NSW Planning Assessment Commission

Coalpac Consolidation Project Review: Main Report

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14 December 2012

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Executive Summary

The Coalpac Consolidation Project proposes open-cut mining and highwall mining of the Illawarra Coal Measures in Ben Bullen State Forest in the Lithgow Local Government Area. The Proponent Coalpac Pty Ltd (Coalpac) seeks approval to consolidate the operations and management of the existing Cullen Valley and Invincible Colliery mines, expand the project area and increase production to 3.5 million tonnes of coal a year over 21 years.

The Minister for Planning and Infrastructure requested the Planning Assessment Commission to review the Coalpac Consolidation Project and to conduct public hearings as part of this process. The Minister requested the review assess the merits of the project as a whole, with particular consideration of impacts on biodiversity, water resources and local health and amenity noting the site's proximity to Cullen Bullen village. The Commission members appointed for the review were Dr Neil Shepherd AM (chair), Mr Garry Payne AM and Mr Joe Woodward PSM. Professor David Cliff provided expert advice on risks associated with underground combustion.

The Commission examined the Proponent's Environmental Assessment, submissions made on the Environmental Assessment, the Proponent's Response to Submissions and other documents submitted by the Proponent. The Commission also received submissions, held public hearings, inspected the site and surrounds and met with representatives of the Proponent, the Department of Planning and Infrastructure, Lithgow City Council, the Office of Environment and Heritage, Energy Australia (formerly TRUenergy), NSW Health, Division of Resources and Energy in the NSW Department of Trade and Investment and Professor Cliff.

The Commission held public hearings on Wednesday 19 September 2012 at the Lithgow & Districts Workmen's Club and on Thursday 20 September 2012 at the Cullen Bullen Progress Association Hall. The Commission heard submissions from 27 and 11 people in Lithgow and Cullen Bullen respectively. Written submissions and correspondence were also received during the review.

The Commission has found that, when the merits of the project are considered as a whole, the benefits of the project are substantially outweighed by the breadth and potential magnitude of the impacts. The Commission therefore recommends that the project should not be approved.

The benefits claimed for the project are principally in the areas of employment (120 positions in total with 30 of these additional); engagement of contractors; wealth generation (claimed net benefits of $1,519 million); provision of a cheap source of coal for Mount Piper Power Station with flow-on benefits for electricity prices; reduced traffic impacts in the local area (i.e. Cullen Bullen); and supply of building sand to western Sydney.

The claimed benefits of the project are largely distributed away from the population bearing most of the impacts of the project. Of the existing mine employees, only 3% come from Cullen Bullen and it is not anticipated that the project will generate significant demand for housing or facilities in the area. The Commission has also found that claims associated with some of the benefits do not appear robust when examined closely. For example, the claimed $1,519 million net benefit is very sensitive to coal price fluctuations. A 20% decrease in the price at which the benefits were calculated decreases the net benefit by 42% to $881 million. The claimed net benefit was calculated using world parity prices (an accepted analytical approach), but the poor quality coal produced by the project is largely (70%) unsuitable for export and could never achieve the world parity price. In fact

the long-term contracted price for the coal produced by the project is well below the export parity price.

The claimed potential increases in wholesale and retail electricity prices if project coal is not supplied to Mount Piper Power Station (35% and 13% respectively) were examined carefully by the Commission including two sets of confidential supporting documentation provided by Energy Australia. The Commission found that, whilst there may be some (limited) impact on wholesale prices in the short-medium term, there was no credible evidence to support a causal relationship between increases in retail prices of the magnitude described and changes in part of the fuel supply to a single NSW power station. The modelling also failed to account for the majority of factors that would influence electricity prices over the period 2013-2022.

In relation to the extraction of sand as part of the project, the Commission has found that there is insufficient information provided by the Proponent to enable a proper assessment of this part of the proposal. Potential issues with acid mine drainage, road transport of the product and washery water management have been identified for further investigation.

The impacts of the project are substantial and occur across a range of domains. The terms of reference specifically direct the Commission to three areas (health and amenity impacts on residents, impacts on biodiversity and impacts on water resources) and to consider any other matters raised in submissions or at pubic hearings.

The Commission has substantial concerns about impacts arising from dust, noise and blasting on the health and amenity of residents of Cullen Bullen and the surrounding district.

For dust, NSW Health provided the Commission with unequivocal advice that the predicted significant increases in PM_{10} levels from the project will lead to increased morbidity and mortality in the Cullen Bullen community from respiratory and cardiovascular disease. It is the increase, not the final level of PM_{10}, that produces this outcome. NSW Health also emphasised the relatively poor health and socio-economic status of this community compared to NSW averages.

The project cannot meet NSW air quality criteria at all residences and is close to the limit at many others. It is therefore at the limit of acceptability for air quality impacts. This situation already assumes that all controls are in place and operating effectively and that the predictions are accurate. The results are that: there is no room for new entrants into the impacted airshed (i.e. no additional impacts can occur); there are potential long-term restrictions on project operations; and further property acquisitions may be necessary. The Commission considers this to be a high-risk situation.

For noise impacts, the project cannot meet the accepted NSW criteria at all residences. Acquisition is required for some residences and mitigation treatments for others. There are also a substantial number of residences close to the limit at which mitigation treatments for noise impacts would be required. The Proponent has modelled the noise impacts with all controls in place and operating effectively. There is no room for error in either the predictions or in operation of the controls. The potential consequences of failure to deliver predicted outcomes are that operating hours will remain restricted or a significant number of additional residences will need to be treated and/or acquired, causing further social disruption to the village and surrounding district.

The project cannot meet the blasting impact guidelines at some locations without a significant increase in the number of blasts above the national criteria for blast frequency. This project seeks up to 40 blasts per week, which is approximately a seven-fold increase above the criteria. Increased frequency may be acceptable where the residential impact is significantly lower for each blast but,

for this project, although the charges would be smaller, the impact at the residences would remain close to or at the maximum allowable level. The Commission considers the proposed level of impact from blasting to be unacceptable for these residents.

Biodiversity impacts are divided into those affecting the pagoda landform and those affecting other aspects of the ecology of the project area. The pagodas are considered to be internationally significant geological features some 250 million years old and worthy of total protection. No mining-induced damage should be permitted to these features. The Commission recommends that highwall mining in the vicinity of the pagodas be prohibited and that the minimum setback for mitigating blasting risk to the pagodas be increased significantly from the proposed 50m. Risks to flora and fauna of the pagoda landform are also significant, particularly for fauna species that utilise the various parts of the landform for shelter, breeding sites and feeding areas on either a daily or seasonal basis. Some of these are listed as threatened species under the relevant NSW and Commonwealth Acts. The proposal to mine up to within 50m of the pagodas and escarpments will have an unacceptable impact on the foraging ability of these species. The Commission considers that a setback of 300m would provide 70-75% of the foraging area required and should be adopted as an absolute minimum.

The project will clear 957.98ha of vegetation – mostly in Ben Bullen State Forest. There is sufficient doubt over the accuracy of the biodiversity assessment for there to be uncertainty about levels of impact, the significance of impacts and the suitability of proposed offsets. Edge effects, have not generally been factored into the impacts. Given the very fragmented nature of the project site this will mean that the real impact of the project on native vegetation will be much greater than the area to be directly impacted by clearing.

The project area contains numerous species listed under the State and Commonwealth threatened species legislation and potential exists for many others to be present. However, the real value of the area from a biodiversity perspective is that it contains a wide diversity of vegetation associations and a very high species richness. Despite low intensity forestry in the past the vegetation is generally in good condition and there is a full range of habitat features available such as tree hollows. It adjoins areas of similar status such as the rest of the Ben Bullen State Forest and Wolgan State Forest and the Gardens of Stone National Park is immediately to the north of the Ben Bullen State Forest.

The Proponent has placed substantial emphasis on rehabilitation as a mitigation strategy for impacts on biodiversity. There is considerable uncertainty about the validity of the claims. Some issues are: rehabilitated areas cannot be returned to their pre-existing landforms across the project area; rehabilitated areas cannot replicate the existing biodiversity characteristics (they will inevitably be less diverse and less species rich); there is no guarantee that mature woodland can develop on rehabilitated areas (there is no example of rehabilitated mature woodland on an open-cut mine in NSW); even if woodland could reach maturity, development of the full range of habitat features is over 100 years away; and there is a direct conflict between the management of rehabilitation and the management of the underground combustion which is present in the project area.

Rehabilitation issues are particularly significant in this project. The impacts are occurring in an area already proposed for inclusion in the conservation reserve system, the Proponent is claiming that rehabilitation will make the area suitable for inclusion in the reserve system in due course, and the visual impacts of the project are very substantial and rehabilitation is essential to provide cover for highly visible areas of scarring. The Commission concluded that the project and reservation of Gardens of Stone Stage II are incompatible if reservation is intended to include Ben Bullen State Forest, either now or in the forseeable future.

For this project to proceed, adequate biodiversity offsets must be secured to compensate for the impacts. At this stage the offset package is best described as 'a work in progress', and cannot be considered adequate. The Commission's conclusion on the offset package is that it is designed to exchange a number of fragmented areas that in some instances require extensive rehabilitation and are not considered suitable for reservation, for a single area of high quality habitat that is already proposed for reservation and which adjoins like areas of high quality habitat.

Potential impacts on water resources were identified for both surface waters and groundwater, but the Commission considers that these could be managed with appropriate conditions.

Other issues of significance arising during the review include cumulative impacts from this project, other existing mining projects and two known potential open-cut mining projects (Pine Dale Stage 2 Extension and Neubeck). The EA does not deal with the potential cumulative impacts from either Pine Dale Stage 2 Extension or Neubeck. The Commission strongly recommends that the Department consider the implications of all existing and proposed mines in this airshed with a view to making considered recommendations to the Determining Authority that ensure air quality impacts remain compatible with sound long-term health and amenity outcomes for the residents. The cumulative impacts on biodiversity are also of concern since the Pine Dale Stage 2 Extension also impacts directly on the Ben Bullen State Forest. The Commission considers that the assessment must cover the total impact from the two proposals before a comprehensive understanding of biodiversity impacts is possible.

