available as part of the Coalpac 2010 exploration program were selected from six drill holes at locations within the Project Boundary, with sufficient spread to enhance lateral coverage.

The sampling strategy was designed to address the following issues:

- Expected geological variability and complexity in rock types;
- Potential for significant environmental or health impacts;
- Scale of the Project;
- Sample representation requirements;
- Project mining schedule and material volumes; and
- Levels of confidence in predictive ability.

A total of 96 samples were collected by Coalpac personnel from six drill holes at various depth intervals for inclusion in the geochemical analysis. The samples included the range of overburden lithologies (37 samples) representative of the Project and also potential coal reject materials taken from the roof, floor and parting material at the target coal seams (51 samples). An additional eight samples of coal reject material from the Lithgow Seam (four samples of coarse reject and four samples of fine reject / tailings) were obtained from the ICPP for inclusion in the geochemical analysis.

Samples were subjected to a series of static geochemical tests at ALS Brisbane. The geochemical test program was designed to assess the presence of and degree of risk posed from oxidation of pyrite, acid generation, and leaching of soluble metals and salts. The static geochemical assessment test program also included characterisation of standard soil parameters including salinity, cation exchange capacity, sodicity, potential nutrients and major metal compositions.

All of the 96 samples collected were subjected to Acid Base Account (ABA) geochemical testing as part of an initial screening process. Specifically, each sample was tested for pH and EC, total sulphur, Acid Neutralising Capacity (ANC) and the net acid producing potential.

After the results of the ABA tests were received and reviewed, selected individual samples were subjected to sulphur speciation tests (chromium reducible sulphur) and Acid Buffering Characteristic Curve (ABCC) tests. A further 18 samples from the initial 96 individual samples were also prepared based on lithology, drill hole, depth interval and geochemical characteristics. These 18 samples were then subjected to Multi-element analysis.

8.11.3 Impact Assessment

Overburden

The majority of overburden materials for the Project are likely to have negligible (<0.2%) total sulphur content low to moderate ANC and are therefore classified as Non Acid Forming (NAF) barren.

One sample from the Marrangaroo Sandstone contained a significantly elevated total sulphur content (0.82%) to Maximum Potential Acidity (MPA) ratio (ANC / MPA ratio less than two) and consequently may have an increased risk of acid generation. Overall, from an acid-base perspective, the overburden material can generally be regarded as a NAF unit that typically has low total sulphur content, low ANC and elevated ANC / MPA values. Materials represented by these samples are expected to have a low to negligible risk of acid generation and a high FoS in terms of potential for Acid and Metalliferous Drainage (AMD). The single sample with some potential to generate acid is located in the Marrangaroo Sandstone and comprises conglomerate, sandstone and carbonaceous mudstone.

The concentration of total metals in overburden solids in the materials sampled is well below applied guideline criteria for soils and is unlikely to present any environmental issues associated with revegetation and rehabilitation.

Most overburden materials were predicted to generate pH neutral and relatively low salinity runoff and seepage following surface exposure. The dominant soluble cation is generally sodium and the dominant soluble anion is generally sulphate, with lesser amounts of bicarbonate and chloride.

The concentrations of trace metals tested in the water extracts from sampled overburden materials are typically very low, and predominantly below the analytical detection limit.

The low concentrations of dissolved metals in initial and ongoing runoff and seepage from overburden materials is unlikely to present any significant environmental issues associated with surface water and groundwater quality as a result of the Project. Overburden materials below 10 m depth have been predicted to be non-sodic (and as such non-dispersive) and may be suitable for revegetation and rehabilitation activities (in final surfaces or as a growth medium). Some materials below the topsoil layer and in the first 10 m depth from surface may have some potential to be sodic and prone to dispersion and erosion.

Coal Rejects

Most potential coal reject materials were found to have negligible total sulphur content (< 0.1%) and are therefore classified as NAF-barren. These materials have a high FoS with respect to potential acid generation.

A small proportion of the potential coal reject materials associated with the Lithgow Seam have a relatively high total sulphur content and negligible buffering capacity (and hence a low FoS) and are classified as Potentially Acid Forming - High Capacity (PAF - HC). In contrast, the tailings materials generated from processing the Lithgow Seam at the ICPP appear to be NAF.

The results indicate that whilst the majority of coal reject materials from the Project are likely to be NAF and have an elevated FoS with respect to acid generation, some coal reject materials are present that have uncertain geochemical characteristics or are classified as PAF. The PAF materials appear to be limited to parts of the Lithgow Coal Seam and mainly report to coarse rejects in the coal washing process. The tailings materials from the Lithgow Seam appear to be NAF as most sulphur is present as organic sulphur.

PAF samples have some capacity to generate acid and materials represented by these samples will need to be managed for the Project to avoid any issues associated with AMD.

The concentration of total metals in potential coal reject solids is well below the applied guideline criteria for soils and is unlikely to present any environmental issues associated with the rehabilitation and the final closure of the mine. Most NAF potential coal reject materials will generate pH neutral and relatively low salinity runoff and seepage following surface exposure. However, PAF coarse reject materials from the Lithgow Seam may have some potential to generate acidic and more saline runoff and seepage if exposed to oxidising conditions.

The major ion chemistry of initial surface runoff and seepage from NAF potential coal reject materials is likely to be dominated by sodium bicarbonate and to a lesser extent chloride and sulphate.

For PAF coarse reject materials, the initial concentration of soluble sulphate in surface runoff and seepage is expected to be relatively low and within the applied water quality guideline criterion, although further exposure to oxidising conditions may lead to increased sulphate concentrations.

The concentration of dissolved metals in initial surface runoff and seepage from NAF potential coal reject materials is unlikely to present any significant environmental issues associated with surface water and groundwater quality as a result of the Project. For PAF coal reject materials, there is some potential for the concentration of dissolved metals in surface runoff and seepage to increase over time.

8.11.4 Mitigation and Management

Overburden

The ongoing management of overburden will consider the geochemistry of these materials with respect to its potential risk to cause harm to the environment and their suitability for use in construction and revegetation.

Coalpac will undertake:

- Pre-stripping topsoil from areas to be mined for use in final rehabilitation activities (surface cover or vegetation growth medium) consistent with that described in **Section 8.18**;
- Placement of overburden within the OEAs in a manner that limits the risk of surface erosion;
- Additional sampling and testing to further define the geochemical characteristics of the Marrangaroo Sandstone prior to potential utilisation as a resource if required, to confirm the extent of any PAF material and any link to lithological rock type; and
- Field trials to identify the most appropriate topsoil and overburden materials for the revegetation and rehabilitation of final landforms.

Further to the above, surface water and groundwater monitoring associated with runoff or seepage from the emplacement areas will be incorporated into the EMP and monitored on a regular basis for pH, EC, TSS and dissolved metals (including arsenic, molybdenum and selenium) (see **Section 9**).

Coal Rejects

The ongoing management of coal rejects materials will consider the geochemistry of the materials with respect to their potential risk to cause harm to the environment and their suitability for use in construction and revegetation. Coalpac will implement the following management measures:

- Placement of NAF coal rejects materials in the open pit and / or co-disposal with overburden. For the co-disposal method, placement of NAF coarse reject material in a manner that limits the risk of erosion;
- Deep (in-pit) burial of PAF coal reject materials from the Lithgow Seam;
- PAF coarse rejects will be covered as soon as practical (within a few weeks) with 5 m of NAF overburden material to minimise the length of exposure time to oxidising conditions (and minimise the potential for AMD);
- The time for covering PAF coarse reject materials and the depth of cover will be optimised by using data from kinetic leach column tests and cover design investigations; and
- Ongoing consideration of the geochemistry of coal rejects materials generated by the ICPP and ETCPP in relation to potential impact risk from these materials.

8.12 ABORIGINAL HERITAGE

8.12.1 Background

AECOM prepared an Aboriginal Archaeology and Cultural Heritage Impact Assessment for the Project which is reproduced in **Appendix K**.

The aim of the assessment was to review and assess the nature of the archaeological landscape of the Project Boundary and assess the potential impacts that the Project may have on Aboriginal cultural heritage values, in consultation with representatives of the local Aboriginal community. A summary of this assessment is provided in the following sections.

8.12.2 Methodology

Desktop Survey

A comprehensive desktop study was undertaken as a background to the assessment, which included:

- A review of previous archaeological reports, to assess the current status of Aboriginal archaeological and cultural heritage literature relevant to the regional and local area and to provide a basis for developing a predictive model for the Project;
- A search of the OEH Aboriginal Heritage Information Management System (AHIMS) databases for all registered sites within an 8 km squared area centred on the Project Boundary (AHIMS search area); and
- A review of the landscape character and land use history, which influences patterning of sites within the landscape; and
- An assessment of the cumulative impact of the Project on the known and potential Aboriginal heritage resource in the wider region using aerial photographs, topographic maps and GIS data.

A number of previous reports were identified as relevant to the local area in terms of assessing the current status of Aboriginal archaeology and cultural heritage. Those previous studies that had been undertaken either wholly or partially within the Project Boundary include:

- Haglund (1982) – surveyed the Cullen Main Colliery (Cullen Main West and east). Two artefact scatters were recorded, both of which were found to be in disturbed contexts. Quartz dominant raw material was found in both sites, with minor quartzite and chert / tuff component. Recorded artefact types included flakes, cores and a single concave scraper (quartz);
- Hagland (1985) – surveyed the proposed rail spur and loop for the Invincible Colliery. No sites were identified during survey;
- OzArk (2006) – surveyed the Extension to Invincible Colliery Open Cut Coal Mine (Project Application 05_0065). No sites were identified during survey;
- OzArk (2008) – surveyed the Extension to Invincible Colliery Open Cut Coal Mine. One site was recorded: a large, open artefact scatter (Invincible OS1) adjacent to the third order tributary of Cullen Creek.

  Recorded artefacts included cores, flakes, blades, non-flake debitage, an edge-ground axe and a broken, but complete portable sandstone grindstone with use-wear on both faces;
- Silcox (1997) – surveyed the Invincible ML 68 Open Cut Coal Mine and Haulage Road. No sites were identified during survey;
- Mills (1996) – surveyed the Feldmast Coal Project. Three sites were recorded: one artefact scatter (RSC-OS-1), one isolated find (CC-IF-1) and one axe grinding groove site (FL-GG-1). All three were found in association with drainage lines. Artefacts recorded at RSC-OS-1 included one chert / tuff flake, one chert / tuff scraper and one quartzite millstone. CC-IF-1 comprises a brown, quartzite hammerstone.

  FL-GG-1 was located on the property *'Forest Lodge'* to the west of the Wallerawang-Gwabegar Railway. The site consists of 12 axe grinding grooves on sandstone exposure (3.8 m^2) within an ephemeral drainage line;
- Kelton (2002a) – surveyed the Extension to Cullen Valley Mine. Two sites were recorded: one artefact scatter (C-OS-1) and one potential rock shelter with PAD (C-S-1). C-OS-1 was recorded on the eastern bank and adjacent alluvial / colluvial terrace of an unnamed second order creekline, 50 m south of the Baal Bone Rail Loop. Recorded artefacts comprised four chert / tuff flakes, one quartzite flake, two *'block-fractured'* chert / tuff fragments, a chert / tuff core and chert / tuff flake fragment; and
- Kelton (2002b) – surveyed the Boulder Road Coal Mine. Two sites were recorded: one isolated find (BPIF-1) on spur overlooking an unnamed tributary of Neubecks Creek, and one open artefact scatter (BP-OS-1) in transmission line easement to immediate east of the Castlereagh Highway.

The information found from the review of these previous assessments along with AHIMS database records were then used to form a predictive model of site types and locations which was then tested by field assessment.

A search of the AHIMS database on 14 December 2010 for the AHIMS search area returned a total of 73 records within and surrounding the Project. Open artefact scatters and isolates dominate the Aboriginal archaeological record of the AHIMS search area, together accounting for 64% of the total. Rock shelters with deposit and / or art or Potential Archaeological Deposit (PAD) are also well represented in the elevated sandstone terrain of the search area, with seventeen registered examples accounting for 23% of the total. Remaining sites comprise two axe grinding groove sites (3%), a single stone arrangement and an isolated example of a scarred tree.

A further search of the AHIMS database for the cumulative impact review was undertaken in October 2011. For this assessment, a study region of 30 km x 30 km was adopted on the basis of having a range of landforms comparable to those present within the Project Boundary. This search area returned a total of 214 records within and surrounding 30 km of the Project Boundary. A breakdown of these records by site type was compared to those sites predicted to be impacted for the Project to assess the level of cumulative impacts.

To support the assessment, an Aboriginal stakeholder engagement program was conducted for the Project in accordance with the OEH Consultation Requirements 2010 and is discussed in **Section 6.5**.

Field Methodology

The field component of the Aboriginal Heritage Impact Assessment aimed to:

- Re-locate and re-record all Aboriginal archaeological sites and PADs previously located within the Project Boundary and within 50 m of the Project Boundary;
- Sample all landform types within the Project Boundary (by way of targeted pedestrian transects);
- Achieve a survey coverage that adequately reflects the variable archaeological potential of differing landform types within the Project Boundary;
- Inspect, where appropriate, areas of known or potential Aboriginal cultural value, as identified by Aboriginal stakeholders consulted for the Project; and
- Provide sufficient data to facilitate the development of appropriate management and mitigation measures for Aboriginal sites identified within the Project Boundary.

A targeted survey strategy was adopted for the Project, involving the division of the Project Boundary into its constituent landform types to ensure that all landforms within the survey areas were sampled appropriately. A proportional field emphasis on those considered as having higher archaeological potential (i.e. higher order creek lines and sandstone ridgelines and cliffs) was adopted.

At the same time, in recognition of the steep topography, existing disturbance and visibility issues, it was decided that final decisions concerning the number, placement and length of transects was best suited to be definitively made in the field.

Fieldwork was completed in three stages to allow all Aboriginal stakeholder groups an opportunity to take part in the survey. The first stage was completed during the period 15 to 26 November 2010, with the second stage undertaken with the remaining groups from 29 November to 10 December 2010. An additional day of survey was undertaken on 12 October 2011 to further assess the elevated ridgelines in the east of the Project Boundary, particularly focusing on the identification of additional of rock shelters (as requested by DP&I).

The field surveys were conducted over a period of 21 working days. Two AECOM archaeologists and a total of nine Aboriginal stakeholder representatives from the five groups involved in the fieldwork carried out these surveys on a rostered team basis. The approach used a pedestrian based survey within a typical linear transect, with widths dependent on the topography and the number of Aboriginal stakeholder representatives available on each day (this range was generally between the range of 20 – 50 m). Aboriginal representatives and archaeologists were evenly spaced depending on the visibility of each transect. A summary of the consultation with Aboriginal stakeholder representatives during the archaeological and cultural heritage assessment process is provided in **Section 6.5**.

The location of all transects was recorded using a hand held Trimble Differential Geographical Positioning System (GPS), with additional transect data (e.g. landform, exposure, Ground Surface Visibility (GSV), land use and disturbance) being recorded separately. The principal environmental characteristics of each transect and other pertinent features (i.e. erosion scalds, etc) were also photographed. All mature trees were inspected for possible cultural scarring. Likewise, all areas for potential rock shelter formations were physically investigated.

All Aboriginal archaeological sites identified during the survey were recorded to the standard required by the *Code of Practise for Archaeological Investigation of Aboriginal Objects in New South Wales* (OEH 2010b) (the Code). Each site located or revisited and the locations of individual artefacts were determined by the GPS.

Associated site data (e.g. location, type, content) was also documented, including raw material, type and size (i.e. maximum length, width and thickness). Photographic records of each site were also taken and where provided, information concerning the cultural value(s) of recorded sites and their associated environmental characteristics was noted.

The assessment also included the identification of areas of sub-surface potential. The effective survey coverage achieved was sufficient to assess the scale and character of the archaeological resource within the Project Boundary.

8.12.3 Impact Assessment

Archaeological Resource

The archaeological potential of the landform units investigated was constrained by the extent to which human activity was represented by preserved evidence, the degree to which post-depositional processes have affected the archaeological record, the extent to which land use (e.g. cultivation or forestry development) has altered the archaeological landscape, the landforms present within the Project Boundary, the time of year and the conditions under which the survey was conducted. The archaeological resources known within the Project Boundary is composed of sites previously identified by Haglund (1982), Kelton (2002a) and OzArk (2008) that have not been subject to salvage in addition to the sites recorded as part of the AECOM study for the Project. Site BP-OS-1 was not relocated during the survey however is registered on the AHIMS database.

A sixth, currently unregistered open artefact scatter (RSC-OS-1) was also identified during desktop review, being identified by Mills (1996). This site is located within the Project Boundary and was successfully relocated during the survey. A detailed reassessment of RSC-OS-1 by Aboriginal stakeholders and AECOM archaeologists during the survey found that this *'site'* is, in fact, not an Aboriginal archaeological site. Accordingly, the site will not be registered on AHIMS or included in the management recommendations for the Project. In addition to six previously recorded sites noted above, a total of nine new sites were recorded during survey. All these sites were located within the Project Boundary.

The locations of all Aboriginal sites identified within the Project Boundary during the field survey are presented on **Figure 40**, with predicted impacts outlined in **Table 40**. The new sites identified during the Project survey comprised:

- Four open artefact scatters (CV-AS1-10; CV-AS2-10; CV-AS3-10 and CV-AS4-10);
- One isolated find (CV-IF1-10);
- One rock shelter with deposit (CV-RCK1-10);
- One potential Aboriginal rock shelter site (CV-RCK2-10); and
- Two rock shelters with PAD (CV-RCKPAD1-10 and CV-RCKPAD2-10).

CV-RCK1-10 was located at the head of steep-sided forested valley approximately 1.5 km east north-east of the main Invincible Colliery site office. CV-RCK2-10 was located at the base of a sandstone escarpment approximately 470 m due west of the Cullen Bullen General Cemetery. CV-RCKPAD1-10 was located at the head of steep-sided forested valley approximately 1.3 km north-east of CV-RCK1-10. CV-RCKPAD2-10 was located approximately 140 m north-west of CVRCKPAD1-10.

Five open artefact scatters (CV-AS1-10; Invincible Colliery site 2; Invincible Colliery site 1; CV-AS2-10 and BP-OS-1) and one isolated find (CV-IF1-10) will be directly impacted by open cut mining activities and infrastructure upgrades for the Project. Five Aboriginal rock shelter sites have been identified as potentially being indirectly impacted as a result of vibration or highwall mining (CV-RCK1-10, CV-RCK2-10, C-S-1, CV-RCKPAD1-10, and CV-RCKPAD2-10). SCT Operations was commissioned to undertake a geotechnical review of these sites, which is described above in **Section 8.7**.

Only one previously recorded site (Invincible OS1) was determined to have high archaeological significance during the field survey within the Project Boundary. Invincible OS1 is an extensive open artefact scatter on a low cleared rise adjacent to an unnamed 3rd order tributary of Cullen Creek. The site is located approximately 150 m north-east of the main Invincible Colliery haul road and 1 km due east of the Castlereagh Highway. This site will not be disturbed by the Project. The characteristics of each of the sites and the distribution of archaeological deposits within the Project Boundary are explained in more detail in **Appendix K**.

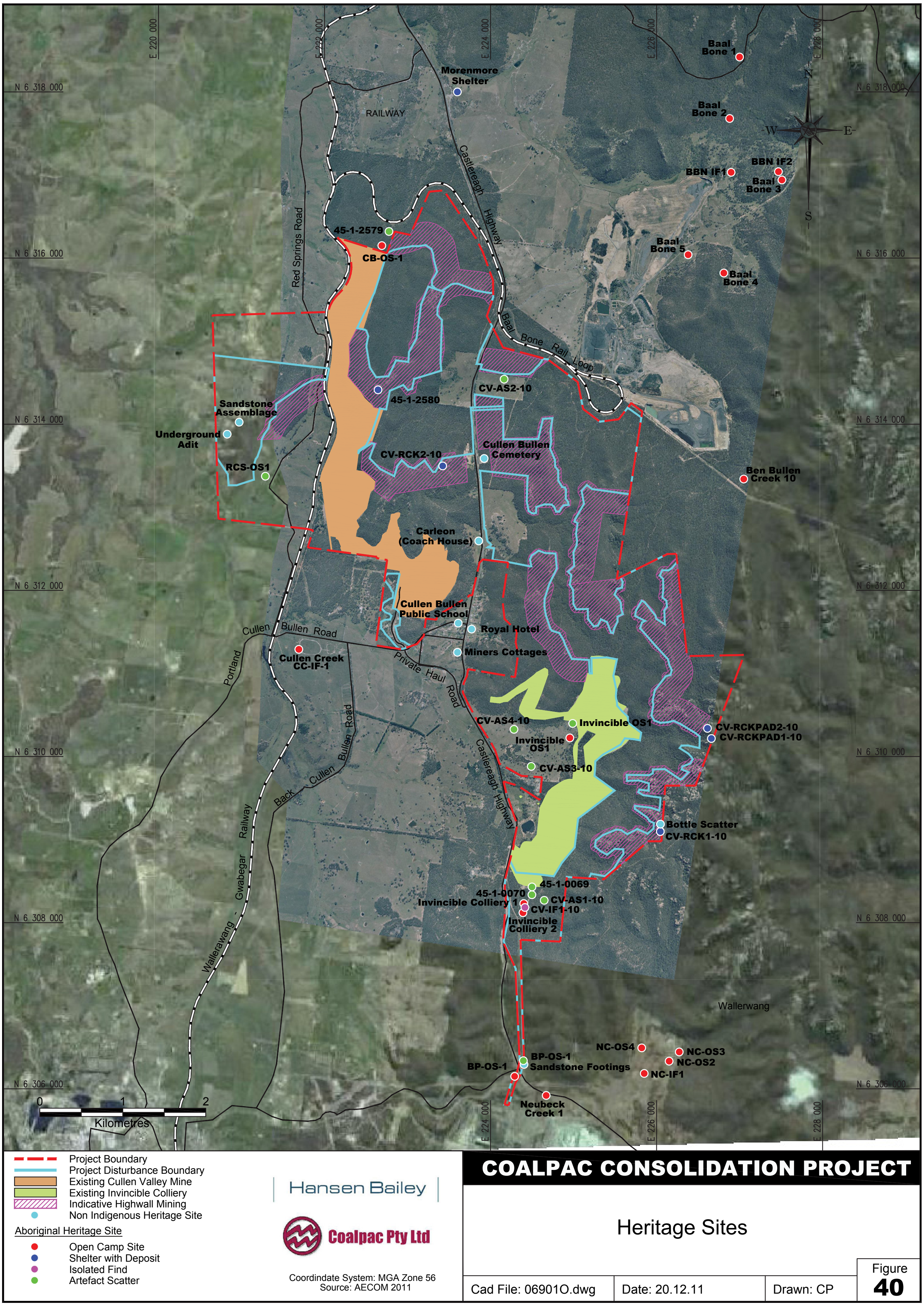
Statement of Significance

The significance assessment was based on the relevant criteria from the *Burra Charter* which was adopted by the Australian International Council on Monuments and sites for the conservation of places of cultural significance in 1979 (ICOMOS 1979). A significance assessment attempts to ascertain a relative value of heritage sites. The appropriate criteria to determine significance in this study included cultural / social (importance to Aboriginal people) and scientific (archaeological value) significance.

The significance of Aboriginal heritage material within the Project Boundary can be assessed on two levels: either a site by site basis, or an archaeological distribution basis. The majority of Aboriginal sites identified within the Project Boundary are open artefact scatters. Relevant considerations in assessing the level of significance are the assemblage content and whether the landscape pattern differs from that already established.

The cultural significance determined by the Aboriginal stakeholders is reflected in their responses to the Aboriginal Archaeological and Cultural Heritage Impact Assessment as described in **Section 6.5** and **Appendix K**.

The following significance statement addresses the scientific importance (or archaeological significance) of the sites recorded. It is based on the potential for sites to add scientific data to the archaeological record, in terms of age and integrity. The potential to add scientific data or preserve that data is influenced by the representation and rarity of the site, as demonstrated by its contents and context.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BBN IF1
Baal Bone 3
Baal Bone 5
Baal Bone 4
Red Springs Road
45-1-2579
CB-OS-1
Baal Bone Rail Loop
CV-AS2-10
45-1-2580
Sandstone Assemblage
Underground Adit
RCS-OS1
CV-RCK2-10
Cullen Bullen Cemetery
Ben Bullen Creek 10
Carleon (Coach House)
Cullen Bullen Public School
Royal Hotel
Miners Cottages
Cullen Bullen Road
Cullen Creek CC-IF-1
Portland
Private Haul Road
Bullen Road
Back Cullen
CV-AS4-10
Invincible OS1
Invincible OS1
CV-RCKPAD2-10
CV-RCKPAD1-10
CV-AS3-10
Castlereagh Highway
Railway
Bottle Scatter
CV-RCK1-10
Gwabegar
Wallerawang
45-1-0069
45-1-0070
Invincible Colliery 1
CV-AS1-10
CV-IF1-10
Invincible Colliery 2
Wallerwang
NC-OS4
NC-OS3
NC-OS2
NC-IF1
BP-OS-1
Sandstone Footings
BP-OS-1
Neubeck Creek 1
0
1
2
Kilometres
Project Boundary
Project Disturbance Boundary
Existing Cullen Valley Mine
Existing Invincible Colliery
Indicative Highwall Mining
Non Indigenous Heritage Site
Aboriginal Heritage Site
Open Camp Site
Shelter with Deposit
Isolated Find
Artefact Scatter
Hansen Bailey
Coalpac Pty Ltd
Coordindate System: MGA Zone 56
Source: AECOM 2011
COALPAC CONSOLIDATION PROJECT
Heritage Sites
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Figure
40

Previous assessments were also used as a guide to assist in determining appropriate levels of significance, where a number of conclusions could be drawn, including that:

- Aboriginal sites have the potential to occur in all parts of the landscape;
- Aboriginal sites differ in the density of artefacts within exposures (more found closer to intermittent creek beds);
- A greater concentration of stone artefacts may be anticipated closer to high order creek lines;
- Artefacts generally co-occur within exposures associated with intermittent creek junctions, in contrast to areas more than 100 m from creeks where exposures without artefacts are more abundant, reflecting isolated artefact discard in these locations;
- Aboriginal site content includes mostly flakes and broken flakes of chalcedony, indurated mudstone / tuff and silcrete with minor proportions of quartz, igneous stone, petrified wood and quartzite; and
- Abraded artefacts such as stone hatchet heads, grindstones and mullers are rare.

The sites identified within the Project Boundary were assessed as to how they fit this predicted pattern. Aboriginal sites considered in isolation within the Project Boundary are generally of a low or moderate significance with the following exceptions:

- Artefact scatters with more than 25 artefacts and / or artefact scatters possessing unique or rare artefact types;
- Scarred trees with well-formed scars or rare scar shapes (circular);
- Unique or rare isolated artefacts; and
- Grinding grooves.

Overall, only one site of high scientific significance has been identified within the Project Boundary: previously recorded open artefact scatter Invincible OS1 which will not be disturbed by the Project. Four sites have been assessed as having *'moderate'* scientific significance including chipped stone assemblages and shelters. The remaining 11 which were identified as having *'low'* significance included chipped stone assemblages, a rock overhang and a rock fall. **Table 40** provides a summary of Aboriginal sites identified within the Project Boundary, notes their significance, the likely impact of the Project on each site and the respective management measures.

Table 40 Project Impacts on Aboriginal Artefacts

Site Type	Site Name	Scientific Significance	Project Impact	Management
Isolated find	CV-IF-1	Low	Open Cut Mining Direct Impact	Surface collection of artefacts
Open Artefact Scatter	Invincible Colliery Site 1	Low	Open Cut Mining Direct Impact	Surface collection of artefacts
	Invincible Colliery Site 2	Low	Open Cut Mining Direct Impact	Surface collection of artefacts
	BP-OS-1	Low	Infrastructure Direct Impact	Surface collection of artefacts
	CV-AS1-10	Low	Open Cut Mining Direct Impact	Surface collection of artefacts
	CV-AS2-10	Low	Open Cut Mining Direct Impact	Surface collection of artefacts
	CV-AS3-10	Low	Not Impacted	N/A
	CB-OS-1	Moderate	Not Impacted	N/A
	CV-AS4-10	Moderate	Not Impacted	N/A
	Invincible OS1	High	Not Impacted	N/A
Potential Aboriginal rock shelter site	CB-S-1	Low	Indirect, Potential Vibration and Subsidence Impact	Monitoring and reporting, Blast protocol as per **Section 8.7**
	CV-RCK2-10	Low	Indirect, Potential Vibration and Subsidence Impact	Monitoring and reporting
Rock shelter with PAD	CV-RCKPAD2-10	Low	Indirect, Potential Vibration and Subsidence Impact	Monitoring and reporting
	CV-RCKPAD1-10	Moderate	Indirect, Potential Vibration and Subsidence Impact	Monitoring and reporting
Rock shelter with deposit	CV-RCK1-10	Moderate	Indirect, Potential Vibration and Subsidence Impact	Monitoring and reporting

Cumulative Impacts

The cumulative impact assessment considered the 214 known Aboriginal sites in the nominated study region (see **Section 8.12.2**) to predictively quantify the impacts of the Project on this heritage resource. Based on the results of the search of the AHIMS database, cumulative impacts could be predicted for each site type and for the total known heritage resource.

Of the 15 Aboriginal archaeological sites identified within the Project area, six (five artefact scatters and one isolated find) are to be impacted as part of the Project, with artefacts to be collected. Based on the current AHIMS search records, these stone artefact sites represent 2.6% of all known Aboriginal sites within the study region and 4.9% of all known stone artefact sites. Together with the figures above, this suggests that the loss of the six sites in question would not constitute a significant impact to the identified Aboriginal heritage resource of the region.

When considered together with the assessments of significance undertaken for each of the Project heritage sites (see **Table 40**), it is considered that the Project would not constitute a significant impact to the identified Aboriginal heritage resources of the study region.

8.12.4 Mitigation and Management

Coalpac will develop an Aboriginal Archaeology and Cultural Heritage Management Plan (AHMP), to be prepared in consultation with Aboriginal community stakeholders and OEH to the approval of DP&I. The AHMP will be guided by specific policies and procedures to manage Aboriginal archaeological sites within the Project Boundary.

The AHMP will be developed consistent with the predicted impacts and management commitments included in **Table 40** and would be periodically reviewed in consultation with Aboriginal stakeholders and OEH. The AHMP will include provisions for at least the following:

- Protection of sites prior to salvage;
- Protection of sites prior to direct impacts or indirect predicted impacts, including development of appropriate monitoring strategies for vibration and to confirm no subsidence impacts occur;
- Protection of sites that are not impacted by the Project by means of fencing or other management controls;
- Detailed salvage methodologies to be carried out prior to impact;
- Development of Protocols for the monitoring of earth works, as required; and
- Identification of an appropriate storage location and procedure for the care and control of salvaged artefacts in accordance with *Code of Practice for Archaeological Investigation for Aboriginal Objects in New South Wales* (OEH 2010b); and
- Implementation of comprehensive monitoring regime for the five rock shelter sites identified within the Project area. All five sites are to be monitored before, during and following proposed open cut and highwall mining operations within the Project area. Specifically, the following provisions will be incorporated into the AHMP:
  - A subsidence and vibration model will be developed for each rock shelter site prior to the commencement of any mining operations within 500 m of the identified sites;
  - Blast management procedures to limit potential for indirect impacts, as discussed in **Section 8.7**;
  - Impact assessment and monitoring of the sites will be conducted throughout the life of the Project;
  - Upon completion of open cut and highwall mining operations within the Project area, a final impact assessment for identified rock shelter sites will be undertaken; and
  - In the event that there are subsidence or vibration impacts to any of the rock shelters being monitored, management strategies specific to the impact identified shall be developed in consultation with registered Aboriginal stakeholder groups for the Project, OEH and the DP&I and implemented in accordance with current conservation practice.

Coalpac will also establish and manage a Keeping Place during the life of the Project. The Keeping Place will be developed in consultation with the Aboriginal community and OEH. It will house the artefacts salvaged prior to Project impacts and will be accessible to appropriately trained Aboriginal Community Representatives, or those otherwise agreed with the local Aboriginal community.

8.13 NON-ABORIGINAL HERITAGE

8.13.1 Background

An assessment was undertaken by AECOM to determine the potential impacts of the Project on Non-Aboriginal heritage items identified within and adjacent to the Project Boundary. A summary of the assessment is provided below and the full report is presented in **Appendix M**.

8.13.2 Methodology

The assessment was undertaken in accordance with the *'NSW Heritage Office guidelines for heritage impact studies'* (NSW Heritage Office 2001), the *'NSW Heritage Manual'* (NSW Heritage Manual 1996) and the *'Burra Charter'* (1999). The methodology for the assessment consisted of several components to ensure that all relevant Non-Aboriginal heritage items that had the potential to be impacted by the Project were assessed. These included:

- A review of historical and archival research and searches of the relevant Commonwealth and State heritage lists to identify any known heritage items of significance within 10 km of the Project Boundary that may have the potential to be impacted by the Project. Two historic heritage items registered within the Project Boundary were identified during these searches, including the Cullen Bullen General Cemetery and the Carleon Coach House;
- A desktop review of previous Non-Aboriginal Heritage assessments of the Project Boundary and surrounds, including an assessment of Parish Maps and searches of the NSW State Library and online State records;
- Liaison with the LCC Heritage Adviser and the Lithgow & District Family History Society to ascertain any knowledge in relation to the historical significance of area within the Project Boundary;
- A field survey undertaken from 15 November 2010 to 10 December 2010 by AECOM archaeologists over the areas identified as having the potential to contain evidence of any historical items of interest based on the devised predictive model and information obtained during the course of the historical and archival research; and
- A Cultural Heritage Landscape Heritage Assessment. This component of the study was undertaken to assess interaction of humans and the natural environment.

European Settlement

European settlement at Cullen Bullen commenced following the construction of Coxs Road across the Blue Mountains in 1815 to make the rich fertile country west of the Great Dividing Range accessible. The development of this road subsequently stimulated settlement in areas such as Cullen Bullen and the Capertee Valley.

The first landowner in Cullen Bullen was Robert Venour Dulhunty, who arrived in Sydney, from Paignton, Devonshire in 1824. Dulhunty received a grant of 2,000 acres (809 ha) and was assigned six convict servants upon his arrival in Sydney. Using his land grant, Dulhunty selected a property on the banks of what is now named Dulhunty's Creek, west of the current location of Cullen Bullen, and constructed his house on Back Cullen Road, outside the Project Boundary, where he imported and bred stock, specialising in Arab horses before he later acquired a nearby property at Ben Bullen.

In 1828, the property carried 75 head of cattle and 600 head of sheep. In 1839, Dulhunty married Eliza Gibbes in Sydney, choosing Penrith for their home, while retaining their property at Cullen Bullen.

History of Coal Mining

Coal mining has, and still plays an important role in the local economy of Cullen Bullen. Initially, commercial exploitation of the resource was not viable due to the difficulty of transporting it over the Great Dividing Range to Sydney. This changed when the Great Western Railway crossed the Blue Mountains between 1867 and 1869, allowing the coal mining industry in the local area to commence. The rail line constructed to Lithgow, known as the Zig Zag Railway due to its winding course, was completed in 1869. Following this, the rail line reached Wallerawang in 1870 and Capertee in 1882. The completion of the railway heralded a boom in coal mining and associated industries in the region.

While it is likely that a number of small private mining ventures had been operating in the Cullen Bullen district prior to 1880, it was not until William Hart Junior opened a coal mine on his own land in 1880 that investment began in earnest. Hart invested considerable amounts of money building barracks, employing workers and opening a shop to sell provisions to the miners. However, despite his great expenditure the mine failed. Regardless of this initial failure, a number of other mines were established in the latter part of the 1880s.

The Cullen Bullen Colliery was the first major coal mining development undertaken at Cullen Bullen, with operations commencing in 1888. Underground operations associated with the Cullen Bullen Colliery are likely to have extended under the existing town and also into the current Project Boundary.

One of most significant and long lasting coal mines in the Cullen Bullen area was the Great Western Mine (this site is now occupied by the Cullen Valley Mine). The Great Western Mine was located immediately east of the Mudgee railway line on the western side of Tyldesley Hill, west of Cullen Bullen and listed as designated *"for Mining"*.

In 1914, the mining lease was taken over by James Errington, representing the Australian Coal Supply Company and renamed Invicta Colliery. Mining continued until 1917, when Tyldesley Colliery Co Ltd (Tyldesley Colliery) purchased the colliery and made substantial investments and increased the mine's capacity. Tyldesley Colliery operated the mine until 1939, increasing employment from a maximum of 39 people in 1910 (while it was managed by Great Western Mine Colliery) to 151 people in 1929.

The mine was taken over again in 1939, this time by Coronation Coal Pty Ltd (Coronation Coal), who operated it until 1960. Coronation Coal also operated Beaumaris Colliery, a small series of open cuts immediately to the south.

It is likely that open cut workings commenced at the site of Great Western Mine in the 1950s. After a variety of operational difficulties, the Tyldesley Colliery was officially abandoned in 1960.

From the time of the establishment of the Great Western Mine until its closure as Tyldesley Colliery, a small village known as Tyldesley grew around the mine's headworks. Tyldesley village consisted of houses, a post office, shops and a small school built in a disorganised manner on company land. Maps of the village show that it was located between the Colliery tunnel mouth and the coal-loading gantry. The village prospered in the 1920s and 1930s but eventually declined in the 1950s due to changes in mining practices and government actions to improve living conditions at the site, which were extremely poor. Tyldesley's post office closed in 1956 and the school in 1963, however the last resident left in 1987.

The site on which the original village was located was remediated until being re-opened by the Lithgow Coal Company for open cut operations in 2000 and is now the location of open cut operations at Cullen Valley Mine.

Old Invincible Colliery operated from approximately 1900 until 1957, making it one of the longest continuously operated mines in the region. Initially, mining consisted of long wall operations, however this ceased after about eight years and mining continued underground at its No.1 Tunnel, east of the Royal Hotel in Cullen Bullen. The Carson Siding rail line was extended travelling under Mudgee Road to the site in 1907. The colliery opened its No.2 Tunnel on the western side of Tyldesley Hill in 1925, directly south of Tyldesley Colliery, calling it Cockatoo Colliery.

In 1957, the Invincible Colliery was relocated 4 km south to its current location where underground operations continued until 1998. Much of the rail siding was removed in 1962; however a short section was retained. Limited open cut operations began at the new site in 1998 and continued until 2001, before recommencing in 2006.

In addition to the above, other historical mining operations in the area included the Renown Colliery and Cullen Bullen Colliery located south and north of Cullen Bullen respectively. Both collieries operated sporadically between 1919 and 1954 with both historically conducting underground followed by open cut mining.

There has been a long history of open cut mining operations in the district with operations in the local area dating from 1946 including Ben Bullen Colliery, Cullen Main Open Cut, Red Springs Open Cut, Renown Colliery and Beaumaris Colliery. Ben Bullen Colliery open cut was extended to become Baal Bone Colliery open cut. Cullen Main Open Cut and Renown Colliery open cut have been extended to become part of the Invincible Colliery open cut and Ivanhoe North Colliery open cut. Beaumaris Colliery open cut was extended as part the Cullen Valley Mine.

Landscape Assessment

The Cultural Heritage Landscape Assessment identified the legacy of Cullen Bullen's development and its ongoing interaction with surrounding lands. Many of these key elements were assessed to still be present within the landscape through an interaction with buildings and structures in the town, the continuation of industry, and the surrounding topography and ecology. The process of Non-Aboriginal settlement and the growth of industry in Cullen Bullen mirror aspects of settlement and resource development that were occurring in the broader regional landscape at the time. This model of settlement was, and continues to be, repeated in many towns in the region such as Portland, Wallerawang, Lithgow, Mudgee and Bathurst.

In the review of the cultural landscape for the Project, the key areas of interaction between the natural landscape and the Non-Aboriginal cultural environment were identified as:

- The topography of the region, including access to fresh water supplies and the sandstone escarpment and pagoda formations that provide a significant component of the aesthetic values and character of the region. These features also influenced the pattern of Non-Aboriginal exploration, settlement and the development of transport infrastructure such as the Mudgee Road (now the Castlereagh Highway) through Cullen Bullen and later, the development of the Wallerawang – Gwabegar Rail Line. The topography of the region also influenced those areas that were developed for agricultural activities and those areas that would retain their natural heritage significance; and
- The location of Cullen Bullen within the Western Coalfields was a significant influencing factor in the initial development of Cullen Bullen. The discovery of coal was the driving factor for significant settlement in the area and one of the principal reasons for the construction of the railway and the subsequent development of the towns of Lithgow, Wallerawang, Ben Bullen and Cullen Bullen. Historical records indicate that significant development did not occur until it became economically viable; as a result of the construction of the railway enable the mining of the area's coal resources. Coal mining created an economy, which supported a relatively large workforce that allowed for the growth of commercial interests, and construction of residences and facilities such as the Royal Hotel. Coal mining activities remain a significant sector of the local economy up to the present day (see **Section 8.21** for further detail).

8.13.3 Impact Assessment

The location of the Non-Aboriginal heritage items identified within and surrounding the Project Boundary are shown on **Figure 40**.

A total of five sites were identified within the Project Boundary, with a further four sites identified within 500 m of the Project Boundary. The NSW Heritage Council has adopted specific criteria for undertaking a significance assessment that are outlined in the guideline *Assessing Heritage Significance*, which forms part of the '*NSW Heritage Manual*' (Heritage Branch, DP&I). There are seven evaluation criteria under which an item is evaluated with reference to State and local importance. All identified sites and their significance is provided in **Table 41**.

The Project will directly impact upon two historic heritage sites, consisting of the Underground Mine Adit and the Sandstone Assemblage which lie within the open cut footprint. The Project has the potential to indirectly impact upon three historic heritage sites including the Cullen Bullen General Cemetery, Carleon Coach House and Sandstone Footings. The remaining four sites will not be impacted by the Project.

8.13.4 Mitigation and Management

Table 41 provides a summary of the proposed management strategies to mitigate direct and indirect impacts of the Project on Non-Aboriginal heritage sites.

Coalpac will develop an HHMP for the Project in consultation with the relevant authorities and to the satisfaction of DP&I. The HHMP will include, but not be limited to:

- A photographic and archival recording of the Underground Adit will be prepared prior to disturbance in accordance with the document '*How to Prepare Archival Records 1996*' (NSW Heritage Branch);
- A photographic and archival recording of the Sandstone Assemblage as per process for the Underground Adit site above. In addition, although the site appears insignificant, due to insufficient information concerning the nature of the Sandstone Assemblage site being available a further archaeological investigation will be undertaken prior to any impacts to the site. It is proposed that this investigation will be in the form of a test excavation, with any assessment process to be undertaken in consultation with the NSW Heritage Branch;
- A Statement of Heritage Impact along with archival recording to establish a baseline for monitoring and a program of site monitoring will be undertaken prior to blasting within 500 m of the Cullen Bullen General Cemetery and the Carleon Coach House;
- Provisions that will enable the Sandstone Buildings Footings site to be signposted and fenced during construction, including an appropriate buffer;
- Proposed strategies for assessing and rectifying any adverse impacts from blasting to heritage items will be detailed in the HHMP (see **Section 8.7**), along with procedures for ongoing monitoring; and
- Measures for the monitoring of issues that may impact the Cullen Bullen cultural heritage landscape, including potential blasting, subsidence and visual aspects that may impact the landscape values in the area.

8.14 ECOLOGY

Cumberland Ecology (Cumberland) has undertaken an Ecological Impact Assessment for the Project, which is included in **Appendix J**. The assessment investigates the impacts of the Project on current biodiversity values, including Threatened species, populations and ecological communities protected under the TSC Act and the *Fisheries Management Act 1994* (Fisheries Act).

The assessment also addresses potential impacts to MNES as listed under the EPBC Act. Assessments have been undertaken in accordance with relevant NSW and Commonwealth legislation and planning policies as relevant to the protection of biodiversity discussed in **Section 5**.

8.14.1 Background

The Ecological Impact Assessment was developed to update existing knowledge of the biodiversity values within the Project Boundary in line with legislative changes, current survey guidelines and new protected species listings.

Detailed surveys within the Project Boundary were completed during 2009 to 2011 to provide updated flora and fauna baseline data for the Project Boundary in accordance with '*Threatened Biodiversity Survey and Assessment Guidelines for Development and Activities*' (DECC 2004). Floristic sampling was designed to meet SEWPaC (formerly the Department of Environment and Heritage) guidelines for identifying the EPBC Act listed CEEC Box Gum Woodland (DEH 2006).

The Ecological Impact Assessment considers the Project's impacts on terrestrial and aquatic flora and fauna, particularly Threatened species, populations and ecological communities. The increasing importance placed by the government agencies on the conservation of CEECs and the changes in the Commonwealth's *Protected Matters* prompted the need for an accurate vegetation map over the Project Boundary and thus a large proportion of the most recent survey efforts have been dedicated to this purpose.

For this reason, matters such as the Capertee Stringybark, Clandulla Geebung, Black Gum, Swift Parrot, Regent Honeyeater and Bathurst Copper Butterfly were of particular focus to the investigation.

Table 41 Non-Aboriginal Heritage Sites

Site Name	Site Description	Significance	Management Action
Located within the Project Boundary			
Cullen Bullen General Cemetery	Located on the Castlereagh Highway between Lithgow and Capertee and approximately 1 ha in size and dates back to 1917. The cemetery remains in use today and is administered by the LCC.	Local	Indirect impact as a result of blasting, a Statement of Heritage Impact, archival recording and monitoring of blasts within 500 m of the site
Carleon *'Coach House'*	Located approximately 700 m north of Cullen Bullen town on the western side of the Castlereagh Highway Carleon was originally built in 1873 from sandstone blocks and a shingle roof	Local	Indirect impact as a result of blasting, a Statement of Heritage Impact, archival recording and monitoring of blasts within 500 m of the site
Underground Mine Adit	A disused underground adit was recorded on the Hillcroft property, located at the western extent of the Project Boundary dating back to c. 1903. Six timber props lining the side walls were visible from the entrance way; however, a determination as to the extent and depth of the adit was not possible due to it being in-filled and immersed in water	Local	Site to be impacted by the Project and will be demolished. Photographic recording of the site to be included in the Historic Heritage Management Plan (HHMP)
Sandstone Assemblage	Located approximately 220 m north of the disused adit, the assemblage consisted of two single layered parallel lines of natural uncut sandstone blocks, approximately 1.1 m apart and 2.25 m long, running in a north / south direction	To be confirmed	Site to be impacted by the Project and will be investigated further prior to any disturbance, in consultation with the NSW Heritage Branch
Bottle Scatter CV-RCK1-10	Recorded at Aboriginal Site CV-RCK1-10. CV-RCK1-10 approximately 20 glass bottle fragments are scattered across the surface of shelter	Local	Not impacted therefore no management action required
Located Outside the Project Boundary			
Sandstone Building Footings	Located south of the Project Boundary, are the sandstone footings of a building with dimensions of 9.8 x 8.5 m. Sandstone blocks forming the footings are irregularly shaped and ranging in size from approximately 70 cm in length to small stone rubble. There is a high potential for subsurface material at the Site	To be confirmed	Potential for impacts during construction of the MPPS conveyor. Site will be temporarily fenced to include a 20 m buffer during construction
Miners Cottages	Located in Cullen Bullen and consisting of weatherboard fronts, fibro clad rears and sides, and brick foundation walling (c1890 - 1900). A gabled iron roof lies over two rooms and skillions at the rear, and a bull-nosed veranda fronts the Cottages	Local	Not impacted therefore no management action required
Cullen Bullen Public School	Located in Cullen Bullen and consisting of a group of three buildings dating from 1875 the first with timber cladding and gabled roofs. A second building was constructed in the 1920s, comprising of two rooms and a fireplace and the third building is a modern demountable structure placed between the first two structures	Local	Not impacted therefore no management action required
Royal Hotel	Located in Cullen Bullen the Victorian styled hotel was built in two stages along roadside frontage. The first southern section of the hotel was constructed in 1890. The second section consists of dry pressed brick with smaller pane windows. A two storey Edwardian veranda continues along the entire street facing facade	Local	Not impacted therefore no management action required
Beaumaris	Located south of Cullen Bullen, Beaumaris was the first settlement in the area and includes the remains of an early 1820s homestead	Local	Not impacted therefore no management action required
Blackmans Flat Roman Catholic Cemetery	Located south of the Project Boundary the Blackmans Flat Roman Catholic Cemetery has been in use since 1877 and is associated with the families in the area	Local	Not impacted therefore no management action required
Cottage	Located south of Cullen Bullen the Cottage is an example of an early 20th century miners home that reflects the socio-economic situation of the occupants	Local	Not impacted therefore no management action required
Cottage 2	Located south of Cullen Bullen Cottage 2 is an example of an early 20th century miners home that reflects the socio-economic situation of the occupants	Local	Not impacted therefore no management action required
Cullen Bullen Landscape	Includes the cultural and natural elements of the landscape such as the location of Cullen Bullen, views to surrounding areas and sandstone outcrops that the local community has strong associations with.	Local	Management and mitigation measures for landscape elements (i.e. for visual, subsidence and blast impacts) to be included in the HHMP

There are areas of land within the Project Boundary that are heavily wooded and it is not possible for activities associated with the Project to occur without incurring impacts to native forests and woodlands, including habitats of Threatened flora and fauna. As a result, land to be designated as compensatory offsets would be required to address the ecological impacts of the Project.

8.14.2 Methodology

Document Review

Extensive ecological survey work has occurred within the locality of the Project Boundary over the past decade, primarily for industry related environmental assessments and existing Coalpac operations. Relevant literature from previous studies conducted within and adjacent to the Project Boundary were reviewed for the Project and incorporated into this report. Other existing information on the biodiversity values of the Project Boundary and its surrounds were obtained via interrogation of the OEH Atlas of NSW Wildlife and SEWPaC's *EPBC Act Protected Matters Search Tool*. The *Protected Matters Search Tool* provides a list of MNES that are predicted to occur within a 10 km search radius of the Project Boundary based on the presence of suitable habitat, which was useful for informing Threatened species searches during field survey.

Field Survey

Flora field surveys took place during Autumn 2009, Spring 2009, Summer 2010 and Spring 2011 to gain an accurate understanding of existing vegetation and communities present within the Project Boundary and the Project offset properties.

Fauna field surveys were undertaken over three periods in Autumn and Spring 2009 and opportunistically during 2010 and 2011 flora surveys. All field work undertaken for the Project is summarised in **Table 42**.

In order to obtain an understanding of the vegetation units present and prepare initial vegetation mapping within the Project Boundary, a review of aerial photographs and available satellite imagery was conducted. In addition, the *Vegetation of the Western Blue Mountains* (DEC 2006) was used to predict and identify the main vegetation communities present within the Project Boundary. The mapping was investigated in the field via the following methods:

- Quadrat sampling (20 m x 20 m) to characterise vegetation map units by their species composition and community structure and to identify the plant species present;
- Transect sampling (100 m x 20 m) to determine the density of Capertee Stringybark across the Project Boundary;
- Targeted species sampling for Threatened flora previously recorded or with the potential to occur within the Project Boundary;
- Random meander transect surveys to obtain information on community distribution in the Project Boundary and surrounds. These surveys involved walking or driving an irregular line through vegetated areas to provide additional information on where communities intergrade, to ascertain an understanding of how communities are distributed in the Project Boundary, to expand on undetected plant species and to search for Threatened plants;

Table 42 Ecological Survey Effort

Survey Dates	Tasks Completed
6 – 8 April 2009	Bat surveys, diurnal and nocturnal bird surveys, spotlighting and call playback, amphibian and reptile surveys
14 – 18 September 2009	Arboreal and terrestrial fauna trapping, hair tubes, bat surveys, diurnal and nocturnal bird surveys, spotlighting and call playback, infrared cameras, amphibian and reptile surveys
21 – 25 September 2009	Vegetation mapping, targeted surveys, quadrat surveys, random meander surveys
19 – 23 October 2009	Vegetation mapping, quadrat surveys, random meander surveys
19 - 23 October 2009	Arboreal and terrestrial fauna trapping, hair tubes, bat surveys, diurnal and nocturnal bird surveys, spotlighting and call playback, Infrared cameras, amphibian and reptile surveys
28 January 2010	Vegetation Mapping, quadrat surveys, random meander surveys
2 – 3 February 2010	Vegetation Mapping, quadrat surveys, random meander surveys
14 – 20 October 2010	Vegetation Mapping, quadrat surveys, random meander surveys
12 – 16 September 2011	Vegetation mapping, quadrat surveys, random meander surveys, Threatened flora species targeted searches and population estimates
11 – 12 October 2011	Vegetation mapping, quadrat surveys, random meander surveys, Threatened flora species targeted searches and population estimates
3 – 6 November 2011	Threatened flora species targeted searches and population estimates

- Detailed walks of vegetation units and recording boundaries using a handheld GPS unit; and
- The resultant information was synthesised using a Geographical Information System (GIS) to create a spatial database that was used to interpret and interpolate the data to produce a detailed vegetation map of the Project Boundary.

The flora assemblage within the Project Boundary was recorded by quadrat sampling, random meander surveys and through targeted searches for Threatened species. A total of 44 quadrats were sampled in 20 x 20 m plots, with quadrats of 20 m x 50 m used in areas predicted to conform to the Box Gum Woodland and Derived Native Grassland vegetation community (see below). In addition, four transects of 100 m x 20 m were surveyed to estimate the density of the Capertee Stringybark across its distribution within the Project Boundary. All individuals of this species recorded within these transects were counted and the count multiplied by five to give a per hectare density. This was then multiplied by the areas of predicted occurrence in order to estimate the total number of Capertee Stringybark trees occurring in the Project Boundary.

Fauna Survey Methods

Fauna surveys were conducted in accordance with the OEH's working draft *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC 2004). Targeted surveys were undertaken over three survey sessions to increase the seasonal range of sampling to maximise detection. The fauna survey work cumulated in over 6,500 trap nights of fauna surveys.

The survey effort was conducted over numerous fauna survey sites and included:

- Microchiropteran bat surveys including anabat echolocation recordings and harp trapping;
- Reptile and amphibian surveys including active and opportunistic searches (diurnal and nocturnal);
- Bird surveys (diurnal and nocturnal);
- Small terrestrial and arboreal mammals (spotlighting, Elliott and cage trapping and Faunatech hair tubes);
- Spotlighting and call playback for nocturnal mammals and birds;
- Infrared cameras on fauna pathways; and
- Fauna habitat assessment including hollow-bearing trees.

Any fauna species that were incidentally observed, heard calling, or otherwise detected on the basis of tracks or signs during any survey work for the Project were recorded and added to the total species list.

Incidental records of Threatened flora and fauna recorded from areas adjacent to the Project Boundary during the survey period were also included.

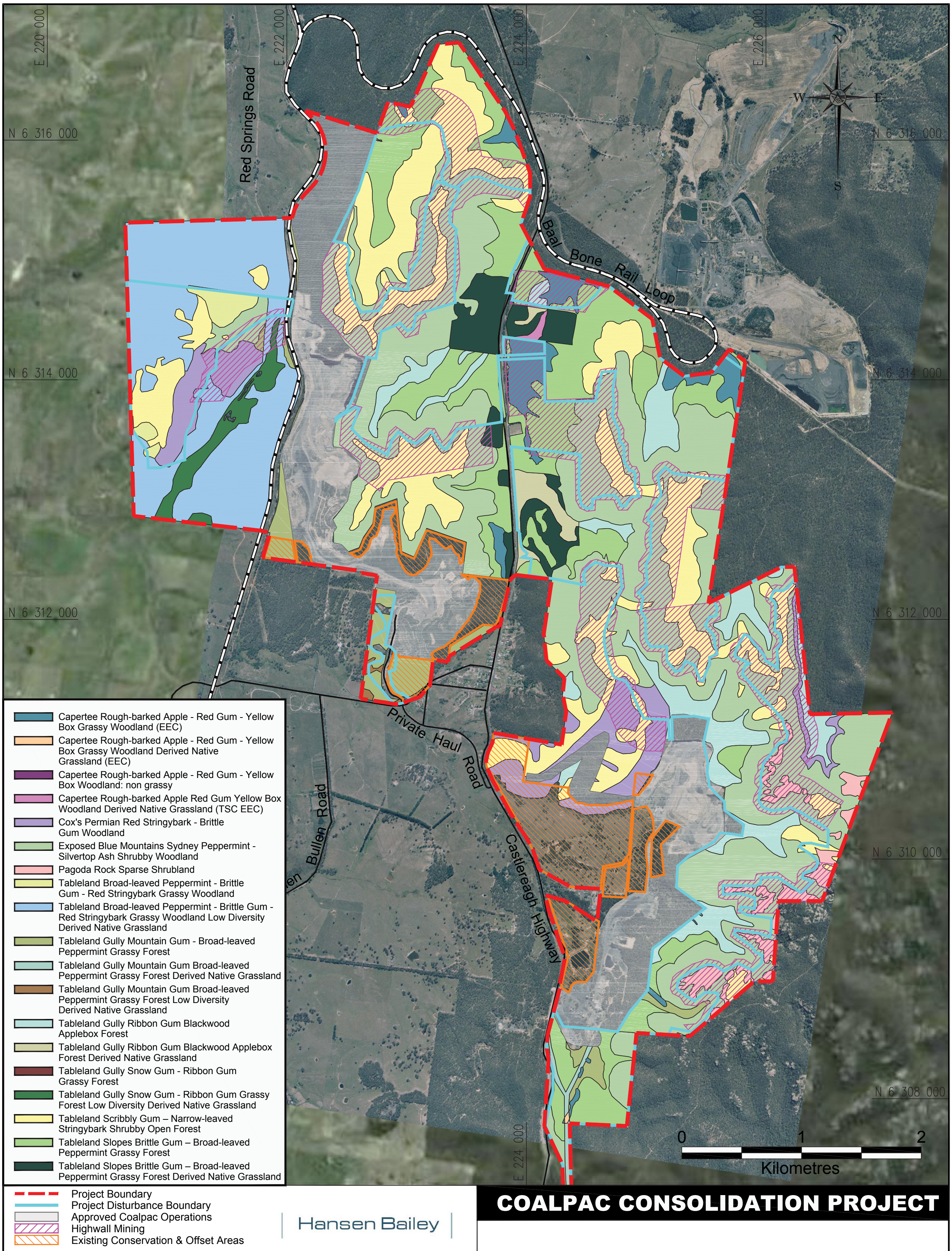
Vegetation Communities

The Project Boundary is dominated by remnant vegetation communities of the Ben Bullen State Forest with high natural species diversity and relatively few exotic species.

Generally, the areas of the Project Boundary which do not contain remnant vegetation are characterised by disturbed communities affected by existing mining operations and agricultural land uses. In broad terms, there are several communities that frequently occur within the Project Boundary as shown on **Figure 41**, including:

- Pagoda Rock Sparse Shrubland;
- Capertee Rough-barked Apple Red Gum Yellow Box Grassy Woodland;
- Capertee Rough-barked Apple Red Gum Woodland – non grassy;
- Tableland Gully Ribbon Gum – Blackwood Apple Box Forest;
- Tableland Gully Mountain Gum – Broad-leaved Peppermint Grassy Forest;
- Tableland Gully Snow Gum – Ribbon Gum Grassy Forest;
- Tableland Scribbly Gum – Narrow-leaved Stringybark Shrubby Open Forest/ Woodland;
- Exposed Blue Mountains Sydney Peppermint – Silvertop Ash Shrubby Woodland;
- Cox's Permian Red Stringybark – Brittle Gum Woodland;
- Tableland Slopes Brittle Gum – Broad-leaved Peppermint Grassy Forest;
- Tableland Broad-leaved Peppermint – Brittle Gum – Red Stringybark Grassy Open Forest;
- Acacia Thickets; and
- Native Grasslands.

Of these communities, Capertee Rough-barked Apple Red Gum Yellow Box Grassy Woodland and Derived Native Grasslands represents a form of the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box Gum Woodland) EEC as listed under the TSC Act, which is also listed as a CEEC under the EPBC Act. The area within the Project Boundary mapped as Capertee Rough-barked Apple Red Gum Yellow Box Woodland Derived Native Grassland is listed as an EEC under the TSC Act.



Hansen Bailey

Coalpac Pty Ltd

Coordinate System: MGA Zone 56
Source: Cumberland Ecology 2011

COALPAC CONSOLIDATION PROJECT

Vegetation Communities

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Figure 41 and **Table 43** outline the extent of the threatened vegetation communities identified within the Project Boundary and the status of each under the TSC or EPBC Act, as relevant.

Flora

Extensive flora surveying has been conducted within the Project Boundary over several years. As a result of the assessments conducted for the Project, more than 400 flora species have been recorded in the Project Boundary, with less than 20% of these being exotic.

The dominant plant families encountered in the open forest and woodland have been consistently represented by the *Myrtaceae*, *Fabaceae*, *Asteraceae* and *Poaceae* families. The most common genera encountered are *Eucalyptus* and *Acacia*. *Poaceae* is the family represented by the highest diversity of species, although it is not strongly represented by any one genus.

Targeted searches were undertaken for Threatened plants recorded from the locality that were considered to have the potential to occur in the Project Boundary. Considering the availability of suitable habitat, Threatened flora species that are considered most likely to occur within the Project Boundary are listed in **Table 44**.

Two Threatened flora species, the Capertee Stringybark and the Clandulla Geebung listed as Vulnerable under both the TSC Act and the EPBC Act were recorded in the Project Disturbance Boundary, with results discussed in **Section 8.14.3**. The Black Gum (also listed as Vulnerable) under both the TSC Act and the EPBC Act, was located in an existing ecological offset area established for Invincible Colliery.

The locations where these threatened flora species were identified during the field surveys undertaken for the Project are shown in **Figure 42**.

Fauna

Extensive fauna surveys have been conducted within the Project Boundary over several years. The fauna surveys were designed to provide additional information for particular fauna groups as well as to address current listings of species under State and Commonwealth legislation.

Forest and woodland communities occur extensively throughout the Project Boundary and provide suitable habitat for a range of fauna types including: amphibians, reptiles, birds, bats and arboreal and terrestrial mammals.

Table 43 Threatened Vegetation Communities within the Project Boundary

Specific Vegetation Community Names	TSC Act Status	EPBC Act Status	Area (ha)
Capertee Rough-barked Apple - Red Gum - Yellow Box Grassy Woodland	Endangered	Critically Endangered	46.18
Capertee Rough-barked Apple - Red Gum - Yellow Box Grassy Woodland Derived Native Grassland	Endangered	Critically Endangered	0.27
Capertee Rough-barked Apple Red Gum Yellow Box Woodland Derived Native Grassland	Endangered	N/A	1.99
Total C/EEC:			**48.44**

Table 44 Threatened Flora Species with Potential to Occur within the Project Boundary

Common Name (*Latin name*)	TSC Act Status	EPBC Act Status
Capertee (Cannon's) Stringybark *(Eucalyptus cannonii)**	Vulnerable	Vulnerable
Clandulla Geebung *(Persoonia marginata)**	Vulnerable	Vulnerable
Silver-leaved Mountain Gum *(Eucalyptus pulverulenta)*	Vulnerable	Vulnerable
Evans Grevillea *(Grevillea evansiana)*	Vulnerable	Vulnerable
Grey Grevillea *(Grevillea obtusiflora)*	Endangered	Endangered
Wollemi Mint-bush *(Prostanthera cryptandroides subsp. Cryptandroides)*	Vulnerable	Vulnerable
Derwentia blakelyi	Vulnerable	N / A
Black Gum *(Eucalyptus aggregata)**	Vulnerable	N / A

* Identified within the Project Boundary

Previous survey efforts have resulted in an extensive fauna species list for the Project Boundary. Despite this, the current surveys resulted in a number of additional fauna species that were not previously recorded from within the Project Boundary. A total of 35 mammal species have been identified within or in the vicinity of the Project Boundary, which includes 14 terrestrial species, five arboreal species and 16 bat species.

Habitat assessments indicated that land within the Project Boundary provides suitable foraging, shelter and breeding habitat for a range of common bird species, in addition to numerous species listed as Threatened or migratory under both the EPBC Act and the TSC Act. The Project Boundary provides suitable habitat for birds dependent on tall wet forest communities as well as for woodland and grassland-dependent birds. A total of 112 bird species were identified within the Project Boundary and immediate surrounds during the field surveys undertaken for the Project and in previous studies in the area.

Several Threatened birds listed under the TSC Act and EPBC Act were either recorded in the locality or are considered to have potential habitat within the Project Boundary and are discussed in **Section 8.14.3**.

A total of eight amphibian species were recorded in the Project Boundary, although none are listed as Threatened. No Threatened amphibian species were recorded during recent or historical surveys, and none are likely to occur within the Project Boundary as suitable habitat was not recorded during habitat assessments.

A total of 18 reptile species were recorded within the Project Boundary, including snakes, geckos and skinks. No Threatened reptile species were recorded in the Project Boundary during the survey period. It is likely that a number of additional common species would also occur as the Project Boundary provides suitable forest and woodland habitat for many of the reptiles known to occur in the wider locality. Two reptile species listed as Threatened under the TSC or EPBC Acts (the Broad-headed Snake and Rosenberg's Goanna) were also considered to have the potential to occur within the Project Boundary.

A list of the Threatened fauna species recorded during the surveys or identified as having some potential to occur within the Project Boundary are included in Threatened Fauna with Potential to Occur in the Project Boundary **Table 45**. The locations of Threatened fauna identified in this assessment are also shown on **Figure 42**.

Assessments of Significance

Assessment of Significance tests were undertaken in accordance with Section 5A of the EP&A Act for each of the Threatened species, populations and communities listed under the TSC Act and EPBC Act and identified as having the potential to occur by the ecological assessment for the Project. These tests were undertaken as a risk assessment tool to determine which listed threatened flora and fauna species may be most at risk from the Project.

Assessments of Significance tests for these species are provided in **Appendix J**.

Ecological Offset Assessments

Due to the impacts to forest and woodland communities and threatened species predicted for the Project (see **Section 8.14.3**) surveys were undertaken to identify lands that may be available as offsets. This component of the ecological impact assessment is discussed further in **Section 8.15**.

8.14.3 Impact Assessment

The Project will remove forest and woodland habitat, comprising non-listed forest and woodland communities and the listed CEEC Box Gum Woodland within the Project Disturbance Boundary (shown on **Figure 7**). As described in **Section 5.7.1**, the Project has been deemed a controlled action under the EPBC Act for the Capertee (Cannon's) Stringybark, Regent Honeyeater, the Swift Parrot and the critically endangered Leek Orchid species.

Table 46 provides a summary of disturbance associated with the Project Disturbance Boundary compared with that not proposed to be disturbed and acknowledges the CEEC proposed to be disturbed as part of the Project.

Vegetation Communities

The areas to be impacted over the life of the Project consist of approximately 835 ha of native forest and woodland habitats, including 16.5 ha of Box Gum Woodland Derived Native Grassland CEEC listed under the EPBC Act and a suite of non-listed forest and woodland communities. Approximately 1.96 ha of Box Gum Woodland Derived Native Grassland as listed solely under the TSC Act will also be disturbed.

The vegetation communities that would be most significantly impacted by the Project include the Exposed Blue Mountains Sydney Peppermint – Silvertop Ash Shrubby Forest (370 ha), Tableland Slopes Brittle Gum – Broad-leaved Peppermint Grassy Forest (186 ha), Tableland Scribbly Gum Narrow-leaved Stringybark Shrubby Open Forest (113 ha) and Tableland Gully Ribbon Gum – Blackwood Applebox Forest (94 ha).

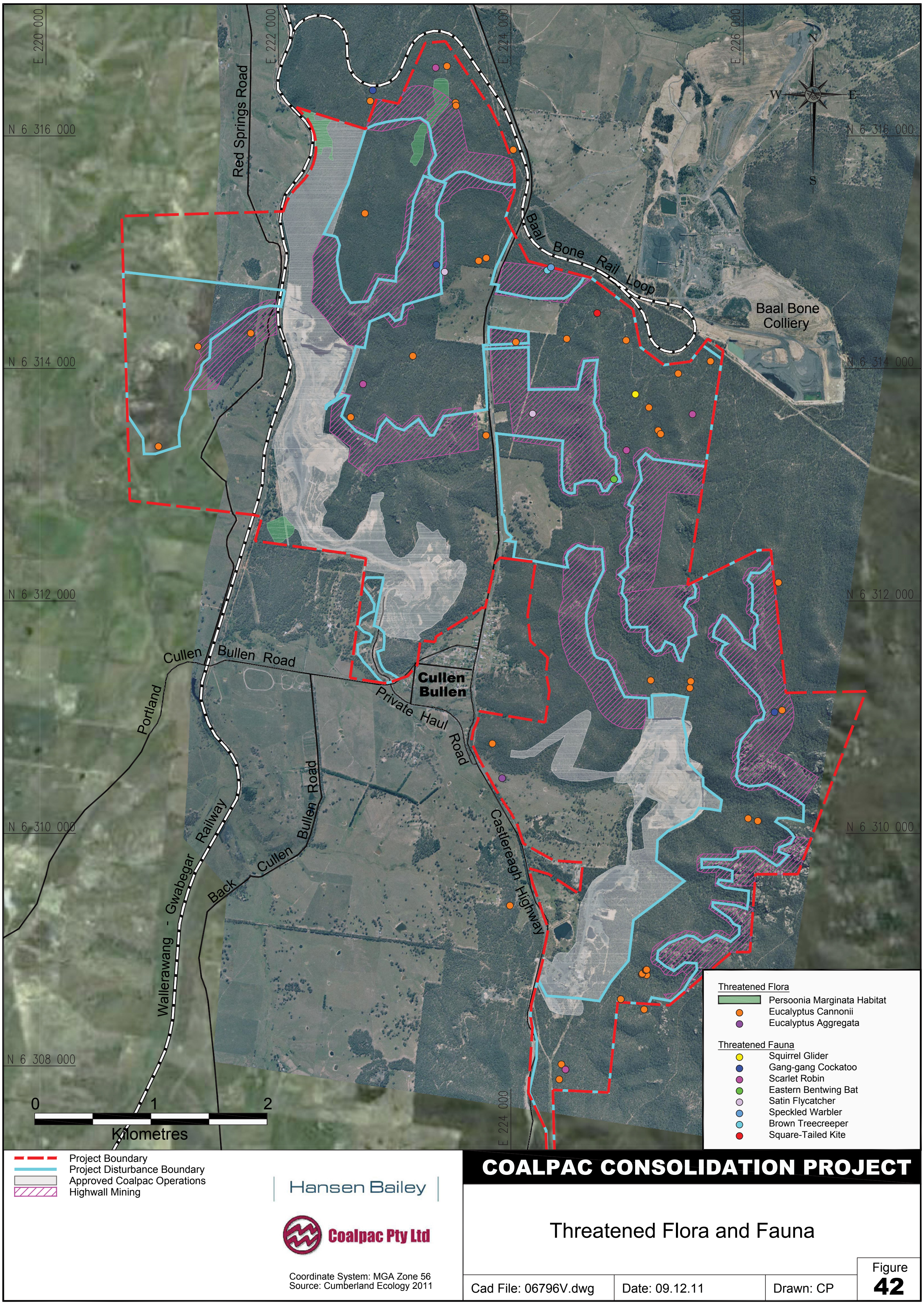
Red Springs Road
Baal Bone Rail Loop
Baal Bone Colliery
Cullen Bullen Road
Cullen Bullen
Private Haul Road
Portland
Wallerawang - Gwabegar Railway
Bullen Road
Back Cullen
Castlereagh Highway
E 220 000
E 222 000
E 224 000
E 226 000
N 6 316 000
N 6 314 000
N 6 312 000
N 6 310 000
N 6 308 000
N
S
E
W
0
1
2
Kilometres
Threatened Flora
Persoonia Marginata Habitat
Eucalyptus Cannonii
Eucalyptus Aggregata
Threatened Fauna
Squirrel Glider
Gang-gang Cockatoo
Scarlet Robin
Eastern Bentwing Bat
Satin Flycatcher
Speckled Warbler
Brown Treecreeper
Square-Tailed Kite
Project Boundary
Project Disturbance Boundary
Approved Coalpac Operations
Highwall Mining
Hansen Bailey
Coalpac Pty Ltd
Coordinate System: MGA Zone 56
Source: Cumberland Ecology 2011
COALPAC CONSOLIDATION PROJECT
Threatened Flora and Fauna
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Figure
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Table 45 Threatened Fauna with Potential to Occur in the Project Boundary

Common Name (*Latin name*)	TSC Act Status	EPBC Act Status	Recorded within Project Boundary (1997-2011)
Birds			
Speckled Warbler *(Pyrrholaemus saggitatus)*	N/A	N/A	Yes
Little Eagle *(Hieraaetus morphnoides)*	Vulnerable	N/A	No – Likely to occur as suitable habitat is present within the Project Boundary
Square-tailed Kite *(Lophoictinia isura)*	Vulnerable	N/A	Yes
Blue-billed Duck*(Oxyura australis)*	Vulnerable	N/A	No – Unlikely to occur as no suitable habitat is present within the Project Boundary
White-throated Needletail *(Hirundapus caudacutus)*	N/A	Migratory	No – Unlikely to occur, however suitable habitat is present within the Project Boundary
Great Egret *(Ardea alba)*	N/A	Migratory	No – Unlikely to occur as no suitable habitat is present within the Project Boundary
Cattle Egret *(Ardea ibis)*	N/A	Migratory	No – Unlikely to occur as no suitable habitat is present within the Project Boundary
Gang-gang Cockatoo *(Callocephalon fimbriatum)*	Vulnerable	N/A	Yes
Glossy Black Cockatoo *(Calyptorhynchus lathami)*	Vulnerable	N/A	No – Potential to occur as suitable habitat is present within the Project Boundary
Brown Treecreeper *(eastern subspecies) (Climacteris picumnus victoriae)*	Vulnerable	N/A	Yes
Regent Honeyeater *(Anthochaera Phrygia)*	Critically Endangered	Endangered	No – Potential to occur as suitable habitat is present within the Project Boundary
Diamond Firetail *(Stagonopleura guttata)*	Vulnerable	N/A	No – Potential to occur as suitable habitat is present within the Project Boundary
Painted Honeyeater *(Grantiella picta)*	Vulnerable	N/A	No – Potential to occur as suitable habitat is present within the Project Boundary
Black-chinned Honeyeater *(eastern subspecies) (Melithreptus gularis gularis)*	Vulnerable	N/A	No – Potential to occur as suitable habitat is present within the Project Boundary
Rainbow Bee-eater *(Merops ornatus)*	N/A	Migratory	No – Unlikely to occur as no suitable habitat is present within the Project Boundary
Satin Flycatcher *(Myiagra cyanoleuca)*	N/A	Migratory	Yes
Varied Sittella *(Daphoenositta chrysoptera)*	Vulnerable	N/A	Yes
Hooded Robin *(Melanodryas cucullata)*	Vulnerable	N/A	No – Potential to occur as suitable habitat is present within the Project Boundary
Scarlet Robin *(Petroica boodang)*	Vulnerable	N/A	Yes
Flame Robin *(Petroica phoenicea)*	Vulnerable	N/A	No – Potential to occur as suitable habitat is present within the Project Boundary
Grey-crowned Babbler *(eastern subspecies) (Pomatostomus temporalis temporalis)*	Vulnerable	N/A	No – Potential to occur as suitable habitat is present within the Project Boundary
Little Lorikeet *(Glossopsitta pusilla)*	Vulnerable	N/A	No – Potential to occur as suitable habitat is present within the Project Boundary
Turquoise Parrot *(Neophema pulchella)*	Vulnerable	N/A	No – Potential to occur as suitable habitat is present within the Project Boundary
Swift Parrot *(Lathamus discolor)*	Endangered	Migratory Endangered	No – Potential to occur as suitable habitat is present within the Project Boundary
Superb Parrot *(Polytelis swainsonii)*	Vulnerable	Vulnerable	No – Low potential to occur as suitable habitat is present within the Project Boundary

Common Name (*Latin name*)	TSC Act Status	EPBC Act Status	Recorded within Project Boundary (1997-2011)
Painted Snipe *(Rostratula benghalensis)*	Endangered	Migratory	No – Unlikely to occur as no suitable habitat is present within the Project Boundary
Barking Owl *(Ninox connivens)*	Vulnerable	N/A	No – Potential to occur as suitable habitat is present within the Project Boundary
Powerful Owl *(Ninox strenua)*	Vulnerable	N/A	Yes
Masked Owl *(Tyto novaehollandiae)*	Vulnerable	N/A	No – Potential to occur as suitable habitat is present within the Project Boundary
Sooty Owl *(Tyto tenebricosa)*	Vulnerable	N/A	No – Unlikely to occur as no suitable habitat is present within the Project Boundary
Insects			
Bathurst Copper Butterfly *(Paralucia spinifera)*	Endangered	Vulnerable	No – Unlikely to occur due to lack of suitable habitat present within the Project Boundary
Giant Dragonfly *(Petalura gigantean)*	Endangered	N/A	No – Unlikely to occur as no suitable habitat is present within the Project Boundary
Mammals			
Eastern Pygmy Possum *(Cercartetus nanus)*	Vulnerable	N/A	No – Potential to occur as suitable habitat is present within the Project Boundary
Spotted-tailed Quoll *(Dasyurus maculatus)*	Vulnerable	Endangered*	No – Potential to occur as suitable habitat is present within the Project Boundary
Yellow-bellied Sheathtail Bat *(Saccolaimus flaviventris)*	Vulnerable	N/A	No – Potential to occur as suitable habitat is present within the Project Boundary
Brush-tailed Rock-Wallaby *(Petrogale penicillata)*	Endangered	Vulnerable	No – Potential to occur as suitable habitat is present within the Project Boundary
Eastern Freetail-bat *(Mormopterus norfolkensis)*	Vulnerable	N/A	No – Potential to occur as suitable habitat is present within the Project Boundary
Yellow-bellied Glider *(Petaurus australis)*	Vulnerable	N/A	No – Potential to occur as suitable habitat is present within the Project Boundary
Squirrel Glider *(Petaurus norfolcensis)*	Vulnerable	N/A	Yes
Koala *(Phascolarctos cinereus)*	Vulnerable	N/A	No – Potential to occur as suitable habitat is present within the Project Boundary
Large-eared Pied Bat *(Chalinolobus dwyeri)*	Vulnerable	Vulnerable	Yes
Eastern False Pipistrelle *(Falsistrellus tasmaniensis)*	Vulnerable	N/A	Yes
Little Bent-wing Bat *(Miniopterus australis)*	Vulnerable	Vulnerable	No – Low potential to occur as suitable habitat is present within the Project Boundary
Eastern Bentwing-bat *(Miniopterus schreibersii oceanensis)*	Vulnerable	N/A	Yes
Large-Footed Myotis *(Myotis adversus)*	Vulnerable	N/A	Potential anabat record
South-eastern Long-eared Bat *(Nyctophilus timoriensis)*	N/A	Vulnerable	No – Suitable habitat is present within the Project Boundary however unlikely to occur
Greater Broad-nosed Bat *(Scoteanax rueppellii)*	Vulnerable	N/A	Potential anabat record
Reptiles			
Broad-headed Snake *(Hoplocephalus bungaroides)*	Endangered	Vulnerable	No – Potential to occur as suitable habitat is present within the Project Boundary
Rosenberg's Goanna *(Varanus Rosenbergi)*	Vulnerable	N/A	No – Potential to occur as suitable habitat is present within the Project Boundary

* South eastern mainland population.

Table 46 Project Vegetation Disturbance within the Project Disturbance Boundary

Vegetation Communities	Status	Total in Project Boundary (ha)	Total to be cleared in Project Disturbance Boundary (ha)	Proportion to be cleared (%)
Capertee Rough-barked Apple - Red Gum - Yellow Box Grassy Woodland	C/EEC	46.2	16.2	35.1
Capertee Rough-barked Apple - Red Gum - Yellow Box Grassy Woodland Derived Native Grassland	C/EEC	0.3	0.3	100.0
Capertee Rough-barked Apple - Red Gum - Yellow Box Woodland: non grassy	N/A	0.1	0.1	91.7
Capertee Rough-barked Apple Red Gum Yellow Box Woodland Derived Native Grassland	EEC	2.0	1.9	98.5
Tableland Gully Ribbon Gum Blackwood Applebox Forest	N/A	111.8	93.94	84.02
Tableland Gully Ribbon Gum Blackwood Applebox Forest Derived Native Grassland	N/A	16.6	15.02	90.37
Tableland Scribbly Gum – Narrow-leaved Stringybark Shrubby Open Forest	N/A	332.4	112.51	33.84
Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Woodland	N/A	13.7	13.02	94.97
Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Woodland Low Diversity Derived Native Grassland	N/A	215.2	42.72	19.85
Tableland Slopes Brittle Gum – Broad-leaved Peppermint Grassy Forest	N/A	260.9	185.8	71.2
Tableland Slopes Brittle Gum – Broad-leaved Peppermint Grassy Forest Derived Native Grassland	N/A	57.1	50.1	87.8
Tableland Gully Mountain Gum - Broad-leaved Peppermint Grassy Forest	N/A	51.7	18.9	36.5
Tableland Gully Mountain Gum Broad-leaved Peppermint Grassy Forest Derived Native Grassland	N/A	12.8	12.4	96.8
Tableland Gully Mountain Gum Broad-leaved Peppermint Grassy Forest Low Diversity Derived Native Grassland	N/A	2.8	0.9	30.5
Tableland Gully Snow Gum - Ribbon Gum Grassy Forest	N/A	0.9	0.0	0.0
Tableland Gully Snow Gum - Ribbon Gum Grassy Forest Low Diversity Derived Native Grassland	N/A	23.4	0.0	0.0
Pagoda Rock Sparse Shrubland	N/A	32.9	0.05	0.15
Cox's Permian Red Stringybark - Brittle Gum Woodland	N/A	92.0	23.7	25.8
Exposed Blue Mountains Sydney Peppermint - Silvertop Ash Shrubby Woodland	N/A	679.1	370.4	54.5
TOTAL AREA		**1,951.9**	**958.0**	**49.1**
TOTAL C/EEC * (EPBC Act and TSC Act)		**46.4**	**16.5**	**35.5**
TOTAL EEC * (TSC Act only)		**2**	**1.9**	**98.5**

* Does not include areas of low diversity native grassland and exotic grassland.

In addition to the direct removal of these native vegetation communities, the Project will also negatively affect vegetation that will remain by additional fragmentation and isolation impacts. Remnant vegetation is already fragmented within the Project Boundary; however the proposed development has potential to increase the level of fragmentation and isolation of forested areas.

Despite this, large areas of suitable habitat will remain within the Project Boundary (977 ha of native vegetation will be retained, including 30 ha of Box Gum Woodland CEEC) and the wider locality within the protected Wollemi National Park, Gardens of Stone National Park, Winburndale Nature Reserve and other remnants including Newnes State Forest, Sunny Corner State Forest, Wolgan State Forest and some parts of the Ben Bullen State Forest.

In the absence of a suitable Biodiversity Offsets Package, the Project would have a significant impact the Box Gum Woodland community as listed as an EEC under the TSC Act and a CEEC under the EPBC Act.

In anticipation of such impacts, the Proponent has proposed an Offset Package to complement Coalpac's existing ecological offsets (as described in **Section 8.15**) that will result in significant net benefits to flora and fauna within the locality and region, including Box Gum Woodland and Threatened species. **Section 8.15** also provides detail on the proposed Biodiversity Offset Package that will be implemented to compensate the impacts of the Project and has the potential to increase connectivity between areas of remnant vegetation and forested areas within the medium to long term.

Threatened Flora

Suitable potential habitat exists within the Project Boundary for a number of Threatened plant species listed under the EPBC Act and / or TSC Act (see **Table 44**). Intensive targeted surveys were undertaken for these species.

Despite intensive survey effort and targeted searches, only three Threatened plant species, the Capertee Stringybark Clandulla Geebung and Black Gum were found within the Project Boundary. Capertee Stringybark is listed as Vulnerable under both the TSC Act and the EPBC Act and the species is restricted to an area of about 100 x 60 km in the Central Tablelands of NSW. It also co-occurs with other Stringybark species including *E. macrorhyncha*, with which the species is known to intergrade, and *E. sparsifolia*.

An estimated 37,602 specimens of Capertee Stringybark are predicted to occur sporadically over much of the Project Boundary. Of these, the Project will remove approximately 278 ha of potential habitat, which is predicted to support 19,219 specimens.

Targeted surveys identified three distinct subpopulations of the Clandulla Geebung within (and partially outside) the Project Boundary. These populations are located in the south, adjacent the Wallerawang – Gwabegar Rail Line and within the existing Cullen Valley Mine Compensatory Habitat Area established for existing operations and in two areas in the northern extent of the Project Boundary.

Of the northern populations, the western-most occurrence of the species extends east from the Wallerawang – Gwabegar Rail Line in a 'mining exclusion area' within the existing footprint of Cullen Valley Mine. The third population located within the Project Boundary is in the northern extent of the Project Cullen Valley mining area and 3.28 ha of this subpopulation will be impacted by the Project. With the recorded density of individuals within this area, approximately 321 individuals are predicted to be disturbed. These locations of these subpopulations in relation to the Project Boundary are shown on **Figure 42**.

While Black Gum was identified in the Project Boundary during the targeted surveys undertaken, this species will not be impacted by the Project. All individuals of this species are protected within an existing biodiversity offset area at Invincible Colliery (see **Figure 42**).

While potential habitat suitable for other Threatened plant species listed under both the TSC Act and the EPBC Acts was assessed to exist within the Project Boundary, intensive targeted surveys for these species have not identified any or resulted in any other species being identified.

Threatened Fauna

The Project will result in the removal of forest, woodland, and derived grassland vegetation communities which provide for foraging, shelter and breeding habitat for the Threatened woodland birds known to occur in the area. One of the major impacts of the Project on fauna will be habitat fragmentation. Fragmentation is the process where habitats that were once continuous become divided into separate fragments isolated from each other by non-forest land.

The Project has the potential to impact on Threatened invertebrates and reptiles including the Bathurst Copper Butterfly, Giant Dragonfly, Broad-headed Snake and Rosenberg's Goanna. Both the Bathurst Copper Butterfly and Giant Dragonfly are not expected to be significantly impacted due to a lack of suitable habitat within the Project Boundary.

The Broad-headed Snake occurs from the coast to ranges of south-eastern Australia, where it is largely confined within an area approximately 250 km of Sydney where Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, occur.

As such, extensive areas of remaining habitat for the Broad-headed snake will remain within the Project Boundary and in adjacent areas within the Ben Bullen State Forest and other reserves. The Rosenberg's Goanna (listed as Vulnerable under the TSC Act) also has potential to occur within the Project Boundary.