There are other impacts associated with visual scarring in the vicinity of the pagodas and escarpments and significantly increased heavy vehicle traffic on the Great Western Highway. There are also significant risks to Aboriginal rock shelters and for increases in underground combustion if the proposed management strategies do not work. The Commission also identified many heavily qualified statements in the Environmental Assessment and Response to Submissions by the consultants preparing reports and also heavily qualified commitments by the Proponent on key issues. In many cases there is no certainty that important outcomes can be delivered or that commitments will be met. The Commission is sufficiently concerned about the extent of this problem to recommend that any further assessment process require the stripping away of the caveats and qualifications so that the decision maker is presented with unequivocal statements as to what will or will not be achieved and also provided with unambiguously enforceable conditions and commitments to consider.

The Commission has provided a suite of recommendations under the individual sections of this review, and a summary list is provided in section 9.5. These recommendations were prepared as each individual issue was considered and before the Commission determined its position on the merits of the project as a whole, which is that the project should not be approved (Term of Reference 1(b)). The recommendations therefore represent the minimum requirements or limitations that the Commission considers necessary to deal with the individual impacts identified. The fact that these individual recommendations have been provided should not be interpreted as modifying the Commission's conclusion and recommendation on the project as a whole. Their existence responds to the Minister's request to *'recommend appropriate measures to avoid, minimise and/or offset these impacts'* (Term of Reference 1(c)) and also recognises that this review is only one step in the assessment and determination process for this project.

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Glossary

10_0178: Department of Planning and Infrastructure's Project Application Reference number.
ACH: Aboriginal Cultural Heritage
ACHMP: Aboriginal Cultural Heritage Management Plan
ANZEC: Australian and New Zealand Environment Council
ANZECC: Australian and New Zealand Environment and Conservation Council
AIA: Acoustic Impact Assessment
AQIA: Air Quality Impact Assessment
ARI: Annual Recurrence Interval
BBSF: Ben Bullen State Forest
CDP: Coal Deshaling Plant
CH_4: Methane
CMA: Catchment Management Authority
CO: Carbon Monoxide
CO_2: Carbon Dioxide
$CO_{2\text{-}e}$: Carbon Dioxide Equivalent
Coalpac: Coalpac Pty Ltd, and the 'Proponent'
Commission: Planning Assessment Commission constituted to review this project, comprising Dr Neil Shepherd AM (Chair), Mr Garry Payne AM and Mr Joe Woodward PSM
dBA: Decibels, A weighting
Department: NSW Department of Planning and Infrastructure
DGRs: Director-General's Requirements
DP&I: NSW Department of Planning and Infrastructure
EA: Environmental Assessment dated March 2012 submitted by the Proponent
EEC: Endangered Ecological Community
EPA: Environment Protection Authority
EP&A Act: NSW Environmental Planning and Assessment Act 1979
EP&A Regs: NSW Environmental Planning & Assessment Regulation 2000
EPBC Act: Environment Protection and Biodiversity Conservation Act 1999
EPL: Environment Protection Licence
ETCPP: East Tyldesley Coal Preparation Plant
ICPP: Invincible Colliery Preparation Plant
INP: NSW Industrial Noise Policy, EPA 2000
ISF: Institute of Sustainable Futures
LCC: Lithgow City Council
LGA: Local Government Area.
Mbcm: Million bank cubic metres
ML: Mega litre
MPPS: Mount Piper Power Station
Mt: Million tonnes
Mtpa: Million tonnes per annum
MW: Megawatt
NEPC: National Environment Protection Council
NO: Nitric oxide
NO_2: Nitrogen dioxide
NO_x: Nitrogen oxides
NOW: NSW Office of Water
OEAs: Overburden emplacement areas
OEH: NSW Office of Environment and Heritage
PAC: Planning Assessment Commission of New South Wales

$PM_{2.5}$: Particulate matter with an aerodynamic diameter smaller than 2.5 micrometres
PM_{10}: Particulate matter with an aerodynamic diameter smaller than 10 micrometres
PONL: Project Operational Noise Level (equivalent to Project Specific Noise Level)
Project: The subject of the application under Part 3A of the EP&A Act 1979, in this report being the Coalpac Consolidation Project.
Proponent: The applicant under Part 3A of the EP&A Act 1979, in this report being Coalpac Pty Ltd. 'Proponent' includes representatives of Coalpac including employees and consultants.
PSNL: Project Specific Noise Level
RMS: NSW Roads and Maritime Service
ROTAP: Rare or Threatened Australian Plant
RTAQMS: Real Time Air Quality Management System
RTNMS: Real Time Noise Management System
RTS: Response to Submissions
SoC: Statement of Commitment(s) by the Proponent as revised in section 5 of the RTS
tpa: tonnes per annum
TSC Act: *Threatened Species Conservation Act 1995*.
TSP: Total suspended particulate
WHO: World Health Organisation
WPS: Wallerawang Power Station

1 Introduction and Terms of Reference

On 22 July 2012 the Minister for Planning and Infrastructure, the Honourable Brad Hazzard MP issued a request to the Chair of the Planning Assessment Commission (the Commission) in relation to the Coalpac Consolidation Project. The Minister's request was made under section 23D(1)(b)(ii) and Schedule 3 of the NSW Environmental Planning and Assessment Act 1979, and Clauses 268R(1)(a) and 268V of the NSW Environmental Planning & Assessment Regulation 2000 as follows:

I, the Minister for Planning and Infrastructure request the Planning Assessment Commission to:

(1) Carry out a review of the Coalpac Consolidation Project, and:

- *a. Consider the Environmental Assessment of the project, all issues raised in submissions on the project, and any information provided on the project during the course of the review;*
- *b. Assess the merits of the project as a whole, paying particular attention to the potential:*
  - *Local health and amenity impacts of the project, particularly dust, noise and blasting impacts noting its proximity to the village;*
  - *Biodiversity impacts of the project;*
  - *Water resource impacts of the project; and*
- *c. Recommend appropriate measures to avoid, minimise and/or offset these impacts.*

(2) Conduct public hearings during the carrying out of the review.

(3) Submit the final report on the review to me by 14 November 2012 unless the Director-General of the Department of Planning and Infrastructure agrees otherwise.

On 12 November 2012 the Commission sought an extension to provide its review report and recommendations by 14 December 2012. This was approved by the Director General of the Department on 19 November 2012.

A copy of the Minister's request is provided in Appendix A of this report.

Ms Gabrielle Kibble AO, Chair of the Commission appointed Dr Neil Shepherd AM, Mr Garry Payne AM and Mr Joe Woodward PSM to constitute the Commission for the project. Dr Shepherd chaired the Commission for the project review.

Professor David Cliff from The University of Queensland was engaged as a consultant to provide advice on the risks associated with underground combustion.

2 Commission Process

2.1 Public Hearings and Submissions

In accordance with the Minister's terms of reference to the Commission, public hearings were held on 19 and 20 September 2012.

The public hearing on 19 September 2012 was held from 9.30am at the Lithgow & District Workmen's Club, 3-7 Tank Street, Lithgow. Twenty-seven people made verbal submissions to the Commission including individuals, representatives of businesses that use the mines' coal resource, and Lithgow City Council. Representatives of the following seven special interest groups also spoke:

- Colong Foundation for Wilderness;
- Colo Committee;
- Blue Mountains Conservation Society;
- Bathurst Community Climate Action Network;
- Total Environment Centre;
- Lithgow Environment Group; and
- Nature Conservation Council of NSW.

The public hearing on 20 September 2012 was held from 9.00am at the Cullen Bullen Progress Association Hall, 37-39 Castlereagh Highway, Cullen Bullen. Eleven individuals made verbal submissions to the Commission.

All persons seeking to be heard were heard, and in Appendix B is a list of people who made verbal submissions at each public hearing and a summary of the matters raised.

Written submissions were also made to the Commission, including at the public hearings, and these are publicly available on the Commission's website unless confidential.[1]

The Commission has also reviewed submissions made available to it by the Department of Planning and Infrastructure that were received during the public exhibition of the proposal.

2.2 Commission Meetings

The Commission was briefed by the Department of Planning and Infrastructure (the Department) on 17 September 2012, with a subsequent meeting on 10 December 2012.

The Commission met with officers from Lithgow City Council on 17 September 2012 to hear their views on the project, and the Council also spoke at the public hearing on 19 September 2012.

Officers from the Office of Environment and Heritage briefed the Commission members and escorted the members on a site visit around the project area (see section 2.4 below) on the morning of 18 September 2012. The Commission also subsequently met with OEH officers at the Commission's offices on 7 November 2012.

The Proponent briefed the Commission on the afternoon of 18 September 2012 as part of an escorted site visit to the mine (see section 2.4 below). The Proponent briefed Professor David Cliff

[1] NSW Planning and Assessment Commission, www.pac.nsw.gov.au (search under Projects for Coalpac, and the Commission's reference is R015/12. The direct link to the application page is http://www.pac.nsw.gov.au/Projects/tabid/77/ctl/viewreview/mid/462/pac/238/view/readonly/myctl/rev/Default.aspx).

on-site on 1 November 2012 specifically in relation to underground combustion. The Commission also met with the Proponent on 30 November 2012.

During its review the Commission met with Energy Australia (formerly TRUenergy) on 17 October 2012 to discuss its coal sourcing requirements for the Mount Piper Power Station and the effect that loss of Coalpac's coal resources may have on wholesale and retail electricity prices. The Commission also held a teleconference with Energy Australia on 30 November 2012.

The Commission met with officers from the Division of Resources and Energy (DRE) within the NSW Department of Trade and Investment with Professor Cliff at the Commission offices on 1 November 2012 to discuss underground combustion. A subsequent meeting with the Commission on 7 November 2012 was attended by the CEO of the Mine Subsidence Board on behalf of DRE, to discuss other DRE concerns including subsidence and acid-forming material.

NSW Health representatives met with the Commission on 15 November 2012 to discuss possible project-specific and cumulative health impacts from the proposed mining operations.

A summary of the matters discussed in each of the above meetings is set out in Appendix C.

Over the course of the review the Commission members met several times to discuss issues and prepare the report.

2.3 Documents

The Commission reviewed a large amount of information before and after the public hearings. The principal sources of this information were:

- the Proponent's Environmental Assessment (EA);
- submissions made to the Department from government agencies, special interest groups and the general public during the public exhibition period of 10 April 2012 to 1 June 2012;
- the Proponent's Response to Submissions report;
- submissions from government agencies made to the Department following release of the Response to Submissions report;
- submissions from any source made direct to the Commission prior to, during, and following the public hearings;
- correspondence and information provided by the Proponent, special interest groups and key government agencies in response to questions from the Commission;
- Professor David Cliff's advice dated 6 December 2012 in relation to underground combustion; and
- previous Commission review and determination reports including Bulli Seam Operations Review Report 2010, Ashton South-East Open Cut Coal Project Determination Report 2012, Boggabri Coal Mine Expansion Project Determination Report 2012 and Maules Creek Coal Project Determination Report 2012.