Both the Regent Honeyeater (listed as Critically Endangered under the TSC Act and Endangered under the EPBC Act) and the Swift Parrot (listed Endangered under the TSC and EPBC Act) can undertake large-scale movements in the order of hundreds of kilometres. The Regent Honeyeater and the Swift Parrot were not recorded within the Project Boundary during historical surveys of those for the Project. However, given both are wide-ranging blossom nomads it is possible that either of these species may forage within the Project Boundary during intense blossom periods. The Capertee and Wolgan Valleys to the north-east of the Project Boundary are often frequented by both species.

In total, eight Threatened bird species have been identified within the Project Boundary during past and current surveys including the Speckled Warbler, Gang-gang Cockatoo, Brown Treecreeper, Satin Flycatcher, Varied Sittella, Scarlet Robin, Square-tailed Kite and the Powerful Owl.

In total, nine Threatened mammal species have been identified within the Project Boundary during past and current surveys or are considered to have the potential to occur. These include the Spotted-tailed Quoll, Brush-tailed Rock-Wallaby, Squirrel Glider, Large-eared Pied Bat, Little Bent-wing Bat, Eastern Freetail Bat, Greater Broad-nosed Bat, Eastern Bent-wing Bat and the Eastern False Pipistrelle.

In addition to the direct impacts predicted for Threatened fauna species, a number of indirect effects are also predicted. These indirect impacts may include:

- Potential degradation of habitat quality in areas adjacent to the Project Disturbance Boundary;
- Increased competition for habitat resources;
- Noise from the Project operations impacting on species;
- Light for Project operations impacting on susceptible species;
- Dust generated by the Project affecting vegetation habitat and resources;
- Impacts to habitat quality due to erosion or changes to drainage patterns; and
- Weeds, feral animals and invasive native species becoming established.

Overall, Project impacts will vary between fauna species and specific effects will depend on their mobility and willingness to move through the modified landscape. As found in the results of surveys, the largest fauna group present within the Project Boundary are birds, which are relatively mobile and will not be directly impacted by isolation of habitats. Highwall island impacts are likely to be reduced as areas of undisturbed habitat shall remain connected to remnant patches of native vegetation (see **Figure 9**). Due to the nature of mining operations and progressive rehabilitation, connectivity to surrounding areas in the State Forest and National Parks will also be retained throughout the life of the Project.

Impact on Biodiversity Values

The open forest, woodland, sandstone escarpments and caves and derived grassland vegetation communities of the Project Boundary provide habitat for a range of flora and fauna; including some species that are listed as Threatened or Migratory under the EPBC Act and / or the TSC Act. Within these vegetation communities, a range of habitat features provide foraging, shelter and breeding opportunities for fauna.

The Project will impact on fauna habitats through the clearance of 835 ha of native vegetation and fauna habitat features. The quality of habitat is dependent upon its location and is very dependent upon past land use. Regrowth areas generally lack many habitat features such as tree hollows but areas of good quality habitat were identified at several locations.

The Project will result in the clearance of vegetation and removal of some key fauna habitat features within the Project Boundary. This process results in numerous actions considered to be Key Threatening Processes by OEH, such as the Clearing of Native Vegetation (NSW Scientific Committee 2004c), Loss of Hollow-bearing Trees (NSW Scientific Committee 2006), Removal of Dead Wood and Dead Trees (NSW Scientific Committee 2004d) Bushrock Removal (NSW Scientific Committee 2004b) and the Alteration to the Natural Flow Regimes of Rivers, Streams, Floodplains and Wetlands (NSW Scientific Committee 2004a).

The Project will result in the removal of approximately 835 ha of treed foraging, breeding and shelter habitat for birds and mammals. Given the extent of woodland habitat to be removed, it is likely that this will result in impacts on common woodland-dependant birds that currently occupy the Project Boundary. As few of the common mammals occurring within the Project Boundary are woodland-dependant species, it is unlikely that the removal of habitat under the Project will result in any significant impacts on common mammal species and their habitat.

Groundwater Dependent Ecosystems

No GDEs have been identified within the Project Boundary. GDEs are likely to occur in areas containing higher levels of oxygen, such as waters contained within the alluvial areas. GDEs are highly unlikely to occur within the deeper hardrock aquifers.

The closest and most likely areas to be associated with GDEs are the Coxs River Swamp and Jews Creek Swamp which are located 2.0 km and 3.5 km respectively from the Project Boundary. While the groundwater impact assessment (**Section 8.10**) predicts a zone of depressurisation that extends beyond the Project Boundary it is unlikely to adversely affect GDEs in these areas.

Stygofauna

As discussed in **Section 8.10**, the Project is not predicted to result in any significant impacts to groundwater regimes or regional groundwater quality. Furthermore, while there is some potential for minor spills and contamination by metals and hydrocarbons, waste disposal and fuel storage areas, Coalpac has a range of waste management procedures in place to prevent contamination of shallow strata and subsequent leakage to the groundwater system.

Given that the Project Boundary does not include any GDEs and that the closest swamps of Jews Creek and the Coxs River will not be impacted, the Project is not expected to impact upon stygofauna.

Edge Effects

Edge effects generally include changes in sunlight, humidity, water runoff and wind and erosion. There is a low potential for extensive edge effects to occur in upslope or mid-slope areas as the highest risk of edge effects will be from unmitigated erosion and surface water runoff. Therefore edge effects within the drier habitats are expected to be minimal and confined close to the edge of clearing.

Such habitats include the following vegetation communities: Pagoda Rock Sparse Shrubland, Exposed Blue Mountains Sydney Peppermint Silvertop Ash Shrubby Woodland and Tableland Scribbly Gum Narrow-leaved Stringybark Shrubby Open Forest. Impacts downslope of clearing have the potential to be more widespread and penetrate significantly further from the cleared areas. For this reason, Coalpac will implement leading practice measures to control impacts from erosion, sedimentation and associated weed invasion.

Cumulative Impacts

Extensive vegetation clearing has already occurred in the locality as a result of agriculture, forestry, and other mining projects. These processes are still occurring and impacting on the biodiversity of the area.

The scale of vegetation clearance that will occur as a result of the Project has the potential to exacerbate these existing ecological impacts. If no mitigation or compensatory measures are provided, this will result in cumulative impacts on flora and fauna as habitats are further reduced and fragmented.

Coal mining has and is currently taking place in other portions of Ben Bullen State Forest and nearby areas. Other operations nearby to the Project include the Baal Bone Colliery, Ivanhoe North Colliery and the Pine Dale Mine. Collectively, when considered with the current proposal, large portions of the existing State Forest areas in the region will be subject to mining activities within the next two to three decades. However, these will cease as coal reserves are depleted; thus the cumulative effects are finite and known, and will dissipate with the cessation of mining in the area.

This includes the direct impacts of habitat removal, and the subsequent impacts of dust, noise and erosion. These cumulative impacts are likely to be most strongly felt in the patches remaining after clearing, and are likely to extend the footprint of the mine beyond the areas actually cleared.

Large areas of such vegetation will remain both within the Project Boundary and outside of it, including areas within the National Parks and surrounding rural areas. Some vegetation communities to be impacted, particularly the CEEC Box Gum Woodland, are not well represented within secure tenures, particularly within conservation reserves. The Biodiversity Offset Strategy will both protect existing forest and woodland communities and restore vegetation on previously disturbed agricultural lands, with the net result being an increase in total woodland vegetation and an increase in such vegetation under conservation tenures. The Biodiversity Offset Strategy for the Project is described in further detail in **Section 8.15**.

Regional and State-wide Impacts

Due to the location of the Project, impacts in a Bioregional, Catchment Management Authority (CMA) and State-wide contexts have been assessed. Each of these is discussed further below.

Bioregional Impacts

The Project is located along the western edge of the Sydney Basin Bioregion. While the Project will have a significant impact on the biodiversity values of the Project Disturbance Boundary in the short term, the vegetation communities and fauna habitat to be removed are generally well represented in regional State Forest and National Park reserves and throughout the Sydney Basin Bioregion as a whole.

In total, the Sydney Basin Bioregion (3,627,008 ha in total) supports extensive areas of habitat in conservation tenure and has the third highest area of conservation-oriented tenures of the NSW bioregions.

Together, they occupy about 1,384,418 ha or 38.2% of the bioregion for the EECs, threatened flora and threatened fauna that will be impacted by the Project. State Forests cover 178,066 ha or 4.91% of the Sydney Basin Bioregion.

The Project disturbance constitutes 0.4% of all State Forest areas within the bioregion.

Ben Bullen State Forest covers approximately 6,783 ha and approximately 1,442 ha (60%) of the Project Boundary occurs within it. Of this, approximately 752 ha lies within the Project Disturbance Boundary and will be impacted. Therefore, a total of 11% of the Ben Bullen State Forest will be progressively removed (and replaced with rehabilitation) during the 21 years of operations sought for the Project.

The Project is also located within the GoS2 proposal area as presented in Muir (2005), which seeks to expand the existing Gardens of Stone National Park (itself located over 2.5 km to the north) by creating a range of new conservation areas. The GoS2 proposal covers an area of approximately 40,000 ha and consists of six divisions. The division that the Project lies within is the Baal Bone and Long Swamp Division (BBLSD). The BBLSD has been nominated by the Colong Foundation for inclusion into GoS2 for its *"massed pagoda 'villages' that stand above the diverse swampy plains"* (Muir 2005). It is understood from discussions with OEH during December 2011, that OEH also has a proposal in progress for GoS2 with a different area to that proposed by the Colong Foundation. This information was not made available by OEH at the time of writing this EA.

The Project Disturbance Boundary will directly affect 1.3% of the total proposed GoS2 conservation area as proposed in Muir (2005). It will not directly affect the existing Gardens of Stone National Park.

Of the 958 ha proposed to be disturbed by the Project, approximately 528 ha are located within the BBLSD which constitutes 6.8% of the total area of BBLSD. This value (528 ha) is lower as areas of Ben Bullen State Forest west of the Castlereagh Highway have not been included in the proposal for the BBLSD component of GoS2. This represents the total disturbance anticipated for the Project and that this would occur progressively, along with rehabilitation development.

Moreover, the proposed biodiversity offset areas for the Project (see **Section 8.15**) will add to and complement some of the objectives of GoS2. The Project has also been designed to avoid significant geological formations and will not remove any natural heritage features such as pagoda or escarpments.

Regional Impacts

The Project Boundary lies within the eastern edge of the Central West Catchment, which covers an area of approximately 8,484,200 ha. To assess the impacts to this region, vegetation mapping completed for the *'Reconstructed and Extant Distribution Native Vegetation in the Central West Catchment'* (DEC 2006) was considered in the context of the Project. This review found that the Project will remove the following percentages of similar vegetation estimated to currently extend across the Central West Catchment:

- 0.86% of Mountain Gum – Red Stringybark Open Forest at High Altitudes;
- 0.39% of Mountain Gum – Peppermint Forest at High Altitudes;
- 0.21% of Scribbly Gum Woodland;
- 0.27% of Stringybark – Box – Gum Woodland; and
- 0.57% of Sydney Sandstone Woodland/Open Forest.

The 835 ha of forest and woodland to be disturbed for the Project was found to constitute 0.21% of the above mentioned vegetation types estimated to cover the Central West Catchment.

In total, Project impacts represent 0.01% of all forest and woodland mapped within the Central West Catchment.

State-wide Impacts

In the context of the vegetation on a state-wide level, it was assessed that the Project would remove the following amount of vegetation classes estimated to extend across NSW:

- $<$ 0.001% of Western Slopes Grassy Woodland;
- 0.067% of Southern Tableland Grassy Woodland;
- 0.051% of Southern Tableland Dry Sclerophyll Forest;
- 0.001% of Sydney Montane Heath; and
- 0.206% of Sydney Montane Dry Sclerophyll Forest.

In total, the Project represents the disturbance of 0.06% of the above-mentioned forest and woodlands as they occur within NSW. It should be noted that when calculating the percentage loss within NSW vegetation communities, the lowest estimated extent of remaining vegetation provided in Keith (2004) was used as a precautionary approach and to compensate for clearing since publication of that report.

8.14.4 Mitigation and Management

Management measures proposed for the Project have followed the OEH's *'Draft Guidelines for Threatened Species Assessment'* (DEC 2005b), 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 below where reasonable and feasible.

Avoid

As discussed in **Section 4.2**, the Project mine plan has been revised through the consideration of a number of alternatives which were developed to reduce the potential for adverse impacts to the environment, including specific impacts on Threatened communities and flora and fauna species.

The Project mine plan has been altered in key areas in the East Tyldesley, Cullen Valley and Hillcroft mining areas to reduce disturbance areas that would have otherwise been impacted by the Project (see **Section 4.2.1**).

The Project mine plan has been devised through the consideration of a number of alternatives which were developed to reduce the potential for adverse impacts to the environment, including specific impacts on Threatened ecological communities and species. In particular, suitable Capertee Stringybark habitat has been purposely avoided and the disturbance area altered or reduced where possible.

Coalpac's commitment to avoiding impacts on threatened species has resulted in the redesign of the existing Cullen Valley Mine pit to avoid the entire Clandulla Geebung sub-population located within the northern extent of the existing approved mining area.

Coalpac has also additionally revised the Project mine plans to implement highwall mining to avoid disturbance to 30 ha of Box Gum Woodland. The implementation of highwall mining methods (as opposed to longwall or bord and pillar underground mining methods) for coal seams located below pagodas, escarpments and rocky outcrop features will reduce the potential for impacts on habitat in these areas that could be utilised by the Brush-tailed Rock-wallaby, Broad-headed Snake, Large-eared Pied Bat and Eastern Bent-wing Bat.

Coalpac has also further reduced the open cut footprint (specifically at the bases of retained rocky outcrops and pagoda habitat) through the implementation of a restricted open cut mining limit of 50 m from pagodas and the escarpment areas and 20 m below other small isolated rocky outcrops as shown in the mine plans and Project Disturbance Boundary assessed in this EA.

Altering the Project Disturbance Boundary to avoid ecological impacts has also resulted in a reduction of impacts to 63 ha of potential habitat for the Capertee Stringybark and approximately 30 ha of Box Gum Woodland CEEC. The alignment of the MPPS conveyor has also been located largely within an existing powerline infrastructure alignment to reduce further vegetation clearing and is within the defined Project Disturbance Boundary.

Coalpac will implement a revised Land Disturbance Protocol for the Project. This Protocol requires the Environmental Manager (or delegate) to carry out an inspection of any proposed disturbance areas prior to any mining activities occurring and is further described in **Section 8.24.4**. This Protocol shall continue to provide a process to ensure that compliance with relevant licences and approvals is maintained, that sensitive ecological habitat and communities are not impacted upon directly without approval, and that appropriate mitigation is in place.

This protocol will also include procedures for the collection and management of timber cleared in advance of mining operations in consultation with Forests NSW.

Mitigate

As part of its EMS, Coalpac will develop and implement a Biodiversity Management Plan (BMP) prior to the commencement of activities for the Project that will be prepared to the satisfaction of DP&I. This BMP will incorporate a number of management and mitigation measures to minimise any adverse impacts to sensitive flora and fauna. These management and mitigation measures will build on current practice and will include:

- An enhanced Land Disturbance Protocol for the Project that sets out the process for the Environmental Manager (or Delegate) to sign off on the staged clearing activities that will be required for the Project;
- Limiting the disturbance of vegetation to the minimum necessary for each stage pre-stripping in advance of mining operations;
- Limits of clearing being delineated to avoid unnecessary vegetation and habitat removal;
- Implementation of a pre-clearing Protocol for all tree clearing to minimise impacts to resident fauna, which may need to be relocated to surrounding habitat prior to disturbance;

- Scheduling the clearing of vegetation to times where it is possible to optimise seed collection;
- Collecting and propagating native seed for use in rehabilitation areas and other disturbed areas;
- Translocating habitat features such as large logs and boulders to rehabilitation areas where safe and practically feasible;
- Trialling and developing regeneration methodologies and strategies with a particular emphasis on Threatened species and species that are part of the Box Gum Woodland CEEC;
- Progressively rehabilitating mined areas and Project biodiversity offsets (see **Section 8.15**). This will include the re-establishment of Threatened flora species in rehabilitated vegetation communities at similar densities to those that currently occur within the Project Boundary;
- Implementation of the Biodiversity Offset Management Plan (BOMP) to provide specifications for the restoration and management of the Biodiversity Offset Areas as detailed in **Section 8.15**;
- Implementation of an annual flora and fauna monitoring program for rehabilitation and Threatened species remaining within the Project Boundary to improve the understanding of impacts and assist with rehabilitation efforts;
- Outline management strategies for the effective control of weeds and feral animals;
- Implement appropriate vehicle driving polices including speed restrictions and signposting of known fauna crossing locations to minimise the risk to fauna species; and
- Provide linkages and or crossing zones between isolated vegetation remnant patches, where feasible.

Compensate

A substantive Biodiversity Offset Strategy is proposed to provide mitigation and compensation measures arising from the Project and is described in **Section 8.15**.

Coalpac will develop a BOMP that will be implemented prior to the commencement of the Project that will provide specifications for the restoration and management of Biodiversity Offset Areas (see **Section 8.15**).

With the implementation of the above mitigation measures in conjunction with the proposed BOP it is apparent that although the habitat for the Threatened flora and fauna within the Project Boundary will be adversely affected, on the whole it will result over time in a net improvement in the biodiversity conservation values within the Central West Region.

8.15 BIODIVERSITY OFFSET STRATEGY

As a component of the Ecological Impact Assessment for the Project, Coalpac has developed a comprehensive Biodiversity Offset Strategy in conjunction with Cumberland which is included in **Appendix J**. This Biodiversity Offset Strategy was developed in response to the predicted Project impacts on biodiversity, particularly on Threatened ecological communities and habitat for Threatened species as described in **Section 8.14**.

A summary of the proposed Biodiversity Offset Strategy and how it will maintain and ultimately improve the amount of forest and woodland under conservation tenure within the locality is provided in the following sections.

8.15.1 Background

The Biodiversity Offset Strategy entails the acquisition of properties for permanent conservation of flora and fauna, including Threatened flora and fauna predicted to be impacted by the Project, in addition to conserving other landholdings currently managed by Coalpac. These areas are additional to rehabilitation within the Project Boundary.

Under existing approvals, Coalpac manages land totalling approximately 166 ha of forest, woodland and grassland which will continue to be managed as long term compensatory conservation and offset areas (see **Figure 5**).

These properties will continue to provide habitat for resident fauna during the implementation of the Project. A summary of these properties is provided below:

- Lot 1, DP 180294 ('Renown Farm'), a 18 ha property containing approximately 5 ha of degraded woodland vegetation and 13 ha of degraded grassland and water storage;
- Lot 112, DP 877190, an 82 ha property containing Tableland Gully Snow Gum, Ribbon Gum Grassy Forest vegetation community, Coxs Permian Red Stringybark Brittle Gum Woodland and Tableland Gully Mountain Gum Broad-leaved Peppermint Grassy Forest which is being rehabilitated and managed;
- Lot 113, DP 877190, which is linked to Ben Bullen State Forest and contains 14.5 ha dominated by Tableland Gully Snow Gum, Ribbon Gum Grassy Forest vegetation community and grassland; and
- A collective area of approximately 51.4 ha is conserved as part of the Cullen Valley Mine habitat compensation. These areas contain Sandstone Ridgetop Woodland, Tableland Sheltered Valley Forest and Tablelands Dry Woodland.

Discussions with DP&I, OEH (formerly DECCW) and SEWPaC during the early stages of Project development confirmed its significance and the need to develop a carefully planned and comprehensive Biodiversity Offset Strategy that compensated (in accordance with current regulatory requirements) for the impacts proposed by the Project upon the listed Box Gum Woodland and Derived Native Grassland and potential habitat for the listed Threatened flora and fauna species.

High level vegetation mapping was undertaken via field surveys to confirm areas containing Box Gum Woodland and Derived Grassland and habitat for Capertee Stringybark. This initial vegetation mapping was used to prioritise areas containing Box Gum Woodland that had some potential value as part of a Biodiversity Offset Strategy in maintaining and improving long term biodiversity outcomes within the region.

By priority, access was arranged with the respective landholders and field surveys were undertaken by teams of ecologists to both validate the findings of the preliminary mapping and assist in completing detailed mapping of vegetation communities on key properties with offset potential. Suitable lands were acknowledged during this process and used in the development of the Biodiversity Offset Strategy for the Project.

The key objectives for the establishment of the Coalpac Biodiversity Offset Strategy included:

- Re-establishment of habitat linkages to existing areas of habitat in the locality, including existing native vegetation within and closely adjacent to the Project Boundary between Sunny Corner State Forest and Ben Bullen State Forest;
- Establishment of long term biodiversity offset and management areas for conservation of existing vegetation habitats for locally occurring Threatened species and ecological communities, particularly Box Gum Woodland and Capertee Stringybark;
- Conservation of land that contains or could be regenerated to provide Tableland Gully Ribbon Gum - Blackwood - Applebox Forest, Tableland Gully Mountain Gum - Broad-leaved Peppermint Grassy Forest and other non-EEC vegetation;
- Conservation of land that includes habitat for all relevant Threatened flora and fauna species that could be impacted by the Project;
- Rehabilitation of the Project disturbance areas to native vegetation communities and described in detail in **Section 8.24**; and
- Development of BMP for the Project to consolidate ecological management across all Coalpac Biodiversity Offset Areas.

8.15.2 Offsetting Principles

The Biodiversity Offset Strategy has been developed to generally comply with the biodiversity offsetting principles developed by both the State and Commonwealth Governments, which includes:

- *'Principles for the Use of Biodiversity Offsets in NSW'* (DECC 2008); and
- *Draft Policy Statement: Use of Environmental Offsets under the Environment Protection and Biodiversity Conservation Act 1999* (DEWR 2007).

The Commonwealth requirements for biodiversity offsets are guided by the *Draft Policy Statement: Use of Environmental Offsets under the Environment Protection and Biodiversity Conservation Act 1999* (EPBC Offsets) (DEWR 2007). The aim of this policy is to outline the Commonwealths' position in relation to the use of offsets and to ensure that the best environmental outcomes are achieved through the consistent, transparent and equitable application of offsets under the EPBC Act.

One of the key principles of this draft policy is that environmental offsets, as a minimum, be commensurate with the magnitude of the impacts of the development and ideally deliver outcomes that are *'like for like'* (DEWR 2007). The Biodiversity Offset Strategy has been developed to comply generally with the above principles as it will compensate the residual impacts of the Project and to help maintain and substantially improve the biodiversity values within the region in the medium to long term.

8.15.3 Methodology

The Biodiversity Offset Strategy proposed for the Project has been developed to ensure that ecological impacts are reduced as far as practicable and that the principles of the OEH *Draft Guidelines for Threatened Species Assessment* (DEC 2005b) have been applied. Offset measures are generally developed in cases where the proposed disturbance is likely to have an impact on native flora and fauna, particular Threatened species, populations, communities and / or habitat and which cannot be adequately mitigated or remediated as part of the development.

The Project requires an Offset Package that addresses impacts to a C/EEC and the loss of native remnant vegetation, including habitat for a suite of Threatened species (see **Appendix J**), all of which are well represented in the offset strategy. This includes various birds, mammals, bats and plants with a particular emphasis on species listed under EPBC Referral (No 2010/5776), including: Box Gum Woodland and Derived Native Grasslands C/EEC, Capertee Stringybark, Regent Honeyeater and Swift Parrot.

8.15.4 Biodiversity Offset Strategy

The Biodiversity Offset Strategy that has been formulated for the Project requires the acquisition of land holdings that contain substantial amounts of remnant vegetation, in addition to the rehabilitation of the Project Disturbance Boundary. These land holdings are shown on **Figure 43** and are located both in the immediate vicinity of the Project Boundary and further away within the region. **Figure 43** also shows the location of the Project and its proposed biodiversity offset properties in the context of existing State Forests, National Parks and the proposed GoS2.

Particulars of each are component of the proposed Biodiversity Offset Strategy are summarised in **Table 47** and include:

- Hillcroft Offset: A property within and immediately to the west of the Project Boundary that will be acquired for conservation. This property is extensively vegetated over the western half, provides suitable habitat for the Capertee Stringybark, Clandulla Geebung and a link between the Sunny Corner State Forest and the Ben Bullen State Forest. The property also provides for suitable riparian habitat along Dulhuntys Creek and Williwa Creek which occur within it, each a tributary of the Turon River (see **Figure 44**). Coalpac is in negotiations with the landowner to acquire this property upon grant of Project Approval;
- Yarran View Offset: A property located to the north of the Project which is located adjacent to the Wollemi National Park and will be acquired for conservation. This property contains both intact native vegetation and C/EEC Box Gum Woodland and Derived Native Grassland (see **Figure 45**). Coalpac owns this property;
- Hillview / Billabong Offset: A property west of the Castlereagh Highway adjacent the Project Boundary west of Invincible Colliery. This property has C/EEC Box Gum Woodland and Derived Native Grassland and non-EEC vegetation similar to the Project Boundary (see **Figure 46**). Coalpac controls this property; and
- Hyrock Hartley Offset: A property located to the south-east of the Project will be acquired for conservation. The property contains sandstone vegetation including escarpment habitats similar to the Project Boundary with the Darling Causeway between it and the Blue Mountains National Park (see **Figure 47**). Coalpac has an agreement to acquire this property upon grant of Project Approval.

A summary of all the vegetation types present within each of the above mentioned offset areas is provided in **Table 47**. Detailed vegetation mapping is provided in **Appendix J** with further detail in relation to the existing biodiversity values of the offset areas provided in the following sections.

The cost of the implementation of these offsets is $23 Million over the life of the Project, not including any future contributions to OEH for their future management.

Numerous field assessments have confirmed that these offset properties contain areas of high quality habitat values. They are strategically located to assist in building links between the Project and existing conservation areas to create a valuable corridor for Threatened communities and species within the Central West Region and enhance existing conservation areas.

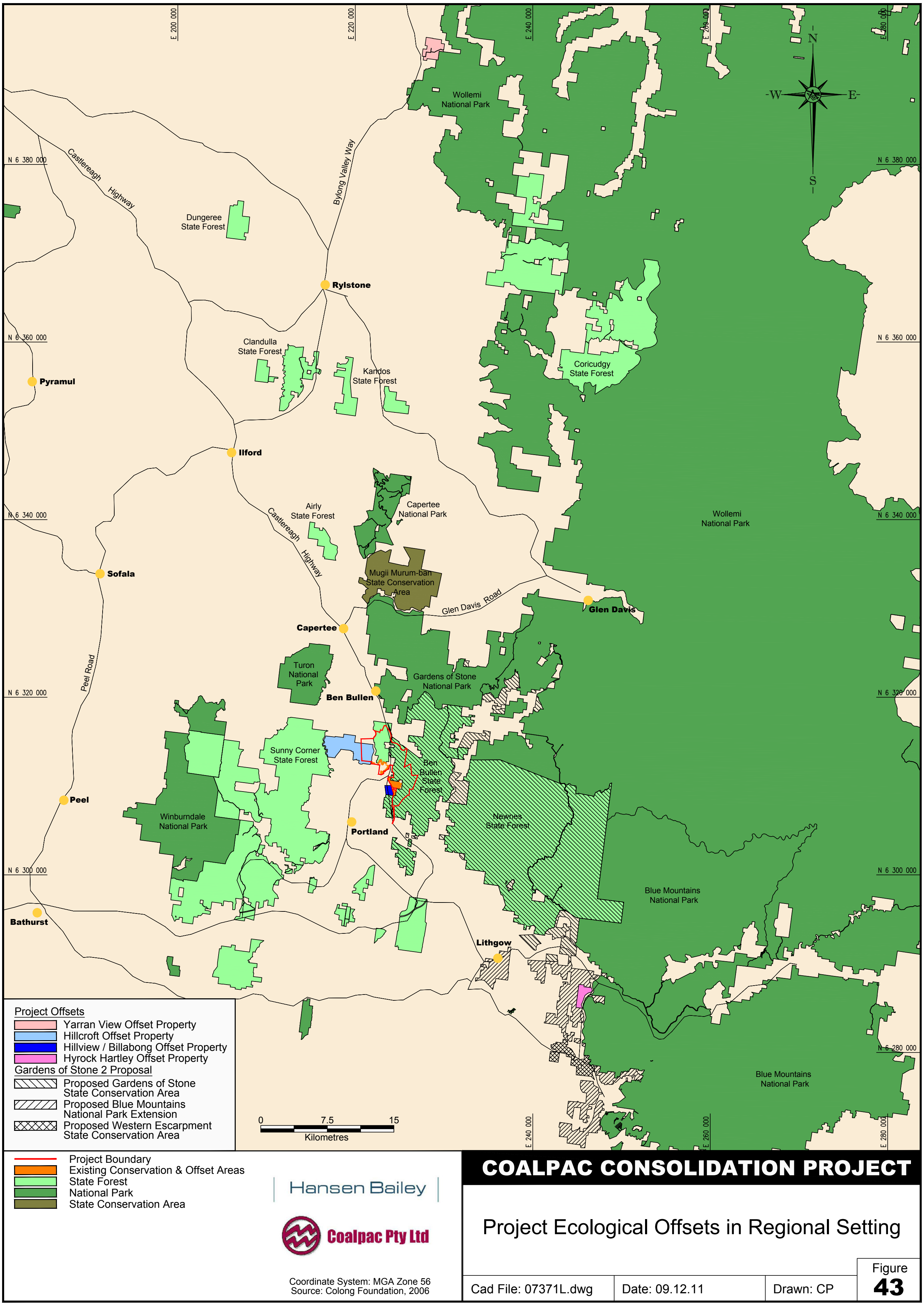
The Biodiversity Offset Strategy has been designed to provide a net benefit to flora and fauna in the locality and the wider region by:

- Adding to the vegetation that is already permanently protected, so that there is a substantial increase in conserved woodland and open forest in the long term;
- Linking large blocks of forest and woodland to Project rehabilitation areas and to substantial blocks of habitat in the locality, including the Wollemi National Park, Ben Bullen State Forest and Sunny Corner State Forest and the riparian forests around the Turon River;
- Providing for the conservation management of vegetation and Threatened species for the life of the Project; and
- Considering the Ben Bullen State Forest and the objectives of the GoS2 proposal. Project offsets were therefore assessed in terms of the benefit that these properties may provide in the long term in relation to promoting connectivity of existing reserves to surrounding habitat and in the development of new conservation areas. Interactions between Project offset properties and the rehabilitation of land within the Project Disturbance Boundary, Ben Bullen State Forest and GoS2 proposal area were also considered.

Hillcroft Offset

The Hillcroft property covers approximately 1,097 ha in total and lies directly west from the northern extent of the Project Boundary (see **Figure 43**). A section of the eastern portion of the property (107 ha) is located within the Project Disturbance Boundary and will be subject to disturbance, resulting in a total of 989 ha of non-C/EEC vegetation remaining.

The Hillcroft offset property contains similar vegetation to that within the Project Boundary, including Capertee Stringybark habitat. Once fully rehabilitated, Hillcroft will provide a substantial wildlife corridor between Ben Bullen State Forest in the east and Sunny Corner State Forest in the west. This will facilitate fauna movement between these two State Forests and beyond as they connect to Winburndale Nature Reserve and Wollemi National Park respectively.



E 200 000
E 220 000
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Wollemi National Park
Castlereagh Highway
Bylong Valley Way
Dungeree State Forest
Rylstone
Clandulla State Forest
Kandos State Forest
Coricudgy State Forest
Pyramul
Ilford
Airly State Forest
Capertee National Park
Mugii Murum-ban State Conservation Area
Glen Davis Road
Glen Davis
Sofala
Capertee
Turon National Park
Ben Bullen
Gardens of Stone National Park
Peel Road
Sunny Corner State Forest
Ben Bullen State Forest
Peel
Winburndale National Park
Portland
Newnes State Forest
Blue Mountains National Park
Bathurst
Lithgow
Project Offsets
Yarran View Offset Property
Hillcroft Offset Property
Hillview / Billabong Offset Property
Hyrock Hartley Offset Property
Gardens of Stone 2 Proposal
Proposed Gardens of Stone State Conservation Area
Proposed Blue Mountains National Park Extension
Proposed Western Escarpment State Conservation Area
0
7.5
15
Kilometres
Project Boundary
Existing Conservation & Offset Areas
State Forest
National Park
State Conservation Area
Hansen Bailey
Coalpac Pty Ltd
Coordinate System: MGA Zone 56
Source: Colong Foundation, 2006
COALPAC CONSOLIDATION PROJECT
Project Ecological Offsets in Regional Setting
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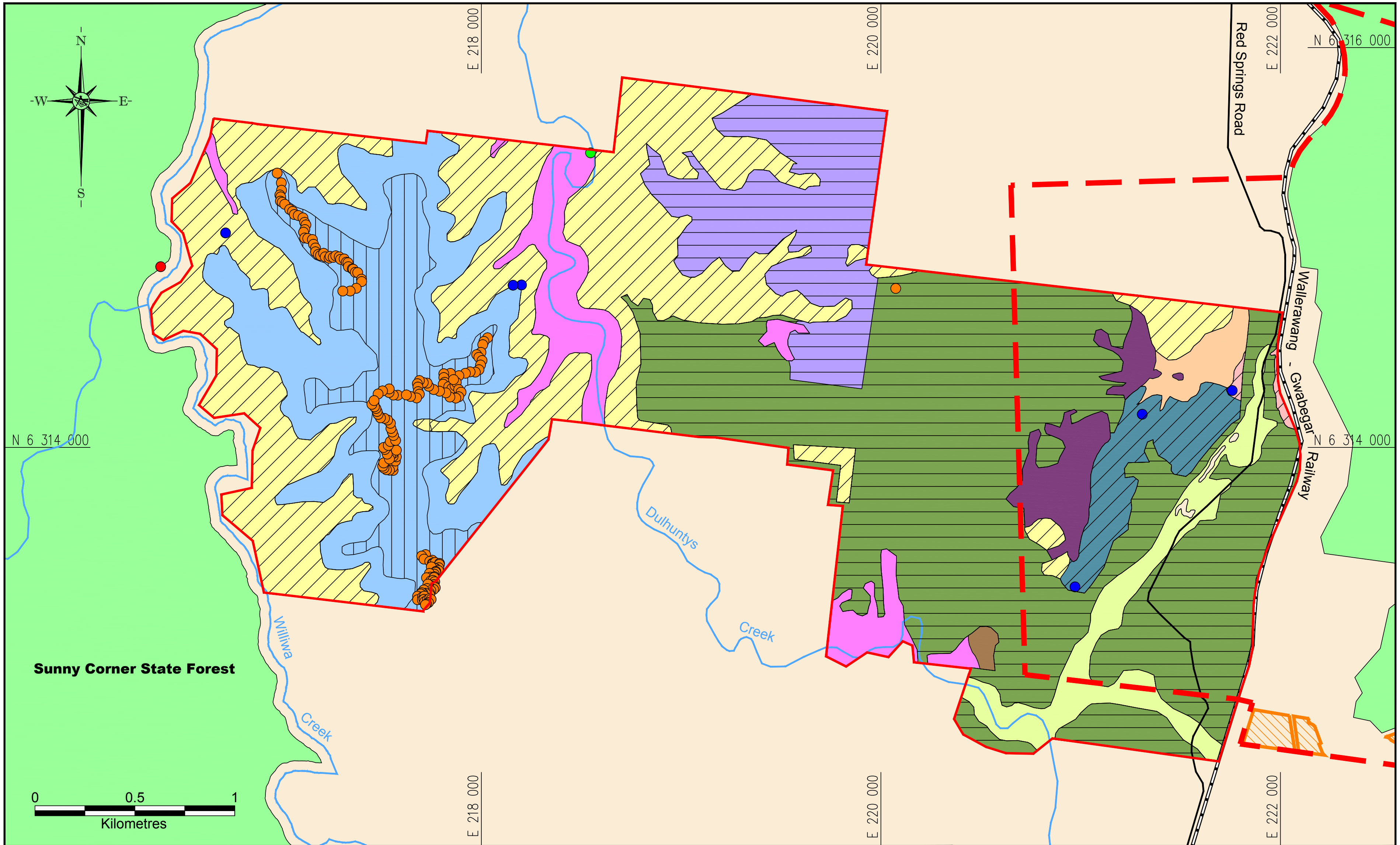
Drawn: CP
Figure
43

Table 47 Vegetation Types within the Biodiversity Offset Properties

Vegetation Type	Area (ha)				
	Hillcroft	Yarran View	Hillview / Billabong	Hyrock Hartley	Total
Box Gum Woodland (CEEC)	0	43.01	0	0	**43.01**
Box Gum Woodland Derived Native Grassland (CEEC)	0	143.77	0	0	**143.77**
White Box Shrubby Woodland (non CEEC)	0	219.75	0	0	**219.75**
Scribbly Gum – Red Stringybark Grassy Woodland	201.2	0	0	0	**201.20**
Tableland Scribbly Gum – Narrow-leaved Stringybark Shrubby Open Forest	25.78	0	0	0	**25.78**
Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Open Forest	270.7	0	0	0	**270.70**
Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Open Forest Derived Native Grassland	88.79	0	0	0	**88.79**
Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Open Forest Low Diversity Derived Native Grassland	367.01	0	0	0	**367.01**
Tableland Slopes Brittle Gum – Broad-leaved Peppermint Grassy Forest	2.33	0	41.31	0	**43.64**
Tableland Slopes Brittle Gum – Broad-leaved Peppermint Grassy Forest Derived Native Grassland	0	0	7.17	0	**7.17**
Tableland Gully Mountain Gum - Broad-leaved Peppermint Grassy Forest	2.08	0	0	0	**2.08**
Tableland Gully Snow Gum - Ribbon Gum Grassy Forest	53.68	0	0	0	**53.68**
Tableland Gully Snow Gum - Ribbon Gum Grassy Forest Derived Native Grassland	42.25	0	0	0	**42.25**
Cox's Permian Red Stringybark - Brittle Gum Woodland	31.24	0	0	0	**31.24**
Exposed Blue Mountains Sydney Peppermint - Silvertop Ash Shrubby Woodland	11.86	0	0	0	**11.86**
Low Diversity Native Grassland/Exotic	0	36.52	0	0	**36.52**
Capertee Rough-barked Apple – Red Gum – Yellow Box Woodland (CEEC)	0	0	5.53	0	**5.53**
Capertee Rough-barked Apple – Red Gum – Yellow Box Woodland Derived Native Grassland (CEEC)	0	0	29.34	0	**29.34**
Blue Mountains Escarpment Complex	0	0	0	20.21	**20.21**
Blue Mountains Heath and Scrub	0	0	0	27.02	**27.02**
Blue Mountains Riparian Complex	0	0	0	1.14	**1.14**
Blue Mountains Swamps	0	0	0	3.38	**3.38**
Eucalyptus oreades Open-forest/Tall Open-forest	0	0	0	5.39	**5.39**
Eucalyptus sieberi - Eucalyptus piperita Open forest/ Woodland	0	0	0	157.92	**157.92**
Modified Bushland	0	0	0	4.87	**4.87**
Montane Gully Forest	0	0	0	16.16	**16.16**
Total (ha)	**1,096.92**	**443.05**	**83.35**	**236.09**	**1,859.41**



- Project Boundary
- Hillcroft Offset Property
- Road
- Creeks
- Railway
- Eucalyptus Canonii Records
- Booroolong Frog
- Satin Flycatcher
- Persoonia Marginata Records
- Existing Conservation & Offset Areas
- State Forest
- Persoonia Marginata Habitat
- Eucalyptus Cannonii Known Habitat
- Eucalyptus Cannonii Potential Habitat
- Cox's Permian Red Stringybark - Brittle Gum Woodland
- Exposed Blue Mountains Sydney Peppermint Silvertop Ash Shrubby Woodland
- Scribbly Gum - Red Stringybark Grassy Woodland
- Tableland Slopes Brittle Gum - Borad-leaved Peppermint Grassy Forest
- Tableland Gully Mountain Gum - Broad-leaved Peppermint Grassy Forest
- Tableland Gully Snow Gum - Ribbon Gum Grassy Forest
- Tableland Gully Snow Gum - Ribbon Gum Grassy Forest Low Diversity Derived Native Grassland
- Tableland Scribbly Gum - Narrow-leaved Stringybark Shrubby Open Forest
- Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Open Forest
- Tableland Broad-leaved Peppermint - Brittle Gum Red Stringybark Grassy Open Forest Derived Native Grassland
- Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Open Forest Low Diversity Derived Native Grassland Diversity Derived Native Grassland

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Hillcroft Offset Property

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Hillcroft also abuts Williwa Creek (a tributary of the Turon River), and a portion of Dulhuntys Creek (also a tributary of the Turon River). These are permanent watercourses and the protection of these areas and their associated riparian zones will provide important habitat values and facilitate fauna movements between landscapes in the region.

The property can be divided into two broad landscapes, farmed land in the eastern portion and good quality remnant vegetation in the western half. The eastern portion is generally made up of Low Diversity Native Grasslands which have been grazed, with small patches of remnant vegetation. The western portion of the property supports good quality vegetation that is structurally intact and connected to larger areas of even higher quality habitat further west. The vegetation within the Hillcroft property contains predominantly Tableland Gully Ribbon Gum – Blackwood – Applebox Forest and Tableland Gully Mountain Gum - Broad-leaved Peppermint Grassy Forest predominantly in the western half. The eastern half contains smaller remnants of Coxs Permain Red Stringybark – Brittle Gum Woodland, Tableland Gully Mountain Gum – Broad-leaved Peppermint Grassy Forest fragmented by Low Diversity Native Grassland / Exotic. Although the property does not contain any derived native grassland capable of enhancement to meet CEEC Box Gum Woodland, it does contain large areas of intact non-C/EEC vegetation and fauna habitat similar to that being removed by the Project. Furthermore, the condition and diversity of the grassland supports a suite of native grasses and forbs capable of providing a foundation for rehabilitation into woodland and forest.

The western portion of the Hillcroft property also provides existing habitat for impacted fauna species in the short term while the remaining areas require regeneration as rehabilitation progresses. In the medium and long term, the property will create a new link between two large tracts of native vegetation, being the Ben Bullen State Forest and the Sunny Corner State Forest. The Booroolong Frog (endangered under both the TSC and EPBC Act) was also found during surveys of the Hillcroft property (see **Figure 44**) in a small area of Williwa Creek that was targeted due to being identified has having suitable habitat for that species.

Several individuals of the Capertee Stringybark were recorded on Hillcroft, indicating that there are suitable areas within the property that are capable of supporting known habitat for the species. Furthermore, Capertee Stringybark is known to occur with other species identified on Hillcroft on a variety of soil types and gradients present over the property. Therefore, the Hillcroft property provides approximately 413 ha of additional habitat suitable for the Capertee Stringybark which equates to approximately 5,370 individuals, using the average density equation applied for the Project in **Section 8.14**. This would include areas of Low Diversity Native Grasslands which will be planted out with Capertee Stringybark during woodland regeneration of the Hillcroft property.

A new previously unknown population of Clandulla Geebung was found in western area of Hillcroft. This population was recorded along ridgelines and upper slopes, underlain by Shoalhaven geology supporting Scribbly Gum Red Stringybark Grassy Woodland. Results from preliminary surveys of this population estimate an average density of 892 individuals per hectare (from a total of 186 quadrats (20 m x 1 m)). Given that approximately 86 ha of habitat have been mapped, it is estimated that this population would contain approximately 76,676 individuals. The western portions of the Hillcroft property also contain high quality vegetation which supports a range of habitat requirements suitable for the Spotted-tailed Quoll. These habitat features include trees with hollows, hollow logs on the ground, rocky outcrops, caves and rock crevices that provide shelter, den and breeding sites, and support a more abundant food supply such as birds and other small animals.

Plate 1 shows Willawa Creek and riparian vegetation that forms the western boundary of the Hillcroft property.

Yarran View Offset

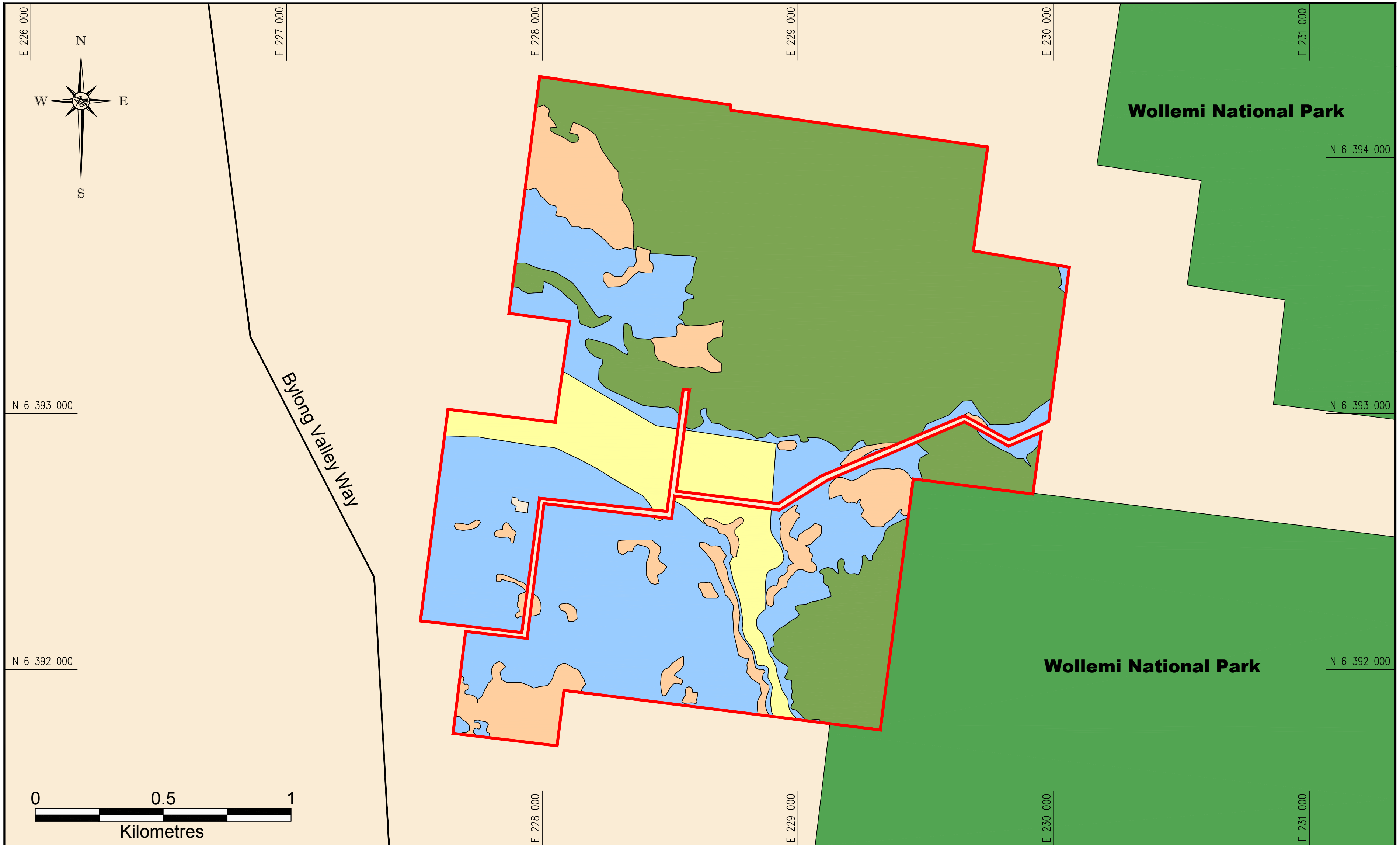
Yarran View covers an area of approximately 450 ha and consists of an array of different landscapes including rocky exposed sandstone ridgetops, steep shrubby mid-slopes and cleared and semi cleared grasslands on undulating lower slopes on basalt soils (see **Figure 43**). Almost half of the property contains remnant vegetation in good condition which is described further below.

Yarran View contains 187 ha of Commonwealth listed Box Gum Woodland and Derived Native Grassland.

Vegetation types across Yarran View can be broadly described by two habitats. The higher country along the upper slopes, which contain a near homogenous tree canopy of *Eucalyptus albens* (White Box), as a result of the quality of the soil which extends high up the slopes. In rockier areas *Eucalyptus punctata* occurs, however it not defined as Box Gum Woodland under the EPBC Act as a dominant shrub layer of 40% or more is present.

The lower slopes and valley floor of Yarran View have been either fully or partially cleared for past agricultural practices, primarily grazing. This undulating terrain on rich basalt soils contains scattered Box Gum Woodland and Derived Native Grassland (CEEC), as described in the EPBC Act.

In this lower country, the drier slopes contain *Eucalyptus albens* and *Brachychiton populneum* (Kurrajong), with *Eucalyptus blakelyi* (Blakely's Red Gum) and *Angophora floribunda* (Rough-barked Apple) occurring on low lying wetter areas.



- Yarran View Offset Property
- Road
- White Box - Yellow Box - Blakely's Red Gum Grassy Woodland (CEEC)
- White Box - Yellow Box - Blakely's Red Gum Grassy Woodland Derived Native Grassland (CEEC)
- White Box - Yellow Box - Blakely's Red Gum Grassy Woodland Low Diversity Native Grassland/Exotic (non C/EEC)
- White Box Shrubby Woodland
- National Park

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Yarran View Offset Property

Cad File: 07912E.dwg	Date: 13.12.11	Drawn: CP	Figure 45

Plate 1 View of Willawa Creek on the Hillcroft Property Offset

The diversity of the native herbs and grasses in the grasslands, except the valley floor, form a mosaic of low diversity and high diversity areas across this map unit. The diversity of groundcover decreases on the valley floor where more intensive cattle grazing has occurred and as such, these areas did not qualify as CEEC. They do, however, contain enough native species to be capable of rehabilitation into quality woodland habitat.

The vegetation across Yarran View includes weed cover varying from 20 - 60% in some areas, primarily consisting of mainly annuals, Saffron Thistle and Fleabane. St John's Wort was also recorded in large densities in some areas across the site, which will require a more intensive management approach than areas where the ground layer is less weedy and / or containing a diversity of more easily managed weed species (e.g. Saffron Thistle).

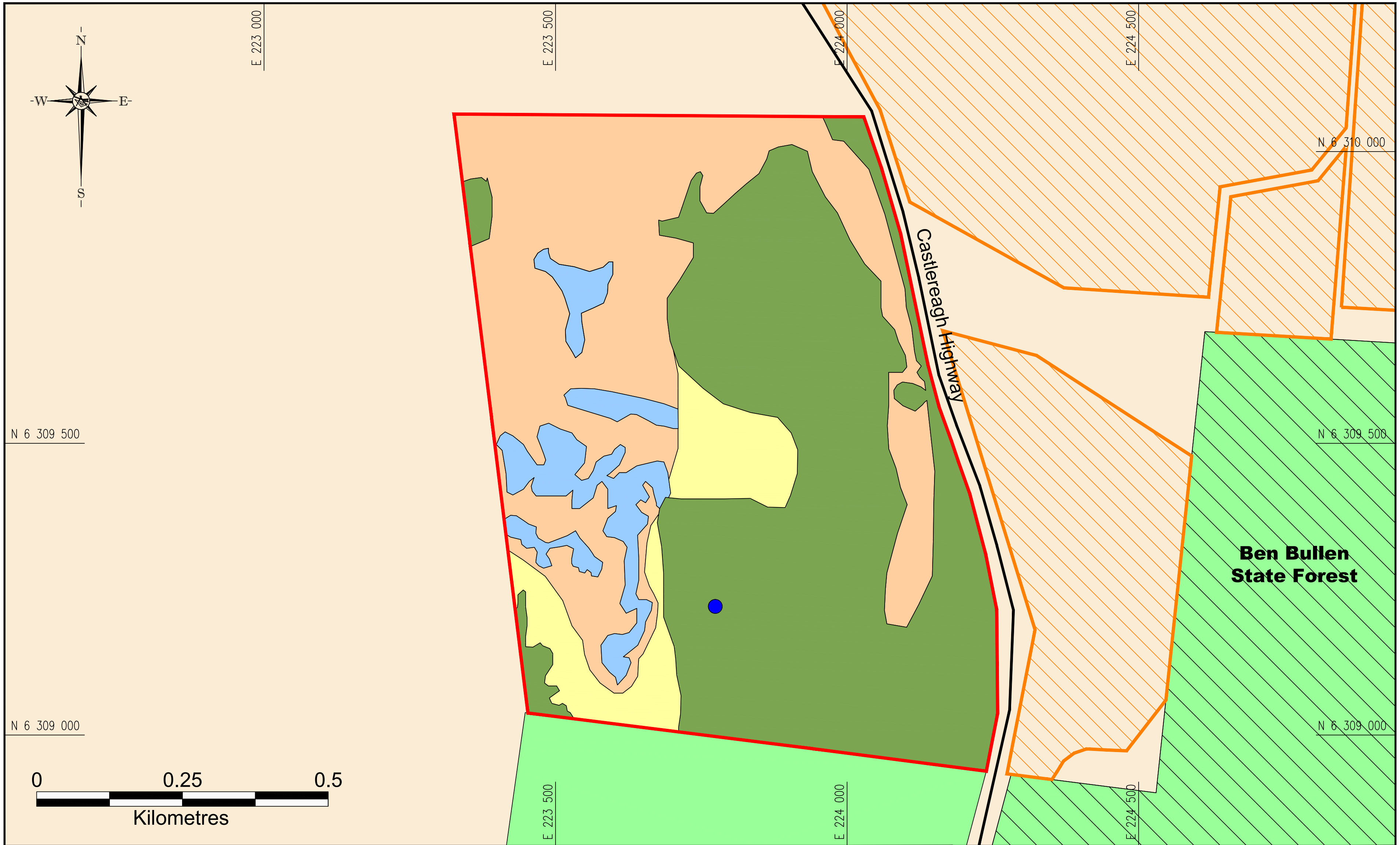
Yarran View adjoins Wollemi National Park along the southern and south-eastern boundary. The northern boundary connects to a large tract of existing vegetation which covers a significant area of approximately 2,000 ha of intact mountainous habitat.

Should Yarran View be effectively rehabilitated as proposed, a substantial link between these two habitats would be created to support the Wollemi National Park. Should it be acceptable, upon transferral to National Parks, this property could increase the area of the Wollemi National Park.

As Yarran View contains large areas of White Box Woodland (CEEC and non-CEEC), there is suitable habitat for the Regent Honeyeater and Swift Parrot. In addition, a number of Mistletoes were observed in abundance across the property, including one of the Regents Honeyeater's preferred food sources, Box Mistletoe (*Amyema miquelii*).

The large expanses of high quality vegetation along the upper slopes and ridgelines of the Yarran View property also support a range of habitat requirements suitable for the Spotted-tailed Quoll. Habitat features such as trees with hollows, hollow logs on the ground, rocky outcrops, caves and rock crevices are present, which provide shelter, den and breeding sites, and support a more abundant food supply such as birds and other small animals.

Plate 2 shows Box Gum Woodland Derived Native Grassland and scattered White Box vegetation on the Yarran View Offset property.



Billabong / Hillview Offset Property
Road
Capertee Rough-barked Apple - Red Gum - Yellow Box Grassy Woodland (EPBC Act: CEEC)
Capertee Rough-barked Apple - Red Gum - Yellow Box Grassy Woodland Derived Native Grassland (EPBC Act: CEEC)
Tableland Slopes Brittle Gum - Broad-leaved Peppermint Grassy Forest
Tableland Slopes Brittle Gum - Broad-leaved Peppermint Grassy Forest Derived Native Grassland
Ben Bullen State Forest
Proposed State Conservation Area (Gardens of Stone 2)
Existing Conservation & Offset Areas
Eucalyptus Canonii Records

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Hillview / Billabong Offset Property

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Plate 2 Views of Box Gum Woodland and White Box on Yarran View

Hillview / Billabong Offset

The Hillview / Billabong (Hillview) property covers an area of approximately 83 ha and is situated on the western side of the Castlereagh Highway to the west of the existing Invincible Colliery site (see **Figure 46**).

Hillview will provide for the conservation and rehabilitation of similar vegetation to that located within the Project Boundary and contains 48.5 ha of non-C/EEC vegetation and 35 ha of CEEC.

Hillview generally contains Tableland Gully Mountain Gum – Broad-leaved Peppermint Grassy Frost and derived grassland on elevated slopes. The lower areas would once have supported Box Gum Woodland, but have been cleared as a result of agricultural practices resulting in a low diversity of native herbs and ground cover predominately dominated by native grasses (80%). However, these areas do not conform to the Commonwealth description of Box Gum Woodland due to a shortfall in understorey species richness. These areas show high resilience and contain the adequate foundations required to be restored to CEEC Box Gum Woodland. For this reason, these areas have been classified as CEEC Box Gum Woodland and Derived Native Grassland.

The southern boundary of the Hillview property borders on Ben Bullen State Forest. Upon regeneration, it would increase the extent of woodland and forest adjacent Ben Bullen State Forest while also providing a stepping stone for fauna moving through the landscape. The property contains areas of White Box Woodland and Derived Native Grassland (CEEC) habitat capable of being restored to Box Gum Woodland and suitable habitat for the Regent Honeyeater and Swift Parrot. In addition, Hillview shows potential for Capertee Stringybark to be used in plantings during woodland regeneration on the property as the species is known to overlap Box Gum Woodland and Tableland Gully Mountain Gum – Broad-leaved Peppermint Open Forest as found in the Hillcroft property.

The Hillview Offset also supports similar habitat features to that found within the nearby Clandulla Geebung population located within the Project Boundary. These features include Shoalhaven Group geology and west facing slopes that are vegetated with Tableland Gully Mountain Gum – Broad-leaved Peppermint Grassy Forest. A targeted search for the presence of the Clandulla Geebung and suitable habitat for the species within the Hillcroft Offset was undertaken. Habitat and the individuals mapped for this species within the Hillcroft Offset property following targeted searches are provided in **Figure 44**.

Hyrock Offset Property
Roads
Montane Gully Forest
Blue Mountains Health and Scrub
Eucalyptus oreades Open-forest/Tall Open-forest
Blue Mountains Riparian Complex
Blue Mountains Swamps
Blue Mountains Escarpment Complex
Eucalyptus sieberi - Eucalyptus pipertia
Modified Bushland
National Park
Proposed Blue Mountains National Park Extension (Gardens of Stone 2)

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Hyrock / Hartley Offset Property

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Plate 3 below shows an area of the Capertee Rough-barked Apple – Red Gum – Yellow Box Woodland located within the Billabong / Hillview property.

Hyrock Hartley Property

The Hyrock Hartley (Hyrock) property is located 40 km south-east of the Project Boundary in Hartley Vale and is covered in high quality remnant sandstone vegetation supporting similar habitats to those found within the Project Boundary (see **Figure 47**). The addition of Hyrock to the Biodiversity Offset Strategy will result in the conservation of similar sandstone habitats to those occurring within the Project Boundary and will provide approximately 235 ha of non-EEC native vegetation.

Hyrock has a varying landscape and as such, supports a diversity of habitats from rocky escarpments and exposed heathland and shrub lands to sheltered deep soiled gullies and riparian habitats. The property also supports a suite of different vegetation communities as explained further below. The rocky escarpments and outcrops in moist, sheltered rock faces in the Blue Mountains Escarpment Complex contain a diverse mixture of cliffline vegetation, heath, swamp rainforest and mallee.

On more exposed sites with skeletal soils, Blue Mountains Heath and Scrub occur, usually with a western aspect.

The majority of the site contains *Eucalyptus sieberi – Eucalyptus piperita* Open forest / Woodland. Sheltered Gullies contain Montane Gully Forest. Not directly connected with the Hyrock property, but immediately east across the road (Darling Causeway) is the Blue Mountains National Park. Should it be acceptable, upon transferral to National Parks, this property would increase the area of Blue Mountains National Park. Hyrock is connected on all sides by high quality sandstone escarpment vegetation.

The quality of vegetation, positioning in the landscape and high connective value would provide suitable habitat for the Spotted-tailed Quoll. Habitat features such as trees with hollows, hollow logs on the ground, rocky outcrops, caves and rock crevices are present. These areas provide shelter, den and breeding sites, and support a more abundant food supply such as birds and other small animals. The rocky escarpments would also provide an abundance of shelter habitat for the Large-eared Pied Bat, Eastern Bent-wing Bat and Broad-headed Snake.

Plate 3 Capertee Rough-barked Apple – Red Gum – Yellow Box Woodland on Billabong / Hillview

Hyrock Hartley is located adjacent to the Western Escarpment Division of the GoS2 proposal in an area proposed as an extension to the Blue Mountains National Park and OEH noted in December 2011 that this property may have some potential for addition to NPWS reserves.

The Western Escarpment Division covers 4,000 ha. The Hyrock Hartley property covers approximately 236 ha of intact native sandstone vegetation and will constitute 5.9% of the Western Escarpment Division and 0.6% of the total GoS2 proposal area.

Plate 4 and **Plate 5** illustrate the escarpment and open forest vegetation present within the Hyrock Hartley property.

Summary of Project Offset

A summary of the Biodiversity Offset Strategy commitments and ratios to compensate for the impacts on biodiversity listed under the TSC Act and EPBC Act is provided in **Table 48**. The offset ratio for Box Gum Woodland CEEC is calculated at 13:1, along with a non-CEEC vegetation offset ratio of 2:1.

An overall offset ratio of 2:1 for native vegetation has been achieved for the Project along with a commitment to continuing high quality rehabilitation of disturbed areas as described in **Section 8.24**.

Threatened Habitat Within Offset Properties

The Biodiversity Offset Strategy will provide suitable habitat for a range of Threatened species and communities potentially impacted by the Project. **Table 49** presents a list of Threatened species that the proposed offset properties would provide habitat for, along with their current status as listed under the TSC Act and EPBC Act (additional to the rehabilitated Project Disturbance Boundary).

In addition to the species listed in **Table 49**, the offset properties would potentially provide habitat for additional Threatened species along with numerous non-listed flora and fauna species.

Plate 4 Blue Mountains Escarpment Complex Vegetation on Hyrock Hartley

Plate 5 Open Forest Vegetation on Hyrock Hartley

Table 48 Summary of Biodiversity Offsets Commitments and Ratio

Vegetation Type	Project Disturbance Boundary (ha)	Offset Areas (ha)	Offset Ratio
Box Gum Woodland (CEEC)	16.48	221.7	13.5
Box Gum Woodland (EEC)	1.96	221.7	113.1
Native Vegetation (non-CEEC)	818.71*	1,533.22^	1.9
Total	**837.15**	**1,754.9**	**2.1**

* Does not include areas of Low Diversity Native Grasslands

^ Includes areas of Low Diversity Native Grasslands. These areas will be enhanced and remediated for the Project

Reasons for Selection

As described above, each of the offset properties have been carefully selected as they boast values of ecological significance that will assist in maintaining and enhancing the biodiversity values within the region within the medium to long term, including that:

- They contain appropriate vegetation communities in good condition, which are comparable or in better condition than the flora and fauna proposed to be cleared for the Project;
- They contain extensive areas of high quality habitat for Threatened flora and fauna species (see **Table 49**), including all species predicted to be impacted by the Project;
- Broad areas of the vegetation within the offset properties can be feasibly regenerated and improved to provide additional woodland communities in the medium term (up to 220 ha of Box Gum Woodland);
- The offset properties are located in areas which will build onto existing State forests (Ben Bullen State Forest and Sunny Corner State Forest) and protected conservation areas (Wollemi National Park);

Table 49 Habitat for Threatened Species within Offset Strategy Areas

Scientific Name	Common Name	Status		Suitable Habitat Present in Offsets
		TSC Act	EPBC Act	
Reptiles				
Hoplocephalus bungaroides	Broad-headed Snake	E	V	Present
Varanus rosenbergi	Rosenberg's Goanna	V		Present
Birds				
Pyrrholaemus saggitatus	Speckled Warbler	V		Present
Circus assimilis	Spotted Harrier	V		Present
Hieraaetus morphnoides	Little Eagle	V		Present
Lophoictinia isura	Square-tailed Kite	V		Present
Apus pacificus	Fork-tailed Swift		M	Present
Hirundapus caudacutus	White-throated Needletail		M	Present
Artamus superciliosus	White-browed Woodswallow	V		Present
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V		Present
Callocephalon fimbriatum	Gang gang Cockatoo	V		Present
Calyptorhynchus lathami	Glossy Black Cockatoo	V		Present
Stagonopleura guttata	Diamond Firetail	V		Present
Xanthomyza phrygia	Regent Honeyeater	CE	E	Present
Grantiella picta	Painted Honeyeater	V		Present
Melithreptus gularis gularis	Black-chinned Honeyeater	V		Present
Merops ornatus	Rainbow Bee-eater		M	Present
Myiagra cyanoleuca	Satin Flycatcher		M	Present
Daphoenositta chrysoptera	Varied Sittella	V		Present
Petroica phoenicea	Flame Robin	V		Present
Melanodryas cucullata	Hooded Robin	V		Present
Petroica boodang	Scarlet Robin	V		Present
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V		Present
Glossopsitta pusilla	Little Lorikeet	V		Present
Neophema pulchella	Turquoise Parrot	V		Present
Lathamus discolor	Swift Parrot	E	E	Present
Ninox connivens	Barking Owl	V		Present
Ninox strenua	Powerful Owl	V		Present
Tyto novaehollandiae	Masked Owl	V		Present
Mammals				
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	V		Present
Cercartetus nanus	Eastern Pygmy Possum	V		Present
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Present
Petrogale penicillata	Brush-tailed Rock Wallaby	E	V	Present
Petaurus australis	Yellow-bellied Glider	V	-	Present

Scientific Name	Common Name	Status		Suitable Habitat Present in Offsets
		TSC Act	EPBC Act	
Petaurus norfolcensis	Squirrel Glider	V	-	Present
Phascolarctos cinereus	Koala	V	-	Present
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Present
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Present
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	Present
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	Present
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Present
Amphibians				
Litoria Booroolongensis	Booroolong Frog	E	E	Present
Reptiles				
Hoplocephalus bungaroides	Broad-headed Snake	E	V	Present
Eulamprus leuraensis	Blue Mountains Water Skink	E	E	Present
Varanus rosenbergi	Rosenberg's Goanna	V	-	Present
Plants				
Eucalyptus cannonii	Capertee Stringybark	V	V	Present
Persoonia Marginata	Clandulla Geebung	V	V	Present
Eucalyptus aggregate	Black Gum	V	-	Present

V: Vulnerable, E: Endangered, CE: Critically Endangered, M: Migratory, - Not listed.

- They include or adjoin permanent streams, including Dulhuntys Creek and the Turon River, that form high quality habitat for wildlife;
- They can be used to form new, or improve existing, habitat corridors, particularly for the Hillcroft property, which:
  - Links between Ben Bullen State Forest and the eastern extent of the Sunny Corner State Forest;
  - Links between Wollemi National Park and Winburndale Nature Reserve; and
- Exist as freehold land that is free of mining authorities held by other mining companies.

The establishment, enhancement and maintenance of habitat corridors is proposed as a major feature of the Project Biodiversity Offset Strategy, particularly for areas of remnant vegetation that occur between forests, woodlands and grasslands of high conservation value in order to provide connectivity between these remnant areas. Research has highlighted the importance of maintaining treed habitats in the intervening disturbed landscape between areas of remnant vegetation as these patches or corridors are important for fauna movement and seed dispersal.

Remnant patches also serve as stepping stone corridors that facilitate the movement of fauna in the landscape. Stepping stones have been shown to be important in maintaining landscape connectivity and maintaining gene flow between separate population because of the movement of pollen and seed vectors such as animals and insects.

The Biodiversity Offset Strategy has been designed to provide a net benefit to flora and fauna in the locality and region. This is to be achieved principally by:

- Adding to the vegetation that is already permanently protected, so that there is a substantial increase in conserved woodland and open forest in the long term;
- Linking large blocks of forest and woodland to the rehabilitation areas and to substantial blocks of habitat in the locality, including Wollemi National Park, Ben Bullen State Forest and Sunny Corner State Forest and the riparian forests around the Turon River; and
- Providing for the conservation management of vegetation and Threatened species for the life of the Project.

Rehabilitation

The Biodiversity Offset Strategy for the Project is dynamic and aims to maintain and then improve the biodiversity values of the landscape in the medium to long term through the restoration and conservation of land with the potential to regenerate.

This rehabilitation will build onto areas of existing native vegetation and provide additional habitat for Threatened species within these properties, in accordance with the BOMP to be developed for the Project.

Local native plant species will be used to replant mine rehabilitation areas. Seed collection programs will be undertaken to ensure adequate seed is collected from all species to ensure species diversity is maintained. Where practical, topsoil will be translocated from proposed mining areas, particularly habitat of the Capertee Stringybark, with minimal stockpiling, in an attempt to maximise the viability of the native seed bank of local ecological communities.

As discussed in **Section 8.24**, Coalpac will develop a consolidated Rehabilitation and Landscape Management Plan and a Mine Closure Plan that prescribes the staged rehabilitation of all mine disturbed areas for the Project. A key objective of rehabilitation will be to establish 16.48 ha Capertee Rough-barked Apple - Red Gum - Yellow Box Grassy Woodland, 450 ha of Capertee Stringybark habitat in Project offsets and the remaining areas to non-C/EEC.

The rehabilitation areas within the Project Boundary will form part of the Biodiversity Offset Strategy. The objective of the post mine landform will be to provide self-sustaining native forest communities that are capable of maintaining pre-mining biodiversity values.

8.15.5 Management

As discussed in **Section 8.14.4** Coalpac will develop a BMP for the Project. As a component of the BMP, Coalpac will also prepare a BOMP that will be implemented prior to the commencement of the Project to provide specifications for the restoration and management of the Biodiversity Offset Areas in accordance with State and Commonwealth Offset Principles.

The BOMP will be prepared to guide restoration and management of the biodiversity offset properties and will include:

- Management of existing Compensatory Habitat and Biodiversity Offset Areas in place for Cullen Valley Mine and Invincible Colliery;
- Management of proposed offset properties for the Project;
- Management of land that contains and / or can be regenerated to provide Box Gum Woodland at a ratio of approximately 13 ha of conserved land for each hectare to be disturbed for the Project;
- Provision of land that contains or could be regenerated to provide Tableland Gully Ribbon Gum - Blackwood - Applebox Forest, Tableland Gully Mountain Gum - Broad-leaved Peppermint Grassy Forest and other non-C/EECs;
- Provision of land that includes habitat for all relevant Threatened flora and fauna species that could be impacted by the Project;
- Revegetation of cleared or degraded areas, fire management, maintenance of tracks and trails, weed and feral animal control and management of the habitats of Threatened species of flora and fauna;
- Measures to ensure that any potential impacts to Aboriginal heritage during revegetation works will be minimised;
- Provision of land that contributes to an existing regional conservation area;
- Re-establishment and maintenance of habitat linkages to existing areas of habitat in the locality including existing native vegetation within and closely adjacent to the Project Boundary and the western portion of the Great Dividing Range; and
- Procedures for monitoring the development and performance of rehabilitation in offset properties for the Project and responding to any issues that require active management.

The BMP and BOMP will prescribe the management of existing vegetation within the Project Boundary, revegetation of cleared or degraded areas, fire management, maintenance of tracks and trails, weed and feral animal control and management of the habitats of Threatened species of flora and fauna.

With the implementation of the above mitigation measures it is apparent that although the habitat for the Threatened flora and fauna within the Project Boundary will be adversely affected, the Project Biodiversity Offset Strategy will result in a net improvement in the biodiversity conservation values within the Central West Region in the long term.

Long Term Security

Coalpac will establish long term security for the Existing and Project Biodiversity Offset Areas within two years following Project Approval. During development of the Project rehabilitation program and Biodiversity Offset Strategy, Coalpac will ensure that these are managed in accordance with any future GoS2 State Conservation Area.

Further to this, Coalpac will support the progressive establishment of GoS2 and to this end; provide a monetary contribution of $0.015 per tonne of coal sold (approximately $1,000,000), to OEH (or other relevant body) throughout the life of the Project to assist in the development, implementation and management of the GoS2. If required by OEH, rehabilitated areas of the Project Disturbance Boundary and biodiversity offset properties will also be progressively released into conservation in GoS2.

Mechanisms being considered by Coalpac to permanently secure the Project offset properties for conservation include the following:

- Voluntary conservation agreements, which are a joint agreement between landowners and the Minister for the Environment under the NPW Act;
- Conservation covenants under Section 88 of the *Conveyancing Act 1919*. This would be a joint agreement between the landowner and an authorised body);
- Application to change zoning regulation that dictates land use (including an option to retain limited areas for 'life-style' habitation blocks and the remainder conserved);
- Dedication of land to the National Parks reserve estates; and
- Management of the land under private ownership with condition commitments.

8.16 TRAFFIC AND TRANSPORTATION

A Traffic and Transport Impact Assessment has been undertaken for the Project by Hyder Consulting in accordance with the RTA's *Guide to Traffic Generating Developments* (2002). The assessment aimed to make accurate predictions of the rail and road traffic generated by the Project, assess any associated impacts on the capacity, efficiency and safety of the surrounding network and determine any required management and mitigation measures required to reduce these impacts. A summary of the report is provided below and the full report is presented in **Appendix Q**.

8.16.1 Background

The regional transport network in the vicinity of the Project is shown on **Figure 1**. This road network is utilised by Coalpac under the existing approvals for Cullen Valley Mine and Invincible Colliery to transport up to 2.2 Mtpa of product coal by road. The road haulage of product coal for existing operations is primarily to MPPS (following a route using the Castlereagh Highway and Boulder Road), with some flexibility available to haul to WPS and other domestic destinations. A summary of the approved methods for product coal haulage transportation from Cullen Valley Mine and Invincible Colliery is provided above in **Section 3.1.4** and **Section 3.2.4**, respectively.

The Wallerawang – Gwabegar Railway Line is also present within the Project Boundary, running approximately north to south between the Cullen Valley and Hillcroft mining areas. This track provides connectivity between the Main Western Rail Line in the south, where it branches at Wallerawang, to Gwabegar in the north. The Baal Bone Rail Loop branches off from the Wallerawang – Gwabegar Rail Line immediately to the north of the Project Boundary, providing a connection to the Baal Bone Colliery approximately 4.5 km to the south-east of the main line.

8.16.2 Methodology

The Traffic Impact Assessment for the Project comprised of the following:

- A review of the existing traffic data, assessments and reports completed in the vicinity of the Project Boundary to calculate the traffic growth per annum for background traffic;
- A traffic survey conducted between 29 April 2010 and 5 May 2010 to assess the existing road network conditions;
- An assessment of the predicted traffic volumes generated by the construction and operational phases of the Project and any associated impacts to the surrounding road network;
- An assessment of the potential road safety impacts of relevant parts of the road network surrounding the Project;
- An assessment of the existing rail network capability, constraints and ability to accommodate additional rail movements associated with the Project; and
- Identification of any management and mitigation measures that may be necessary for the Project.

As noted in **Section 4.13**, Coalpac is proposing a construction program of approximately 15 months. This is anticipated to include the development of a haul road bridge over each of the Castlereagh Highway (to link operations east and west of the highway) and over the Wallerawang - Gwabegar Railway Line (to permit access to the Hillcroft mining area). Once the two existing mines are directly connected, the primary access point for the Project will be via the existing Invincible Colliery site access road. A new overland conveyor will be constructed for the transportation of product coal from the existing ICPP to the MPPS. A rail siding and associated infrastructure will be constructed for the Project to utilise the rail network for transportation of product coal and sand.

The operational phase of the Project proposes a permanent mine workforce of approximately 120 full time employees, plus contractors. The Project will include the extraction of approximately 0.64 Mtpa of product sand from the Marrangaroo Sandstone horizon and product coal up to 3.5 Mtpa. The Project will involve the following with respects to traffic and transport generation:

- A maximum of 3.5 Mtpa product coal made up of:
  - Up to 1.0 Mtpa of product coal to be transported by rail to Port Kembla for export;
  - Up to 2.625 Mtpa of product coal to be transported by conveyor to MPPS;
  - Up to 0.45 Mtpa of product coal to be transported by truck to other domestic customers at up to 51 one-way truck movements per day; and
  - Up to 0.64 Mtpa of product sand during Year 2 to Year 14, to be transported by truck to Sydney-based customers at up to 64 one-way truck movements per day;
- All access and egress movements for heavy vehicles to and from the Project following Year 2 will be from the Invincible Colliery site access only.

Should any emergency haulage be required (e.g. during conveyor outages) prior notification would be provided to DP&I and the local community.

Road Network Assessment

As part of the assessment undertaken, existing traffic volumes recorded between 1980 and 2002 were reviewed from two RMS counting stations located on the Castlereagh Highway to the north and south of Boulder Road. Using this data, a conservative annual traffic growth rate of 2% per annum, was assumed for background traffic growth on the Castlereagh Highway. The calculated annual growth rates were used to predict the future background road traffic volumes.

Traffic count surveys were also undertaken at three key intersection locations in 2010, including at the Castlereagh Highway / Invincible Colliery Access, Castlereagh Highway / Boulder Road and Boulder Road / MPPS Truck Access. Traffic counts were recorded continuously for a seven day period using detector tube counters to assess the existing traffic volumes, vehicle classification, speed data and individual turning movements for each intersection. Impacts to key intersections surrounding the Project were assessed using SIDRA, an intersection performance and simulation software.

The assessment focused on the Castlereagh Highway / Invincible Colliery intersection as an indicator of network wide intersection performance, as this would be the point which would experience the most Project related traffic.

The following are used as indicators of overall intersection performance:

- Level of service (LoS), which is a criteria related to the average intersection delay (see **Table 50**). The LoS categories describe intersection conditions based on factors including speed and travel time, freedom to manoeuvre, traffic interruptions, comfort, convenience and safety;
- Degree of saturation (DoS), which is the ratio of demand flow to capacity and therefore the closer to 1.0, the greater the delays and queue length;
- Average intersection delay, which is the difference between interrupted and uninterrupted travel times through the intersection including deceleration, static delays and acceleration; and
- Maximum queue length, which is the greatest number of vehicles waiting at the hold line at any point in time.

Road Safety Assessment

The road safety impact assessment component of the Project calculated the existing crash exposure in Million Vehicle Kilometres Travelled (MVKT) and predicted any likely changes in MVKT (crash exposure) to assess any safety impacts as a result of the Project. The section of the Castlereagh Highway between Cullen Bullen and the Great Western Highway was used as an indicator of network wide road safety, as this would be the section which would experience the most variation in traffic movements as a result of the Project.

Rail Network Assessment

As part of the assessment, the surrounding rail network was assessed for efficiency, safety and available capacity. This included the consideration of the operation of the rail siding proposed to be constructed for the Project from the Wallerawang-Gwabegar Railway line to enable coal trains to be loaded directly from within the Project Boundary without any need for truck haulage on public roads.

The proposed production of up to 1 Mtpa of export quality coal product was predicted to generate 290 one-way train trips per year. Rail transport to Port Kembla, as proposed for the Project, would rely on two routes, the primary route via the Illawarra Line or the secondary route via the Southern Highlands. These routes are characterised by a limited number of train paths through the Blue Mountains, steep grades and associated horizontal curves.

These physical constraints place restrictions on the operation of the network, limiting train lengths and speeds.

8.16.3 Impact Assessment

Road Traffic Volumes

Existing traffic volumes recorded during the 2010 traffic count survey (see **Table 51**) were used to predict base case and Project generated traffic volumes. Three peak periods of hourly traffic movements were adopted from the survey as an indicator of network wide traffic volumes.

Table 50 Intersection Levels of Service Performance Categories

Level of Service	Average Delay per Vehicle (seconds)	Description
A	Less than 14	Good
B	15 to 28	Acceptable
C	29 to 42	Satisfactory
D	43 to 56	Near capacity
E	57 to70	At capacity
F	Greater than 71	Unsatisfactory

Source: RTA Guidelines for Traffic Generating Developments (2002).

These included an AM peak period (from 6:00 am – 7:00 am), a Midday (MD) peak period (from 11:00 am to 12:00 pm) and a PM peak period from 4:00 pm – 5:00 pm (Peak PM) as these were shown to be the times which would experience the maximum traffic volumes associated with the Project.

The peak construction period for the Project (summarised in **Section 4.13**) is likely to generate approximately 60 one-way car trips associated with journey to work trips for construction workers. This is forecast to occur in month four of the 15 month construction program proposed for the Project.

Table 52 compares the predicted background and Project generated traffic volumes at the Castlereagh Highway / Invincible Colliery Access Road intersection for the construction phase for the PM peak period. The Castlereagh Highway/ Invincible Access intersection is not likely to be significantly impacted by the construction traffic generated by the Project. This is indicated by the marginal increase in the modelled delays for the intersection from 3.8 to 5.7 seconds/ vehicle for the AM peak, 4.7 to 5.0 seconds/vehicle for the Midday peak, and a reduction from 4.3 to 4.0 seconds/vehicle for the PM peak.

The Castlereagh Highway/ Boulder Road intersection is also not likely to be impacted by the construction stage traffic. The modelled average delays for the intersection actually decrease for the AM and PM scenarios, and remain the same for the Midday peak. The peak Project period is likely to reduce coal hauls by 202 one-way truck movements per day, continue 51 one-way truck movements for domestic coal hauls and increase hauls to Sydney to 64 one-way movements for product sand haulage. There will also be 21 additional light vehicle journeys to work per shift, assuming worst case scenario of one person per vehicle.

Table 51 Existing Peak Traffic Volumes

Road	Location	Direction	Traffic Volume		
			AM Peak	Midday Peak	PM Peak
Castlereagh Highway	North and south of Invincible Colliery Access	Northbound	45	118	143
Castlereagh Highway	North and south of Invincible Colliery Access	Southbound	146	105	109
Invincible Colliery Access	Intersection with Castlereagh Highway	Eastbound	4	21	16
Ivanhoe Access	Intersection with Castlereagh Highway	Westbound	29	21	18
Castlereagh Highway	North and south of Boulder Road	Northbound	61	132	164
Castlereagh Highway	North and south of Boulder Road	Southbound	164	101	115
Boulder Road	Intersection with Castlereagh Highway	Westbound	57	50	71
Boulder Road	East and west of Mount Piper truck access	Eastbound	55	25	33
Boulder Road	East and west of Mount Piper truck access	Westbound	46	40	47
Mount Piper Truck Access	Intersection with Boulder Road	Southbound	10	17	18

Table 53 displays the Project generated traffic volumes at the Castlereagh Highway / Invincible Colliery Access Road intersection for the operation phases. It is unlikely that traffic generated by the Project will have any significant impacts to the volume of traffic on the surrounding road network.

The construction of the overpass bridge to link the two sides of the Project and the proposed overland conveyor from the ICPP to MPPS will significantly reduce the generation of road transportation required for product coal transport. Despite the proposed increase in product coal yield, a minimum of 87% of the total product coal will be transported from the Project Boundary by either the proposed rail siding or overland conveyor to MPPS. Although some truck traffic will be generated by the residual product coal and sand, it will not be substantial in the context of the haulage undertaken under current approvals as outlined in **Section 3**. Overall, the Project will result in an approximate 54% reduction in the total truck movements generated under current approvals (reduced to 115 one-way truck movements per day from the 202 one-way truck movements per day under current approvals) away from Cullen Bullen.

Road Intersection Performance

- As part of the Traffic and Transport Impact Assessment, road intersection performance was assessed using SIDRA by calculating the key performance indicators for intersections outlined in **Table 50**.

The SIDRA outputs indicate satisfactory performance under the base case conditions as all individual movements would perform at a LoS of C (refer to **Table 50**) or better. The average delays at each of the study intersections would be less than 5 seconds per vehicle.

SIDRA results of the PM peak construction phase modelling showed little difference to the PM base case condition, including the average intersection delays, levels of service for each movement, and also in the modelled queue lengths.

All individual movements at the Castlereagh Highway / Invincible Colliery intersection would perform at an acceptable LoS of B (refer to **Table 50**) or better. The average delays of all vehicles would be four seconds, with a maximum delay of 23.8 seconds.

Table 52 Predicted Project Traffic Volumes at Peak Construction Period (mid 2012)

Road	Location	Direction	Background Traffic (AM/MD/PM)*	Peak Construction Contribution (AM/MD/PM)	Maximum Predicted Traffic (AM/MD/PM)
Castlereagh Highway	North and south of Invincible Colliery Access	Northbound	47/123/148	0/1/1	47/124/149
Castlereagh Highway	North and south of Invincible Colliery Access	Southbound	152/109/113	0/1/1	152/110/114
Invincible Colliery Access	Intersection with Castlereagh Highway	Eastbound	4/25/16	60**/25/0	64/25/16
Ivanhoe Access	Intersection with Castlereagh Highway	Westbound	29/21/18	0/21/0	29/21/18

* Includes predicted growth in background traffic numbers
** Represents workforce for the Project.

Table 53 Predicted Traffic Volumes at Peak Project Operational Period

Road	Location	Direction	Background Traffic (AM/MD/PM)*	Peak Project Traffic (AM/MD/PM)	Maximum Predicted Traffic (AM/MD/PM)
Castlereagh Highway	North and south of Invincible Colliery Access	Northbound	51/127/154	0	51/127/154
Castlereagh Highway	North and south of Invincible Colliery Access	Southbound	165/113/117	0	165/113/117
Invincible Colliery Access	Intersection with Castlereagh Highway	Eastbound	4/9/0#	21/13/13	25/22/13
Ivanhoe Access	Intersection with Castlereagh Highway	Westbound	29/21/18	0**	0**

* Includes predicted growth in background traffic numbers
** Ivanhoe North Colliery predicted to cease operations from 2012
# Background haulage for approved Invincible Colliery operations no longer required under the Project.

The SIDRA model outputs for the operational phase of the Project indicate that there will be improved intersection performance at the Castlereagh Highway / Invincible Colliery Access intersection.

This is indicated by the reduction in average delay from 4.7 to 4.5 seconds per vehicle in the AM peak, and from 4.3 to 3.7 seconds per vehicle in the PM peak. It is also reflected in the reduction in 95th percentile queue length, from 7 m to 6.8 m in the AM peak, and 7 m to 4.5 m in the PM peak.

The assessment of traffic movements during the construction stage of the Project indicated there would be no adverse impacts to the Castlereagh Highway / Invincible Access intersection, Castlereagh Highway / Boulder Road intersection or the boulder Road / MPPS Truck Access.

In the interim operational period which will occur post-approval and prior to the construction of the overland conveyor and rail siding, the product coal quantities will be the same as the existing scenario currently approved. As such, the impact to the key intersections will be similar to those currently experienced as a result of Coalpac's approved operations under previous conditions. Following the interim period, impacts to road intersection performance are predicted to be substantially reduced due to the:

- Cessation of the Ivanhoe North Colliery mining operations and associated coal haulage;
- The provision of an overland conveyor to MPPS. Construction of the conveyor will effectively negate the need for truck haulage of product coal to that facility;
- The Castlereagh Highway overbridge, which will link Cullen Valley Mine with Invincible Colliery; and
- The provision of the rail siding. This will allow for all product coal for export (up to 1 Mtpa) to be transported by rail to Port Kembla.