As stated above, the Commission received a large amount of information after the public hearings from the Proponent, special interest groups and government agencies typically in response to questions asked by the Commission. Correspondence sent by the Commission, and correspondence and information received that is relevant to the Commission's review is appended to the report, and all submissions and correspondence/additional information is available on the Commission's website unless confidential.[2]

[2] NSW PAC, www.pac.nsw.gov.au

2.4 Site Visits

The Commission visited the site and surrounds on 18 September 2012 with officers from the OEH in the morning and separately with the Proponent in the afternoon.

With the OEH officers, the Commission visited the Ben Bullen State Forest and drove along access trails with various stops to view the pagodas, the existing mines, flora species, vegetation and habitat types and mining-induced damage to pagodas and escarpments.

In the afternoon the Proponent arranged for the Commission to fly over the area by helicopter. The Commission flew over the Ben Bullen State Forest, the existing Cullen Valley and Invincible Colliery mines, Cullen Bullen village and cemetery, and the Mount Piper Power Station. The helicopter flight plan outlining points of interest identified by Coalpac is available on the Commission's website.[3] Following this, the Proponent drove the Commission members around the site to view the existing mining operations and the rehabilitation areas.

The Commission also visited Cullen Bullen and surrounds including Red Springs Road on 20 September 2012.

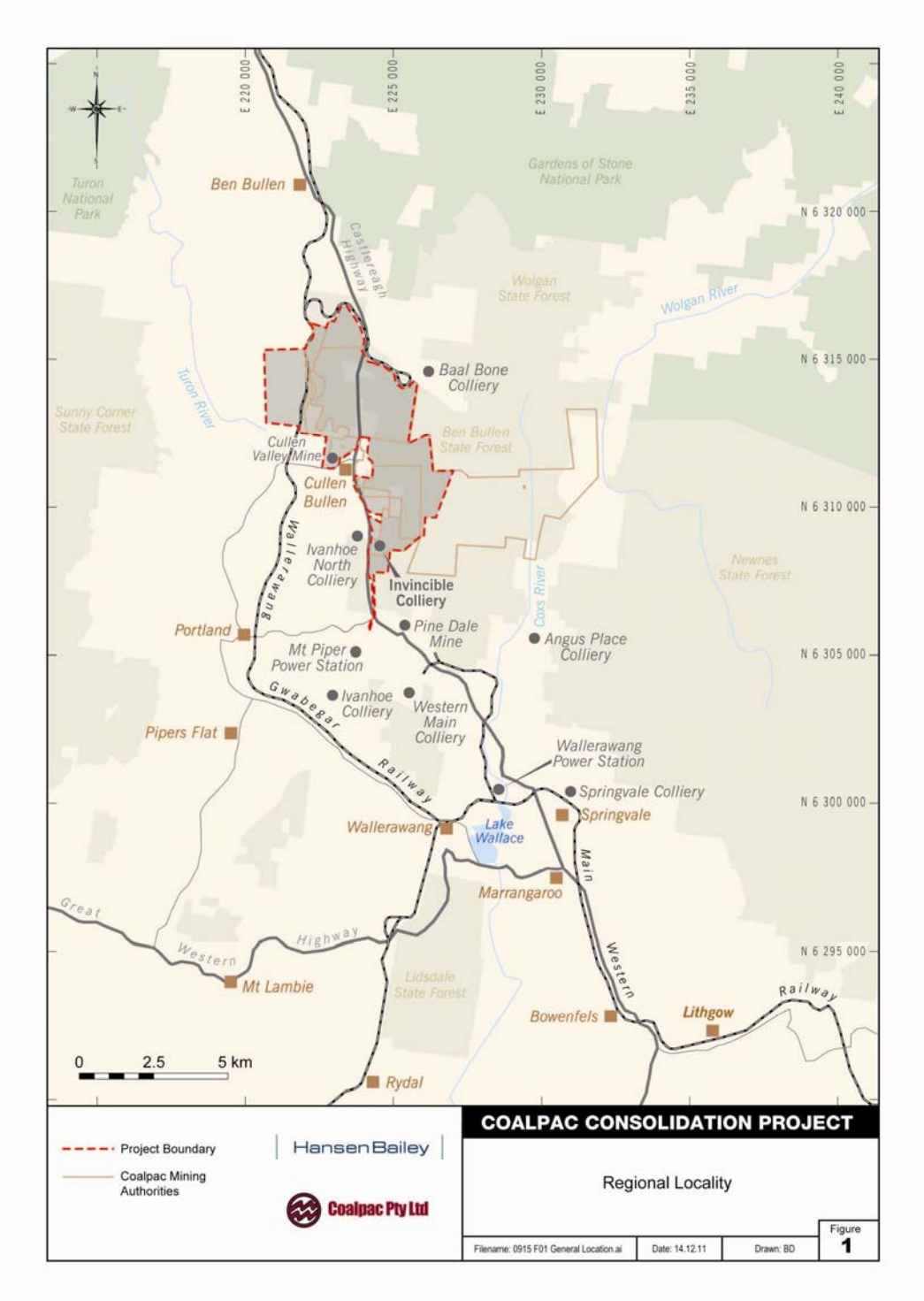
Mr Garry Payne AM separately visited the public road network around the site and inspected the Great Western Highway from Lithgow to the M4 connection on 15 October 2012.

[3] NSW PAC, www.pac.nsw.gov.au

3 Project Description

Coalpac currently operates two open-cut mines (Cullen Valley and Invincible Colliery) within the Ben Bullen State Forest approximately 25km north west of Lithgow. Both mines are approximately 1km distance from the village of Cullen Bullen to the north-west and south-east respectively. The project's location is identified in Figure 3-1 below.

Figure 3-1: Project Location (Source: Hansen Bailey (2012), EA, Fig. 1)



3.1 Background

Historically, mining operations in the project area were predominantly underground although in 1949 open-cut mining began at Beaumaris Colliery. Beaumaris Colliery subsequently became the Tyldesley Colliery, and it now is the Cullen Valley mine.

The Proponent for the project application is Coalpac Pty Ltd which was formed in 1988. Since November 2006 CET Resources Pty Ltd has had a controlling interest in Coalpac. In 2006 Coalpac already owned Invincible Colliery, and Coalpac then acquired Cullen Valley mine in 2008. The current operations and approvals for both Cullen Valley and Invincible Colliery are summarised in section 4.1 below.

Coalpac intends to surrender its existing approvals if project approval is granted under this project application (Department Reference: 10_0178) which is the subject of this review. The Commission notes that some aspects of the prior approvals could be readily transferred to a new project approval for the site. Nonetheless, the proposal before the Commission would substantially increase the scale and duration of mining activities.

3.2 The Current Proposal

The Proponent is seeking permission under Part 3A of the Environmental Planning & Assessment Act 1979 (EP&A Act) to expand the project area and the mines' annual capacity through a mixture of open-cut and highwall mining methods. As part of this process, the Proponent would consolidate the operations and management of the Cullen Valley and Invincible Colliery into a single mine under a single planning approval. The extent of the proposed project area and coal extraction is shown in Figure 3-2 on the following page.

The project would:

- allow the mine to operate on the site for a further 21 years;
- increase the extracted coal resource to a maximum of 108 Mt ROM over 21 years, corresponding to an annual maximum production rate of 3.5 Mtpa of product coal;
- extract Marrangaroo Sandstone to a maximum of 5 Mbcm over 21 years, corresponding to an annual production rate of 0.45 Mbcm product sand; and
- disturb 835 hectares of native vegetation and habitat. [4]

The coal and sand product is stated to be distributed as follows:

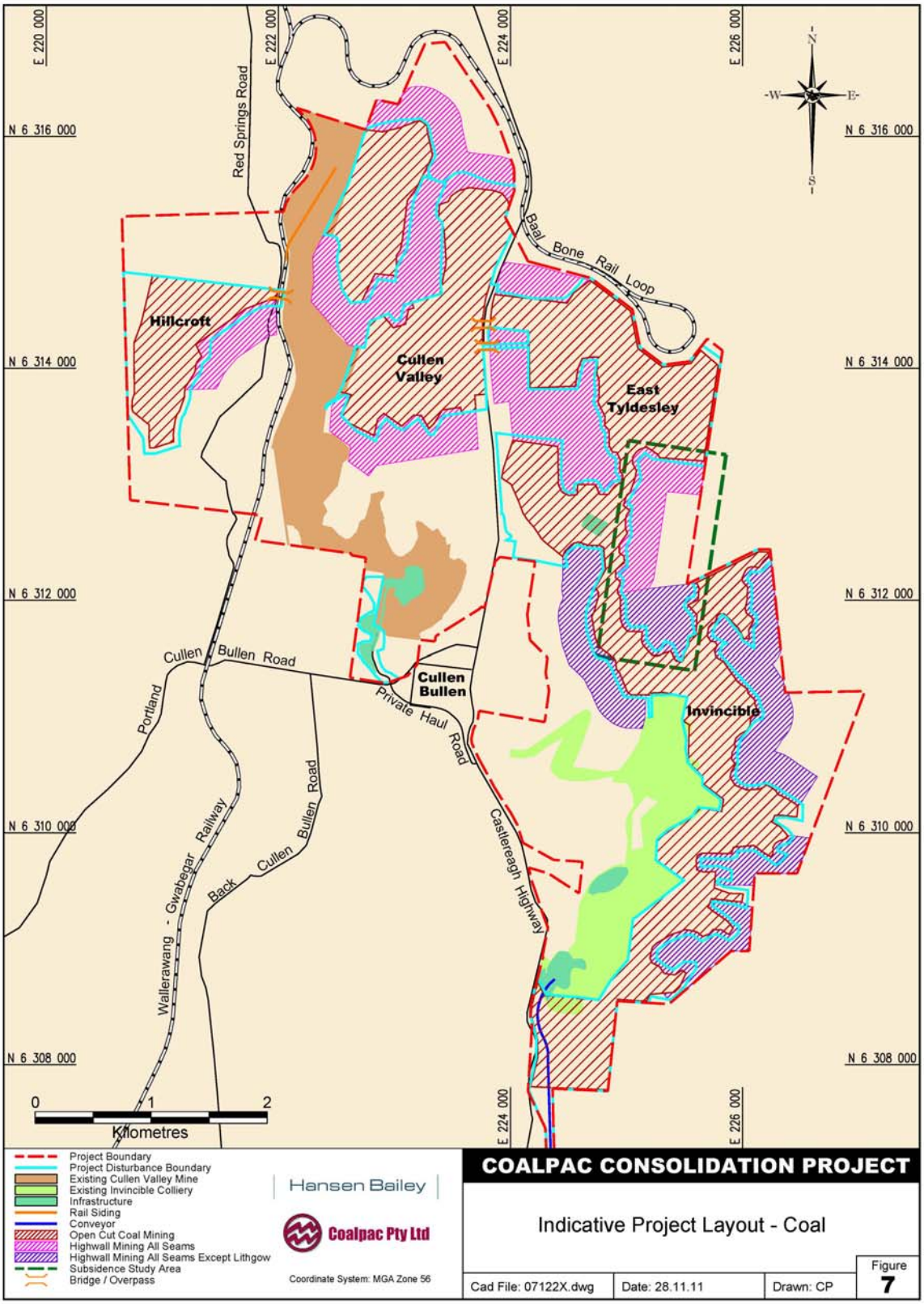
- conveyor transport of up to 2.625 Mtpa of product coal to Mount Piper Power Station;
- road transport of up to 0.45 Mtpa of product coal to domestic markets other than the Mount Piper Power Station;
- rail transport of up to 1.0 Mtpa of product coal to Port Kembla and then shipping to export markets; and
- road transport of up to 0.45 Mbcm product sand per annum.