From Project Years 2 to 14, up to 0.64 Mtpa of product sand will be transported from the site by truck to Sydney-based customers at up to 64 one-way truck movements per day. The representative transport route proposed for these trucks to access markets in that region was assumed as being via the Great Western Highway to customers based in the Parramatta and Granville industrial areas. The Great Western Highway has undergone several recent upgrades which are ongoing and further improvements have been proposed by the State Government in the future. These existing and proposed upgrades to the Great Western Highway will support the truck movements from the Project. As such, the Great Western Highway is the preferred route for the haulage of product sand.

Sand haulage trucks for the Project will not access the Sydney market via the Bells Line of Road through Lithgow.

Road Safety

A Road Safety Impact Assessment undertaken for the Project focused on likely changes to crash risk on the section of the Castlereagh Highway between Cullen Bullen and the Great Western Highway near Lithgow. The Castlereagh Highway is an undivided rural arterial road generally on a north-south alignment connecting Lithgow and Mudgee via the western coal field areas.

Between the Invincible Colliery and MPPS, it is predominately a two-lane, two-way road with short sections providing additional lanes for ascending / overtaking, for deceleration and storage of turning vehicles, and acceleration lanes for high-speed merges.

The Castlereagh Highway / Invincible Colliery intersection is a four way intersection with the Castlereagh Highway as the major approach from the north and south and access roads for Invincible Colliery and the Ivanhoe North Colliery operations providing eastern and western approaches respectively. Turning bays into the access roads are within the minimum requirements of the RTA's *Road Design Guide* and there is adequate signage provided.

Two key risks were identified at the Castlereagh Highway / Invincible Colliery Access intersection from existing operations. Haul trucks from the Ivanhoe North Colliery proceed through the intersection and perform a u-turn on Coalpac property, to turn left onto the highway, increasing the traffic volume using the Invincible Colliery Access road. There have been some reports of hazardous overtaking by faster vehicles moving across the centre line as trucks slow to enter the Project site. These activities will cease in 2012 when Ivanhoe North Colliery ceases operation.

There were a total of 36 reported crashes on the Castlereagh Highway between Cullen Bullen and the Great Western Highway between January 2005 and December 2009, with four of these at the intersection with Boulder Road. The crash rate for the section of the Castlereagh Highway assessed for the Project was approximately 29 crashes per 100 MVKT and crash trends for reported accidents included the following:

- 18 (50%) injury crashes and 18 (50%) tow away non-casualty crashes;
- 18 (50%) single vehicle loss-of-control crashes, six head-on crashes, and five intersection crashes;
- 16 of the loss-of-control crashes were run-off-road crashes;
- Eight crashes (22%) when the road was wet, and seven crashes (19%) during snow / ice surface conditions; and
- 12 (33%) crashes involving a truck either as the primary or secondary vehicle.

For the Project, it was assessed that there would be an increase of 0.04 crashes per year (the equivalent of one additional crash every 25 years) which is not considered a significant increase above background levels, particularly given the reduction in heavy vehicle movements for the Project and that the Boulder Road intersection will not be used after the MPPS conveyor is constructed. Road safety risks will be further reduced by the construction of the Castlereagh Highway overpass bridge and the overland conveyor link to MPPS.

Due to the reduction in truck traffic generation between the base case and Project conditions, it may be concluded that road asset impacts will be reduced in the local area. Road asset impacts are measured by assessing Equivalent Standard Axles (ESA) to indicate road deterioration. The reduction of truck movements on the Castlereagh Highway between the Project and MPPS from 506 to 230 trucks per day will reduce the ESA by 54% and take 2.2 times as long to generate the same number of ESAs. As such, the road pavement's residual life would be increased and road deterioration reduced.

The number of ESAs on the section of the Castlereagh Highway between Boulder Road and the Great Western Highway would, however, be increased by 2.3 times due to the additional sand haulage for the Project.

Railway Network Impacts

The research conducted as part of the Project Traffic and Transport Impact Assessment indicated that there are a number of existing opportunities and physical and operational constraints on the rail network between the Project and Port Kembla.

Generally, these relate to the limited number of train paths available through the Blue Mountains Region and steep track grades which reduce train length and speeds.

With only two tracks, there are also only limited opportunities for passing on the Western Rail Line to the west of St. Marys Station (DOTARS 2007c).

The primary route via the Illawarra Line may conflict with passenger services in the section of the Western Line to the west of St. Marys Station due to the limited passing opportunities notes above. While this route has a shorter distance, there are limited train paths available on the Illawarra Line as the high demand for passenger services means there are time restrictions on coal haulage operations. As a result, there are seven hours per weekday when coal trains do not operate along this route, however recent assessments by the Department of Transport and Regional Services indicate there is spare capacity during the non-peak periods with flexibility to add more train paths (DOTARS 2007a, 2007b, 2007c).

The Illawarra Line is also restricted to two tracks south of Hurstville and additional traffic is created at Sutherland as it is the terminating station for many passenger trains and a maintenance workshop which generates additional train traffic.

The secondary route via the Southern Highlands has a longer haul distance and is therefore used less frequently. Physically, the line is restricted by the steep grades of the Illawarra escarpment and the track from the Sydney metropolitan area to the Southern Highlands is shared with urban and regional passenger services, which have priority over freight trains.

There are, however, a number of positives as the route bypasses the Tempe to Port Kembla section of the rail network which is heavily constrained by lack of train paths. In addition, the Moss Vale to Unanderra section of the network has ample spare capacity and is currently under-utilised. The freight traffic generated along this line includes coal, flour, grain and limestone.

The future South Sydney Freight Line (SSFL) will create potential benefits to the Project as it will include a dedicated freight line adjacent to the passenger line between Sefton and Macarthur. This will provide more opportunities for freight trains to bypass the slower passenger services.

The Port Kembla Coal Terminal (PKCT) is located immediately south of Wollongong Central Business District and currently handles approximately 14 Mtpa of coal for export. The theoretical coal handling capacity of PKCT is 18 Mtpa, indicating that the port has spare capacity for increased coal export quantities. Coal trains are restricted to a maximum length of 850 m at the PKCT, and could therefore accommodate those proposed for this Project. There may be issues in the future as there are growing demands on Port Kembla which will inevitably lead to increased pressure on the access road and rail networks surrounding the Port which may impact the long term capacity of PKCT and the coal supply chain in the region.

For the maximum of 1 Mtpa of product coal sought to be transported by rail for the Project, a maximum of 290 one-way train movements would be required per year (assuming a maximum train payload of 3,465 t / train). It is not predicted that the two routes considered for this EA would be significantly impacted by the rail haulage operations of the Project.

Economic Justification of Transport Options

The majority of the coal from the Project will be directly fed to the MPPS via a dedicated coal conveyor.

The Project also seeks to gain approval to transport up to 1 Mtpa of export coal to the Port Kembla Coal Terminal through the construction of a new rail siding and via the existing Wallerawang – Gwabegar Rail Line.

There is an existing unloading facility at the PKCT.

Coalpac has committed to the construction of this rail siding and conveyor (which has been included in the economics assessment in **Section 8.22**) to avoid 202 one-way truck movements per day that would occur if product coal was to be hauled by road, which also reduces potential environmental impacts.

Other markets for which approval is sought to deliver coal and sand products are small, domestic customers who do not have access to rail unloading facilities immediately adjacent to their operations.

To construct rail unloading facilities for receipt of relatively minor amounts of coal and sand would not be reasonable or economically feasible to enable these customers to receive Coalpac product.

No other commercially viable transport options are available, other than road transport to this existing (and relatively small) domestic coal and sand users. Without the ongoing road supply of small volumes of specialised coal and sand input products these small local regional industries would potentially close down.

8.16.4 Mitigation and Management

Results from the assessment identified that the Project will not have any significant road and rail traffic and transport impacts from those currently approved. As part of its EMS, Coalpac will develop a Traffic and Transport Management Plan to manage possible impacts resulting from construction and to ensure the traffic network can be managed throughout the life of the Project.

The Traffic and Transport Management Plan will be prepared in consideration of the management and mitigation measures below.

Roads and Intersections

- The overland conveyor to MPPS will be built as soon as it is feasible following approval to immediately reduce the demand for road hauls to MPPS;
- The Castlereagh Highway overpass bridge between the eastern and western sides of the Project will be built as soon as possible, post-approval, to consolidate access to the Project at one point, which will reduce the number of truck trips on the public road system and reduce the associated noise impacts to the adjacent to the village of Cullen Bullen due to truck haulage on the Cullen Valley Mine Private Haul Road;
- Haulage of product coal and sand by road will be undertaken using covered trucks within daily timeframes approved for the Project and the minimisation of any haulage during the identified AM and PM peak times, where practical. All haulage of coal and by road will continue to be monitored to record product volumes and the number of movements and reported in the Annual Review;
- Haulage of product sand to the Sydney market by road will be via the Castlereagh Highway and Great Western Highway. The Bells Line of Road will not be used as a truck haulage route;
- Consultation with the LCC, RMS and other local authorities as required prior to the movement of oversize loads on public roads;
- Regular training of workforce and contractors in relation to safe interactions with the local community; and
- The encouragement of car pooling amongst the Project workforce.

Road Safety

The Road Safety Assessment concluded that it is unlikely there will be any increased safety impacts as a result of the Project. Due to the reduction in the number of truck hauls for product coal and the consolidation of access into one point, there was no significant increase in crash risk. Coalpac will continue to ensure all reasonable and feasible measures are taken to minimise any road safety risks. In consultation with RMS, this will include:

- Implementing appropriate mitigation treatments to reduce hazardous overtaking practices over an interim period until the Castlereagh Highway overpass bridge is constructed, in consultation with the RMS;

This may include improvements to the delineation of the centreline and installation additional signs advising of the commencement of the overtaking lane at the Castlereagh Highway / Invincible Colliery site access road intersection;

- Once the Ivanhoe North Colliery ceases mining operations, it may be possible to adjust the line markings to provide an indented left-turn lane into the Invincible Colliery site access road, with approval from the relevant regulators;
- Undertake road safety improvement works for the Invincible Colliery site access road identified in any future road safety audits commensurate with the impacts of the Project; and
- Implementing appropriate design parameters in the construction of Project infrastructure that will cross over the public road network (i.e. the Castlereagh Highway overpass and MPPS conveyor), to meet safety requirements.

Rail Transport

The review conducted as part of the EA Traffic and Transport Impact Assessment indicated that there are a number of existing opportunities and constraints on the rail network between the Project and Port Kembla. Whilst the two train paths per day proposed by the Project are not envisaged to significantly impact the rail network, the following mitigation and management measures will be undertaken:

- Continued liaison with the ARTC and DP&I regarding the planning and schedule of the rail network improvements, including the Enfield ILC project, SSFL, Maldon to Dombarton link and Port Kembla expansion;
- Liaison with PKCT regarding the transportation of product coal to this facility; and
- Maintain flexibility for using both the primary route via the Illawarra Line as well as the secondary route via the Moss Vale to Unanderra route.

8.17 BUSHFIRE

8.17.1 Background

Coalpac currently manage the potential risk of bushfires for their existing operations in accordance with the approved management plans. These documents outline fire management strategies that have been implemented to minimise fire risk and assist in the protection of Coalpac lands and adjacent properties from the threat of bushfires.

The Project is located partially within the Ben Bullen State Forest, which covers an area of approximately 6,783 ha and is dominated by dry sclerophyll forest communities. There are several other State Forests and National Parks located in the regions adjacent to the Ben Bullen State Forest, including the Gardens of Stone National Park (approximately 2 km north of the Project), the Wolgan State Forest (approximately 8 km to the north-east of the Project) and the Newnes State Forest (located approximately 12 km to the south-east).

8.17.2 Methodology

Bushfires are common in dry sclerophyll forests of Australia with certain native flora evolving to rely on bushfires as a means of reproduction and fire events are an interwoven and an essential part of the ecosystem. Coalpac has therefore implemented bushfire management measures for their existing operations in the approved Fire Management Plan for Cullen Valley Mine and as a component of the approved Land Management Plan for Invincible Colliery.

Coalpac has also recently completed a Bushfire Risk Assessment for existing operations (Coalpac 2011). The objectives of this review were to assess and rank potential bushfire risks and confirm specific plant or operational areas where modifications to site practices could be made to help control and manage those risks based on their severity / risk ranking.

Potential bushfire hazards from existing operations were identified in the following locations:

- Coal stockpiles;
- ICPP;
- Administration buildings;
- Workshop facilities;
- Active operational areas;
- Biodiversity offset areas;
- Public access areas; and
- Ben Bullen State Forest areas.

The Bushfire Risk Assessment applied the Coalpac Risk Assessment matrix to the identified hazards, which considers risks in the context of impacts to the health and safety of employees, infrastructure and materials, business operations and the environment. Given the location and nature of Project operations, it was assessed that the key risk areas identified for existing operations would continue to apply.

8.17.3 Impact Assessment

Due to the relatively moderate rainfall and summer temperatures, combined with the potential for the build-up of high fuel loads (leaf drop and tinder) over time, a significant risk of bushfire presents itself intermittently within and adjacent to the Project Boundary in the Ben Bullen State Forest. The bushfire season experienced in the Central West Region of NSW occurs predominantly during the hotter months, from September to April. The frequency and severity of bushfires also depend on other environmental factors, including available fuel loads and rainfall.

The Bushfire Risk Assessment completed by Coalpac identified a low to moderate bushfire risk associated with the Project operations, provided that the implementation of risk prevention and management measures occurs. It was also assessed that there is a potential risk for offsite bushfires to cross into the Project Boundary due to its location within the Ben Bullen State Forest (which is in turn linked to other larger forest reserves).

On site bushfires and potential bushfire hazards are managed in accordance with the Rural Fires Act and regulated by the NSW Rural Fire Service. Fire controls and emergency systems in place for existing operations are implemented in accordance with the CMHS Act and the approved management plans.

8.17.4 Mitigation and Management

Coalpac will continue to operate in accordance with the management procedures outlined below which will be reviewed and consolidated for the Project to the satisfaction of DP&I and in consultation with the NSW Rural Fire Service, NSW Forests and other relevant regulators. These procedures will be provided in a Bushfire Management Plan for the Project, which shall include measures to respond to both internal and external fire events. Specifically, Coalpac will implement the following controls and emergency systems safeguards to manage potential bushfire hazards for the Project and to prevent the potential for any such event spreading from the Project to adjacent lands:

- All employees and contractors to be made aware of emergency procedures and responses in the case of a fire event;
- Use of official warnings broadcasts to evacuate in the event of a bushfire and notify the relevant authorities;
- Advising the local Rural Fire Service, other authorities and / or neighbours of any fire within the Project Boundary or immediate surrounding area;
- Communicate with Fire Captain (services) to offer assistance of trained persons / equipment in the event of an encroaching bushfire within the Ben Bullen State Forest;
- Maintaining, in conjunction with Forests NSW, fire trails or access roads at the extremities of the Project Boundary in the Ben Bullen State Forest, to serve as access for fire fighting services in the event of a fire, as well as a means for establishing fire breaks, if required. Monitoring of these fire trails and access roads will include regular inspections during periods of high bushfire risk;
- Undertaking back burning as required in consultation with the local Rural Fire Service, Forests NSW and neighbouring landowners;
- Ongoing support of the Cullen Bullen brigade of the Rural Fire Service;
- All roads and water infrastructure within the Project Boundary will be maintained for access and use by emergency services in the event of a fire;
- Internal monitoring and communication of specific fire danger risks. No hot work will be undertaken in extreme weather conditions;
- Regular checking and maintenance of all fire management equipment to ensure ongoing effectiveness;
- The area impacted by the underground heating (see **Section 8.4**) will continue to be monitored in accordance with the approved *'Subsurface Heating Monitoring Program'* (Coalpac 2010b);
- Monitoring and maintenance of areas and equipment where bushfire hazards are present to prevent or minimise the potential outbreak of bushfire, particularly the specific locations identified as presenting potential bushfire hazards (see **Section 8.17.2**);
- Fitting of fire extinguishers to all mobile equipment and training of staff in their operation;
- Modification of water carts to allow for fire extinguishing;
- Training of water cart operators / handlers in fire response;
- Fitting and maintaining efficient exhaust systems to mobile equipment;
- Ensuring that vehicles with low level exhaust systems do not leave defined access tracks in conditions likely to lead to ignition of combustible plant material; and
- Segregation and secure storage of all flammable materials at workshop and infrastructure areas in accordance with Work Cover Licence to Store.

8.18 SOILS AND LAND CAPABILITY

8.18.1 Background

Ecobiological Pty Ltd (Ecobiological) completed a Soil and Land Capability Impact Assessment for the Project which is reproduced in full in **Appendix R**.

The major objectives of this assessment were to:

- Review existing information;
- Define the soil types present within the Project Boundary;
- Provide a description of the land classifications;
- Provide a description of pre and post-mining land capability within the Project Boundary;
- Provide a description of pre and post-mining agricultural suitability within the Project Boundary;

- Conduct an assessment of available topsoil and subsoil resources; and
- Determine appropriate selective topsoil and subsoil management measures.

8.18.2 Methodology

In order to obtain a preliminary assessment of the soil units present within the Project Boundary, a broad scale review of the *'Atlas of Australian Soils'* was conducted. The review concluded that the majority of the Project Boundary consisted of soil unit Tb33, with the exception of two small areas in the north-east and to the south which were classified as soil unit Mb2 and a small portion in the north-western corner of the Project Boundary was mapped as Mw10.

A geophysical description associated with each of the identified soil units is provided below:

- **Tb33** - Dissected plateau;
- **Mb2** - Dissected sandstone plateau of moderate to strong relief with sandstone pillars, ledges, and slabs - level to undulating ridges, irregularly benched slopes, steep ridges, cliffs, canyons, narrow sandy valleys; and
- **Mw10** - Hilly to steep and rugged country with some flat to undulating areas.

An initial soil map was developed relative to the distribution of soils within the Project Boundary, using aerial photographs and topographical map interpretation.

To further refine the assessment, a soil and land capability survey of the land within the Project Boundary was undertaken in December 2010 and January 2011 by Ecobiological and included soil mapping and profiling, a soil field assessment and soil laboratory testing to:

- Classify and determine the soil profile types;
- Assess suitable topsoil material for future uses including rehabilitation; and
- Identify any potentially unsuitable soil material for rehabilitation.

Soil profiling was undertaken with the development of 24 soil test pits at selected sites to enable soil profile descriptions to be made. Soil layers at each profile site were assessed in accordance with *'Selection of Topdressing Material for Rehabilitation of Disturbed Areas in the Hunter Valley'* (Elliot and Veness 1981) for the recognition of suitable topsoil material.

This procedure assesses soils based on grading, texture, structure, consistence, mottling and root presence.

Test pit locations were selected to provide representative profiles of the soil types encountered over the Project Boundary and to define boundaries between them. The soil layers were generally distinguished on the basis of changes in texture and / or colour.

Soil colours were assessed according to the *'Munsell Soil Colour Charts'* (Macbeth 1994). Soil samples collected from the test pits were despatched to the DoL Soil & Water Testing Laboratory at Scone for analysis. Samples were analysed to establish the geochemical suitability including particle size, as a potential high value growth medium for use in rehabilitation, and conversely, soils that may have properties that are deleterious to vegetation establishment.

Land capability was determined in accordance with OEH (formerly the NSW Soil Conservation Service) *'Systems Used to Classify Rural Lands in New South Wales'* (Cunningham *et al* 1988) which is comprised of eight classes, classified on the basis of an increasing soil erosion hazard and decreasing versatility of use.

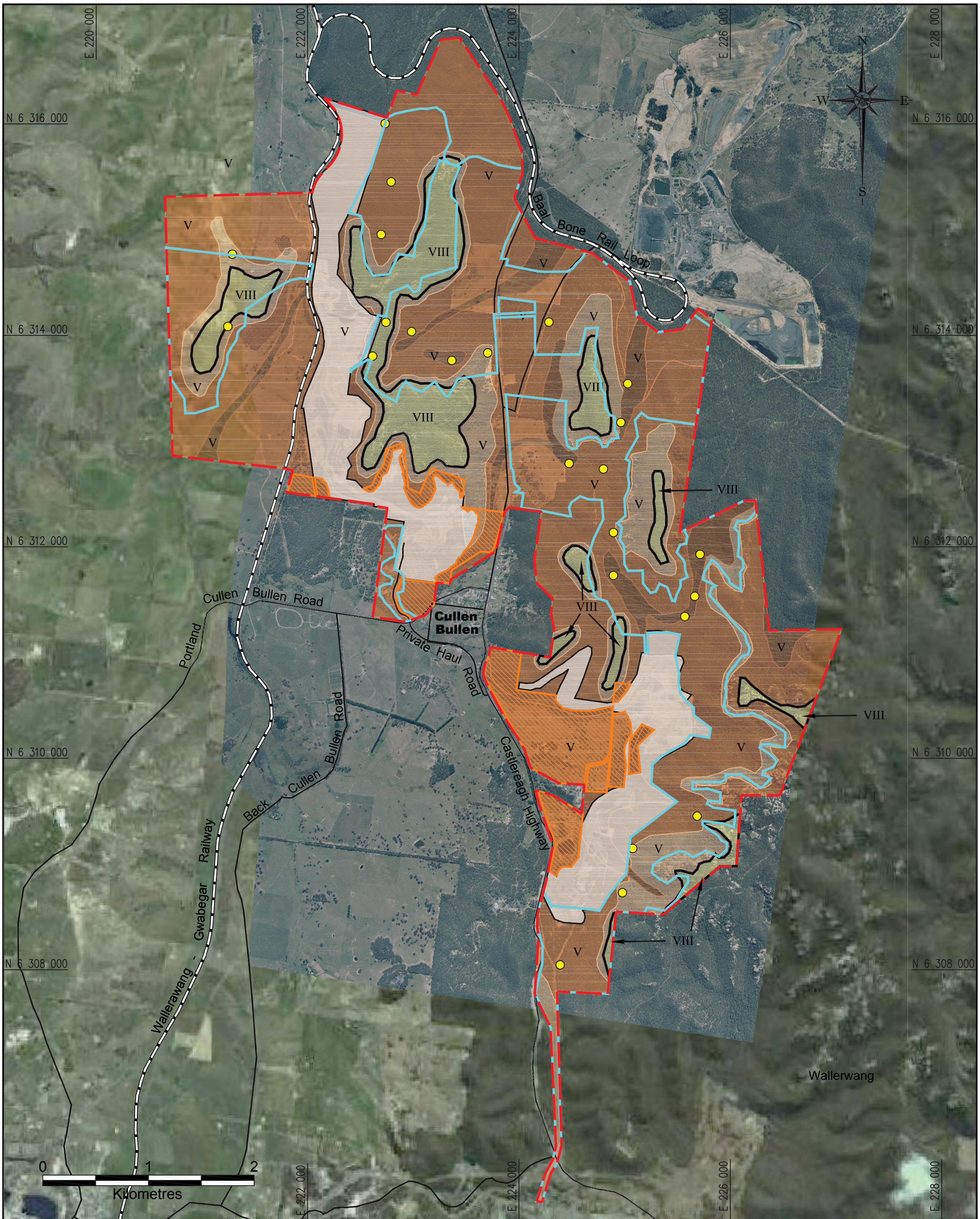
Agricultural suitability was also determined in accordance with DTIRIS – MR's (formerly NSW Agriculture) *'Agricultural Land Classification'* (Agfact AC.25) which consists of five classes, providing a ranking of lands according to their productivity for a wide range of agricultural activities with the objective of determining the potential for crop growth within certain limits.

8.18.3 Impact Assessment

Table 54 provides an overview of each soil type and the quantitative distribution of each. **Figure 48** provides an illustration of the spatial distribution of soil types and agricultural suitability within the Project Boundary. Four soil types were identified within the Project Boundary which are described further below.

Table 54 Project Soil Types and Area

Soil Type	Soil Unit	Area within Project Boundary (%)	Area within Project Boundary (ha)
1	Deep dark sandy loam	5.5	136
2	Deep orange clay loam	70	1,739
3	Shallow brown clay loam	14.5	360
4	Skeletal sandy loam	10	248



Project Boundary
Project Disturbance Boundary
Roads
Existing Conservation & Offset Areas
Approved Coalpac Operations
Test Pits
VIII Land Capability Classes

Soil Categories
Deep Dark Sandy Loam
Deep Orange Clay Loam
Shallow Brown Sandy Loam
Skeletal Sandy Loam

Hansen Bailey

Coalpac Pty Ltd

Coordinate System: MGA Zone 56

COALPAC CONSOLIDATION PROJECT

Soil Types and Land Capability

Cad File: 07283I.dwg	Date: 09.12.11	Drawn: CP	Figure 48

Soil Type 1

Soil type 1 is a deep dark sandy loam and covers approximately 5.5% or 136 ha of the land within the Project Boundary. They occur in a transferral landscape generally within valley flats and along drainage lines (alluvial / colluvial). The topsoil associated with the soil is approximately 50 cm in depth is non-saline, slightly dispersive and slightly acidic. The subsoil extends to a depth of up to 250 cm and is non-saline, moderately dispersive and acidic.

The topsoil is suitable for stripping and reuse as topdressing in rehabilitation. The subsoil has similar textural and chemical properties to the topsoil and therefore stripping to depths lower than 50 cm may be achieved in some areas depending on profile characteristics.

Soil Type 2

Soil type 2 is a deep orange clay loam and covers approximately 70% or 1,739 ha of the land within the Project Boundary. They occur in a residual soil landscape and primarily on lower gradual slopes. The topsoil associated with the soil is approximately 20 cm in depth is non-saline, slightly dispersive and slightly acidic. The subsoil extends to a depth of up to 240 cm and is non-saline, moderately dispersive and acidic.

The topsoil is suitable for stripping to a depth of 15 – 20 cm and reuse as topdressing in rehabilitation. The subsoil however is texturally and structurally unsuitable for stripping, due to high clay content and massive structure, and should not be retained for topsoil respreading. Salinity levels and acidity are not suitable to supporting vegetation growth.

Soil Type 3

Soil type 3 is a shallow brown sandy loam and covers approximately 14.5% or 360 ha of the area within the Project Boundary. They occur in residual soil landscapes located primarily on the upper gradual slopes.

The topsoil associated with the soil is approximately 15 cm in depth is non-saline, slightly dispersive and slightly acidic.

The subsoil extends to a depth of up to 114 cm and is non-saline, moderately dispersive and acidic.

The topsoil is suitable for stripping to a depth of 10 – 15 cm and reuse as topdressing in rehabilitation. The subsoil however is texturally and structurally unsuitable for stripping, due to high clay content, and should not be retained for topsoil respreading. Further the salinity levels and acidity of the subsoil material are not suitable to supporting vegetation growth.

Soil Type 4

Soil type 4 is a Skeletal sandy loam and covers approximately 10% or 248 ha of the area within the Project Boundary. They occur in a residual soil landscapes located primarily on crests and upper steep slopes.

The topsoil associated with the soil is approximately 2 cm in depth is non-saline, slightly dispersive and slightly acidic. The subsoil is limited to a depth of only 2 cm and is non-saline, moderately dispersive and generally slightly acidic.

Given that the topsoil is extremely shallow and the subsoil contains high density of parent rock material, the soil is texturally and structurally unsuitable for stripping and both the topsoil and subsoil should not be retained for respreading.

Topsoil Availability and Suitability

Appropriate topsoil stripping depths for each of the soil types are shown in **Table 55**. A figure showing the spatial distribution of the topsoil stripping depths is presented in **Appendix R**.

The estimated total volume of suitable topdressing materials available from areas proposed to be disturbed within the Project Boundary is up to 2.3 Million cubic metres. When a handling loss of 10% is allowed, the quantity decreases to approximately 2 Million cubic metres, which will be adequate for the Project requirements.

Land Capability

The majority of the Project Boundary is considered Class V land suited for grazing activities (as defined in Cunningham *et al* 1988). This is consistent with neighbouring agricultural land outside the Project Boundary. The pre-mining rural land capability classifications of the Project Boundary are shown on **Figure 48**.

Table 55 Topsoil Stripping Depths

Soil Type	Stripping Depth (m)	Disturbed Area (ha)	Volume within Project Disturbance Boundary (m^3)	Maximum Volume (10% Handling Loss) (m^3)
1	0.30	87.0	180,000 – 270,000	243,000
2	0.20	593.3	889,950 – 1,186,600	1,067,940
3	0.15	141.1	161,600 – 242,400	218,160
4	Stripping not to be undertaken	45.1	0	0
Total		**866.5**	**1,699,000**	**1,529,100**

The percentage area of each class prior to and following mining is indicatively shown in **Table 56**.

Class VIII land occurs on the more elevated crests where Skeletal Soils were identified. Class VIII land is highly susceptible to degradation, requiring severe restrictions for use. Given that the land is highly elevated with steep slopes, it is more suitable for wildlife reserves, bushland, recreation or water supply catchment.

All Class V and Class VIII land which is not proposed to be disturbed by mining will remain the same land capability as the pre-mining class.

The majority of the disturbed post-mining landform consists of slopes of 10 degrees and will be covered in low to moderate quality topdressing materials.

The aim of these rehabilitation activities will aim at restoring the land back to the pre-mining land capability of Class V and Class VIII land. The flatter slopes of rehabilitation will enable the land capability to be generated back to Class V land which will continue to dominate the site after cessation of mining. The steeper highwall areas will be rehabilitated with the aim of generating Class VIII land.

Table 56 Pre-mining Land Capability

Land Class	Pre-mining	
	ha	%
Class V	2,235	90
Class VIII	249	10
Total	**2,484**	**100**

Agricultural Suitability

The majority of land within the Project Boundary is currently vegetated with native forest associated with the Ben Bullen State Forest. Adjacent farmland is predominantly used for low intensity cattle and sheep grazing.

The pre-mining agricultural suitability classification of the Project Boundary is shown in **Appendix R**. The percentage area of each class with respect to both cropping and grazing prior to mining is indicatively shown in **Table 57**.

With respect to cropping suitability, the majority of land within the Project Boundary was identified as Class 5. This indicates that the land is unsuitable for cropping which was mainly due to the inaccessibility of the undulating terrain and a lack of available topsoil for most soil units.

Soil unit 1 (Deep Dark Sandy Loam) was identified as Class 4 land due to its greater topsoil availability; however, this still indicates that it is only marginally suited for cropping due to limited areas available and inaccessibility.

Table 57 Pre-mining Agricultural Suitability

Land Class	Pre-mining	
	Area in Project Boundary (ha)	%
Cropping		
Class 4	161.5	6.5
Class 5	2,322.5	93.5
Total	**2,484**	**100**
Grazing		
Class 4	2,235	90
Class 5	249	10
Total	**2,484**	**100**

With respect to grazing, the majority of the site is identified as Class 4 land which indicates that the land is suited to support native pastures and or improved pastures using minimum tillage techniques.

The overall level of production for this land would however be comparatively low due to environmental constraints such as low topsoil availability and undulating terrain. Skeletal Soils were identified as Class 5 (unsuitable for grazing) due to their low topsoil availability, higher erosion potential and inaccessibility.

Overall the percentage area of each class of agricultural suitability will remain relatively similar to that of the existing environment.

8.18.4 Mitigation and Management

In order to reduce the potential for degradation within the Project Boundary and adjoining lands, the following strategies will be implemented during operations and rehabilitation to achieve the desired post-mining land capability and agricultural suitability:

- Materials will be stripped to indicated levels. Where possible, materials will not be stripped in excessively dry or wet conditions;
- Topsoil materials will be spread directly onto reshaped areas to a minimum depth of 0.1 m where practical to avoid stockpiling;
- Where topsoil must be stockpiled, efforts will be made to reduce compaction by keeping soil in as coarsely textured a condition as possible in order to promote infiltration and minimise erosion until vegetation is established and to prevent anaerobic zones forming; stockpiles 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;

- 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 to create a *"key"* between the soil and the spoil. Ripping will be undertaken on the contour, preferably when soil is moist. The respread topsoil surface will be scarified prior to, or during seeding, to reduce runoff and increase infiltration via tilling with a fine tyned plough or disc harrow;
- Re-grading 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.

Coalpac will develop an internal Soil and Land Capability procedure for management of its soil resources, in consideration of the above mitigation and management measures.

8.19 PRELIMINARY HAZARDS ANALYSIS

8.19.1 Background

Hansen Bailey has completed a Preliminary Hazards Analysis (PHA) for the Project which provided in **Appendix S** and summarised below. This assessment was aimed at identifying potential hazards associated with the Project, assess the significance of each and develop possible management and control procedures as outlined in the relevant legislation.

8.19.2 Methodology

This hazard assessment was undertaken with the objective of ensuring that there was an appropriate level of understanding of the hazards and risks that have the potential to occur during the construction and operation of the Project. Following the review of the risk screening method provided under the under SEPP 33 Guidelines for potential fire, explosion and toxicity hazard, it was determined that a PHA for the Project would be required.

This Project PHA was been prepared 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 – Hazard Analysis* (HIPAP No. 6) (NSW Department of Planning (DoP) 2011b). The *Hazardous Industry Planning Advisory Paper No 4 – Risk Criteria for Land Use Planning* (HIPAP No. 4) was also considered throughout the preparation of this document (DoP 2011a).

8.19.3 Impact Assessment

Key bulk storage locations identified in the hazards review for existing operations that will be utilised for the Project include:

- Explosives Storage Facility;
- Explosive Precursor Storage Facility;
- Diesel Storage Facilities; and
- Other Potentially Hazardous Materials Storage.

Coalpac holds a Licence to Store explosives materials (07-100153-004) for the existing explosive precursor storage facility and explosives storage facility located at Cullen Valley Mine. These facilities will continue to be used as the sole storage location for explosive precursors and explosives required for the Project. Under the Licence to Store, these facilities are approved to store the following volumes of potentially hazardous materials as defined by AEISG (1999):

- Up to 2 tonnes of explosives (of Class: 1.1D);
- Up to 7,000 units of explosives (of Class 1.1B); and
- Up to 155 tonnes of oxidising substances (of Class 5.1).

These existing explosives precursor and explosives storage facilities are located 544 m from the closest private residence. These facilities have been designed in accordance with *'AS 2187.1-1998 Explosives – Storage, Transport and Use – Storage* and the AEISG *Code of Practice - Precursors'*. Explosives will continue to be utilised in accordance with site procedures and the requirements of *'AS/NZS 2187 – 1998: Explosives – Storage, Transport and Use'* (Standards Australia, 1998), the *Explosive Act 2003*, the *Explosive Regulations 2005*, the *Coal Mines Health and Safety Act 2002*, the CMH&S Regulations 2006 and other relevant codes.

The existing main diesel storage facilities that will be required for the Project are indicated in **Appendix S** and will include:

- A 75,000 Litre (L) bunded diesel storage tank within the Cullen Valley Mine infrastructure area;
- A 10,000 L bunded diesel storage tank approved for the explosives storage facility at Cullen Valley Mine;
- A 40,000 L underground diesel storage tank located near the existing Invincible Colliery infrastructure area;

- A 75,000 L bunded diesel storage tank located near the Invincible Colliery infrastructure area; and
- Up to 12 oil storage pods at the infrastructure and workshop areas of Cullen Valley Mine and Invincible Colliery, which will also continue to be stored and transported within self-bunded containers.

Up to four additional self-bunded diesel storage tanks of 75,000 L capacity will be used for the Project. One of these storages will be used in each of the four mining areas of Hillcroft, Cullen Valley, East Tyldesley and Invincible proposed for the Project to support mining operations. These storages shall be periodically relocated as open cut operations in each area progress during the life of the Project.

Small volumes of petrol and oils will also be required for some site maintenance equipment (i.e. mowers, etc) and in workshop areas at Cullen Valley Mine, Invincible Colliery and the proposed ETCPP.

Based on the hazards identified, a risk assessment was undertaken for the Project operations, which were divided into a number of activities, including:

- Transportation to the Project;
- Loading storage facilities on-site;
- Storage of goods on-site;
- Re-loading and transportation of goods within the Project site; and
- Project operations.

Each hazard identified for the Project was then assessed according to qualitative risk assessment criteria to determine the scale, likelihood and consequence of potential risks (see **Appendix S**) and to assist in the development of additional management measures, if required.

8.19.4 Mitigation and Management

The Project will continue to be managed in accordance with existing management measures and procedures in place for existing Coalpac operations by Coalpac staff, contractors and the specific management plans for the Cullen Valley Mine explosives storage and explosives precursor storage facilities.

The risk assessment identified a need for the following preventative measures:

- Personnel entering the explosive precursor and explosives storage facilities will be authorised to do so and trained in relevant procedures for the loading, transport and preparation of hazardous substances. Any visitors entering this area must be site inducted and will need to 'sign on';
- A review of Coalpac Waste Management Plans and management procedures for infrastructure and workshop areas is required to minimise the chance of a hazardous incident occurring for the Project as a result of operations in these areas; and
- An Emergency Response Plan prepared by the explosive supplier for the existing explosives and precursor storage facilities will be put in place for the Project and reviewed on at least a five yearly basis.

Coalpac will also update the relevant management plans in place for existing operations to manage other hazards and risks associated with the Project. In particular, this will include revising the Waste Management Plans and the Coalpac Environmental Management Strategy to reflect the hazards and risks associated with the Project.

8.20 WASTE MANAGEMENT

Coalpac has an existing Waste Management System (WMS) which was developed to manage the disposal, tracking and reporting of all waste generated onsite. The WMS will be enhanced to meet both legislative and internal Coalpac requirements as discussed below.

8.20.1 Waste Management System

Coalpac's WMS will utilise an approved, independent waste contractor working within the provisions of the *Waste Avoidance and Resource Recovery Act 2001* and the POEO Act to monitor, remove, track and report wastes. Complementing this, waste streams are segregated in the separate receptacles to ensure waste is effectively screened for recycling, reuse and / or disposal.

The existing procedures in place for waste management include measures for the minimisation, storage, transport, disposal, tracking and reporting of waste generated from Cullen Valley Mine and Invincible Colliery operations. A spill response procedure is also in place that provides a staged process to be followed in the event of a spill incident.

To ensure that the WMS continues to work effectively, regular inspections and monitoring of waste management measures is conducted by environmental personnel, with training for other personnel as required. Any spills that may occur within infrastructure and workshop areas are designed to be contained within bunds and other pollution control structures, whilst regular inspections of the WMS ensure compliance with regulatory requirements.

Maintenance Workshop Waste

Waste greases and bulk waste oil are held in a storage tank located adjacent to the existing Invincible Colliery workshop. This facility is fully bunded and has been designed with a capacity to contain 110% of the maximum storage volume in accordance with the relevant Australian Standard. Waste oil and grease from the Cullen Valley Mine workshop area are currently captured in sumps and a bunded storage tank.

Waste oils and grease generated are removed from site on a regular basis by a licensed contractor and recycled or disposed of at a licensed facility.

A vehicle wash bay is located at both the Cullen Valley Mine and Invincible Colliery workshop and utilises an oil and water separator. Silt from the wash bay is removed on a regular basis, and the oily water is pumped out and treated by a licensed contractor when required. The vehicle wash bays contain access ramps that provide access to remove any silt which may build up. Any excess water from the oil and water separators will be pumped to mine water storage dams for use in dust suppression, as required.

Scrap metals will be collected and removed from site for recycling.

General Waste

Domestic waste and rubbish will be stored in skips adjacent to the site offices and collected on a regular basis by a licensed contractor. Separate bins will be provided for recyclable materials in an effort to reduce the amount of waste generated onsite. Waste suitable for recycling will be 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 will be transported to an appropriate recycling centre for separation and recovery.

Other general waste unsuitable for recycling shall be placed in general waste bins for licensed transport and disposal to the LCC Waste Depot. Batteries and light vehicle tyres are kept separate from other waste in separate storage areas, and then removed from site by licensed contractors.

Waste tyres from mining equipment are buried within OEAs. The location and quantity of tyres disposed is recorded onsite in accordance with the requirements under the POEO Act.

Sewage Treatment

Coalpac will operate an onsite wastewater treatment facility to treat waste water collected from the staff amenities located at the mine offices. The LCC permits Coalpac to utilise treated effluent for spray irrigation on a small area of undisturbed land within the Project Boundary. No effluent will be discharged from the Project unless in accordance with an EPL.

The contractor's crib areas at Cullen Valley Mine and Invincible Colliery contain permanent toilets operating with an Envirocycle Disposal System in conjunction with two ablution tanks. The ablution tanks are regularly pumped out by a licensed private contractor and transported to the LCC waste water treatment facility for treatment.

8.20.2 Impact Assessment

General Waste

During the 2010 to 2011 financial year, approximately 90 m^3 of general waste unsuitable for recycling was generated by the Invincible Colliery and approximately 81 m^3 by Cullen Valley Mine. General waste products were disposed of in designated general waste skip bins, which were collected on a regular basis for licensed transportation to the LCC Waste Depot for disposal.

The volume of waste generated by the Project is expected to increase due to the increased workforce and mining operations sought for the Project, due to the proposed increase in full-time personnel to 120. However, any potential for increase in general waste volumes will also be minimised, where practicable, by the implementation of more efficient strategies for reuse and recycling.

Recycled Waste

During the 2010 to 2011 financial year, approximately 9 m^3 of recyclable waste (including paper, cardboard, glass, recyclable plastics, wooden pallets and aluminium and steel cans) was collected in a designated recyclable waste bin and by a licensed contractor and transported from the site for separation, recovery and processing.

It is anticipated that the quantity of recycled waste products will increase significantly due to a combination of the proposed increase in full-time personnel and the implementation of more efficient reuse and recycling options and management strategies for the Project.

Workshop Waste

During the 2010 to 2011 financial year, approximately 15,300 L of waste oil was collected from Cullen Valley Mine and approximately 94,400 L of waste oil was collected from the Invincible Colliery. These waste products were recorded on a waste tracking register for disposal by an appropriately licensed contractor.

An indicative list of mobile equipment to be utilised for the Project is provided in **Table 10**. It is noted that due to the proposed mining operations and the update of the mobile equipment fleet currently utilised for the existing Cullen Valley Mine and Invincible Colliery operations, current workshop waste volumes are not representative of the Project.

Mining and Rejects Waste

Mining and processing waste have been quantified and described in **Section 4.4.2**.

8.20.3 Mitigation and Management

The Coalpac WMS procedures will continue to be utilised for the Project and enhanced as required to reflect the additional workforce and operational areas required. This will include a revision of current procedures to reflect the operations and workforce proposed for the project ensure that all waste materials are tracked, stored, transported disposed of and reported in accordance with relevant legislative requirements. Training of all personnel will continue in the minimisation of waste streams, procedures for the reuse and recycling of waste materials and the 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 consolidated EPL to be sought for the Project and the *Environmental Guideline for the Utilisation of Treated Effluent* (DEC 1995).

Ablution tanks required for the Project will continue to be pumped out by a licensed contractor and transported to the LCC waste water treatment facility for processing.

8.21 SOCIAL

8.21.1 Background

Hansen Bailey completed a SIA for the Project which is outlined in the following sections. This study developed a profile for the closest townships of Cullen Bullen and Portland (the local area) and Bathurst LGA and the Lithgow LGA (the wider area) and aimed to identify any future social impacts which may result from the Project. The SIA also considered issues raised by stakeholders during the EA stakeholder engagement program described in **Section 6**.

8.21.2 Methodology

The SIA methodology included the following key tasks:

- Development and analysis of the existing local socio-economic setting based on a review of existing information;
- Development and analysis of the Project workforce profile and workforce residential pattern;
- Consultation with the local community;
- Assessment of potential social impacts of the Project on the local area, including the social impacts associated with the additional workforce;
- Assessment of potential social impacts associated with the Project with reference to surrounding industry; and
- Development of appropriate mitigation and management measures for any adverse social impacts.

Existing Socio-Economic Environment

Local Area Setting

Table 58, **Table 59** and **Table 60** provide summaries of the key demographic characteristics of the local area and wider region which are discussed in further detail in the following sections. The 2006 census data has been utilised for completeness as only partial information is available from 2007 onwards.

Cullen Bullen and Portland townships are key local communities within the near vicinity to the Project, located approximately 1 km and 10 km, from the site respectively. Due to proximity to the Project, these communities are the most likely to be impacted by the Project and surrounding industry. As a result, priority consideration has been given to the mitigation of impacts on these townships.

Table 58 Local and Regional Population Growth Statistics

Town / LGA / State	Total Population (persons)		Population Change from 2001 to 2006	
	2001	2006	Persons	%
Cullen Bullen township	209	198	-11	-5.26%
Portland township	1,813	1,881	68	3.75%
Lithgow	11,023	11,298	275	2.49%
Lithgow LGA	19,173	19,756	583	3.04%
Bathurst township	26,920	28,992	2,072	7.70%
Bathurst LGA	29,702	35,845	6,143	20.68%
Central West SD	169,7175	170,899	1,184	0.70%
NSW	6,311,168	6,549,177	238,009	3.77%

Source: ABS census data 2006.

Table 59 Local and Regional Demographic Statistics

Location	Median Age	Indigenous (% of pop.)	Total Occ. Dwellings	Occupancy Rate
Cullen Bullen township	40	3.5%	72	2.6
Portland township	42	3.7%	736	2.4
Lithgow	40	3.0%	4,680	2.3
Lithgow LGA	40	3.1%	7,742	2.4
Bathurst township	33	3.9%	10,670	2.5
Bathurst LGA	35	3.4%	13,087	2.5
Central West SD	38	4.5%	65,389	2.5
NSW	37	2.1%	2,470,451	2.6

Source: ABS census data 2006.

Table 60 Local and Regional Industry Employment Distribution

Industry	Cullen Bullen (%)	Portland Township (%)	Lithgow Township (%)	Lithgow LGA (%)	Bathurst Township (%)	Bathurst LGA (%)	Central West SD (%)	NSW (%)
Agriculture, forestry and fishing	0	1	1	3	2	5	12	3
Mining	23	11	10	12	1	1	3	1
Manufacturing	7	11	8	8	13	12	10	10
Electricity, gas, water and waste services	0	9	5	6	2	2	2	1
Construction	0	6	6	5	7	7	6	7
Wholesale trade	8	2	2	2	2	2	3	5
Retail trade	15	10	13	12	13	12	11	11
Accommodation and food services	0	6	10	9	8	7	7	7
Transport, postal and warehousing	5	5	6	5	4	4	4	5
Information media and telecommunications	0	0	1	1	2	2	1	2
Financial and insurance services	5	2	2	2	2	2	2	5
Rental, hiring and real estate services	0	1	1	1	1	2	1	2
Professional, scientific and technical services	0	3	2	3	3	3	3	7
Administrative and support services	11	3	3	3	2	2	2	3
Public administration and safety	5	10	8	9	9	8	7	6
Education and training	0	4	6	7	12	12	8	8
Health care and social assistance	13	10	10	10	11	11	11	10
Arts and recreation services	0	1	1	1	1	1	1	1
Other services	0	3	4	3	4	4	4	4
Inadequately described / Not stated	8	3	2	1	2	2	2	3

Source: ABS census data 2006.

The Project occurs within the Lithgow LGA and Central West SD which are also discussed below. The Bathurst LGA is adjacent to the Lithgow LGA and has been considered as it is potentially a key residing location for employees associated with the Project. Statistics for the State of NSW have been included for comparative purposes.

Cullen Bullen Township

Cullen Bullen was first settled in 1824, with development of the village in the 1840s for the purposes of a stopping place on the road to Mudgee. The township expanded with the discovery of coal in the vicinity of the village and the development of a range of coal mining operations in the district from 1880. A summary of the development of Cullen Bullen township following European settlement is provided in **Section 8.13**. There are currently six coal mines and two power stations in the vicinity of Cullen Bullen and **Table 60** demonstrates the high percentage (23%) of persons residing in Cullen Bullen that are employed in the mining industry.

Generally, Cullen Bullen is characterised by:

- A decrease in population of 5.3% between 2001 and 2006, in contrast to the surrounding towns and the LGA which have seen a general increase;
- A high unemployment rate of 16.7% compared to a State average of 5.9%; and a low participation rate, indicating a larger proportion of the community are not part of the workforce;
- A higher Indigenous population than the NSW average;
- Mining industry dominated employment; and
- Median household income levels lower than average NSW income levels, with the median household weekly income of $596 being 42.5% less than the NSW median household income of $1,036.

Portland Township

The township of Portland is known as *"the town that built Sydney"* as a result of being home to the first cement works in Australia. Portland is an historic mining town with the cement works continued operation until closing in 1991. According to the Australian Bureau of Statistics (ABS) census data (ABS 2006b) the equal highest industries of employment in Portland are manufacturing and mining.

The township of Portland is characterised by:

- An increase in population of 3.75% between 2001 and 2006, consistent with the surrounding towns and the LGA;
- A moderately high unemployment rate of 9.6% compared to a State average of 5.9%; and a low participation rate;
- A higher Indigenous population than the NSW average;
- Manufacturing and mining industry dominated employment; and
- Median household income levels lower than average NSW income levels, with the median household weekly income of $681 being 34% less than the NSW median household income of $1,036.

Lithgow LGA

The Project is located within the Lithgow LGA which is generally characterised by strong mining and manufacturing industries. Tourism and identification as an important heritage centre, being home to a World Heritage National Park, are also key to the identity of the region. According to ABS census data (ABS 2006b), the highest employer in the Lithgow LGA is equally shared by mining and the retail sector, each of which employ 12% of the working population.

The Lithgow LGA is characterised by:

- Increasing population, with the population growing by 583 people (3%) between 2001 and 2006;
- Relatively high unemployment rate when compared to the NSW average of 5.9%, which has dropped marginally from 9.7% in 2001 to 8.5% in 2006;
- Mining, retail and healthcare industries dominated employment; and
- Median household income levels are lower than the NSW average. In 2006, median weekly household income levels in Lithgow LGA were $738 which is 29% less than the median NSW household income.

Bathurst LGA

Bathurst is located approximately 60 km to the south from the Project Boundary.

The Bathurst LGA is generally characterised by strong educational facilities including public, private and Catholic schools, TAFE and University. The Bathurst LGA is also home to tourism activities including Mount Panorama motor racing circuit and vineyards.

The Bathurst LGA is characterised by:

- Increasing population, with the population growing by 6,143 people (20.7%) between 2001 and 2006;
- Lower than State median age, most likely due to being an education centre;
- Lower unemployment rate than surrounding regions and higher participation rate than the State average;

- Employment largely within manufacturing, retail and education sectors; and
- Median household income levels are lower than the NSW average however higher than surrounding regions. In 2006, median weekly household income levels in Bathurst LGA were $975 which is 6% less than the median NSW household income.

Labour Force and Skill

Table 61 provides a summary of the employment statistics and an indication of the available labour in the region. As outlined in **Table 60**, labour skills in the local area are primarily driven by the mining and retail industries and health care services. The local area has a significantly high unemployment rate, lower rate of workforce participation and higher part time workforce compared to the Central West SD and NSW average.

This coupled with the declining population of the Cullen Bullen township indicates a decline in social and economic growth in the local area.

The Lithgow LGA has a higher unemployment rate and lower participation rate than the Central West SD and NSW average; the difference is not however as significant as that which can be seen between the local areas. Bathurst LGA has a higher than State average participation rate and a lower unemployment rate than the Central West SD.

This combined with the population increase indicates increasing social and economic growth in the Bathurst LGA.

Housing Market and Affordability

Figure 49 demonstrates median house prices across the local and wider area. It generally demonstrates that house prices in the wider area saw a steady rise to 2004 when they generally stabilised.

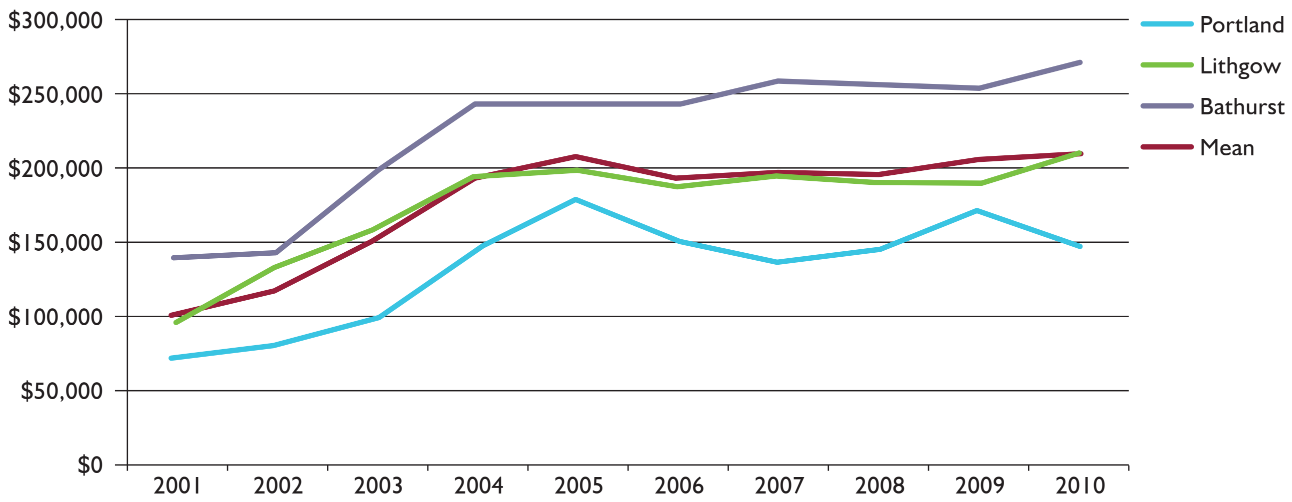
Table 61 Available Labour in Local Area

Detail	Cullen Bullen	Portland	Lithgow LGA	Bathurst	Bathurst LGA	Central West SD	NSW
Unemployment Rate %	16.7	9.6	8.5	6.7	6.2	6.3	5.9
Participation Rate %	39.4	35.8	42.7	47.7	48.1	45.7	47.2
Total Labour Force	78	674	8,434	13,838	17,242	78,172	3,092,600
Unemployed	13	65	718	930	1,067	4,897	183,157
Not in Workforce or Labour Force status not stated	74	674	6,617	8,270	10,086	49,854	1,801,011
Part Timers	24	178	2,405	4,028	5,067	21,649	842,714
% Part time	30.8	26.4	28.5	29.1	29.4	27.7	27.2

Source: ABS census data 2006.

* A Participation Rate is the total labour force as a % of the total population.

Figure 49 Median House Price Trend 2001 - 2010



Source: www.realestate.com.au (2011).

Sale numbers in Cullen Bullen are generally not high enough to develop a reliable data set from which to analyse trends. Based on anecdotal evidence, the rental market in the local area appears to vary between being relatively tight with very few available rental properties in areas such as Cullen Bullen and Portland, to a reasonably balanced supply and demand in the larger centres of Lithgow and Bathurst.

Table 62 provides a comparison of the median household incomes across the local and wider area with the Central West SD and NSW. It also provides a comparison of the median housing loan repayments as a proportion of the household income. A comparison of median household income and median housing loans indicates that housing in the local and wider area is affordable as a comparison to other areas such as the Central West SD and NSW. Housing in the local area is equal to or less than the NSW average. Available in the Portland area are two hotel accommodation options. Generally available across the wider area are a number of hotels, motels and caravan parks which may be utilised for short term accommodation.

Community Services and Facilities

The wider area is serviced by local hospitals in the townships of Bathurst and Lithgow which provide emergency services; and Portland which provides more basic care and does not have an emergency department. Additional health care services in the region include aged care facilities, home and community health centres and general practitioners. Many of these facilities include mental health care services. Cullen Bullen is not serviced by a medical facility.

The local and wider area is serviced by numerous public and private primary and secondary schools. Additionally, tertiary education facilities are available, including TAFE in Lithgow and Bathurst and Charles Sturt University in Bathurst.

There are a large number of educational facilities in the wider area, including Bathurst which is known to be an educational centre for all levels of education. The schooling opportunities in the local area are not as extensive as in the wider area. A list of education facilities in each township is provided in **Table 63**.

Project Workforce

Workforce

During operations, it is anticipated that the Project will employ up to 120 people, plus contractors. Currently, there are approximately 90 employees employed in the existing operations of Cullen Valley Mine and Invincible Colliery. It has conservatively been assumed that approximately 30 positions will be required to be filled from the local, regional or larger community.

Labour Force Supply

Due to the number of Coalpac personnel and contractors employed in existing operations and the relatively small increase in required employee numbers, the local community is not anticipated to have significant difficulty providing the additional workforce required for the Project.

The residential pattern of the additional workforce required for the Project is anticipated to remain similar to that of the existing workforce as shown in **Table 64**.

For the purposes of this assessment, it has been anticipated that at peak production, 93% (28 employees) of the new hires will be local hires and 7% (two employees) will be non-local hires based on current residential patterns. Non-local hires will predominantly consist of experienced maintenance workers, mine operators and professional staff. Local hires are likely to include mine operators, maintenance workers, local ancillary staff, apprentices and graduates.

Table 62 Housing Affordability

Location	Median Household Income ($/week)	Median Rent ($/week)	Median Housing Loan Repayment ($/month)	Loan Repayment as Proportion of Income (%)
Cullen Bullen township	596	110	867	34
Portland township	681	135	867	29
Lithgow township	669	140	1,083	37
Lithgow LGA	738	135	1,107	35
Bathurst township	959	175	1,300	31
Bathurst LGA	975	170	1,300	31
Central West SD	808	140	1,090	31
NSW	1,036	210	1,517	34

Table 63 Education Facilities Summary

Location	School	Grades	Enrolled
Cullen Bullen	Cullen Bullen Public School	K - 6	27
Portland	Portland Central School	K - 12	170
	St Joseph's School	K - 6	N/A
Lithgow	Lithgow Public School	K - 6	460
	Cooerwull Public School	K - 6	335
	St Patrick's Primary School	K - 6	N/A
	Lithgow High School	7 - 12	1,000
	La Salle Academy	7 - 12	380
	Lithgow TAFE Campus	N/A	N/A
Bathurst	Bathurst High School	7 - 12	842
	All Saints College	Transition -12	550
	The Scots School	K - 12	N/A
	MacKillop College (girls only)	7 - 12	600
	St Stanislaus College (boys only)	7 - 12	N/A
	Bathurst TAFE Campus	N/A	N/A
	Charles Sturt University	N/A	N/A

Table 64 Workforce Residential Breakdown

Location	Existing Workforce Residential Pattern (%)	Anticipated New Hire Residential Breakdown
Lithgow	30	9
Portland	20	6
Bathurst	20	6
Cullen Bullen	3	1
Other local and wider areas	20	6
Non-local areas	7	2

Coalpac Existing Community Contributions

As described in **Table 60**, the local area is dominated by employment in mining and associated industry. Cullen Bullen has a long history as a mining town and as a result, has been exposed to the various influences of this industry. Coalpac assists the Cullen Bullen township and wider community through regular contributions and involvement in community projects.

Since 2006, Coalpac has made the following contributions to the Cullen Bullen community:

- $5,250 in 2011 to the Cullen Bullen Progress Association, Cullen Bullen Rural Fire Service Brigade and in support of community members;
- $5,000 in 2010 to the Cullen Bullen Progress Association for support of Cullen Bullen Progress Hall; and
- $80,000 in 2009, $19,895 in 2008, and $38,857 in 2007 to LCC in accordance with Community Economic Contributions for the Invincible Colliery Development Consent. These funds were intended to be utilised within the Cullen Bullen community.

Coalpac (and previously the Lithgow Coal Company) also provided a range of smaller contributions to a number of schools, sporting and cultural community groups based in Cullen Bullen, Portland and Lithgow since 2006.

Stakeholder Issues Identification

Regulators

A detailed discussion of consultation with regulators and other community members, and the issues raised is provided in **Section 6**. These issues are addressed throughout the EA.

Community

Consultation with near neighbours and the local community for the Project included a component which aimed to identify specific areas of concern and the needs of the community. A detailed discussion on the issues raised by the community is provided in **Section 6**.

Media

A review of media sources was conducted in order to identify the general assumptions and concerns of the wider community.

The main concerns identified in the wider region included traffic and transport impacts arising from the transportation of product coal by road and the ecological impacts of mining in State Forests and other conservation areas.

8.21.3 Impact Assessment

Population

The operational phase of the Project may require up to three non-local hires. At an average household size of 2.5 persons (average for Central West SD (ABS 2006a), the Project may result in a permanent population increase of approximately 7.5 persons across the local area.

Assuming this population increase is spread across the local area as predicted in **Section 8.21.1**, the impact of the Project on the population of the local area will be negligible.

Housing

The minor permanent population increase in the local area will generate demand for approximately three dwellings across the local area, assuming an occupancy rate of 2.5 (Census 2006).

When compared to the available dwellings in both the rental and property purchase markets, it is considered unlikely that the Project will impact housing affordability or availability within the Lithgow LGA.

Labour Pool and Skills

The number of people potentially available for employment across the local area far exceeds the required 30 new hires for the Project.

If the required skilled labour is not available to fill positions, Coalpac will train local residents to the required skill level or source the required employees from outside the local area.

It is unlikely the Project will place significant additional pressure on the skilled labour force in the local and wider area.

Community Services and Facilities

The local and wider area is currently serviced by a range of community facilities and services. There is available capacity in local infrastructure, services and facilities to accommodate the potential minor population increase associated with the Project.

Education and health services are likely to have the capacity to meet the additional demand generated by the Project.

Cumulative Impacts

There are a number of existing mining developments at various stages of mine life in the wider area. As a result of this there is potential for cumulative social impacts. A number of surrounding mines are due to close down in the near future leading to a potential loss of employment.

Baal Bone Colliery is scheduled to close in 2014 (according to a recent Part 3A Planning approval). Ivanhoe North Colliery is anticipated to close by 2012, and Pine Dale Mine has been granted a three year extension to its Project Approval to August 2013. No other publicly available information was available at the time of writing this EA in relation to any Pine Dale future plans.

The completion of the above mining projects may influence population, housing and development growth, economic growth and support for community services and facilities, albeit to a small extent. The Project may provide mitigation for some areas anticipated to be impacted by the closure of surrounding industry.

8.21.4 Mitigation and Management

Coalpac will employ the following management strategies to mitigate impacts from the Project on the community:

- Completion of the negotiation of a VPA in accordance with Section 94 of the EP&A Act with LCC which provides funds for works in the local area (i.e. Cullen Bullen and Portland) in consideration of the needs of the local community as discussed in **Section 6**;
- Continuation of the Coalpac internal sponsorship and donations program with a focus on the local community (e.g. Cullen Bullen Public School and Community Hall);
- Coalpac will continue to support local businesses as their preferred source of supply;
- As part of its Employment Strategy, use its best endeavours to:
  - Source additional employees from the local area, followed by regional areas;
  - Encourage any externally sourced employees to reside in the local area (particularly Cullen Bullen which has a declining population);
  - Engage at least one apprentice / trainee from the local area on an annual basis, followed by regional area; and
  - Engage employees from neighbouring mine closures from the local area, followed by regional area.
- Continue to engage with its local and regional area community through mechanisms such as:
  - Employment of a dedicated Community Liaison Officer;
  - Operation of a combined Project CCC;
  - Collation and distribution of its Environment and Community Annual Review; and
  - Distribution of newsletters, information sheets and hold open days, as appropriate.

8.22 ECONOMICS

8.22.1 Background

An Economic Impact Assessment was undertaken for the assessment of the Project by Gillespie Economics and is reproduced in **Appendix T**.

The economic impact 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 or State economy).

A description of this comparative assessment is provided below.

8.22.2 Methodology

The DP&I commissioned the development of the *Draft Guideline for Economic Effects and Evaluation in Environmental Impact Assessment* in 2002 (Economic EIA Guidelines) (James and Gillespie 2002). The Economic EIA Guidelines identifies economic efficiency as the key consideration of economic analysis.

Benefit Cost Analysis (BCA) is the method used to consider the economic efficiency of proposals. The Economic EIA Guidelines identify BCA as an essential component to undertaking a proper economic evaluation of proposed developments that are likely to have significant environmental impacts.

The Economic EIA Guideline indicates that an economic impact assessment may provide additional information as an adjunct to the economic efficiency analysis. Predicted economic stimulus to the regional and State economies can be estimated using input output modelling.

The main decision criterion for assessing the economic desirability of a project to society is its net benefit. Net benefit is the sum of the discounted benefits to society, less the sum of the discounted costs. A positive net benefit indicates that it would be desirable from an economic perspective for society to allocate resources to a proposal, because the community as a whole would be better off. The BCA for the Project utilised the following key steps:

- Identification of the base case or *"without"* Project case;
- Identification of the *"with"* Project scenario;
- Physical quantification and valuation of the Projects incremental benefits and costs;
- Consolidation of values using discounting to account for the different timing of costs and benefits; and
- Sensitivity testing.

While Coalpac would initially bear the production costs and receive the financial production benefits of the Project, the net production benefits would be distributed between a number of stakeholders as discussed in **Section 8.21.4**.

Environmental impacts of the Project such as noise and dust, greenhouse gas and vegetation removal would initially be borne by the general community. However, noise and dust impacts will be internalised by Coalpac through the acquisition of adversely affected properties and mitigation measures for those located within the management zones. Impacts on native vegetation will also be internalised through the development of a suitable Biodiversity Offset Strategy as discussed in **Section 8.15**.

Regional and State economic impact assessment is primarily concerned with the effect of an impacting development of an economy in terms of a number of specific indicators, such as gross regional output, value added, income and employment.

These indicators can be defined as follows:

- Gross regional output – the total business turnover;
- Value added – the difference between the gross regional output and the costs of the inputs of raw materials, components and services bought in to produce the gross regional output;
- Income – employees' wages including imputed wages for self-employed and business owners; and
- Employment – the number of people employed (including full time and part time).

For the purposes of the economic impact assessment for the Project, a new Coalpac Consolidation Project sector was inserted into the regional input output tables for analysis. This reflected the annual average production levels of the Project. The assessment provided an analysis of direct and indirect impacts of the Project on the local regional economy (i.e. Lithgow and Bathurst LGAs). An assessment of the direct and indirect impacts of the Project on the State economy was also undertaken utilising the same method.

To estimate the impacts of the Project, the average revenue, expenditure and employment over the life of the Project was identified. The detailed expenditure profile of the existing operations of Cullen Valley Mine and Invincible Colliery for the 2007 to 2010 years was obtained and scaled to reflect the average expenditure over the life of the Project. Allocation was then made between *intermediate sectors* in the local (and State) economy and *imports* based on regional location quotients. Purchase prices for expenditure in each sector in the region (and the State) were adjusted to basic values and margins and taxes and allocated to appropriate sectors using relationships in the National Input-Output Tables.

8.22.3 Impact Assessment

Benefit Cost Analysis

The level of net production benefit accruing to Australia is estimated at $1,519 Million. It is also based on maximum product coal sales of 2.5 Mtpa to MPPS and 1 Mtpa to export in addition to product sand sales. However, because the potential incremental employment benefits and environmental impacts of the Project have not been valued, this net production benefit represents a minimum threshold value that the value of any environmental impacts of the Project, after mitigation by Coalpac, would need to exceed to make the Project questionable from an economic efficiency perspective.

The main environmental impacts of the Project relate to dust and noise affectation of properties, greenhouse gas generation and the clearing of native vegetation. There will also be some road externalities mainly associated with road transport of product sand.

Dust and noise impacts are internalised into the costs of the Project by including the acquisition costs of affected properties and the mitigation measures proposed for properties in the management zones.

Using a carbon value of $23/t $CO_{2\text{-e}}$, the incremental greenhouse gas emissions of the Project are valued at $15 Million present value. The externality costs associated with the clearing of native vegetation would be counterbalanced by the offset actions proposed by Coalpac. The Australian damage costs from the Project greenhouse gas emissions are estimated to be in the order of $0.2 Million. When the carbon tax is implemented by the Australian government, then global greenhouse gas costs would also be internalised into Coalpac's operating costs.

The costs of these offset actions have been included in the estimation of net production benefits. The external environmental impacts of the Project are therefore likely to be valued at significantly less than the estimated net production benefits.

The Project design has already considered the environmental constraints associated with the coal resource and foregoes $325M in net production benefits, including $31 Million (present value) in royalty payments to the NSW government. Based on this outcome the Project is considered desirable and justified from an economic efficiency perspective. The BCA confirms when production costs (acquisition costs for affected land, opportunity cost of land, operating costs, decommissioning costs, etc.) and production benefits (revenues from production, residual values of land, etc.) are considered the Project will have net production benefits of $1,519 Million.

This net production benefit is distributed amongst a range of stakeholders including:

- The local community in the form of donations and community support programs;
- Coalpac and its shareholders in the form of net profits;
- MPPS and WPS in the form of low cost coal;
- The NSW Government via royalties; and
- The Commonwealth Government in the form of Company tax.

The environmental impacts of the Project have also been reduced through the implementation of a number of management and mitigation measures and commitments for issues such as ecology, noise, air quality and blasting (see **Section 4.1**).

The cost of expenditure for impact mitigation as discussed in this EA has been estimated to be in the order of $14 Million on an annual basis or up to $295 Million over the life of the Project.

Project Benefits Compared to Other Potential Land Uses

The potential economic benefits of the Project were also assessed in comparison to other potential land uses that could currently occur within the Project Boundary.

The maximum values of agricultural and forestry activities within the Project Boundary and offset properties over the life of the Project were therefore calculated to allow a comparison with the proposed extraction of coal and sand product.

In total, the maximum value of these activities over a period of 21 years was found to be $1.4 Million for agriculture (Barnett 2011) and $0.9 Million for forestry and recreational activities within the Ben Bullen State Forest. The net production value of the Project ($1,519 Million) far exceeds any values that could be generated from the agricultural lands and State Forest lands within the Project Boundary.

The impacts of the Project were also considered in comparison to the costs associated with the cessation of Coalpac operations under current approvals, which would in the absence of this Project Approval being granted, occur in 2013. The approximately $18 Million of decommissioning costs that would have been incurred in 2013 following cessation of the current operations are therefore deferred. This is an economic benefit of the Project. This is offset, however, by the deferred costs associated with the extension of the life of Coalpac operations past 2013 for the Project which would otherwise be realised by the residual capital and land values of approximately $15 Million.

Project Benefits Compared to the Gardens of Stone National Park Stage 2 Proposal

The Blue Mountains Conservation Society Inc. and Colong Foundation for Wilderness Ltd have proposed a nature-based recreation and tourism plan for the GoS2. The proposal covers an area of approximately 40,000 hectares of sandstone escarpments and plateaus in the western Blue Mountains, 1.3% of which is within the Project Disturbance Boundary.

The GoS2 proposal is estimated to have a net benefit of $28M to $38M, which is contingent on there being no opportunity cost in relation to sand mining or coal mining. The Project Disturbance Boundary accounts for 1.3% of the land area of the GoS2 proposal. The advancement of both the Project and the GoS2 proposal is likely to provide the greatest net benefits to the community. In order to accomplish this, the land contained within the Project Boundary would need to be excluded from the GoS2 proposal until mining operations and appropriate rehabilitation procedures have been finalised before being incorporated into the State Conservation Area proposed by the BBLSD of GoS2.

Transportation of Coal and Sand

The majority of the product coal from Project will be directly fed to the MPPS via a dedicated coal conveyor or transported to Port Kembla by rail through the construction of a new rail siding from the existing Wallerawang - Gwabegar Rail Line.

A small quantity of product coal will continue to be transported by road for industrial use, including to current customers located at Nowra, Newcastle, Mudgee, Maldon, Berrima and Galong. Like the industrial use of product coal, customers for the product sand resource are expected to be diversely located including in country NSW and Western Sydney.

Road transport of the product coal and sand for industrial uses may potentially have a number of economic costs including pavement damage, traffic (capacity) impacts and road safety impacts. Nevertheless, these are considered to be minimal and partly internalised into freight charges paid by customers. There is no practical and feasible alternative to road transportation of product coal for smaller industrial users, and sand from the Project to the disparate locations required.

Alternative Sources of Coal to MPPS

A significant proportion of the product coal proposed for the Project will be supplied to Delta Electricity for use at the MPPS, which will in turn provide for over half of the coal demand of that facility. Given the uncertainty over the availability of other coal resources and the availability of other operations in the area to continue supply of product, the Project represents an efficient, secure and low cost option for MPPS.

TRUenergy (2011) is responsible for supplying fuel to, and marketing the electricity production of the MPPS and WPS, and has identified that Coalpac is an important supplier of fuel to these facilities, and consequently as an important supplier of energy for the national electricity market. Delta Electricity (2011) also identifies the Project as a means of securing the long term coal fuel supplies required to maintain affordable electricity supply to the NSW market. See **Appendix D** for relevant correspondence.

Further, it is also noted by Delta Electricity that should Coalpac cease operations once coal resources under current approvals are exhausted, there is no obvious replacement supply available in the Western Coalfields. It is likely that significant costs would likely be associated with developing a means to efficiently source coal for MPPS, or alternatively operate MPPS at decreased capacity, resulting in inefficiencies and subsequent increased generation at other facilities to make up any shortfall in the National Electricity Market.

Regional and State Economic Impact Assessment

Table 65 provides the calculated regional and State economic contributions from the Project in terms of specific economic parameters. The regional sectors are most impacted by output, value added and income flow-ons that would be felt across a range of sectors in the economy.

The impacts on the NSW State economy are greater than those for the regional economy, as the NSW economy is able to capture more of the Project's direct expenditure than the regional economy.

Table 65 Project Economic Contributions to the Region and to NSW

Region	State
$219 Million in annual direct and indirect regional output or business turnover	$275 Million in annual direct and indirect regional output or business turnover
$105 Million in annual direct and indirect regional value added	$133 Million in annual direct and indirect regional value added
$30 Million in annual household income	$48 Million in annual household income
293 direct and indirect jobs	519 direct and indirect jobs

8.22.4 Mitigation and Management

The end of the Project, assuming no further planning approval is granted for its extension, may lead to a reduction in economic activity in the region. The significance of these Project cessation impacts will depend on:

- The degree to which any displaced workers and their families remain within the region;
- The economic structure and trends in the regional economy at the time; and
- Whether other mining developments or other opportunities in the region arise that allow employment of displaced workers.

Nevertheless, given the uncertainties about the circumstances within which Project cessation will occur, it is important for regional authorities and leaders to take every advantage from the stimulation to regional economic activity and skills and expertise that the Project will bring to the region, to strengthen and broaden the region's economic base. Mitigation measures for the specific environmental issues are addressed within other sections throughout this EA.

8.23 FORESTRY VALUES

8.23.1 Background

A Forestry Assessment was undertaken for the Project by GHD Pty Ltd (GHD) and is reproduced in **Appendix U**.

The forestry assessment was primarily concerned with the following issues:

- Determination of the previous values of the forestry resource from within the Ben Bullen State Forest from a review of existing literature;
- The maximum potential of areas of the Ben Bullen State Forest located within the Project Boundary that could be utilised as a commercial forestry resource; and
- The potential maximum value of forestry that could be harvested from the resource.

8.23.2 Methodology

The following six native plant communities, identified by Cumberland Ecology (2011) within the Project Boundary (**Section 8.14** and **Appendix J**), were considered to be relevant to the forestry assessment:

- Tableland Gully Ribbon Gum – Blackwood – Apple Box Forest (TGRG);
- Capertee Rough-barked Apple – Red Gum – Yellow Box Grassy Woodland (CRBA);
- Tableland Scribbly Gum – Narrow Leaved Stringybark Shrubby Open Forest / Woodland (TSGN);
- Tableland Slopes Brittle Gum – Broad-leaved Peppermint Grassy Forest (TSBG);
- Cox's Permian Red Stringybark – Brittle Gum Woodland (CPRS); and
- Exposed Blue Mountains Sydney Peppermint – Silver Ash Shrubby Woodland (EBMS).

A number of other vegetation communities (or derived communities) that were identified within the Project Boundary were not considered as part of the forestry study due to their small area, absence of commercial timber species (shrublands or grasslands) or inaccessibility for forestry operations (Pagoda shrubland). Existing land use and fire history within each community was also considered.

GHD conducted a targeted field survey of the Project Boundary in June 2011 to estimate the availability and commercial viability of timber species present. A survey of commercial timber species was conducted within fixed area circular plots at representative locations occupied by the target plant communities.

The forestry value of each of the assessed communities was estimated and this value was used in assessment of the following two scenarios to derive an assessment of the total forestry resource:

- A Salvage Scenario - assuming all accessible timber products within the Ben Bullen State Forest and the Project Boundary are recovered during a pre-clearing salvage harvest operation; and
- A Sustained Yield Scenario - assuming the current status of management of the forest is ongoing, with a planned sustainable harvest scheduled to occur within an immediate timeframe and under the forest's current condition. Subsequent to this harvest, it is envisaged that the forest would not be re-harvested within a nominal 50 year life cycle or rotation.

8.23.3 Impact Assessment

Based on the review of regional forestry operations and products, it was considered that any harvesting within the Ben Bullen State Forest could include sawlogs for construction purposes, mine prop material for use in underground mining operations and firewood / fuel wood. A range of stumpage values was then assigned to each product type for use in calculation of the assessment of each operational scenario. Other factors that were considered in the assessment of forestry values of each community included:

- Harvest smash and additional docking during felling operations (5% value loss);

- Internal timber defects and rot (20% defect level discount);
- Area losses due to exclusion from drainage lines and high heritage or biodiversity value (10% are loss due to slope and terrain conditions); and
- Costs of developing additional access roads in the Ben Bullen State Forest.

Salvage Scenario

The estimated net value of each of the vegetation communities considered to have forestry values under the Salvage Scenario is presented in **Table 66**.

Under the salvage scenario, the CRBA community is not considered to be viable after factoring in the estimated operational costs of harvesting. Therefore, without considering the CRBA community, which has a negative value, the estimated net value of the target vegetation communities for the Project Disturbance Boundary under the Salvage Scenario is $467,527.

Sustainable Yield Scenario

The estimated net value of each of the vegetation communities considered to have forestry values under the Sustainable Yield Scenario is presented **Table 67**.

Under the Sustained Yield Scenario, both the TSGN and CRBA communities were not considered to be viable after factoring in the estimated operational costs of their harvesting.

Without considering those communities, the estimated net value of the target vegetation communities for the Project under the Sustainable Yield Scenario is $253,445.

Summary

With the assessment of the two scenarios, it was found that the forestry resources impacted by the Project would range from $0.25 M up to a maximum of $0.47 M.

8.23.4 Mitigation and Management

No mitigation and management measures are proposed based on the results of the forestry assessment, however Coalpac will provide timber harvested from within the Project Disturbance Boundary and the Ben Bullen State Forest to Forests NSW if requested.

Lands within the Project Disturbance Boundary will otherwise be rehabilitated as discussed below in **Section 8.24**. The results of the forestry assessment were used to assist in the preparation of the Economic Impact Assessment for the Project undertaken by Gillespie Economics to allow a comparison of the maximum value of different land use types within the Project Boundary (**Section 8.22**).

8.24 REHABILITATION AND FINAL LANDFORM

8.24.1 Background

Rehabilitation at Cullen Valley Mine and Invincible Colliery is currently undertaken in accordance with a series of approved management plans. Coalpac has a history of successfully establishing and developing rehabilitation areas for existing operations to the satisfaction of relevant government regulators. Coalpac's existing rehabilitation is lower impact in that it infills the open cut void immediately behind mining, without requiring additional out of pit OEAs beyond mining and will limit the need for a final void at the completion of mining.

Rehabilitation undertaken by Coalpac to date for existing operations includes significant areas (or blocks) established in 2002, 2003, 2004 and 2008. In the 2010 independent review of rehabilitation performance at Cullen Valley Mine and Invincible Colliery these blocks were considered to generally be of good quality (Ecobiological 2010).

Table 66 Estimated Net Value Forestry Value under Salvage Scenario

Vegetation Community	Estimated Gross Value ($)	Estimated Operational Costs ($)	Estimated Net Value ($)
TSBG	135,893	52,725	83,169
TGRG, EBMS, CPRS*	447,450	73,217	374,233
TSGN	58,739	48,615	10,125
TOTAL	**642,082**	**174,557**	**476,725**
*CRBA***	*11,230*	*28,850*	*-17,619*

* These communities were assessed to have similar forestry values

** CBRA community not considered in net estimate due to negative value

Table 67 Estimated Net Value Forestry Value under Sustainable Yield Scenario

Vegetation Community	Estimated Gross Value ($)	Estimated Operational Costs ($)	Estimated Net Value ($)
TSBG	66,351	51,909	14,442
TGRG, EBMS, CPRS*	340,867	101,864	239,003
TOTAL	**407,218**	**153,773**	**253,445**
*TSGN***	*20,445*	*44,820*	*-24,375*
*CRBA***	*4,935*	*27,137*	*-22,202*

* These communities were assessed to have similar forestry values

** TSGN and CBRA communities not considered in net estimate due to negative value

This review collected data against a series of nominated performance criteria to review rehabilitation performance of rehabilitation blocks in key areas such as vegetation diversity, density, complexity, growth development and foliage cover against those from surrounding native vegetation communities.

Plate 6 to **Plate 8** illustrates rehabilitation progression at Cullen Valley Mine and Invincible Colliery.

Overall, the review undertaken by Ecobiological (2010) noted that the rehabilitation blocks are progressing well. In terms of performance against the specific criteria developed for rehabilitation areas, it was noted that species diversity is high and close to target values, with plant density also increasing with the age of each block. A breakdown of the vegetation stratum was also assessed to determine the proportion of species in each vegetation type for each area (i.e. ground, shrub, midstorey and overstorey species).

This found that the stratum proportions are strongly dominated by shrub, midstorey and overstorey layers in all blocks assessed. Given the development recorded to date, it was estimated that the overstorey species would meet the desired height criteria within a period of 20 – 30 years post the establishment of each area. The review against the target levels of weed foliage showed that coverage and diversity of weed species across the rehabilitation areas was low, even in more newly established areas.

In addition to the management procedures utilised for the progressive establishment and development of rehabilitation areas, Coalpac has also undertaken a number of rehabilitation trials and research programs with the objective of increasing the effectiveness of rehabilitation through the ongoing review and assessment of what management practices promote as successful rehabilitation outcomes. The findings of the rehabilitation trials are also used to provide important information that is used to improve the quality of existing and future rehabilitation.

8.24.2 Rehabilitation Objectives

Coalpac's primary rehabilitation objective is to create a stable final landform and return the post-mining landscapes of Cullen Valley Mine and Invincible Colliery to emulate the pre-mining land capability and vegetation communities. The rehabilitation program also aims to enhance local and regional ecological linkages across the site and with adjacent areas of the Ben Bullen State Forest. These key objectives for rehabilitation will be retained for the Project.

Re-forestation will continue to be undertaken to develop vegetation communities that are generally consistent with the surrounding landscape, aiming to connect remnant native vegetation communities with re-established habitat areas. The rehabilitation strategy for the Project will also continue to focus on promoting biodiversity and the establishment of habitat for Threatened flora and fauna species.

Plate 6 Seven Year Old Rehabilitation Area at Cullen Valley Mine

Strategic Framework

Rehabilitation processes implemented for the Project will be undertaken generally in accordance with the *'Strategic Framework for Mine Closure'* (ANZMEC MCA) and the *'Mine Rehabilitation'* and *'Mine Closure and Completion'* Handbooks both developed as part of the Leading Practice Sustainable Development Program by the Department of Industry, Tourism and Resources.

Planning objectives for rehabilitation activities for the Project will be based on those management measures already in place, including:

- The development of a Rehabilitation and Landscape Management Plan for the Project during the planning phase which has the flexibility to evolve with further research;
- Utilisation of the Coalpac's extensive knowledge of developing effective rehabilitation in the local area, gathered during rehabilitation already undertaken at Cullen Valley Mine and Invincible Colliery;
- Early characterisation of materials to avoid any future issues associated with materials used in rehabilitation; and
- Understanding the external environment and how it may affect the success of rehabilitation.

Objectives for the environmental management of the Project to promote rehabilitation development will include the:

- Management of site water to reduce potential erosion or pollution;
- Development of stable and safe landforms that are well integrated with the surrounding environment;
- Establishment of effective covers for stability and hazardous material containment within landforms where required;
- Management of topsoil to conserve nutrients and encourage native seed and micro-organisms; and
- Aim to establish dynamic and resilient flora and fauna communities.

The key objectives for mine closure of the Project will include:

- Enabling all stakeholders to have their interests considered within the mine closure process;
- Ensuring the mine closure process is timely, cost effective and orderly;

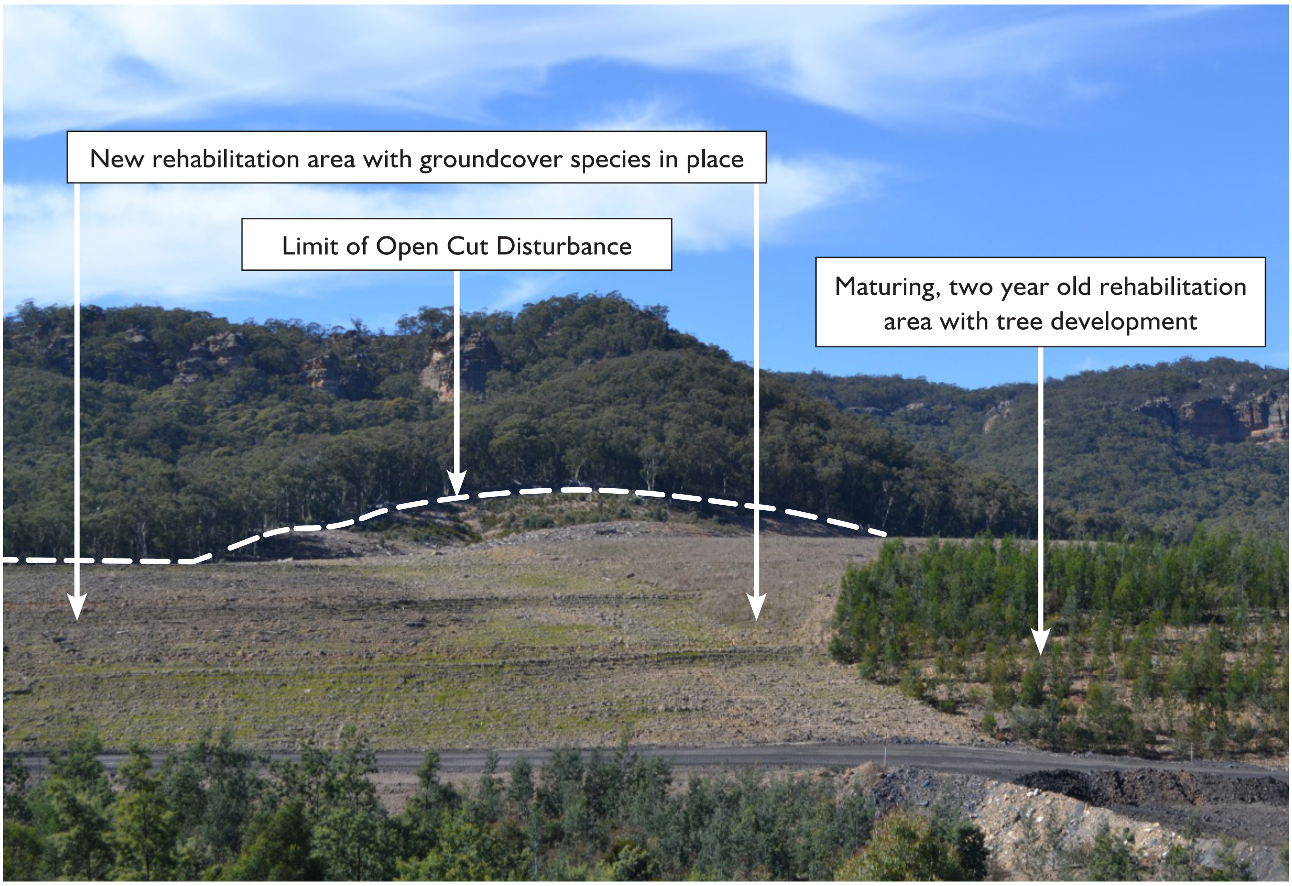


Plate 7 Rehabilitation Development at Invincible Colliery

- Ensuring the costs for mine closure are reflected in the Coalpac budget adequately and that the community is not left with a liability;
- Ensuring there is effective implementation of the mine closure process, including adequate resources and clear accountability;
- The establishment of a set of indicators and an ongoing rehabilitation monitoring program to ensure mine closure can be demonstrated as a successfully completed process where relevant completion criteria are met;
- Establishing a point at which all agreed criteria are deemed successfully met by the relevant regulatory Authorities;
- Ensuring future public health and safety, environmental resources, post-mining land use and socio-economic assets are not affected in any negative way and enhanced where possible; and
- Implement sustainable development considerations in corporate decision making processes and the reduction of risk through management strategies based on sound data.