The product coal distribution above totals 4.075 Mtpa which exceeds the maximum 3.5 Mtpa sought under the project application, however the limits are 'up to' and it must be assumed that the destination quantities would fluctuate to keep extraction to within the approved limits.

Figure 4 of the Proponent's EA shows the geological stratigraphy of the Illawarra Coal Measures. Under the proposal the Proponent would continue to mine the coal seams down to and including the Lithgow Coal Formation in the parts of the site that have not been previously mined by underground methods. Beneath is the Marrangaroo horizon which contains a sandstone seam that would be extracted for sand production.

[4] The Commission's estimate is 914.4ha based on OEH advice (see section 6.3.2.2).

Figure 3-2: Project Area and Area of Coal Extraction (Source: Hansen Bailey (2012), EA, Fig. 7)



To accommodate the proposed expansion and production capacity increases, a number of additional infrastructure works and facilities are sought as set out in the EA, including:

- construction of a dedicated coal conveyor over the Castlereagh Highway to transport coal from the project area to the Mount Piper Power Station (MPPS);
- upgrades to the existing Invincible Coal Preparation Plant (ICPP), administration buildings and other infrastructure;
- construction of additional offices at Cullen Valley mine;
- construction of the East Tyldesley Coal Preparation Plant (ETCPP) and associated workshops, offices, and infrastructure. Post-construction to relocate the Cullen Valley Coal Deshaling Plant (CDP) to the ETCPP and potentially construct a product coal conveyor to transfer coal from the ETCPP to the ICPP;
- ETCPP tailings to be emplaced/encased within overburden emplacement areas (OEAs);
- coarse rejects to be emplaced in overburden dumps;
- construction of a bridge and haul road across the Wallerawang-Gwabegar Railway Line to provide access to extract the previously approved Hillcroft coal resource;
- construction of a rail siding and associated loading infrastructure;
- integration of water management infrastructure on both sites into a single system;
- divert the Fish River pipeline and install other communications and data infrastructure; and
- relocate Endeavour energy power line south of Invincible Colliery.[5]

Prior to preparation of the Director-General's Requirements (DGRs), the project as described in the Preliminary Environmental Assessment included construction of a (road) bridge over the Castlereagh Highway to link operations east and west of the highway, and the development of required access roads to the East Tyldesley area.[6] The Department confirmed that the road crossing does form part of the current project application.[7]

The Proponent is seeking permission to carry out mining and coal processing operations 24-hours per day up to seven days per week (including rail haulage). Blasting would be limited to between 0900 and 1700 Monday to Saturday, with no blasting outside these times or on public holidays without prior OEH approval. Coal and sand truck haulage would occur between 0700 and 2130 Mondays to Saturdays, excluding public holidays from year two with more restrictive hours beforehand on part of the site.

Employment generation is anticipated at 120 full-time personnel plus contractors.

[5] Hansen Bailey 2012, *Coalpac Consolidation Project: Environmental Assessment for Coalpac Pty Ltd – Volumes 1 to 5*, March, Vol.1, Section 4.1

[6] Hansen Bailey 2010. *Coalpac Consolidation Project: Preliminary Environmental Assessment for Coalpac Pty Ltd,* October, Section 1.4

[7] Department, Meeting with the PAC, 10 December 2012

4 Background and Strategic Context

4.1 Project Area - Existing Consents and Operations

The area around Cullen Bullen has been mined since the 1880s in an intermittent fashion with a range of underground, open-cut and highwall mining operations, by different mining operators and under a range of approvals.

Broadly, prior and currently operating mines in the area have typically utilised underground mining methods, except for the Ivanhoe North Colliery and the mines (now known as Cullen Valley and Invincible Colliery) within the project area. However, there appears to be a trend toward greater use of open-cut mining methods noting the current Coalpac proposal, and proposed open-cut mining operations at Pine Dale and Neubeck. Further detail of other mining operations in the area is discussed in section 4.2.

Cullen Valley and Invincible Colliery are the two existing coal mines in the project area and their production of up to 2.2 Mtpa product coal is subject to a number of separate approvals.

Below is a brief summary of the current relevant approvals and range of operations for both mines.

4.1.1 Cullen Valley

The primary development consent for Cullen Valley is DA 200-5-2003 granted by the then Minister for Planning and Infrastructure on 24 December 1997. This approval, as modified on 19 August 2004 permits open-cut, underground and highwall mining activities over 21 years until 2025. The approval restricts production of saleable coal to 1 Mtpa, and of that amount only a maximum of 250,000 tpa (cumulative total) may be transported to destinations other than Mount Piper Power Station (MPPS).[8]

Coalpac advised the mine requires up to 26 fulltime personnel plus contractors. The Cullen Valley mine may operate 24 hours per day, seven days of week, although it currently does not operate to the maximum hours permitted. Restricted hours apply to blasting, which may occur between 0900 and 1500 Monday to Friday, inclusive.[9] Restrictions also apply to road haulage, being between 0700am and 1730 Monday to Friday, and between 0700 and 1700 on no more than 30 Saturdays annually.[10]

Under its approval, the mine owners are required to establish and maintain offsets in the form of Compensatory Habitat Areas, which for Cullen Valley comprises a total area of 51.4ha.

At Cullen Valley open-cut mining involves extraction of coal from the following seams within the Illawarra Coal Measures:

- Katoomba;
- Middle River;
- Moolarben;
- Upper Irondale;
- Irondale;
- Lisdale; and
- Lithgow. [11]

[8] Conditions 5 and 6 of DA-200-5-2003
[9] Condition 12 of DA-200-5-2003
[10] Condition 50 of DA-200-5-2003
[11] EA, Vol.1, Section 3.1.3, p.23

The EPA summarised its relevant regulation history with Cullen Valley mine as follows:

- prior to 2001 it received 120 complaints about dust, and the then operator (prior to Coalpac's ownership) was convicted in 2003 in the Land and Environment Court following the mine's dust impacts on Cullen Bullen village in 2001 and the company was fined $30,000;
- since 2001 the EPA has *'received 29 complaints (14 for noise, 9 for dust, 2 for odour, 1 for blasting and 3 for tracking mud off-site…..)'*.[12]
- since 2005-2006 Coalpac self-reported two non-compliances with its license at Cullen Valley. These related to a water pollution limit exceedence and malfunctioning of a meteorological station, and did result in regulatory action; and
- two Pollution Reduction Programs have been placed on the licence since 2010. One was for improving drainage/haul road profiling to reduce tracking of mud. The second required the licensee to assess site performance against best practice for reducing coal dust.

The EPA advised it has not considered it necessary to issue any Penalty Infringement Notices to the Lithgow Coal Company (Coalpac subsidiary).[13]

Failure of the mine to supply contract coal to the MPPS meant that the operation was placed on a Care and Maintenance project in June 2007 when it was under the ownership of the Lithgow Coal Company. Coalpac acquired Cullen Valley in 2008 and mining recommenced.[14]

4.1.2 Invincible Colliery

Invincible Colliery currently operates under approval PA07_0217 which was granted by the Department on 4 December 2008. This approval, following three subsequent modifications, permits the mine to produce up to 1.2 Mtpa of product coal primarily to supply the MPPS, with up to 200,000 tpa permitted to be transported to other domestic markets.[15] The subsequent modifications also recommenced coal washing at the Invincible Colliery Preparation Plant (ICPP) and permitted highwall mining from within the open-cut footprint.

Coalpac advised the mine requires up to 20 fulltime personnel plus contractors. The Invincible Colliery may operate between 0700 and 2200 Monday to Saturday, except public holidays.

For current operations Invincible Colliery has an approved offset package that consists of approximately 165ha of degraded agricultural lands and moderate to good quality vegetation.[16]

The approval allows for open-cut and highwall mining to the year 2016 extracting from the following Illawarra Coal Measures:

- Irondale;
- Lisdale; and
- Lithgow.

The EPA summarised its relevant regulation history with Invincible Colliery as follows:

- since 2005-2006 Coalpac self-reported three non-compliances with its license. These related to non-compliance with a water pollution limit, failure to monitor, and exceedence of a blasting limit. The EPA considered the three exceedences minor and did not take regulatory action.

[12] EPA, letter to PAC, 24 October 2012, p.8 (available in Appendix D)
[13] EPA, letter to PAC, 24 October 2012, pp.7-8
[14] EA, Vol.1, Section 3.1.1, p.23
[15] Department application reference PA07-0217 (MOD3), http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=4036
[16] EA, Vol.1, Section 3.2.7

- since 2007 the EPA has received 28 complaints from the public (4 for noise, 7 for dust, 5 for blasting 11 for tracking coal/mud off-site on the Castlereagh Highway and 1 for vegetation clearing).
- three Pollution Reduction Programs have been placed on the licence since 2008. One for reducing noise emissions from haul trucks and the ICPP. The second to implement measures to reduce tracking of coal and mud off-site. The third required the licensee to assess site performance against best practice for reducing coal dust; and
- the EPA sent Coalpac a Warning Letter for tracking material on to the Castlereagh Highway in 2011.

The EPA advised it has not considered it necessary to issue any Penalty Infringement Notices to Coalpac.[17]

Between 2001 and 2006 Invincible Colliery was placed on Care and Maintenance while it was in the ownership of Coalpac.

In 2008 Coalpac was fined $200,000 and agreed to pay the prosecution's $55,000 costs following proceedings in the Land and Environment Court.[18] The fine was imposed by the Court as Coalpac produced 635,277 tonnes of saleable coal at the Invincible Colliery between 7 September 2006 and 6 September 2007, being some 80% more than the 350,000 tpa permitted under its then approval and contravening its conditions of consent. As outlined above, subsequent approvals at the Invincible Colliery have significantly increased the production limits.

Coalpac has advised that the mines' operations have almost exhausted its approved coal extraction and that by early 2013 both mines will close, resulting in job losses. However, not all of the approved coal resource has been extracted, including the approved Hillcroft open-cut coal resource to the west of the Castlereagh Highway, although an expanded Hillcroft open-cut area and an overpass of the Wallerawang-Gwabegar Railway forms part of the current project application. The EA also states that underground mining of the Irondale and Lithgow Seams east of Castlereagh Highway is 'sub-economic' due to access issues via the Irondale Seam and the low quality of coal.[19]

4.2 Site Surrounds – Existing and Future Operations

4.2.1 Existing Operations

There are a number of coal mines within 25km of Coalpac's Invincible Colliery and Cullen Valley mines. These are summarised in the EA and form the basis for the summary below.[20] Many of the mines referred to below are shown in Figure 3-1.

Adjoining to the north-east is the Baal Bone Colliery owned by a company called Wallerawang Collieries Ltd which is effectively majority-owned by Xstrata.[21] Baal Bone has approval for underground mining of up to 2.8 Mtpa ROM coal until the end of 2014, but mining ceased in 2011. The site is currently used as an underground mining training facility for Xstrata employees.[22]

[17] EPA, letter to PAC, 24 October 2012, p.7
[18] Minister for Planning v Coalpac Pty Limited [2008] NSWLEC 271
[19] EA, Vol.1, Section 3.1.3 p.26
[20] EA, Vol.1, Section 2.2.2 and Table 1.
[21] Xstrata Coal, http://www.xstratacoal.com/EN/Operations/Baalbone/Pages/BaalBone.aspx
[22] Xstrata Coal, http://www.xstratacoal.com/EN/Operations/Baalbone/Pages/BaalBone.aspx

Approximately 5km to the south-east is Pine Dale mine which was acquired in 2012 by Energy Australia.[23] Pine Dale mine, including its Yarraboldy Extension, has approval for open-cut mining at a rate of 350,000 tpa ROM to a maximum of 800,000 tonnes for the life of the approval.[24] After modification of the Yarraboldy Extension approval, this permission will expire on 31 December 2014. A potential further expansion of the mine is discussed in section 4.2.2.2 below.

To the west, south and south-east are the following coal mines owned by Centennial Coal Company:

- the open-cut mine at Ivanhoe North Colliery had approval to extract 300,000 tpa (ROM), which expired on 2 May 2012, although rehabilitation of the site is continuing with some associated vehicle movements.
- Angus Place/Springvale has approval for underground mining at a combined rate of 6.9 Mtpa of ROM coal until 1 September 2025 (at Springvale) at the latest;
- Airly Mine some 17km to the north has approval to extract 1.8 Mtpa through underground mining until 21 August 2014; and
- Clarence Colliery approximately 25km to the south-east has approval to extract up to 3 Mtpa until the end of 2026 through underground mining methods. [25]

As a comparison, under existing approvals the Cullen Valley Mine and Invincible Colliery combined are permitted to produce up to 2.2 Mtpa product coal.[26] Of this, a maximum of 450,000 tpa may be directed to markets other than the MPPS.

4.2.2 Future Operations

4.2.2.1 Neubeck Coal Project

Centennial Angus Place Pty Ltd is the Proponent for the Neubeck Coal Project. An application, with a briefing paper dated September 2012, has been submitted to the Department requesting issue of the Director-General's Requirements (DGRs).[27]

The Neubeck Coal Project is located south of the project area outside of the Ben Bullen State Forest. The application (SSD 12_5598) seeks approval to produce ROM coal at a rate of up to 1.2 Mtpa for approximately 8 years using open-cut and highwall mining methods.

According to the information available to date, the market would be predominantly domestic, and the project would provide employment for up to 65 full time equivalent personnel.

4.2.2.2 Pine Dale Coal Project - Stage 2 Extension

Enhance Place Pty Limited is the Proponent for the Pine Dale Coal Project Stage 2 Extension application (SSD-5086), although Energy Australia advised the Commission on 17 October 2012 it now owns the mine. Director-General's Requirements for the project were issued on 10 February 2012, however the Environmental Assessment has not yet been submitted to the Department.

As set out in documents available on the Department's website the proposal would encompass:

- the original Pine Dale Coal Mine (82ha);
- the approved Yarraboldy Extension area (Stage 1) (27ha);

[23] Energy Australia, http://www.energyaustralia.com.au/about-us/what-we-do/power-generation/gas-plants/pine-dale-mine and Energy Australia, meeting with PAC, 17 October 2012
[24] Department application reference 10_0041, http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=3870
[25] EA, Vol.1, Table 1
[26] EA, Vol.1, pp.23,27
[27] Department application reference SSD 12_5598, http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=5598

- a Stage 2 Extension area (approximately 210ha); and
- the Rail Corridor.[28]

The project life would be approximately 10 to 15 years and extract approximately 14.2 Mt of ROM coal up to a maximum 2.0 Mtpa of product coal by open-cut mining methods. The project is expected to generate employment for an additional 60 on-site employees when the mine is operating at maximum capacity.[29]

4.3 Mount Piper and Wallerawang Power Stations

Mount Piper Power Station (MPPS) is approximately 4km south of the Invincible Colliery, and Wallerawang Power Station (WPS) is approximately 10km to the south-east.

Mount Piper Power Station (MPPS) is an electricity generation plant that was commissioned in the early 1990s which is run by two 700 Megawatt (MW) coal-fired steam turbine generators. Two additional generators were approved for the MPPS, but these have never been constructed. The Wallerawang Power Station (WPS) began operation in 1957. It is also a coal-fired power station with two 500 MW generating units.[30] The combined capacity of both power stations is up to 2,400 MW.

The application would supply up to 2.625 Mtpa product coal to the MPPS via a proposed conveyor system from the Invincible Colliery through an existing electricity easement to the MPPS.[31] Under the current approvals for Cullen Valley and Invincible Colliery up to 2.2 Mtpa, as a maximum and assuming no direction of coal to other markets, could be transported to the MPPS via public roads. Therefore, the proposal could provide an additional 425,000 tpa to the MPPS, and from year 2 upon completion of the conveyor system it would remove the need for truck haulage on public roads to the MPPS unless there is a system malfunction. The WPS may also receive coal from the mines as an alternate domestic user, but this would be capped at a maximum 0.45 tpa assuming there are no other non-MPPS domestic recipients. The EA refers to *'emergency road supply to WPS'*.[32]

Both power stations are owned and operated by Delta Electricity which provided correspondence in support both as part of the EA and also in response to the exhibition of the EA. Delta Electricity in its submissions advises that the MPPS and WPS combined consume some 6.0 Mtpa of coal and supply approximately 8% of the total generation in the National Electricity Market.[33] The National Electricity Market incorporates five regions, being New South Wales (including ACT), Victoria, South Australia, Queensland and Tasmania.[34]

According to Delta Electricity, the Invincible Colliery has supplied coal to both power stations at intervals over many years, and Cullen Valley has continuously provided coal to MPPS since 2000.[35] Delta Electricity also advises that Cullen Valley and Invincible Colliery combined at time of writing (November 2011) provided approximately 25% of the total coal consumed at the MPPS and WPS.[36]

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[28] Department application reference SSD-5086, http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=5086

[29] R.W Corkery and Co Pty Ltd 2011, *Documentation Supporting an Application for Director-Generals Requirements for the Pine Dale Coal Mine Stage 2 Extension,* December, p.1. Available at: http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=5086

[30] Delta Electricity, www.de.com.au

[31] EA, Vol.1, Section 4.8.3

[32] EA, Vol.1, p.267

[33] EA, Vol.1, Appendix D. Delta Electricity, letter, 25 November 2011, p.3

[34] Delta Electricity, www.de.com.au

[35] EA, Vol.1, Appendix D. Delta Electricity, letter, 25 November 2011

[36] EA, Vol.1, Appendix D. Delta Electricity, letter, 25 November 2011

Delta Electricity advises that if Coalpac is forced to cease operations there would be no obvious replacement from within the Western Coalfield due to existing contractual agreements, and that coal would therefore need to be sourced from elsewhere. This would, in Delta's view, cause a *'rise in the wholesale electricity price with a consequent increase in retail prices'*.[37] In addition, Delta considers it could be expected there would be a resultant loss of direct and indirect jobs in the region, and that this would potentially result in a partial shutdown of the Western capacity leading to job losses at Delta which employs some 270 people in the region.[38]

Although Delta Electricity owns and manages both the MPPS and WPS, TRUenergy (now Energy Australia) acquired the Delta West 'Gen-Trader' contract which provides it exclusive rights to trade the electricity output of both power stations, and it has also assumed responsibility for sourcing the fuel for both the MPPS and WPS.[39] Energy Australia has made similar submissions to Delta Electricity in relation to the project. The Energy Australia submissions are considered in detail in section 8.6.3 of this review report.