Existing Offset Strategy and Documents

As described in **Section 3.1.7** and **Section 3.2.7**, Coalpac has a compensatory habitat area in place for Cullen Valley Mine and an existing offset strategy for Invincible Colliery that has been developed to ensure that there will be no net loss of biodiversity values in the medium to long term associated with its existing mining operations. This offset strategy has been reviewed and enhanced for the Project in consultation with the relevant regulators, as discussed above in **Section 8.15**.

An indicative final landform developed for the Project will ensure that landscape connectivity is afforded to the existing vegetation associated with the Coalpac Biodiversity Offset Areas as described above and presented on **Figure 50**. In addition, the Biodiversity Offset Strategy developed for the Project as discussed above also aims at enhancing the overall connection between existing offset and conservation areas in the local area, offset areas required for the Project and existing mine rehabilitation areas at Cullen Valley Mine and Invincible Colliery.

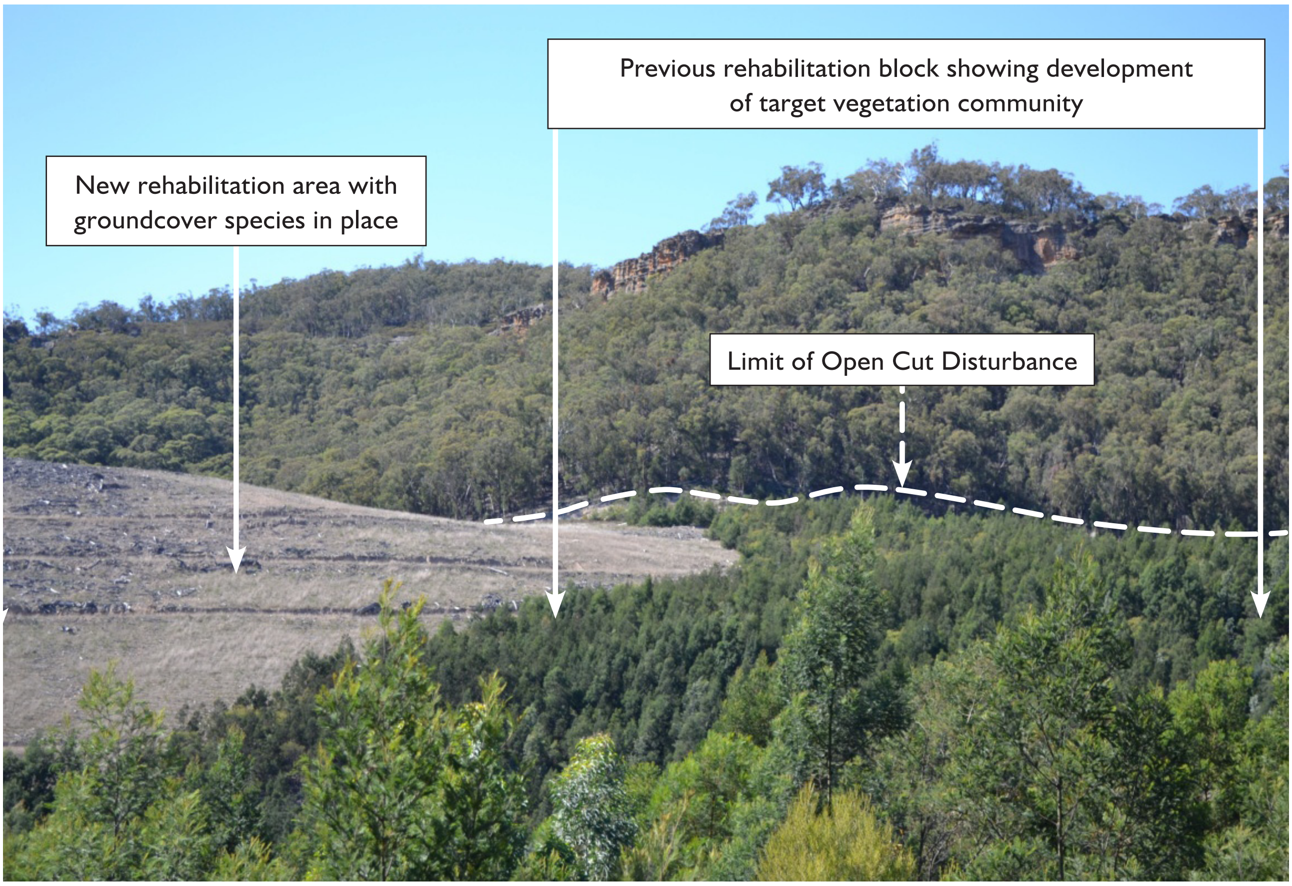


Plate 8 Rehabilitation Development at Cullen Valley Mine

Relevant Planning Instruments

As discussed in **Section 5.3.7**, all land within the Project Boundary is zoned under the Lithgow LEP as 1(a) – General Rural Zone or 1(f) – Rural Forestry. The objectives of 1(a) – General Rural zoning in regard to rehabilitation are the proper management and utilisation of resources by:

"protecting, enhancing and conserving:

- *Rural land in particular prime crop and pasture land, in a manner which sustains its efficient and effective agricultural production potential,*
- *soil, by controlling and locating development in accordance with soil capability,*
- *forests of existing and potential commercial value for timber production,*
- *valuable deposits of minerals, coal and extractive materials, by controlling the location of development for other purposes in order to ensure the efficient extraction of those deposits,*
- *trees and other vegetation in environmentally sensitive areas, where the conservation of the vegetation is significant for scenic amenity or natural wildlife habitat or is likely to control land degradation,*
- *water resources for use in the public interest, preventing the pollution of water supply catchment and major water storages,*
- *localities of significance for nature conservation, including places with rare plants, wetlands and significant wildlife habitat, and*
- *items of heritage significance."*

The objectives of 1(f) – Rural Forestry zoning with regard to rehabilitation include:

- *"protecting, enhancing and conserving rural land, in particular prime crop and pasture land, in a manner which sustains its efficient and effective agricultural production,*
- *to identify land managed by the Forestry Commission under the Forestry Act 1916,*
- *to preserve existing forests within the City of Lithgow, while allowing compatible development, and*
- *to prevent pollution of water supply catchments and water quality in major water storages."*

The conceptual final landform and rehabilitation strategy for the Project (see **Figure 50**) has been developed in consideration of all of the above objectives from the Lithgow LEP.

8.24.3 Land Disturbance Protocol

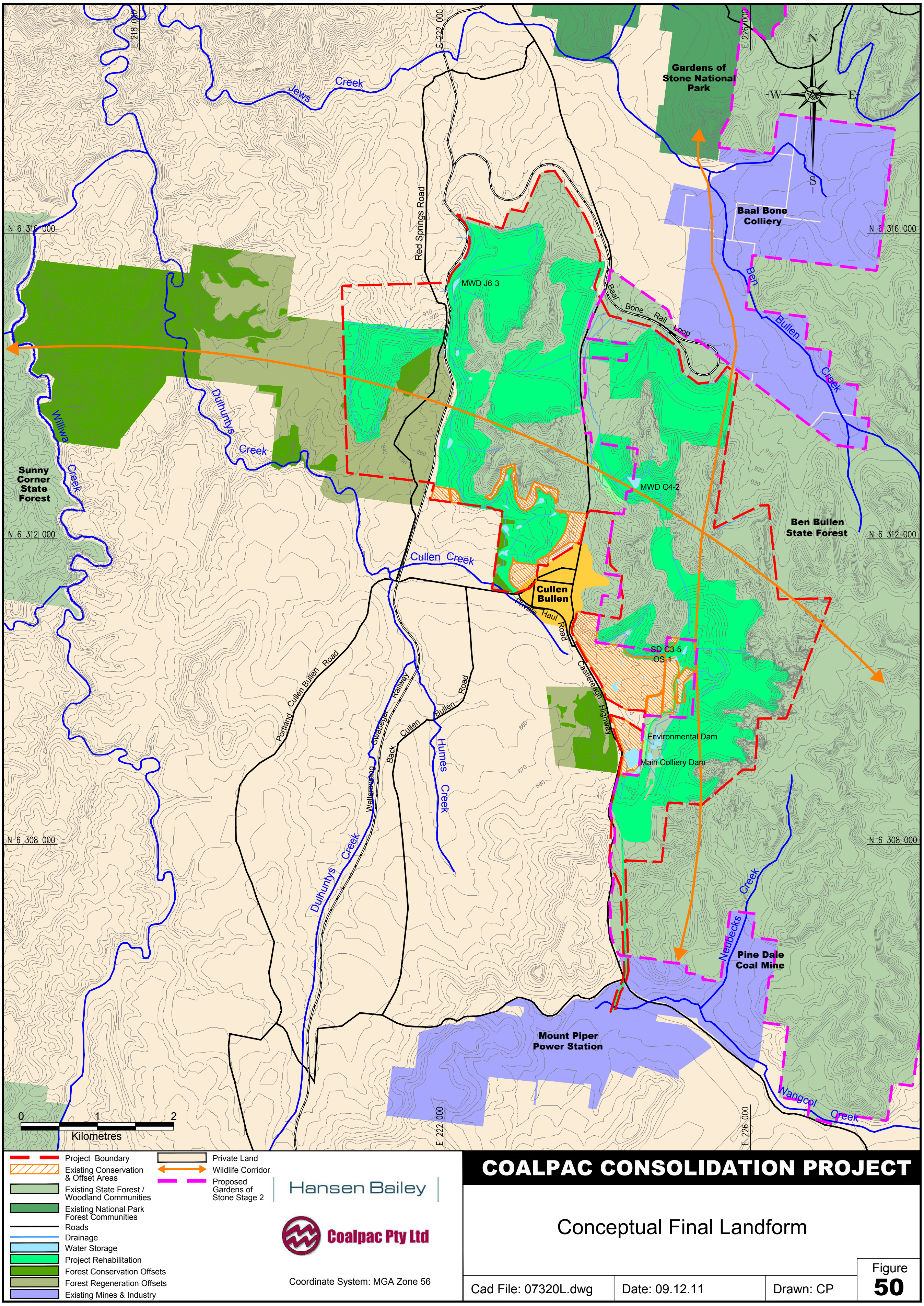
Prior to the clearing of any native vegetation, in particular pre-strip clearing activities in advance of mining, the Land Disturbance Protocol will be utilised, which will further enhance current practices and include:

- Due diligence field inspection prior to disturbance by an appropriately qualified person to ensure no impacts to threatened ecology and archaeology;
- Progressively clearing vegetation in advance of mining and blasting operations to minimise cleared areas to as small an area as practical;
- Establishing erosion and sediment controls appropriate for the area to be disturbed;
- Stockpiling of cleared trees adjacent to cleared areas or near existing shaped areas to include in rehabilitation;
- Selective stripping of suitable topsoil and subsoil materials in advance of overburden removal and immediate use for spreading in available reshaped areas. Any topsoil material required to be stockpiled for later use will be minimised, where possible; and
- Overburden material will be stockpiled in nominated areas adjacent to existing overburden emplacements or near shaped rehabilitation and is used in rehabilitation once waste material is shaped and contour drains are constructed. Overburden material will be spread over the shaped and contoured area with dozers and allowed to settle, forming a crust. Once crusting has occurred, available subsoil and topsoil will be applied.

8.24.4 Rehabilitation Techniques and Criteria

The following proven rehabilitation techniques developed by Coalpac under existing operations will continue to be applied to all rehabilitation activities for the Project:

- As noted in **Section 8.24.2**, the implementation of the progressive rehabilitation program is undertaken with the primary aim of returning the post-mining landscape to a form that emulates the pre-mining capability and enhancing local and regional ecological linkages across the Project Boundary and proximate areas;
- Rehabilitation of all OEAs and backfilled voids will be conducted on a progressive basis over the life of the Project, as an integral component of mining operations. It is anticipated that this will allow the rapid completion of the post-mining landform (see **Figure 14**) and establishment of rehabilitation of the disturbed areas remaining at the conclusion of Project mining operations;


Gardens of Stone National Park
Baal Bone Colliery
Ben Bullen State Forest
Sunny Corner State Forest
Pine Dale Coal Mine
Mount Piper Power Station
Cullen Bullen
MWD J6-3
MWD C4-2
SD C3-5
OS-1
Environmental Dam
Main Colliery Dam
Jews Creek
Dulhuntys Creek
Williwa Creek
Cullen Creek
Humes Creek
Ben Bullen Creek
Neubecks Creek
Wangcol Creek
Red Springs Road
Baal Bone Rail Loop
Private Haul Road
Castlereagh Highway
Portland Cullen Bullen Road
Back Cullen Bullen Road
Wallerawang Gwabegar Railway
N 6 316 000
N 6 312 000
N 6 308 000
E 218 000
E 222 000
E 226 000
0 1 2
Kilometres
Project Boundary
Existing Conservation & Offset Areas
Existing State Forest / Woodland Communities
Existing National Park Forest Communities
Roads
Drainage
Water Storage
Project Rehabilitation
Forest Conservation Offsets
Forest Regeneration Offsets
Existing Mines & Industry
Private Land
Wildlife Corridor
Proposed Gardens of Stone Stage 2
Hansen Bailey
Coalpac Pty Ltd
Coordinate System: MGA Zone 56
COALPAC CONSOLIDATION PROJECT
Conceptual Final Landform
Cad File: 07320L.dwg
Date: 09.12.11
Drawn: CP
Figure
50

- Rehabilitation works will be scheduled to commence as soon as practical after mining disturbance. This approach will minimise any disturbed areas within the Project Boundary at all times and therefore reduce the potential impacts of the Project;
- Progressive rehabilitation of mining areas will be undertaken to develop self-sustaining native vegetation communities, using a combination of native species endemic to the area and promoting the re-establishment of threatened species, wherever possible; and
- Rehabilitation will be conducted primarily using a combination of direct seeding and tube stock planting involving a range of native tree and shrub species to promote the development of sustainable vegetation communities.

Rehabilitation techniques and strategies will include a particular focus on the establishment of the Box Gum Woodland. Individuals of the Capertee Stringybark will also be used in the development of rehabilitation areas for the Project, continuing the use of this species by Coalpac in site rehabilitation.

Rehabilitation performance monitoring will also continue to be undertaken by Coalpac, with results to be used to assist in the continual improvement and refinement of the rehabilitation techniques applied for the Project.

Rehabilitation

Vegetation and topsoil will be removed prior to mining activities occurring under the Land Disturbance Protocol described above. The topsoil will contain a valuable native vegetation seed bank that will generally enhance the performance of rehabilitation works. Where practical, topsoil stripped will be immediately spread over available rehabilitation areas to enhance the rehabilitation outcomes. Where stockpiling is required, measures to protect its quality by retaining soil microbes and maintaining a viable soil seed bank will be implemented (see **Section 8.18**).

The geochemical impact assessment undertaken for the Project has confirmed that with the appropriate management implemented there is a low risk of acid bearing overburden material forming (**Section 8.11**). Overburden materials that have been found during existing operations to be the most suitable for plant growth will be spread over the disturbed areas prior to the application of topsoil where possible. Topsoil will be spread and managed consistent with the management and mitigation measures identified in **Section 8.18**. These measures will promote the development of rehabilitation that will meet the overall objectives.

Revegetation

Revegetation works will generally be carried out when climatic growth conditions are optimal. Revegetation works will involve direct native seeding and supplementary tube stock planting.

Initially, native groundcover vegetation will be established to prevent raindrop and sheet erosion from occurring in rehabilitation areas.

In the event that native grass cover is initially insufficient to stabilise sloped areas due to slow growth rates, introduced sterile ground covers such as a sterile millet species may be used to supplement plantings. Natural seed germination from the soil seed bank will be also assisted with direct seeding and where applicable, seed will be treated to enhance germination rates. Planting of tube stock will be used to supplement any areas supplement areas that show limited success in the natural regeneration of vegetation from the soil seed bank and direct seeding activities. In response to feedback from the Cullen Bullen community during the stakeholder engagement of this EA, wattle species will not be used to promote the development of rehabilitation for the Project.

8.24.5 Conceptual Final Landform

Coalpac will maximise opportunities for the development of a post-mining landscape that is generally consistent with pre-mining land use and biodiversity. All disturbed areas for the Project will be shaped prior to rehabilitation establishment to promote this outcome.

Three key rehabilitation domains have been identified in the rehabilitation strategy based on the Project impacts, post mine landform, future land use and biodiversity values. These are discussed below, with the conceptual final landform for the Project shown on **Figure 50**.

Project Disturbance Areas

The indicative final landform for the Project has been developed to promote visual characteristics and biodiversity outcomes that generally conform to the existing landscape of the Ben Bullen State Forest. To ensure long term stability and sustainability, the slopes of the final landform within the Project Disturbance Boundary will generally have a maximum slope of 18 degrees, consistent with the surrounding topography.

The conceptual final landform for the Project will be free draining and designed to integrate with the surrounding catchments by channelling water towards natural drainage lines of the Cullen, Dulhunty's and Jews Creeks. The final landform will contain some more gentle slopes to allow drainage to form preferential paths on the slopes (see **Figure 50**).

The re-establishment of native vegetation would predominantly focus on the Box Gum Woodland (Tableland Gully Snow Gum – Ribbon Gum Grassy Forest) vegetation community, Coxs Permian Red Stringybark – Brittle Gum Woodland and Tableland Gully Mountain Gum – Broad-leaved Peppermint Grassy Forest. The OEAs will be progressively rehabilitated over the life of the Project as soon as is practical following the completion of mining disturbance.

This process will be in accordance with DTIRIS – MR requirements for Rehabilitation Completion Criteria as described above in **Section 8.24.2**.

The continuation of this progressive approach to rehabilitation development will minimise the mine disturbance area at any one time and reduce the environmental impacts from the open cut operations. The Project rehabilitation strategy and the development of rehabilitation areas will be reviewed on a regular basis to ensure disturbed areas are kept to a minimum and that rehabilitation areas are performing appropriately.

Mine Infrastructure Areas

The existing site infrastructure and those components proposed for the Project will be decommissioned following the completion of mining and the landscape rehabilitated as part of the mine closure strategy. The final land use of these areas following the decommissioning of infrastructure will be mainly of land capability class between Class V and Class VIII, depending on landform slopes (see **Figure 48**).

Existing Biodiversity Offset Areas and Rehabilitation

The existing Biodiversity Offset Areas and rehabilitated lands established under existing approvals that are not to be disturbed for the Project will constitute a separate component of the final landform for the Project. These areas will be in accordance with the Consolidated Offsets Strategy management commitments for the Project. The vegetation communities and habitat within both of the existing Biodiversity Offset Areas and rehabilitated lands that make up this domain will be well established by the end of the 21 year life of the Project.

8.24.6 Mine Closure

This EA presents a conceptual final landform that has been developed based on the conceptual mine plan at the end of Year 21. This final landform has been designed such that there will be no final void associated with the Project and that all mine disturbance areas will be rehabilitated post Year 21 (see **Figure 50**). This is possible as a result of Coalpac's current rehabilitation procedures which allow the open cut void to be filled directly following mining.

For the Project, Coalpac will develop a free draining final landform to ensure that the landscape is representative of pre-mining conditions and compatible with the surrounding landscapes of the Ben Bullen State Forest. A discussion of the post-mining management of surface water for the Project is presented in **Appendix N**.

Decommissioning

A Mine Closure Plan will be prepared within five years of closure and shall reflect contemporary expectations including any changes to the final mine plan, regulatory requirements and guidelines, new rehabilitation technologies and stakeholder expectations.

Generally, overburden will be emplaced up to final rehabilitation surface level and bulldozers will progressively shape the spoil to develop slopes generally less than 18 degrees, consistent with pre-mining landform. This will allow continuous emplacement of overburden and topsoil over the shaped surface to ensure a stable final landform, ready for seeding during spring and autumn months. Reshaped areas will be topsoiled and deep contour ripped. Planting will follow after erosion control is achieved. Drains and ponds will collect runoff from rehabilitation areas.

Once shaped to the appropriate form, overburden will be topsoiled and seeded with a mixture of native trees, midstorey and groundcover species to re-establish vegetation communities similar to those of the pre-mining landscape that provides appropriate habitat for local fauna species consistent with the Project Offset Strategy (see **Section 8.15**). Post-mining landforms have been developed to integrate the Project disturbance areas with the surrounding landscape and vegetation communities.

Decommissioning and removal from the site of all infrastructure items will take place if that infrastructure is not required post-mining or sold on for other industrial purposes. Any infrastructure including dams, levee banks, roads and buildings, which is beneficial for future use by post mine land use, will be left in place in accordance with the relevant stakeholder or landowner agreements.

Decommissioning of the Project infrastructure areas will include removal, remediation of any land contamination, ripping, topsoiling (if necessary) and seeding.

8.24.7 Rehabilitation Completion Criteria

Completion criteria for mine closure will be developed and agreed in consultation with the relevant government agencies and community and included in the Rehabilitation Management Plan. These criteria will continue to be revised and developed to demonstrate that the rehabilitation objectives have been achieved. Progress against the completion criteria will be regularly monitored and reported to relevant stakeholders.

Coalpac is committed to the development of sustainable rehabilitation for the Project and the achievement of leading practice completion criteria, as this will provide the best framework for the long term protection and management of the post-mining landscape and its biodiversity conservation values.

A list of preliminary rehabilitation completion criteria for the Project is outlined in **Table 68**.

Table 68 Preliminary Rehabilitation Criteria

Aspect	Domain		
	Mine Disturbance Area	Mine Infrastructure Areas	Existing Biodiversity Offsets and Rehabilitation
	Criteria		
Landform	• Final slopes will be predominantly formed at 18 degrees or less • Erosion and drainage channels will be managed to minimise impacts • Contour banks will be stable and uniform • The surface layer will be free from potentially hazardous materials • All boreholes will be sealed	• These domains will be initially quite flat, with no slopes • Erosion will be managed to ensure the final land use is not compromised • Contour banks will be stable, revegetated and uniform • Surface layer will be free from hazardous materials • Drainage lines will be reinstated to prevent instability and erosion where possible and to develop flows similar to the pre-mining landscape	• The landform of these areas will be considered in the final landform for the Project and incorporated into the design process
Soil	• Topsoil will be spread on all rehabilitation surface areas as soon as possible following stripping, to prevent the requirement for stockpiling and will include weed infestation assessment prior to this • Soils suitable for re-establishing vegetation will be lightly contour ripped to create a grade between the soil and spoil • Field review of soils used in rehabilitation areas will continue to further develop data on usage to prevent favourable rehabilitation outcomes • Erosion and sediment control will be achieved through the construction of contour furrows or contour banks at intervals down slope from rehabilitation areas		
Water	• Runoff water quality from rehabilitated areas will be managed to reduce any possible adverse impacts to downstream water quality • Catchment areas in the final landform will be free draining, with low velocity to minimise surface erosion potential		
Fauna	• Vertebrate pests will be managed to ensure effective control • Rehabilitated areas will be designed to contain a range of habitat structures for native fauna (e.g. eucalypts, shrubs, ground layer, developing litter) • Rehabilitated areas will be designed to support stable populations of native fauna species from the local area	• Vertebrate pests will be managed to be absent or kept under control and monitored on an annual basis	• Vertebrate pests will be managed to be absent or kept under control and monitored on an annual basis • Connectivity between existing Biodiversity Offset Areas rehabilitation areas for the Project will be promoted to support regional wildlife corridors and reduce barrier effects
Vegetation	• Rehabilitated areas will be designed to promote the desired flora species characteristic of the pre-mining vegetation communities • Rehabilitated vegetation will be designed to develop the desired community structure • Second generation seedling production will be encouraged • The health of trees in rehabilitation areas will be monitored for the long term to ensure high survival rates	• Rehabilitated areas will contain a mixture of pasture and woodland communities consistent with pre-mining land capability • Rehabilitated drainage lines will be designed to contain the desired vegetation structures and characteristic species	• The final landform for the Project will be developed to promote connectivity with existing offset areas • Rehabilitated areas for the Project adjoining this domain will contain native vegetation communities with a consistent structure and similar floristic characteristics • Native flora species typical of those present in the local area will be used in the establishment of native woodland in these domains

Aspect	Domain		
	Mine Disturbance Area	Mine Infrastructure Areas	Existing Biodiversity Offsets and Rehabilitation
	Criteria		
	• Significant weed infestations or noxious weeds will be removed in accordance with relevant guidelines • The highest percentage soil surface cover possible will be maintained		
Land Capability	• Rehabilitated areas will be designed to be of a land capability class suitable for biodiversity conservation	• Rehabilitated areas will be designed to be representative of a suitable land capability Class VII for the majority of areas and Class V for flatter slopes • All sites which are not disturbed by mining activities will remain the same land capability as the pre-mining class • Native flora species typical of the local area will be used in the establishment of native forest land in areas of pre-mining land capability Class VII	• Offset areas and rehabilitation areas will be designed and maintained to be generally representative of surrounding land capability structure and class

8.24.8 Management and Mitigation

Coalpac will develop a consolidated Rehabilitation and Landscape Management Plan (RLMP) for the Project. The RLMP will include provision for the monitoring of rehabilitated lands on a regular basis to ensure that rehabilitation objectives and targets are being met and that sustainable revegetation and landform sustainability is achieved in the long term. Rehabilitation monitoring will include regular inspections of rehabilitated areas to assess:

- Structural stability;
- The effectiveness of erosion and sediment control measures;
- Vegetation species development and revegetation success, including the establishment of Box Gum Woodland understorey, Capertee Stringybark individuals and fauna habitat; and
- The effectiveness of weed and pest management measures.

Maintenance works in existing and Project rehabilitation areas will be completed as required to address any issues of concern identified during monitoring reviews. Maintenance activities may include a range of management responses, including:

- Supplementary seeding of vegetated areas;
- Weed and pest control;
- The application of fertiliser to selected areas;
- De-silting or repairing drainage structures and sedimentation dams; and
- The infill and regrading of any eroded areas.

Coalpac will undertake ongoing rehabilitation maintenance works as required. 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 Annual Review.

SECTION 9
Statement of Commitments

9

Statement of Commitments

In addition to conditions of Project Approval, Coalpac commits to the operational controls outlined in **Section 8** of this EA for all activities associated with the Project.

The SoC as listed in **Table 69** summarises the major aspects of the Project as described throughout this 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, mitigation and monitoring strategies.

Table 69 Statement of Commitments

Ref	Commitment	Section
Mining Operations		
1	Coalpac will extract coal via open cut and highwall mining methods at a rate of up to 3.5 Mtpa product coal for 21 years from the grant of a mining authority, generally in accordance with this EA.	4
2	Coalpac will ensure that open cut mining in the Lithgow Seam does not encroach within 50 metres of the Tyldesley Colliery Workings and that the water extraction from these workings will be managed to assist with mitigation of the localised subsurface heating at Cullen Valley Mine.	8.10
3	Coalpac will design and undertake highwall mining operations generally as described in this EA to no noticeable surface subsidence (i.e. < 20 mm at the surface).	4.4.3 & 8.1
4	The total area of active open cut mining in any given year will be limited to less than 100 ha over the life of the Project.	4
5	The Project will include an additional standoff zone from any open cut highwall crest of at least 50 m from any pagoda or significant sandstone escarpment or outcrop. For any exposed significant outcrop or formation that does not occur within the above category, the open cut highwall crest will include a standoff zone of a minimum of 20 m.	4.4.3
6	Coalpac will seek the appropriate licences and approvals as relevant to the Project and listed in **Table 12**.	5.8
7	Coalpac will surrender its existing planning approvals as listed in **Table 12** following the grant of the Project Approval at a time mutually agreeable with DP&I.	5.8
Environmental Management		
8	Coalpac will develop and implement an Environmental Management System in consultation with the relevant regulators (and the Aboriginal community where relevant) consistent with **Section 6** of this EA to the approval of DP&I which shall comprise: • Environmental Management Strategy; • EMP (incorporating subsidence, air quality, noise, blasting, surface water and groundwater); • Highwall Mining Management Plan; • Subsurface Heating Response Plan; • Biodiversity Management Plan (including Land Disturbance Protocol); • Biodiversity Offsets Management Plan; • Rehabilitation and Landscape Management Plan (including consideration of Cullen Bullen General Cemetery); • Water Management Plan (including groundwater and surface water); • Aboriginal Cultural Heritage Management Plan; • Historic Heritage Management Plan; • Bushfire Management Plan;	8

Ref	Commitment	Section
8	• Traffic and Transport Management Plan (including coal and sand haulage); • Waste Management Plan (including for hazardous materials); • Slope Stability Major Hazard Management Plan; and • Sandstone Pagoda Risk Analysis Procedure (including all commitments from blast, slope analysis, Aboriginal heritage assessments into one checklist form).	8
9	Coalpac will seek an environmental monitoring data sharing agreement with neighbouring industry to allow for the assessment of cumulative impacts and the development of co-operative management measures.	8.3 & 8.10
Air Quality and Greenhouse		
10	Coalpac will utilise technologies and initiatives to achieve the air quality outcomes described in this EA.	8.3 & 8.5
11	Coalpac will undertake calculations of greenhouse gas emissions and annually review energy efficiency initiatives to ensure that Scope 1 greenhouse gas emissions per tonne of product coal are kept to the minimum practicable level.	
12	Coalpac will install a real-time air quality monitor in consultation with Office of Environment and Heritage.	
13	Coalpac will install a real-time meteorological monitoring station with predictive air quality modelling software capabilities at a location selected in consultation with the Office of Environment and Heritage.	
Noise and Blasting		
14	Coalpac will utilise the noise control and management measures listed in **Section 8.6.4** to achieve the predicted noise levels at private receivers as listed in **Table 27** and **Table 28**.	8.6
15	Coalpac will install a real-time noise monitoring system with monitors at locations selected in consultation with Office of Environment and Heritage.	8.6
16	Coalpac will design all mine blasts through utilising the control and management measures in this EA to achieve the vibration and overpressure criteria for all sensitive surface features listed in this EA (see **Table 30**).	8.7
Visual		
17	Visual bunds will be constructed generally in accordance with **Figure 10** to **Figure 13** to reduce visual impacts of private receivers and where practical, along the Castlereagh Highway.	8.8
18	Infrastructure lighting will consist of horizontal lights with hoods and louvres in elevated and exposed areas utilising low brightness lights to the level necessary for operational and safety requirements to minimise adverse night lighting impacts.	8.8
19	Specific mitigation measures will be developed and implemented by Year 2 for the Cullen Bullen General Cemetery to reduce visual impacts from mining in consultation with LCC to the approval of DP&I.	8.8.4
20	Should a landholder with a residence (constructed prior to grant of the Project Approval) within 5 km of the active mining area consider they are experiencing high visual impact as a result of the Project, Coalpac will carry out a specific visual assessment from the residence and develop a tree screening strategy for the residence on the property in consultation with the landholder and to the satisfaction of the DP&I.	8.8
Ecology		
21	Coalpac will progressively rehabilitate mined areas and regenerate cleared areas with a focus on the re-establishment of Capertee Stringybark, Clandulla Geebung and Box Gum Woodland as habitat for the region's Threatened wildlife species.	8.15
22	Coalpac will establish the Biodiversity Offset Strategy as described in this EA for the purpose of initially maintaining and ultimately improving the ecological values of the region.	8.15
23	Coalpac will confirm a mechanism for the long term security of all of its Biodiversity Offset landholdings within two years of Project Approval.	8.15
24	Coalpac will implement its mine rehabilitation program and Biodiversity Offset Strategy consistent with the objectives for the establishment of the proposed GoS2 State Conservation Area. Further to this, Coalpac will support the progressive establishment of GoS2 by providing a monetary contribution to OEH (or other relevant body) of $0.015 per tonne of coal sold throughout the life of the Project; for the development, implementation and management of the GoS2.	8.15

Ref	Commitment	Section
Aboriginal Archaeology and Cultural Heritage		
25	The salvage or protection of all known Aboriginal objects within the Project Boundary will be managed in accordance with an AHMP to be developed in consultation with the Aboriginal community and Department of Office of Environment and Heritage.	8.12
26	Coalpac will establish, in consultation with the Aboriginal community and Office of Environment and Heritage, a keeping place for the purpose of housing salvaged Aboriginal artefacts from the local area.	
27	Coalpac will conduct relevant monitoring at all rock shelters with deposit sites as shown on **Figure 40** when blasting within 500 m of each to achieve the criteria in **Table 30**. Safe access tracks will be installed to facilitate this in accordance with the Land Disturbance Protocol to the approval of relevant regulators.	8.7 & 8.12
Non-Aboriginal Heritage		
28	Coalpac will complete an archival recording of the Heritage items predicted to be disturbed by the Project as described in **Table 41** in consultation with the NSW Heritage Office.	8.13
29	Coalpac will ensure that the remaining Heritage items located on its landholdings are managed in accordance with this EA.	8.13
30	Coalpac will undertake a detailed archival recording and structural inspection of the Cullen Bullen General Cemetery in accordance with relevant guidelines prior to the commencement of coal extraction under this EA in consultation with LCC.	8.13
Water Resources		
31	Coalpac will undertake groundwater and surface monitoring for the Project in consultation with relevant regulators, including the installation of two additional bores and four replacement bores.	8.9 & 8.10
32	Coalpac will design and construct a consolidated Water Management System for the Project in consultation with relevant regulators and to the approval of DP&I to ensure that water quality in the surrounding catchments is maintained.	
33	Coalpac will maintain its existing licensed water discharge points and operate them to the approval of relevant regulators.	
Rehabilitation		
34	Bunds in key sensitive locations will be treated as quickly as possible to promote the rapid establishment of rehabilitation.	4.4.3
Geochemical		
35	Potentially acid forming coarse rejects will be covered as soon as practical with at least 5 metres of Non Acid Forming overburden material to minimise the length of exposure time to oxidising conditions and minimise the potential for acid mine drainage.	8.11
36	All inert waste from the washing of crushed sandstone will be pumped into the flooded Tyldesley Colliery underground workings via boreholes drilled to intersect the workings or co-disposed in-pit. In the unlikely event that any waste material is determined to be PAF this will be buried deep in-pit with Potentially Acid Forming overburden.	
Traffic		
37	Coalpac will construct the MPPS conveyor by Year 2 to reduce haulage of product coal by road from Invincible Colliery site access road.	8.16
38	Haulage of product coal by road to WPS and MPPS (following the construction of the MPPS conveyor) for emergency supply will only be undertaken on a limited basis and with prior notification to DP&I and the local community.	
39	No haulage of product sand for the Project will travel through Lithgow to access the Sydney market via the Bells Line of Road.	
40	All heavy vehicles for the Project, with the exception of those required for deliveries to Cullen Valley Mine via the Private Haul Road, will enter site via the Invincible Colliery access road intersection with the Castlereagh Highway following the construction of the Castlereagh Highway overpass bridge and associated internal access roads.	

Ref	Commitment	Section
Community		
41	Coalpac has offered to enter into an appropriate VPA on terms it will seek to agree with LCC. Coalpac proposes to develop a Community Fund centred on Cullen Bullen (and the wider local area). This proposed fund will be supported by contributions from Coalpac over the 21 year life of the Project to be overseen by a committee made of local residents, LCC officials and Coalpac staff.	8.21
42	Coalpac will consolidate the two existing Communities Consultative Committees for the Project in consultation with them, LCC and DP&I.	6.6
Training and Reporting		
43	Coalpac will provide regular, relevant training to all employees and contractors in relation to the commitments in this EA.	6.6
44	Coalpac will prepare an Annual Review report (which summarises monitoring results and reviews performance against the predictions and commitments in this EA) and distribute it to the relevant regulatory authorities and the CCC.	6.6

SECTION 10
Project Justification

10 Project Justification

10.1 NEED FOR ENERGY

There is general acceptance, including from the United Nations sponsored International Energy Agency (2011) and AEMO (2011), that there will be a continuing need for coal to meet basic energy needs and in particular electricity generation. International and local predictions are that the need for coal as a source of energy for electricity production will increase for some years to come despite an expectation of an increase of energy from alternate sources.

10.2 COAL

Greenhouse and anthropogenic climate change is a global issue. Since the 2009 Copenhagen Climate Conference, it has become apparent that the path to achieving material reduction in the use of carbon based energy is challenging and will take time.

The issue is not a jurisdictional issue, but a world issue and achieving consensus, or even actions to reduce the use of carbon across the world will be difficult. The 2011 United Nations Climate Change Conference in Durban reached agreement as to the reduction of greenhouse gasses and is a step towards the reduction, in due course, of greenhouse gas emissions.

There are and will continue to be actions to manage climate change which include different approaches in different jurisdictions, the objective being to reduce reliance on carbon by making it more expensive and by developing alternate non-carbon based sources of energy such as wind, solar, geothermal and others.

However, an alternative source has not yet been, or not considered to be for some time to come, developed sufficiently to replace carbon based energy entirely as the source of energy for base load electricity supply (IEA 2011). The demand for electricity is predicted to continue to increase with growing populations and the standards of living that are expected and required in the developing world.

The expected path forward with regard to energy for the world, is that while there will be development of non-carbon based energy, the political technological challenges and infrastructure development requirements (when compared to the inevitable increase in demand for electricity) is that there will, for some time, continue to be a need for low cost, good quality, thermal coal for electricity generation, such as would be produced by the Project.

10.3 CONTEXT

The existing workforce, plant and infrastructure, with some minor additions of the existing Invincible Colliery and Cullen Valley Mines, will support the continuation of operations as proposed by the Project. This will enable the:

- Recovery of coal that can be acceptably mined environmentally and socially;
- Continuation of economic support for Cullen Bullen, Portland, Lithgow and the region by the existing workforce and contracts with Suppliers of goods and services;
- Continued stability for the operation and economic electricity production from the Delta Electricity owned power stations;
- Maximisation of the value of the in-situ coal resource;
- Optimal social and environmental mine closure;
- Optimisation of the return of value from the existing infrastructure and mine development; and
- Mine planning that will facilitate mine closure, appropriate final land forms and uses.

10.3.1 Environmental and Social Concerns

The Project would address some issues that have in the past caused concern in the community by substantially removing coal haulage from the road system by the construction of a conveyor to MPPS, and the construction of rail siding thus reducing road use, air quality and noise issues. Additionally, the Project would enable the rationalisation of the existing multiple approvals which would be replaced by a single, contemporary Approval for all operations implementing current environmental and social standards for management plans.

Through the extraction of the remaining recoverable coal resource, the Project will optimise the benefits from environmental and capital costs that have been incurred and ensure an orderly and leading practice closure of the mining operations and rehabilitation of the site.

10.3.2 Economic Benefits

The continuation of Invincible Colliery and Cullen Valley Mine will ensure the continuation of (and increase) the economic and social benefits that are attributable to mining, maximise the benefits from this mining by securing the optimal recovery of the in-situ coal resource, maximise the benefits that will come from the already expended capital and provide the platform for the achievement of 'leading practice' mine closure and post mining land uses.

10.3.3 Electricity Supply

The Project will ensure the continuation of coal supply to the local power stations for the support of the capacity and reliability of the operation of the Delta Electricity power stations to support the ability of TRUenergy to supply competitively priced electricity to NSW.

10.3.4 TRUenergy and Delta Electricity

Following the NSW government's electricity privatisation program in late 2010, TRUenergy has assumed responsibility for the supply of energy to the Energy Australia retail business. This business alone comprises around 1 Million customers, the majority of whom are based in NSW. TRUenergy acquired the Delta West "Gentrader" contract through that process, which provides it exclusive rights to trade the electricity output generated by the MPPS and WPS (see correspondence in **Appendix D**).

Coalpac seeks approval for the production of 3.5 Mtpa of product coal of which up to 2.625 Mtpa is currently contracted for future supply to the Delta Electricity owned MPPS located close to the Project.

All coal will be delivered via a new conveyor, approval for which is sought as part of the Project, for electricity generation to support reliable and competitively priced electricity to the State of NSW.

Under the Gentrader contract, TRUenergy is responsible for supplying fuel to MPPS and WPS. With Coalpac being a major source of coal supply for MPPS, TRUenergy relies heavily on coal production from Coalpac to meet the fuel requirements.

To the extent that planning approvals to allow ongoing coal production are not granted, TRUenergy will need to procure additional coal supplies from either local suppliers or further afield. Significant reductions in Coalpac's supply will lead to higher costs for TRUenergy, the wholesale market and in turn retail customers of electricity. One of the key reasons for increased supply lies in the potential need to move away from local mines or pay higher coal prices to local suppliers if Coalpac's operations are discontinued.

Construction of a rail unloader at the power stations is under consideration to provide options for coal supply from further afield. While entirely possible, this will bring with it a new set of challenges including the requirement for rail track upgrades, increased frequency of coal trains and a longer supply chain that has more potential for supply disruptions. Given that Invincible Colliery and Cullen Valley Mine are existing low cost operations with short supply chains to a local power station, they offer the benefits of reliability, cost effectiveness, reduced environmental costs and continued support for the local community and economy, rather than moving to freight more coal from distance.

The Coalpac proposal for a conveyor to deliver the coal to MPPS is a more efficient method of securing delivery of the coal with less environmental and social impacts, including the use of less energy and less emissions of greenhouse gases while supporting the local economy in the Lithgow LGA.

Presently, there are other local coal suppliers to the power stations but no one mine will be able, or likely, to satisfy the need for coal and none is likely to commit its major production as the export price materially exceeds the domestic price for steaming coal.

Over ten years the divergence between the price of coal and electricity has increased. The price of steaming coal has increased materially yet the price of electricity has not increased at the same rate. The divergence is now a matter for concern. With the increase in export prices, local availability of coal has decreased at prices that the electricity generators are able to pay to keep electricity prices at appropriate levels for Government.