Both Delta Electricity and Energy Australia have made reference to Delta Electricity's Western Rail Coal Unloader and its role in securing long-term coal supplies particularly from the Gunnedah/Cobbora region. The loading facility was approved on 27 June 2009 with a condition requiring commencement of works within ten years, and restricting the maximum coal received to 8 Mtpa subject to compliance with noise related conditions.[40] Both companies consider this will broaden long-term coal supply options for the MPPS and WPS, but that there are a number of issues with expanding the rail corridor up towards Cobbora including estimated associated construction costs of some $310m and a project timeframe of approximately four years.[41] Both companies advise that local coal supplies remain important in both the short and long-term.[42]

4.4 Coalpac's Justification for the Project

Section 10 of the EA sets out the Proponent's justification for the project in full. The Commission's summary of this material is:

- there is a current and continuing need for coal to meet basic energy needs and in particular electricity generation;
- the project would provide a local and reliable coal resource for the MPPS and WPS and help maintain wholesale/retail electricity prices;
- the mines provide coal of certain characteristics for small speciality markets (e.g. Manildra Group Shoalhaven Starches);
- the mines have developed a workforce, plant and infrastructure that are in place to support the continuation of operations and maximise the value of an in-situ coal resource, representing an efficient use of land and resources;
- employment generation and opportunities;
- economic generation within the local and broader community to support the workforce and mining operations;
- consolidation and expansion will increase efficiencies of both mines and assist in optimal mine planning including addressing environmental and social concerns (e.g. reduction in road haulage, a comprehensive mine closure plan);

[37] EA, Vol.1, Appendix D. Delta Electricity, letter, 25 November 2011, p.3
[38] EA, Vol.1, Appendix D. Delta Electricity, letter, 25 November 2011, p.4
[39] EA, Vol.1, Appendix D. TRUenergy letter, 23 November 2011.
[40] http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=27
[41] TRUenergy, meeting, 17 October 2012
[42] EA, Vol.1, Appendix D. Delta Electricity, letter, 25 November 2011, p.4 and EA, Vol.1, Appendix D. TRUenergy, letter, 23 November 2011 and meeting, 17 October 2012

- the disturbance to the State Forest will be offset, and the disturbed area constitutes only some 1.3% of the total potential Gardens of Stone Stage II area; and
- there is a shortage of construction sand.[43]

The Commission has considered these claimed social, environmental and economic benefits of the project, and the disbenefits arising from its various impacts, in sections 5-9 below.

[43] EA, Vol.1, Section 10.1-10.4

5 Local Health and Amenity (Term of Reference 1(b)(i))

The terms of reference request that the Commission assess the local health and amenity impacts of the project, with particular regard to dust, noise and blasting impacts noting the project area's close proximity to Cullen Bullen village.

5.1 Air Quality

5.1.1 Introduction

Although the region has been subjected to coal mining for over 100 years, both the extent and nature of mining has changed over this period. The number of mines has increased along with the intensity of mining and there has been a transition from underground to open-cut mining. The current proposal is to increase the extent of mining including expansion of open-cut areas and highwall mining. Open-cut mining in particular is a major potential source of air emissions mainly due to the large area of disturbed land necessary for this type of mining. The proximity of the proposed mining activities to residences and the village of Cullen Bullen village has been considered carefully by the Commission.

In addition the Commission has considered the cumulative impacts from other mining activities in the region and from proposed future mines. Studies in other mining regions, for example the Upper Hunter, have shown that excessive air pollutants can impact on health and amenity as well as impacting on the social and economic structure of affected communities.[44] There have also been calls for a more intensive health impact study in the Upper Hunter. For these reasons the Commission has carefully considered the impacts of potential air pollution on health and amenity.

5.1.2 Air Quality Criteria

The relevant air quality criteria for particulates normally adopted by the Department and adopted by the Proponent in the EA are derived from the following sources and the relevant criteria are summarised in the tables below:

- the National Environment Protection Council (NEPC) which sets national air quality standards for environmental pollutants;
- the NSW Environment Protection Authority, (EPA) which specifies air quality criteria for NSW; and
- National Health and Medical Research Council (NHMRC).

A standard requirement in planning approvals is that all reasonable and feasible avoidance and mitigation measures are employed so that the project does not cause or contribute to exceedence of the criteria listed in Tables 5-1, 5-2 and 5-3 (all on the following page) at any residence on privately owned land or on more than 25 percent of any privately owned land not otherwise listed for acquisition. Recently the Commission has inserted a definition of *'reasonable and feasible avoidance and mitigation measures'* to include, but not be limited to, the requirements in any relevant conditions including to develop and implement a real-time air quality management system that ensures effective operational responses to the risks of exceedence of the criteria.[45]

[44] NSW Health, submission to the EA, 29 May 2012

[45] e.g. See Condition 29 of Schedule 3 of the Maules Creek Coal Project Approval, October 2012

Table 5-1: Long-term Criteria for Particulate Matter

Pollutant	*Averaging Period*	*[d] Criterion*
Total suspended particulate (TSP) matter	Annual	[a] 90 µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	[a] 30 µg/m^3

Table 5-2: Short-term Criteria for Particulate Matter

Pollutant	*Averaging Period*	*[d] Criterion*
Particulate matter < 10 µm (PM_{10})	24 hour	[a] 50 µg/m^3

Table 5-3: Long-term Criteria for Deposited Dust

Pollutant	*Averaging Period*	*Maximum increase in deposited dust level*	*Maximum total deposited dust level*
[c] Deposited dust	Annual	[b] 2 g/m^2/month	[a] 4 g/m^2/month

Notes to Tables 5-1, 5-2 and 5-3:

- *[a] Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to all other sources);*
- *[b] Incremental impact (i.e. incremental increase in concentrations due to the project on its own);*
- *[c] Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method.*
- *[d] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity which has been endorsed by OEH and then agreed to by the Director-General.*

5.1.2.1 Mine-Specific Air Quality Criteria

Table 5-4 lists the criteria for particulate matter emissions generated by the project alone at any residence on privately owned land or on more than 25 percent of privately owned land not otherwise listed for acquisition.

Table 5-4: Short-term Criteria for Particulate Matter

Pollutant	*Averaging Period*	*Criterion*
Particulate matter < 10 µm (PM_{10})	24 hour	50 µg/m^3

5.1.2.2 Air Quality Acquisition Criteria

Normal practice for planning approvals has been to adopt the following criteria for acquisition of properties where the air quality criteria are not met. If particulate matter emissions generated by the project cause or contribute to exceedence of the cumulative criteria, in Tables 5-5, 5-6 and 5-7 (all on the following page) at any residence on privately-owned land, or on more than 25 percent of any privately-owned land, then upon receiving a written request for acquisition from the landowner, the Proponent shall acquire the land in accordance with other relevant conditions.

Table 5-5: Long-term Land Acquisition Criteria for Particulate Matter

Pollutant	*Averaging period*	*[d] Criterion*
Total suspended particulate (TSP) matter	Annual	[a] 90 µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	[a] 30 µg/m^3

Table 5-6: Short-term Land Acquisition Criteria for Particulate Matter

Pollutant	*Averaging period*	*[d] Criterion*
Particulate matter < 10 µm (PM_{10})	24 hour	[a,] 150 µg/m^3
Particulate matter < 10 µm (PM_{10})	24 hour	[b] 50 µg/m^3

Table 5-7: Long-term Land Acquisition Criteria for Deposited Dust

Pollutant	*Averaging period*	*Maximum increase in deposited dust level*	*Maximum total deposited dust level*
[c] Deposited dust	Annual	[b] 2 g/m^2/month	[a] 4 g/m^2/month

Notes to Tables 5-5, 5-6 and 5-7

[a] Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to all other sources);

[b] Incremental impact (i.e. incremental increase in concentrations due to the project on its own);

[c] Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method;

[d] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, or any other activity agreed by the Director-General.

The Proponent has adopted these criteria in the EA. The Commission considers the criteria are appropriate with the exceptions of the proposed level of 150 µg/m^3 24-hour average PM_{10} in Table 5-6 (discussed further in section 5.1.6 of the Commission's report) and the proposed level of 30 µg/m^3 annual average PM_{10} in Table 5-5 (discussed at 5.1.4 and also at 5.1.6).

5.1.3 Modelling

The EPA submission on the EA raised concerns about the methodology for prediction of particulate emissions.[46] Specifically,

- the Air Quality Impact Assessment provided no site specific parameterisation to qualify emission variables;[47]
- the wind blown dust emission estimation techniques did not use the most up to date methods, and;
- the emission control efficiencies used in the assessment.

5.1.3.1 Parameterisation of Emission Variables

Emission estimation requires certain characteristics such as moisture content and silt content to be included to enhance the reliability of estimations and the EA provides no information to support the correct use of these variables. This limits the ability to verify the predictions in the EA. In its Response to Submissions (RTS) the Proponent states that relevant parameters including silt and moisture will be included in the Air Quality Management Plan (AQMP), when and if the project is

[46] EPA, submission to EA, 4 June 2012
[47] EA, Vol.2, Appendix G

approved.[48] A subsequent EPA letter dated 14 September 2012 accepted this response from the Proponent. The Commission, however, is concerned that it may not be practical to provide any additional mitigation measures if the parameters used in the final AQMP show that the original assessment underestimated the emissions. The Commission therefore recommends these estimates be reassessed using the appropriate emission variables prior to any final approval for the project.

Recommendation 1 : The Commission recommends that the emission estimate predictions should be updated and reconfirmed using the most relevant emission variables as recommended by the EPA prior to any determination of the project.

5.1.3.2 Wind Blown Emissions

The EA assessment for wind blown emissions was based on 1983 State Pollution Control Commission (SPCC) material of 0.4kg/hr/ha rather than the more relevant USEPA AP 42 (2006) guidance recommended by the NSW EPA. The EPA suggests that the method used in the EA may result in a significant underestimation of dust emissions. In the RTS the Proponent calculated wind blown emissions using both the SPCC and the US EPA methodology and say they used the most conservative results.[49] The EPA in its response maintains some disagreement with the assessment but says it would result in a minor discrepancy with little significance and therefore the EPA now accepts the wind blown emissions estimates.[50]

5.1.3.3 Emission Control Efficiencies

The EPA notes the EA assumption of 75 per cent control of dust on haul roads using 'level 2 watering' and suggests the assessment may underestimate the actual emissions in practice. Again the EPA disagrees with the assessment in detail but states the discrepancy is minor and of little significance to the overall emission of particulates.

In summary the EPA now accepts the Proponent's response to the modelling and predictions for the purposes of assessment of the project. The Commission accepts this with the proviso that the emission estimate predictions should be updated and reconfirmed using the most relevant emission variables prior to any final determination of the project.

As with noise which is considered in section 5.2, it is important to have a high confidence in the predicted air quality levels because of the heavy reliance by the Proponent on a large range of mitigation measures and the failure of any of these possibly resulting in additional exceedences of the air quality criteria.

The Commission notes the air quality modelling is based on limited existing air monitoring data for the mine. The Air Quality Impact Assessment (AQIA) shows the existing air monitoring network for PM_{10} consists of two Hi volume air samplers, one located at the southern end of the Cullen Valley mine site, near the Cullen Bullen village and the other at the southern side of the Invincible Colliery site.[51] Hi volume air samplers provide limited 6-day data compared to continuous air monitors used at most open-cut mining operations. The AQIA states that the air quality monitoring program was established in 2004 but that '*PM_{10} concentration measurements from the Cullen Valley and Invincible HVASs have been made available from February 2008 to July 2010.*'[52] One submission questioned why data prior to 2008 or post July 2010 was not provided or used. No explanation for this was provided in the EA or AQIA.

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[48] Hansen Bailey 2012, *Coalpac Consolidation Project: Environmental Assessment Response to Submissions for Coalpac Pty Ltd,* August, Section 4.2.4
[49] RTS, Section 4.2.4
[50] EPA, submission to RTS, 14 September 2012
[51] EA, Vol.2, Appendix G, Figure 6.2
[52] EA, Vol.2, Appendix G, Section 6.6.1

5.1.4 Predicted Air Quality Impacts

The Commission notes the prediction in the EA that there will be general compliance with the air quality criteria with some exceedences as summarised below. Prediction of air quality exceedences requires consideration of many variables including mining activities, exposed land surfaces and weather variability and the accuracy of the predictions relies heavily on the degree of confidence of each of the variables. The Proponent claims they have used worst-case scenarios for modelling predictions of exceedences and that these should be able to be managed by the proposed real time monitoring and response system and Air Quality Management Plan. The Proponent acknowledges the challenges in achieving this in the RTS which states *'Coalpac acknowledges that it is paramount that an effective AQMP is developed and implemented for the Project. This AQMP will not remain static but develop and adapt over time as operations change over the life of the Project'*.[53] This creates some question over the certainty of the predictions that can be made in the EA and the capacity of the available mitigation strategies to keep the project within the criteria.

The EA has predicted 17 properties would have some exceedence of the air quality criteria at some stage. The Proponent advises that nine of these are now owned by Coalpac or under negotiation for purchase, two are owned by the Crown or Government and the remaining five are privately owned.[54] The latter five would experience some exceedences of the 24-hour PM_{10} criterion at various stages during the life of the project. The Proponent claims that these exceedences would be 'small and infrequent' and would be managed as part of the AQMP real-time monitoring system.

The Commission notes that the predicted PM_{10} 24-hour average, 50µg/m^3 contour is very close to the Cullen Bullen village.[55] The conclusion drawn in the EA is that the residents in Cullen Bullen are outside the 50µg/m^3 contour and therefore meet the criteria. The Commission notes, as with noise, that achievement of the predicted air quality levels relies on a large suite of control measures and a real-time management system, and failure of any of these could result in exceedence of the acceptable air quality criteria in Cullen Bullen.

Many submissions from the public and agencies expressed concerns about the possible impact on amenity and health from air pollution from the project. A medical practitioner, Dr Stiles provided a comprehensive submission summarising existing health issues in the region.[56] He cited health data showing the Lithgow LGA has above state average rates of respiratory disease (e.g. asthma, chronic obstructive pulmonary disease), cardiovascular diseases, metabolic diseases, renal disease and slightly higher cancer rates and stated, '*Significantly, the Lithgow LGA has a premature mortality rate that is 30 per cent above the NSW state average'*. He concludes that increased air pollution from the proposed open-cut mining will exacerbate the health problems that already exist in this community.

NSW Health has raised concern about the predicted incremental increase in PM_{10}s, (fine particles less then 10 microns in size), in Cullen Bullen during the life of the project and notes World Health Organisation (WHO) estimates of increased mortality with increases in PM_{10}. The NSW Health submission dated 12 September 2012 notes the WHO annual goal of less than 20µg/m^3 would be exceeded in parts of Cullen Bullen village. NSW Health advised a linear relationship exists between particulate matter exposure and health effects, and suggests the predicted 30-100 percent increase in exposure to particulate matter for residents of Cullen Bullen may result in increased respiratory and pulmonary problems including asthma and increase the mortality risk by three per cent.

[53] RTS, Section 4.2.18
[54] RTS, Section 4.2.15. The Commission notes this does not total 17
[55] EA, Vol.1, Figure 24: Air Quality Contours (Worst Case All Year)
[56] Dr Stiles, submission to EA, 31 May 2012

In its submission, NSW Health advised there is no safe level for PM_{10} and recommended that should the project be approved all feasible measures be adopted to minimise exposure of particulate matter to residents of Cullen Bullen. In this context NSW Health emphasised that, since the medical literature demonstrates a relationship between incremental increases in PM_{10} average levels and health effects, efforts to control exceedences of peak levels may not be effective in reducing this risk. This calls into question reliance on Real Time Air Quality Management Systems as the potential panacea for air quality problems from open-cut mines.

$PM_{2.5}$ particles are very small particles less than 2.5 microns in diameter. The $PM_{2.5}$ 24-hour advisory level has been discussed in the EA and has been raised in several submissions, including by NSW Health. The $PM_{2.5}$ level has been set by NEPC as an advisory reporting standard and no mandatory level has yet been adopted by NSW or at the national level. The advisory levels of 25µg/ m^3 (24-hour average) and 8µg/ m^3 (annual average) are also consistent with WHO guidelines. The Commission considers it important to take $PM_{2.5}$ into account when considering the impacts on the community. The predicted $PM_{2.5}$ have been shown in the EA but not related to the advisory standard.[57] However the RTS advised that two private residences (ID196 and 197) would exceed the 24-hour level in one year.[58] Coalpac is negotiating agreement with both these residents. No exceedences of the $PM_{2.5}$ criteria are predicted for the village of Cullen Bullen and the Proponent has committed to monitor $PM_{2.5}$ and PM_{10} in the vicinity of the Cullen Bullen Public School.

The Commission is aware of the growing medical evidence concerning the health impacts of $PM_{2.5}$ but notes there is still debate about whether emissions from open-cut coal mines are likely to contain significant levels of $PM_{2.5}$ particles.[59] The Commission therefore considers it would not be appropriate to apply a $PM_{2.5}$ criterion for this project but it would be prudent to adopt all reasonable and feasible measures to minimise $PM_{2.5}$ emissions and to monitor these emissions in the community as proposed in the EA. It should also be made clear that if a national standard is adopted for compliance purposes it would be expected to be incorporated into the EPL for the project at the appropriate time.

The submission by NSW Health on the EA suggested long term impacts of both fine and coarse particles can increase the risk of health impacts on the respiratory system as well as the cardiovascular system, and referred to recent research that heightens concerns about the coarser $PM_{2.5-10}$ particles.[60] NSW Health submission recommended that Coalpac further evaluate measures to prevent or minimise all dust impacts.[61]

In its RTS the Proponent states that the size of the particles determine their behaviour in the respiratory system, and shows in Figure 3 that the finer particles, $PM_{2.5}$ are deposited in the trachea and lungs while the coarser particles greater then $PM_{2.5}$ are deposited in the nose and mouth.[62] The implication here is that the dust from mining is of less concern because it is predominantly composed of coarse particulate matter (and larger particles). A further submission from NSW Health dated 12 September 2012 provided additional documented information about the potential health impacts of the coarser particulates, i.e. the $PM_{2.5-10}$ fraction and suggested the RTS did not address this concern adequately. NSW Health's review suggested coarse particulate matter ($PM_{2.5-10}$) can have a similar impact to the finer particulates on the lungs and cardiovascular system.

[57] RTS, p.12 and EA, Vol.2, Appendix G, Appendix D (of the AQIA)
[58] RTS, p.39
[59] NSW Planning Assessment Commission 2012, *Boggabri Coal Mine Expansion Project Determination Report*, 18 July, NSW Planning Assessment Commission, Sydney.
[60] RTS, Section 4.2.18
[61] NSW Health, submission to EA, 29 May 2012
[62] RTS, Section 4.2.20

The Commission sought a meeting with NSW Health to seek further justification of their concerns and met with senior officers on 15 November 2012. NSW Health summarised its position on the following issues in this meeting:

1. The air monitoring network upon which the assessment is based is not robust, for example there is no regional air monitoring network and only two Hi volume air samplers are available that do not measure continuous or daily air quality.
2. The existing community is socially disadvantaged with higher than average respiratory disease.
3. PM_{10} are the main concern from open-cut mines rather than $PM_{2.5}$s and the coarser fraction of PM_{10}, i.e. $PM_{2.5}$ to PM_{10} does cause respiratory and other health impacts.
4. The annual exposure is of particular concern. The WHO annual exposure goal of 20µg/ m^3 is based on health considerations unlike the adopted NEPC and NSW goal of 30µg/ m^3. By comparison Sydney is currently at approximately 20µg/m^3 and the project would increase the annual average in Cullen Bullen from 13 to above 20µg/ m^3.
5. This predicted increase in PM_{10} exposure has related health risks. Studies have confirmed there is no 'safe' level of PM_{10}s and there is a linear relationship between the increase in PM_{10} exposure and increases in mortality and morbidity.[63] The predicted increase in exposure at Cullen Bullen caused by the project is 30-100 percent. This is rare in NSW Health's experience and will cause adverse health impacts.
6. The proposed real-time air quality management system will be more targeted towards short term actions to manage peaks in emissions and may do little to reduce the annual average exposures.

NSW Health also provided the Commission with a published scientific review of the health effects of coarse particles.[64]

The Commission notes the concerns raised by NSW Health and the Proponent's reliance on a large suite of equipment attenuations, day to day operational variations, monitoring, predictive and reactive measures to achieve the predicted levels. The Commission's concern is similar to that outlined in relation to noise (section 5.2.3.1) and the potential for human or equipment failure of any of these would increase the risk of increased air emissions.