Even with a reduction in the energy growth rate due to demand management initiatives and increased production from renewable energy sources in the State, it is expected that a large proportion of the energy demand will need to be met by the existing coal fired power generating facilities for some time to come (Dodson & Dunckley 2011).

The Invincible Colliery and Cullen Valley Mine have been long term suppliers to the Delta Electricity owned WPS and MPPS near Lithgow which together produce approximately 8% of the total generation in the National Electricity Market from some 6.0 Mtpa of coal. Presently, the two mines provide more than 40% of the coal consumed at MPPS. With the Project, this would increase to a predicted 70% in the future. Coalpac has entered into a long term contract to supply 2.625 Mtpa of coal to MPPS.

The Project therefore plays an important role in the continuation of the supply of the coal to MPPS ensuring continuity of their capacity to meet the demands for reliable and optimally priced steaming coal in the cheapest and least environmentally impacting manner.

10.3.5 Specialty Coal

Coalpac has long been a supplier of coal to small speciality markets including the Manildra Group Shoalhaven Starches plant at Nowra for its coal fired boilers which require coal with the characteristics of the Invincible Colliery coal. The Manildra Group of companies is now the largest user of wheat for industrial purposes in Australia processing some 1 million tonnes of wheat per annum and has diversified the product range to include flour, pre-mixes and products derived from flour such as modified starches, glucose syrups, maltodextrine, gluten, specialty protein products and ethanol. A reliable supply of suitable coal is key to the operation with many other processes, products and external companies dependent upon the continued operation of the Nowra Plant.

Attempts by Manildra to use other coal have been unsuccessful and expensive for Manildra (see correspondence in **Appendix D**).

10.3.6 Sand

There is a significant shortage of construction sand for the Sydney building and development markets with the Penrith Lakes operation scheduled to close in the near future.

Sand is necessary for building and other markets of metropolitan Sydney. Existing supplies in and nearby Sydney are challenged and new sources of supply are required to meet the demand.

The Project's proposed development of its sand resource within the footprint of the proposed open cut mine would allow that market to be partially satisfied with a minimal additional environmental impact. The Project proposes a source that is close to the Sydney market that minimises the social, economic and environmental costs associated with longer transport distances including financial cost, road and rail use and greenhouse gases. Development of the Project's local sand resource would partly address Sydney's industrial sand demand, which increasingly has to be sourced from further afield.

10.3.7 Export Coal

Invincible Colliery has been an exporter of coal in the past, and the re-introduction of this practice will significantly assist the Project to provide the profitability and therefore the capital resources required to achieve a high level of resource recovery whilst ensuring 'leading practice' environmental management, life-of-mine mitigation measures, and enhanced bio-diversity outcomes for the Cullen Bullen region. Exporting coal also increases the economic return to the State of NSW, by providing increased royalties.

10.3.8 Ben Bullen State Forest

The Project area is predominantly located in the Ben Bullen State Forest, where the Invincible Colliery and Cullen Valley Mine have operated since they began operations up to 130 years ago, with the support of Forests NSW with whom Coalpac is engaged in discussions for continued access arrangements for the operation of the Project.

10.3.9 Rural Uses

Privately owned parts of the Project Boundary, some of which have been acquired by Coalpac and others of which are subject to current negotiations for purchase, are generally small areas used for hobby farms and recreational uses.

Due to the small area sizes and relative lack of suitability for agriculture of the privately owned land the agricultural use is of limited economic value with an economic assessment of the value of the agricultural use at $1.4 Million and for forestry of up to $0.47 Million.

10.3.10 Recreation and Environment

Ben Bullen State Forest extends over an area of approximately 6,783 ha. The Project will involve the gradual disturbance and progressive rehabilitation over a 21 year period of 752 ha (11%) of the Ben Bullen State Forest.

There is a proposal for the Ben Bullen State Forest in the vicinity of the Project to be included in the GoS2 State Conservation Area.

The GoS2 proposal is comprised of six divisions with the Project occurring within the BBLSD. The GoS2 proposal has an estimated net economic benefit of $28 Million to $32 Million (BMCS & Colong Foundation 2009).

Of the 958 ha proposed to be disturbed by the Project, approximately 528 ha are located within the GoS2 proposal. The GoS2 proposal covers approximately 40,000 ha (Muir 2005). The Project's disturbance within the GoS2 proposal therefore represents 1.3% of the total area and 6.8% of the BBLSD.

The creation of the GoS2 would be able to proceed without the inclusion of the Project Boundary while mining continues, with this land being added when mining and rehabilitation is completed. That is, The Project area will not be necessarily permanently lost from any GoS2 proposal.

The Project proposes areas of vegetation offset to be secured in perpetuity. This land could also be included in, and as such further enhance, the GoS2 proposal in addition to the rehabilitation of the Project area by appropriate forward planning. Thus the Project would allow the completion of the recovery of the valuable open cut coal resource within the GoS2 proposal whilst at the same time ultimately enhancing the GoS2 proposal through the progressive rehabilitation of the proposed disturbance areas and the establishment of complimentary biodiversity offset lands.

10.4 PROJECT NEED

Coalpac is an Australian owned, experienced coal mining company which owns and operates the Invincible Colliery and Cullen Valley Mine. Mines have operated on these leases near Cullen Bullen, west of Lithgow since the late 1800s. The mines have been, and continue to be, an important part of the regional economy and will be required to close when the approved and accessible resources are extracted in 2012 unless the Project is approved.

10.4.1 Electricity

Invincible Colliery and Cullen Valley Mine currently provide more than 40% of the coal for the operation of the MPPS, which the Project will increase to more than 70%. MPPS and the nearby WPS produce 8% of the power to the National Electricity Market, suppliers to which are challenged to contain increasing power costs particularly with increasing export demand for coal.

10.4.2 Location

The Project is needed to assure the continued supply of coal for the ongoing reliable operations of MPPS at optimal economic and environmental cost ensuring the continued operation of MPPS for NSW and to support the economy of the Lithgow LGA as well as the State.

10.4.3 Employment and Regional Economy

The Project is needed to prevent what would be a material reduction of economic and financial inputs to the Lithgow and Bathurst regions if the Project does not proceed. Alternatively these same economic and financial inputs to the Lithgow and Bathurst regions would be continued, and expanded if the Project does proceed. The majority of the employees reside in the Lithgow and Bathurst areas. Contractors are also based in or near Lithgow.

10.4.4 Resource Recovery

The Project is needed to secure the economic benefits to be derived from the recovery of the potentially sterilised coal which can be realised at reduced new environmental cost by the continuation of the existing mining as proposed by the Project. The Project will utilise the existing plant and infrastructure and the capital cost of the recovery of this otherwise sterilised coal will also be optimised. Closure of the Cullen Valley Mine and Invincible Colliery would sterilise more than 108 Mt of recoverable coal reserves. The environmental cost of the recovery of this coal has, in part, already been incurred as these are established operations.

10.4.5 Rehabilitation and Final Land Form

The Project will assist in achieving the optimal mine closure, rehabilitation and final landform of the existing surface disturbance in accordance with current expectations and the use of leading practice processes which would not be available if the mines were to close in 2012.

10.4.6 Leading Practice Approvals

The Project is needed to replace the existing multiple and sometimes conflicting approvals comprising the 'approvals platform' for the Cullen Valley Mine and Invincible Colliery with a single, contemporary approval providing for appropriate environmental management.

10.5 PROJECT ALTERNATIVES

Coalpac has established the existence of more than 108 Mt thermal coal resource remaining following the completion of currently approved mining. Coalpac has considered a number of mining options for the recovery of this valuable coal resource.

A risk assessment for the recovery of the remaining residual coal was completed. It was identified that the primary constraints related to ecology, Aboriginal heritage, subsidence, transport, water, noise and air quality. Visual and other effects and interactions in the context of the location of the Project were also considered, being in proximity to: the township of Cullen Bullen, Forests NSW lands, National Parks (the World Heritage Listed GOS) and GoS2 proposal. These were identified as the constraints which would, having established the need for the Project, dictate the scale and form of any mining development.

The mine plans evaluated for the Project were considered in the context of the value of the coal remaining in the ground against the sensitivities of the environmental and social context of mining operations involved in its recovery, and the costs of doing and applying the 'objects' of the EP&A Act and the 'principles of ESD'.

10.5.1 Underground

Underground mining was considered but was determined not to be operationally or economically feasible. Much of the central and southern extent of the Project is located above areas which have previously been selectively mined by underground methods in the only seam (Lithgow Seam) that is economically recoverable by underground methods due to coal quality and geological conditions. The Lithgow Seam actually reduces in thickness and quality to the north and west such that it cannot be worked underground and was a mining limit to earlier underground operations in the Tyldesley Colliery. As such, the maximised recovery of coal from these areas is only amenable to open cut and highwall mining methods.

10.5.2 No Project

Closure of the Invincible Colliery and Cullen Valley Mine in 2012 would result in loss of the employment and economic benefits from more than 90 jobs that would be lost, as well as the economic benefits from existing service and supply contracts that currently contribute to the economy of the Lithgow region and the State.

In addition, there would be the loss of the economic returns from the remaining recoverable in-situ coal and capital, along with some environmental costs which have already been incurred.

Closure of the Invincible Colliery and Cullen Valley Mine in 2012 would sterilise more than 108 million tonnes of unrecovered coal reserve. Closure would sterilise a coal reserve that is optimally located for the most environmentally and economically efficient fuel supply to the MPPS.

TRUenergy would lose the availability of up to potentially 2.625 Mtpa of suitable steaming coal from the Project seen to be critical for the future stable and economically optimal operation of MPPS and generation of electricity. Coal for MPPS would need to be replaced by other sources expected to be from further afield via rail, for which the rail unloader would need to be constructed at cost to electricity prices and greater other costs (including greenhouse gas emissions and other social and environmental costs).

10.6 PROJECT DEVELOPMENT

With the conclusion that the 'No Project' and the Optimal Recovery Mine Plan approaches were unacceptable, the Project was critically analysed to identify issues that must be addressed. Through further assessment of these issues, the Project team derived a Project that could meet the legal, social, political and environmental expectations of the community and achieve a *'social licence to mine'*.

10.6.1 Process

This review and assessment process involved:

- Reducing the areas of open cut mining which minimised noise and air quality impacts and reduced native vegetation impacts achieving a reduction in disturbance of 5 ha of CEEC, 4.5 ha of habitat for the threatened Clandulla Geebung and 48 ha of potential habitat for the threatened Capertee Stringybark;
- Replacing a number of potential open cut mining areas with highwall mining, resulting in reduced impacts on surface water flow, visual, noise and air quality impacts and the preservation of 63 ha of native vegetation (including 23 ha of CEEC);
- Constructing a rail siding (instead of a rail loop) resulting in a reduction in direct impacts to 15 ha of native vegetation, all of which is potential habitat for the threatened Capertee Stringybark;
- Lowering the elevation of the ETCPP infrastructure, resulting in a reduction to off-site noise impacts and reductions to offsite visual effects;
- Progressive development of noise bunds resulting in a further reduction of noise impacts on private receivers;

- Construction of a conveyor to MPPS, resulting in a reduction of 202 one-way truck movements per day, enhanced road safety, reduced noise effects; and reduced impact on road surfaces; and
- Reducing the size of the proposed sand mining area resulting in avoidance of impacts to approximately 4.5 ha of the Clandulla Geebung threatened species.

The process also involved the application of the following principles with regard to mine planning and has resulted in the exclusion of open cut mining:

- Where sandstone escarpments may have been threatened by potential stability issues;
- North of the Cullen Valley Mine area to avoid unacceptable impacts on residences on Red Springs Road, and on a private property to the north of the Hillcroft area;
- In the north-western portion of the East Tyldesley mining area, to avoid unacceptable amenity impacts on the residences located east of the Castlereagh Highway to the north of the Project Boundary; and
- In close proximity to the township of Cullen Bullen to the north and east to limit amenity impacts.

Bunding, shielding and changes to mine scheduling and operating hours under certain meteorological conditions were incorporated to further mitigate impacts.

10.6.2 Environmental Savings

The result of this process to move from the Optimal Recovery Mine Plan to the Project as proposed for approval is summarised and shown in **Figure 6** as follows using letters from that figure and resulted in the following outcomes:

- Open cut mining being abandoned in Area A removing impacts to ecology, noise and air quality;
- Changing the mining method from open cut to high wall in Area B to minimise noise, visual and ecological impacts;
- Constructing a rail siding and loading infrastructure at Area C to Cullen Valley Mine away from the Hillcroft area;
- Lowering and moving the ETCPP to a more shielded location at Area D;
- Undertaking highwall mining in key sensitive areas to minimise the area of impacts to surface features at Area E;
- Developing earthen bunds in various areas in Area F to reduce noise and visual impacts at nearby residences;
- Reducing sand mining at Area G to avoid impacts to habitat of the Threatened species Clandulla Geebung;
- Construction of an overland conveyor linking the Project to MPPS to reduce truck haulage on local roads; and
- Implementing a stand off zone of 50 m for open cut mining from the sandstone escarpments and pagoda features within the Project Boundary.

These material changes to the Optimal Recovery Mine Plan have resulted in the Project as proposed for approval removing the following mining impacts from what they would have been if the Project were the Optimal Recovery Mine Plan:

- Approximately 30 receivers north of the Project Boundary are removed from noise impacts;
- Approximately 17 receivers west and south of the Project Boundary are removed from noise impacts;
- Receivers in Cullen Bullen township are removed from receiving significant and moderate noise impacts;
- Up to 15 receivers (also predicted to be impacted by noise) are removed from air quality impacts;
- Retaining of 101 ha of native vegetation (including 5 ha CEEC);
- Removal of impact to 4.48 ha of habitat of the Threatened species Clandulla Geebung;
- Removal of impact to 48 ha of potential Capertee Stringybark Threatened species habitat;
- Reduction in visual impact to northern and north-eastern receivers and passers-by on Castlereagh Highway; and
- Reduction in blast vibration impacts to receivers to the north and north-east of the Cullen Valley and East Tyldesley mining areas.

10.6.3 Economic Costs

The costs to the Project and to economic benefits to achieve the environmental outcomes described will be the sterilisation of a total of 27.6 Mt of coal, with a corresponding reduction in revenue to Coalpac of $1.2 Billion (from the Optimal Mine Plan). This includes 4.45 Mt ROM coal sterilised in Area A in the northern extent of the Cullen Valley mining area and a reduction of total revenue of $200.3 Million. 1.65 Mt ROM coal will be sterilised in Area A at Northern Hillcroft mining area with a reduction in revenue of $74.2 Million. Additionally, 3.4 Mt ROM coal will be sterilised in Area A in central Cullen Valley mining area with a reduction in revenue of $152.7 Million. Coal sterilised in Area B by electing to undertake highwall mining rather than open cut mining has decreased the coal recovered by 4.1 Mt resulting in a further reduction in revenue of $184.5 Million.

The replacement of open cut mining with highwall mining will result in the retention of 63 ha of native vegetation (including 23 ha CEEC), significant reduction in visual impacts to Cullen Bullen General Cemetery and to passers-by on the Castlereagh Highway as well as reductions in amenity impacts on receivers north of the Project.

In addition, due to increasing the stand off zone for open cut mining from the sandstone escarpments and pagoda features within the Project Boundary by 50 m, a further 14 Mt of the coal resource would be sterilised. This further reduces total Coalpac revenue for the Project by approximately $629.4 Million.

In total, the consideration of long term environmental and social outcomes in the development process for the Project mine plan resulted in the recovery 108 Mt of the coal resource over the mine life, leaving 20% of the Project resource identified under the optimal resource extraction case (or 27.6 Mt) sterilised. This enables the Project to appropriate address the 'objects' of the EP&A Act, including the principles of ESD. Approximately 16% of the total sand resource (1 Mbcm) will also be sterilised to avoid impacts to ecology.

10.6.4 Outcome

The outcome of this process is that the Project is able to be approved in accordance with the 'objects' of the EP&A Act and the principles of ESD, as well as compliance with the DGRs (as supplemented by the letter of the Director General dated 19 April 2011 to enable the assessment of the Project as a 'controlled action' under the EPBC Act).

10.7 THE PROJECT

The Project would recover, over the project life, more than 108 Mt of coal by open cut and highwall mining methods from the Optimal Mine Plan reserve of 135.6 Mt, of which 27.6 Mt has been left sterilised in the interests of achieving a mine development that meets the current social and environmental planning requirements of the community.

The essential elements of the Projects are as follows:

- Consolidation and extension of operations at Cullen Valley Mine and Invincible Colliery;
- Recovery of up to 3.5 Mtpa of product coal;
- Continuation of coal supply to MPPS via a conveyor;
- Emergency road supply to WPS, limited road supply to additional domestic destinations, and export from Port Kembla;
- Upgrades to existing administration, ICPP transport and other infrastructure;
- Construction and operation of the ETCPP, additional offices and the existing CDP at Cullen Valley Mine;
- Construction of a bridge over the Castlereagh Highway to link operations east and west;
- Construction and operation of a bridge and haul road to permit access to the Hillcroft resource;
- Extraction, crushing and sale of up to a 5 Mbcm sand resource;
- Construction of a rail siding and associated infrastructure to permit transport of coal and sand products;
- Integration of water management infrastructure on both sites into a single system; and
- Integration of the management of mine rehabilitation and conceptual final landforms for the Project.

10.8 ENVIRONMENTAL PLANNING AND ASSESSMENT

The Project has followed the methodology outlined below:

- Establishment of the resource;
- Confirming the need for the Project;
- The review and assessment of a number of potential alternatives for the Project;
- The consideration of the 'objects' of the EP&A Act including the principles of ESD;
- Commitment to current leading environmental and social practice;
- The application of a detailed, risk-based assessment process;
- Identification of key environmental issues;
- Comprehensive stakeholder engagement in relevant stages of the EA process; and
- Optimising the social and economic benefits associated with the Project.

10.9 ENVIRONMENTAL IMPACT ASSESSMENT

The Project has been assessed based on worst case scenarios, assuming the Project will operate at a maximum coal production rate of 3.5 Mtpa, with all feasible and reasonable management and mitigation measures applied. The Project mine plans have been prepared to facilitate economic productivity within the constraints of the site and all relevant environmental criteria.

Careful consideration has been given to comments received from the local community of Cullen Bullen and other near neighbours, particularly in relation to noise, blasting, air quality and potential visual issues.

Commitments are made to reducing the open cut footprint by 50 m around sensitive sandstone 'pagodas' and further blasting restrictions have been incorporated to address community concerns.

The EA has identified the following potential for significant environmental impacts despite the application of all feasible and reasonable management controls.

10.9.1 Noise, Blasting and Dust

Two private receivers (with whom Coalpac does not have an Agreement) may experience significant noise impacts under noise enhancing weather conditions. Coalpac will acquire these properties upon the request of the landholders.

Three private properties (i.e. vacant blocks) with whom Coalpac does not have an Agreement are predicted to experience noise levels greater than the relevant criteria over more than 25% of the property area, in noise enhancing weather conditions. Coalpac will enter into agreements and/or provide mitigation at these properties upon the request of the relevant landholders.

Blasting impacts of the Project have the potential to impact a number of natural features and known items of Aboriginal and Non-Aboriginal heritage. Coalpac will monitor at sensitive locations and manage blasting to ensure that impacts remain within relevant management criteria.

Three private receivers (owned by two landholders) with whom Coalpac does not have an Agreement are predicted to experience air quality levels greater than the relevant criteria. Coalpac will acquire or provide mitigation at these properties upon the request of the landholders.

10.9.2 Greenhouse Gas

Greenhouse gas emissions including from the coal exposed during the mining process (Scope 1), transport of the product coal and sand and the conduct of the Project (Scope 2) and final use of product coal (Scope 3) are estimated at 0.0069 Gigatonnes of carbon dioxide equivalent per annum on the basis of the 'worst case' context for the Scope 3 emissions.

The Project will supply up to 70% of product coal demand at MPPS over a period of 21 years, thereby making a vital contribution to the operation of this facility which is integral to meeting energy needs in NSW. If the Project does not proceed, MPPS would need to source coal from more distant (and potentially poorer quality) sources which would therefore create additional greenhouse gas emissions than what would result for the Project.

Furthermore, Coalpac is committed to minimising Scope 1 and the Scope 2 greenhouse gas emissions of the Project and will implement all feasible and reasonable measures to ensure that operations are efficient in this respect, including reporting against emissions targets on an annual basis.

10.9.3 Ecology

The ecological assessment has identified approximately 16.5 ha of EPBC listed Box Gum Woodland is located within the Project Disturbance Boundary, with approximately 835 ha of native forest and woodland vegetation to be impacted, in total.

Through the implementation of leading practice measures to avoid ecological impacts, an estimated 30 ha of Box Gum Woodland located within the Project Boundary will not be disturbed, in addition to 8.98 ha of known Clandulla Geebung habitat and 63 ha of potential habitat for Capertee Stringybark.

Coalpac has proposed a Biodiversity Offset Package for the Project that will be implemented to compensate for these ecological impacts, which has the potential to decrease the level of fragmentation and isolation of forested areas in the region within the medium to long term and minimise impacts to the populations of threatened species.

Lands proposed to be used within this Biodiversity Offset Package have been assessed for biodiversity values and have been strategically selected to assist in building onto existing State Forests, the GoS2 proposal and existing National Parks in the region.

10.9.4 Economics

When the production costs (acquisition of affected land, opportunity cost of land, operating costs, decommissioning costs, etc.) and production benefits (revenues from production, residual values of land, etc.) are considered, the Project will provide net financial benefits of approximately $1,519 Million.

The design of the Project has already considered the environmental constraints associated with the coal resource and foregoes $325 Million in net production benefits as well as $31 Million (present value) in royalty payments to the NSW government. Based on the above, the Project is considered desirable and justified from an economic efficiency perspective.

The Project will deliver significant socio-economic benefits to the region and the State of NSW through the provision of employment, electricity generation, taxes and fees.

The Project will result in the following economic benefits to the Lithgow and Bathurst regional economies:

- $219 Million in annual direct and indirect regional output or business turnover;
- $105 Million in annual direct and indirect value added;
- $30 Million in annual household income; and
- 293 direct and indirect jobs.

The annual economic impact to NSW associated with the Project is estimated at in the order of:

- $275 Million in annual direct and indirect regional output or business turnover;
- $133 Million in annual direct and indirect regional value added;
- $48 Million in annual direct and indirect household income; and
- 519 direct and indirect jobs.

10.9.5 Social

The Project will deliver substantial socio-economic benefits to the Lithgow region, but in doing so will create some ongoing demand for support infrastructure and services. To address this need, Coalpac is in advanced discussions with LCC with the objective of entering into a VPA for the Project, pursuant to Section 93F of the EP&A Act.

This VPA will provide ongoing contributions to address the identified increased demand on local community infrastructure and services in Cullen Bullen and Portland that will be associated with the Project.

Coalpac proposes to develop a Community Fund centred on Cullen Bullen (and the wider local area) that would be overseen by a committee made of local residents, council officials and Coalpac staff. This fund would be supported by contributions from Coalpac over the 21 year life of the Project.

Coalpac will also endeavour to fill the additional 30 employee positions to be created by the Project and obtain its apprentices and trainees from the local area.

10.10 CONSISTENCY WITH OBJECTS OF EP&A ACT

This EA has assessed the environmental and planning context of the Project in accordance with Section 5 of Part 1 of the EP&A Act and in doing so, has addressed the 'objects' of the EP&A Act.

10.10.1 Objects of the EPA Act

> *"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 continued development of the valuable coal resource within the footprint of existing mining authorities held by Coalpac, generally utilising the existing mining infrastructure in place and following current leading practice environmental and operational management measures.

The implementation of such measures during the life of the Project will ensure that the target coal and sand resource will be recovered as efficiently as possible, whilst minimising any potential for environmental and social impact.

The use of lands within the Project Boundary for mining will continue to promote economic growth in the Lithgow and Bathurst regions leading to a number of social benefits.

> *"To encourage the promotion and co-ordination of the orderly and economic use and development of land."*

The Project will result in the recovery of a valuable coal resource from areas which are largely within mining authorities held by Coalpac and related corporate bodies in relation to its existing coal mining operations as well as from some smaller adjacent areas without detriment to existing regional agricultural, forestry and recreational land uses.

The mining activities of the Project provide a higher value production activity and offer greater potential for regional growth than other alternative uses of the land and will enable the Coalpac mining to continue to support and further stimulate the regional economy with spending for production related costs and wages for labour.

> *"To encourage the protection, provision and co-ordination of communication and utility services."*

As the lands within the Project Boundary are already used for existing Coalpac mining operations, communications and utility services are available to serve the Project.

Where necessary, the Project proposes the relocation of existing power lines and communication facilities to enable the progression of the Project and neighbouring landholders.

The existing alignment of the Fish River Pipeline will, if necessary, also be modified within the Project Boundary towards the end of the life of the Project, prior to any disturbance to minimise any impacts to stakeholders utilising this infrastructure.

The construction of the proposed rail siding from the Wallerawang – Gwabegar Railway line will be undertaken in consultation with the relevant regulators and will facilitate the productive use of existing railway infrastructure.

The construction of the proposed overland conveyor to MPPS and the Castlereagh Highway overpass will reduce the amount of coal haulage vehicle movements required on public roads for the Project and in particular heavy vehicle movements for coal haulage on the Castlereagh Highway, Boulder Road and the Cullen Valley Mine Private Haul Road.

> *"To encourage the provision of land for public purposes."*

The Project will result in the establishment of a Biodiversity Offset area of approximately 1,764 ha in total, which will be set aside for recreational and conservation purposes. The proposed rehabilitation of Project lands on the completion of mining will be undertaken to generally reinstate the topography and vegetation of the Ben Bullen State Forest within which the Project is sited.

> *"To encourage the provision and co-ordination of community services and facilities."*

The net economic benefits resulting from the Project will encourage the provision and co-ordination of community services and facilities to the region. Coalpac proposes to enter into a VPA which is presently being negotiated with LCC and has the objective of providing and/or funding community services and facilities.

> *"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 changes made to the Optimal Mine Plan resulting in the Project maximise the recovery of coal within the existing mining authorities consistently with current environmental planning goals and constraints to minimise the impacts to sensitive biodiversity values as well as reducing any potential adverse environmental and social impacts.

The Project will result in the establishment of an extensive Biodiversity Offsets Strategy designed to protect and conserve native flora and fauna within the region. Management and mitigation measures to be put in place have been designed to minimise the extent to which impacts on wildlife will occur during the operation of the Project.

Coalpac's considered Biodiversity Offsets Strategy and commitment to progressive rehabilitation of the 1.3% of the GoS2 proposal area to be mined will further assist in meeting this objective.

Completion of the extraction of the last remaining open cut reserves and progressive rehabilitation within Coalpac's mining tenements would enable the estimated \$28 M to \$32 M net benefits of the GoS2 proposal to be fully realised in addition to the net benefit of \$1,519 Million.

> *"To encourage ecologically sustainable development."*

This 'object' of the EP&A Act is considered in **Section 10.10.2**.

> *"To encourage the provision and maintenance of affordable housing."*

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 engagement process undertaken during the preparation and assessment of this 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 this EA has followed this due process and maximised every opportunity for stakeholder engagement over the Project with all levels of Government.

> *"To provide increased opportunity for public involvement and participation in environmental planning and assessment."*

Coalpac engaged in an extensive stakeholder engagement process undertaken in the preparation of this EA as detailed in **Section 6** and fulfilling this objective of the EP&A Act.

10.10.2 Ecologically Sustainable Development

The *'objects'* of the EP&A Act adopt the principles of ESD in the application of the Act. These principles are articulated in Section 6 (2) (a) of the *Protection of the Environment Administration Act 1991* where it is stated that, *"ecologically sustainable development requires the effective integration of economic and environmental considerations in decision-making processes. Ecologically sustainable development can be achieved through the implementation of the following principles and programs: …"*

Principles are listed below with an explanation of how the Project meets each.

Precautionary Principle

The precautionary principle is *"that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*

In the application of the precautionary principle, public and private decisions should be guided by:

i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

ii) an assessment of the risk-weighted consequences of various options,"

Adherence to the precautionary principle requires avoiding serious or irreversible environmental damage by properly assessing potential impacts and taking the necessary mitigation measures.

The Project is consistent with this principle in that it has been assessed to avoid all serious or irreversible damage to the environment. This EA identifies, with certainty, all environmental impacts from the development of the Project which has been designed to avoid serious or irreversible environmental damage to the environment by properly assessing potential impacts.

To ensure this, this EA is based on a 'worst case scenario' basis. Where a potential serious or irreversible damage was identified the appropriate redesign of the Project has been implemented to avoid those consequences.

Intergenerational Equity

This principle requires *"that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations"*.

The structure of the Project, determined through the examination of the alternatives along with the commitments to environmental management systems, and the management and mitigation measures proposed, will operate to ensure that there is no effect on the environment as a result of the Project which would diminish the health, diversity or productivity of the environment for future generations.

This has been achieved by limiting the scale of the Project and excluding development from sensitive areas. Where appropriate for compliance with this principle the Project has been subjected to development and operational standards as well as by providing for generous offset areas, particularly in relation to native vegetation and CEEC.

Biodiversity Conservation

This principle requires the *"conservation of biological diversity and ecological integrity—namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration"* of any development proposal.

The design of the Project in excluding large areas of native vegetation and CEEC along with the Biodiversity Offset Strategy committed to by Coalpac, demonstrate adherence to this principle and ensure that the Project will not threaten the preservation of biodiversity and ecological integrity of the area and that the biodiversity and ecological value of the area is maintained and potentially improved in the long term.

Improved Valuation

This principle is as to *"improved valuation, pricing and incentive mechanisms—namely that environmental factors should be included in the valuation of assets and services, such as:*

i) polluter pays—that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems."

The Project adheres to this principle in providing for Coalpac to acquire properties that are materially impacted, the establishment of infrastructure such as the coal conveyor to the MPPS, the construction of a bridge over the highway, the bunding of active areas, surrendering areas sensitive to mining from the active Project area and the vegetation offset strategy.

10.11 CONCLUSION

10.11.1 Need

This assessment has established that there is a need for the Project from an economic perspective including the continued, and potentially expanded economic support for the local region and the State and the securing of lowest cost coal for MPPS to seek to assure the ability of TRUenergy to reliably supply appropriately priced electricity to NSW.

In addition, the 1 Mtpa proposed for export is necessary and fundamental to assist in meeting the capital costs of the continuation of coal mining at the site and the implementation of the environmental commitments in this EA, whilst allowing MPPS to be provided with cost effective coal.

The Project will provide for the environmental need to ensure the appropriate ultimate closure of Cullen Valley Mine and Invincible Colliery following the mining of the recoverable in-situ coal resources. It will also enable rehabilitation of currently disturbed mining and facilities areas in a manner to achieve the environmental planning goals for the post mining land use of the area, whether that be for economic, recreational or long term environmental protection purposes.

10.11.2 Assessment

The Project has been rigorously environmentally assessed in accordance with the EP&A Act, its 'objects' including the principles of ESD and by processes and in the manner required by the DGRs concluding that the Project is appropriate for approval under the EP&A Act and as a controlled action under the EPBC Act.

10.11.3 Environmental and Social Costs

There are environmental costs which have been identified with certainty and which are capable of being acceptably managed by operational controls, land acquisition and management plans that would be established and adopted as approved by the Director General of Planning and appropriate other Government agencies and authorities. Ecological and long term costs have been minimised and will be offset by vegetation and ecological long term offset strategies.

10.11.4 Benefits

The Project mine plan appropriately represents a material reduction in scale and impact from the plan that would be the Optimal Mine Recovery Plan and justifiably sacrifices a material proportion of the remaining in-situ coal. The Project mine plan meets environmental and social requirements and still results in a mine plan and development for which there is a demonstrated need and from which there are material economic, environmental and social benefits.

The Project will maximise the economic and social value from the remaining coal resource by a mine plan that will appropriately address the environmental and social constraints and the objects of the EP&A Act, including the principles of ecological sustainability. The Project will also provide net benefits of $1,519 Million over its life.

The Project will:

- Maximise the recovery of a coal resource which has been the subject of mining operations for over 100 years;
- Contribute more than 70% of the coal required to maintain efficient operation of the MPPS;
- Contribute to maintaining reliable supply of competitively priced electricity by TRUenergy to NSW;
- Maintain direct employment of up to 120 people and additional contractors;
- Continue and extend financial support to the region and NSW as well as Australia;
- Provide a sand resource to partly address Sydney's increasing demand for industrial sand; and
- Achieve the most efficient economic use of the land.

On the basis of this EA, it available to conclude that the Project is consistent with the objects of the EP&A Act and the principles of ESD and that the economic and social benefits of the Project outweighs its social and environmental costs. As such, it is available to the consent authority to approve the Project.

SECTION 11
Abbreviations

Abbreviations

Abbreviation	Description
ABA	Acid Base Account
ABCC	Acid Buffering Characteristic Curve
ABS	Australian Bureau of Statistics
AEMR	Annual Environmental Management Report
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHMP	Aboriginal Archaeology and Cultural Heritage Management Plan
AMD	Acid Metalliferous Drainage
ANC	Acid Neutralising Capacity
ARTC	Australian Rail Track Corporation
A	Authorisation
AWBM	Australian Water Balance Model
BCA	Benefit Cost Analysis
BMP	Biodiversity Management Plan
bcm	bank cubic metres
BoM	Bureau of Meteorology
BOMP	Biodiversity Offset Management Plan
CALMET	A diagnostic meteorological modelling system known as California Meteorological
CALPUFF	A dispersion model used to predict the maximum 24 hour PM_{10}, annual average PM_{10}, annual average TSP and annual average dust deposition.
CDP	Coal Deshaling Plant
CCC	Community Consultative Committee
CEEC	Critically Endangered Ecological Community
CH4	Methane
CHPP	Coal Handling and Preparation Plant
CCL	Consolidated Coal Lease
Coalpac	Coalpac Pty Ltd
CO_2	Carbon dioxide

11 Abbreviations

Abbreviation	Description
CO_{2-e}	Carbon dioxide equivalent
CMA	Catchment Management Authority
Crown Lands Act	Crowns Land Act 1989
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DA	Development Application
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
DECCW	Department of Environment, Climate Change and Water (now the Office of Environment and Heritage)
DEWHA	Commonwealth Department of Environment, Water, Heritage and the Arts (now Department of Sustainability, Environment, Water, Population and Communities))
DTIRIS - MR	Department of Trade and Investment, Regional Infrastructure and Services – Minerals and Resources
DoL	Department of Lands
DP&I	NSW Department of Planning (Incorporates former DIPNR, DoP, Planning NSW and DUAP)
DoP	Department of Planning (now DP&I)
DoS	Degree of Saturation
DYAC	Dhuuluu-Yala Aboriginal Corporation
EA	Environmental Assessment
EARs	Environmental Assessment Requirements
EC	Electrical conductivity
EEC	Endangered Ecological Community
ECRTN	Environmental Criteria for Road Traffic Noise 1999
EIS	Environmental Impact Statement
EL	Exploration Lease
EMP	Environmental Monitoring Program
EMS	Environmental Management System
ENCM	Environmental Noise Control Manual
ENM	Environmental Noise Model
EP&A Act	Environmental Planning and Assessment Act 1979
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth)
EPL	Environmental Protection Licence
ESA	Equivalent Standard Axles

Abbreviation	Description
ESD	Ecologically Sustainable Development
ETCPP	East Tyldesley Coal Preparation Plant
Fisheries Act	Fisheries Management Act 1994
FoS	Factor of Safety
Forestry Act	Forestry Act 1916
GDE	Groundwater Dependent Ecosystem
GoS2	Gardens of Stone Stage 2 Proposal
GPS	Geographical Positioning System
GSV	Ground Surface Visibility
GWP	Global Warming Potential
ha	Hectare
Heritage Act	Heritage Act 1977
HHMP	Historic Heritage Management Plan
HVAS	High Volume Air Sampler
I&I NSW	Industry & Investment NSW (now Department of Trade and Investment, Regional Infrastructure and Services – Minerals and Resources)
ICPP	Invincible Colliery Preparation Plant
INP	NSW Industrial Noise Policy 2000
Integral	Integral Landscape Architecture and Visual Planning Pty Ltd
ISCMOD	Modified version of the US EPA ISCST3 model
K	Hydraulic Conductivity
LALC	Local Aboriginal Land Council
L_{A1}	The noise level exceeded for 1% of the time
L_{A10}	A noise level exceeded for 10% of the time
L_{A90}	Commonly referred to as the background noise, this is the level exceeded 90% of the time
L_{Aeq}	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
LCC	Lithgow City Council
LEP	Local Environment Plan
LGA	Local Government Area
LoS	Level of Service
MAC	Mingaan Aboriginal Corporation

11 Abbreviations

Abbreviation	Description
Mbcm	Million bank cubic metres
mbgl	Metres below ground level
Mining Act	Mining Act 1992
MLA	Mining Lease Application
ML	Mining Lease / Mega litres
MNES	Matter of National Environmental Significance
MPA	Maximum Potential Acidity
MP	Member of Parliament
MPPS	Mount Piper Power Station
MREMP	Mining, Rehabilitation and Environmental Management Plan (formerly Mining Operations Plan)
MSDS	Material Safety Data Sheet
Mt	Million tonnes
Mtpa	Million tonnes per annum
MVKT	Million Vehicle Kilometres Travelled
N_2O	Nitrous oxide
NAF	Non Acid Forming
NEWAC	North-East Wiradjuri Aboriginal Corporation
NOW	NSW Office of Water
NPW Act	National Parks and Wildlife Act 1974
NT Act	Native Title Act 1993
NV Act	Native Vegetation Act 2003
OEA	Overburden Emplacement Area
OEH	Office of Environment and Heritage (formerly DECCW)
PA	Project Approval
PAD	Potential Archaeological Deposit
PAF - HC	Potentially Acid Forming High Capacity
PEA	Preliminary Environmental Assessment
PKCT	Port Kembla Coal Terminal
PM_{10}	Particulate Matter <10 microns
POEO Act	Protection of the Environment Operations Act 1997
Project Boundary	Project Application Boundary

Abbreviation	Description
PVC	Primary Viewing Catchment
PVZ	Primary Viewing Zone
Receiver	Private property adjacent the Project Boundary containing a receiver
Relics	Items of European Heritage Significance
RGS	RGS Environmental Pty Ltd
RL	Reduced Level
Roads Act	Roads Act 1993
ROM	Run of Mine
RMS	NSW Transport, Roads and Maritime Services
Rural Fires Act	Rural Fires Act 1997
SD	Statistical Division
SEPP	State Environmental Planning Policy
SEPP 33	Hazardous and Offensive Development
SEPP 44	Habitat Koala Protection
SEPP 55	SEPP 55 – Remediation of Land
SEPP Mining	State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007
SEPP Major Development	State Environmental planning Policy (Major Development) 2005
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities (formerly Commonwealth Department of Environment, Water, Heritage and the Arts)
SIA	Social Impact Assessment
Subsidence Study Area	The highwall mining area assessed in the Geonet Assessment of Stability and Subsidence
t	Tonne
tpa	Tonnes per annum
tph	Tonnes per hour
TDS	Total Dissolved Solids
The Code	Code of Practise for Archaeological Investigation of Aboriginal Objects in New South Wales (OEH 2010b)
The Project	Coalpac Consolidation Project
TSC Act	Threatened Species Conservation Act 1995
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
VCU	Visual Character Units

11 Abbreviations

Abbreviation	Description
VPA	Voluntary Planning Agreement
WAL	Water Access Licence
Water Act	Water Act 1912
WM Act	Water Management Act 2000
WMS	Waste Management System
WNTCAC	Warrabinga Native Title Claimants Aboriginal Corporation
WSP	Water Sharing Plan
WTOCW	Wiradjuri Traditional Owners Central West Aboriginal Corporation
WVWP	Wellington Valley Wiradjuri People

SECTION 12
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SECTION 13
Study Team

13 Study Team

Section	EA Component / Role	Team Member and Company	
Project Management			
	Chief Executive Officer	Ian Follington	Coalpac
	Chief Development Officer	Bret Leisemann	
	General Manager	Graham Goodwin	
	Environmental Manager	Ben Eastwood	
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	Project Director	Dianne Munro	Hansen Bailey
	Project Manager	Dorian Walsh	
	Project Coordinator	Jason Martin	
	Peer Review	James Bailey	
Stakeholder Engagement			
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	Managing Director	Tony Hanrahan	NMC Australia
	Principal Environmental Scientist	Dianne Munro	Hansen Bailey
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1	Background	Jason Martin	
2	Existing Environment	Dorian Walsh	
3	Approved Operations	Dorian Walsh	
4	The Project	Dorian Walsh	
5	Regulatory Framework	Dianne Munro	
6	Stakeholder Consultation	Dorian Walsh	
7	Risk Assessment	Jason Martin	
8	Impacts, Management and Mitigation	Dorian Walsh, Jason Martin, Nathan Cooper and Dianne Munro	
9	Statement of Commitments	Dianne Munro	
10	Project Justification	James Bailey	
11	Abbreviations		
12	References		
13	EA Study Team		

13 Study Team

Section	EA Component / Role	Team Member and Company	
Appendices			
Appendix A	Existing Development Approvals		Hansen Bailey
Appendix B	Schedule of Land to which this EA Applies		Hansen Bailey
Appendix C	Regulatory Correspondence		Hansen Bailey
Appendix D	Stakeholder Engagement		Hansen Bailey
Appendix E	Revised Environmental Risk Assessment		Hansen Bailey
Appendix F	Assessment of Stability and Subsidence	Dr Ian Clark Graeme Boyd (Peer Review)	Geonet Consulting Group Boyd Mining
Appendix G	Air Quality Impact Assessment	Francine Triffett	PAEHolmes
Appendix H	Acoustics Impact Assessment	Mark Bridges	Bridges Acoustics
Appendix I	Visual and Lighting Impact Assessment	John van Pelt	Integral Landscape Architecture and Visual Planning
Appendix J	Ecological Impact Assessment	Dr David Robertson	Cumberland Ecology
Appendix K	Aboriginal Archaeology and Cultural Heritage Impact Assessment	Andrew McLaren & Geordie Oakes	AECOM Australia Pty Ltd
Appendix L	Geotechnical Review of Stability of Aboriginal Rock Shelters	Luc Daigle	SCT Operations Pty Ltd
Appendix M	Historic Heritage Assessment	Geordie Oakes & Andrew McLaren	AECOM Australia Pty Ltd
Appendix N	Surface Water Impact Assessment	Greg Roads & Rhys Cullen	WRM Water & Environment
Appendix O	Groundwater Impact Assessment	James Tomlin & Tim Armstrong	Australasian Groundwater and Environmental Consultants
Appendix P	Geochemical Impact Assessment	Dr Alan Robertson	RGS Environmental
Appendix Q	Traffic and Transport Impact Assessment	Damien Chee	Hyder Consulting
Appendix R	Soils Survey and Land Capability Impact Assessment	Adam Blundell & Gilbert Whyte	Ecobiological
Appendix S	Preliminary Hazard Analysis		Hansen Bailey
Appendix T	Economic Assessment	Robert Gillespie	Gillespie Economics
Appendix U	Forestry Assessment	Melinda Mylek, Alan Cole & Stephen Dahl	GHD
Legal Advice provided by Sparke Helmore Drafting and Graphics Design by Pegasus Technical Pty Limited, Graphic Design and Publishing Services and Greenpond TSG			