Some submissions including Lithgow City Council have requested that the internal haul road be sealed to minimise dust emissions. The AQIA indicates that uncontrolled haulage emissions would be 3,680,628 kg/yr but that with regular watering the expected emission rate from haulage will be 920,157kg/yr.[65] This 75 percent reduction will rely on regular, Level 2, watering. Based on the RTS, it is better to wet often than soak infrequently.[66]

The Commission acknowledges the haul road is a large potential source of emissions but understands it is not general practice to seal internal haul roads for open-cut mines. The Commission accepts the Proponent's response that the internal road system has transient haul roads and it would not be practical to seal the roads. However, it will be critical that the proposed road watering and dust suppression measures are maintained and operating at all times to control dust from the internal unsealed roads if the predicted particulate levels are to be achieved.

[63] NSW Health, submissions dated 29 May 2012 and 12 September 2012

[64] Sheppeard, V, Puntsag, O & Capon, A of the Environmental Health Branch, NSW Health 2007, *Health effects of coarse particles*, Proceedings of the 14th International Union of Air Pollution Prevention and Environmental Protection Associations (IUAPPA) World Congress, 9-13 September, Brisbane.

[65] EA, Vol.2, Appendix G, Section 11.3

[66] RTS, Section 4.2.12

5.1.5 Cumulative Impacts

The AQIA assessed the cumulative impacts from the project and other current and potential sources but noted difficulties that could affect the accuracy of the assessment;

> *'It is difficult to accurately predict the cumulative 24-hour PM_{10} concentrations using dispersion modelling due to the difficulties in resolving (on a day to day basis) the varying intensity, duration and precise locations of activities at mine sites, the weather conditions at the time of the activity or combination of activities'* and '*The difficulty in predicting cumulative 24-hour impacts are compounded by the day to day variability in ambient dust levels and spatial and temporal variation in any other anthropogenic activity, including mining in the future.'*[67]

The AQIA states it used assumed worst-case assumptions consistent with standard methods for air quality assessments.[68]

Notwithstanding these difficulties, the EA considered the potential for cumulative impacts from other sources in the area. These included the Ivanhoe North Colliery, Pine Dale Mine (Yarraboldy Extension) and the Baal Bone Colliery.

Modelling shows that several properties will be impacted by emissions from the project alone as well as some contribution from other sources, although the Commission was unable to differentiate between predictions for PM_{10} 24-hours for the project alone versus total emissions from all sources from the information in the EA and AQIA.[69]

The EA states that should Ivanhoe North Colliery, Pine Dale (Yarraboldy Extension) 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 operating simultaneously.[70] The conclusion drawn is that the contribution from other sources is likely to be minor. There is further information in Appendix G, Air Quality Impact Assessment (Section 7.2). This section discounts any cumulative impacts for PM_{10} 24-hour from the following mines:

- Ivanhoe North because it will not be in operation simultaneously with Coalpac;
- Pine Dale Yarraboldy Extension because there are few winds from the south east (the direction of Pine Dale from Coalpac), the predicted PM_{10} 24-hour contours show a worst-case level of 50ug/m3 two kilometres from the closest sensitive receptor to Coalpac's current operations, and it would only operate simultaneously with Coalpac for the first two years and production is expected to be limited during this period; and
- Baal Bone colliery because it will be operational in year two of the Coalpac project but because it is an underground mine the cumulative impact is low and has not been included in the assessment.

A number of submissions, including one from The Blue Mountains Conservation Society, raised the issue of cumulative impacts affecting air quality and pointed out that the EA did not address the proposed Pine Dale Stage 2 extension that is in close proximity to Coalpac.[71] The Department confirmed in a meeting with the Commission that the Department had issued Director-Generals Requirements for the proposed Pine Dale extension on 10 February 2012, but no development

[67] EA, Vol.2, Appendix G, Section 8.3.1.1
[68] EA, Vol.2, Appendix G, Section 13
[69] EA, Vol.1, Section 8.3.3
[70] EA, Vol.1, Section 8.3.3
[71] Blue Mountains Conservation Society, submission, 26 May 2012 and the Colong Foundation for Wilderness, public hearing, 19 September 2012

application has yet been submitted to the Department. The section of the EA dealing with cumulative impacts makes no mention of the possibility of this mining project. As the Pine Dale Stage 2 Extension is some 4 or 5 kilometres south east of the Coalpac project it is possible there could be additional cumulative impacts to those predicted. Prior to final determination of the project an assessment of the cumulative impacts from the Pine Dale Stage 2 Extension should be considered.

The current air quality around Cullen Bullen is relatively good based on the information contained in the EA. The average annual PM_{10} is 12.8µg/m3[72] compared to the EPA criteria of 30 and WHO goal of 20µg/m3. The average PM_{10} 24-hour is below 20µg/m3 with two potential mine related instances above the EPA criteria of 50µg/m3 between 2008 and 2010. The project alone will increase these particulate levels, in several cases above the air quality criteria where acquisition of properties is required and NSW Health has already expressed strong concern about the predicted increase in annual PM_{10} concentrations in the village of Cullen Bullen. While it may not be possible to predict with certainty the cumulative impact of future proposed mines, it should be noted that approval of the Coalpac Project could result in limitations to future proposed mining related developments because of the limited capacity of the airshed to accommodate additional particulate emissions within the acceptable air quality criteria.

5.1.6 Acquisition of Properties

Acquisition of properties is considered a last resort where acceptable air (or noise) quality criteria cannot be achieved using all feasible and reasonable measures. The general practice in NSW for dealing with predicted exceedences of the air quality criteria has been for the landowner to have the option for the Proponent to acquire the property where the air quality criteria are predicted to be exceeded or where they have repeated exceedences in practice at the residence or on more than 25 percent of any privately owned land. The Proponent has advised it has acquired or is in the process of acquiring properties where the relevant criteria are predicted to be exceeded.

The Commission notes that for PM_{10} the practice has been to provide for an option for acquisition where the 24-hour incremental impact in concentration due to the project on its own is 50µg/m^3 or where the total concentration from all sources is greater then 150µg/m^3.

The Commission addressed this issue in some detail in its Determination Report for Boggabri.[73] The relevant section is repeated here for information:

> *'Table 15 in the Department's recommended conditions of approval uses 150 µg/m^3 as the acquisition criteria for cumulative 24 hour PM_{10} accumulation. The source of this figure is the US EPA. However, the Commission's search of PM_{10} standards worldwide suggests that only the US uses this standard. All other jurisdictions appear to use 50 µg/m^3. The Commission also notes that the US standard is under review.*
>
> *The Commission is aware that this standard has been used in coal mine approvals for a long time. However, the health effects of airborne particulate matter are becoming increasingly well documented. The National Environment Protection (Ambient Air Quality) Measure Review Report, prepared for the National Environment Protection Council, dated May 2011 states that:*
> *The health effects of both PM_{10} and $PM_{2.5}$ include:*
> - *increases in daily mortality*
> - *estimates of 0.12-0.8% increase per 10 µg/m^3 of PM_{10} for all causes of mortality*

[72] EA, Vol.2, Appendix G, Section 6.6.1
[73] PAC, 2012, Boggabri Coal Mine Expansion Project Determination Report

- *Australian studies show 0.2 % increase per 10 µg/m^3 of PM_{10} for all cause of mortality*
- *much stronger evidence now for particles causing cardiovascular disease*
- *some heterogeneity in effects*

If PM_{10} levels were to reach a 24 hour average of 150 µg/m^3 this would result in an air quality index (AQI) value of 300. The NSW Health website indicates that an Air Quality Index of 200+ is classed as Hazardous and everyone is advised to "significantly cut back on outdoor physical activities". There is no higher AQI category than Hazardous. Consequently it appears that if residents were relying on the 24 hour average of 150 µg/m^3 criteria for protection, they would be exposed to hazardous air conditions well before this level was triggered.

Although the Commission has accepted the Department's recommended condition for this project approval, the Commission considers that the relevant State agencies should review the use of this standard as a matter of some urgency since there may soon be no basis for its retention (e.g. if the US EPA review modifies the standard) and the implication of this for mining approvals in some parts of NSW may be significant. In this context the Commission notes the increasing level of health concerns relating to particulate matter and that in some centres 24 hour PM_{10} measurements already exceed 150 µg/m^3 on many days of the year.'

NSW Health objected to this acquisition criterion in its meeting with the Commission. The EPA in its letter to the Commission dated 30 October 2012 said it has concerns with the 150 µg/m^3 acquisition criteria and will progress discussion with the Department and NSW Health to work through this particular issue with the intention of developing an updated acquisition framework.

Given the concerns expressed by NSW Health regarding new evidence about the adverse health impacts from PM_{10} and the most recent EPA advice, the Commission considers the acquisition option for average 24-hour PM_{10} should be reviewed and possibly reduced having regard to the NEPC standard of 50 µg/m^3 and more recent information from NSW Health.

In the same vein the Commission considers that it is difficult to justify retention of the NEPC/EPA standard of 30 µg/m^3 annual average PM_{10} in the face of the advice from NSW Health regarding health-based WHO PM_{10} goal of 20 µg/m^3 annual average. This should also be reviewed.

Recommendation 2: The Commission recommends the current acquisition criterion for PM_{10}s, 150 µg/m^3 24-hour average from all sources, should be reviewed from a health perspective given the NEPC criteria of 50 µg/m^3 and more recent advice from NSW Health about mortality and morbidity impacts. This should be done in consultation with NSW Health and the EPA prior to any final approval for the Coalpac project.

Recommendation 3: The Commission recommends the NSW long-term acquisition criterion for annual average particulate matter less than 10 microns (PM_{10}) of 30 µg/m^3 should be reviewed against the WHO goal of 20 µg/m^3 for this parameter.

In the context of cumulative impacts it should be noted that NSW Health recently put forward strong arguments that new entrants should not be permitted to add emissions to an airshed that was already exceeding the health criteria.[74] The Commission accepts that, given the seriousness of the emerging concerns about health impacts of PM_{10}, that this may be a necessary restriction on future mining development. It follows that not undertaking careful assessment of the cumulative impact

[74] See the discussion in the Commission's Determination Report for the Ashton South-East Open Cut Coal Project 2012, pp.6-7

possibilities of known potential developments at the planning assessment stage may have one or more significant consequences including:

- increased morbidity and mortality in impacted communities;
- restriction on overall development opportunities because the first entrant(s) take the airshed to the health limits; and
- a requirement to purchase large numbers of affected properties due to cumulative impacts.

The Commission has attempted to assess potential cumulative impacts from other future projects but this has been inconclusive because of limited available information. The Commission accepts that there was insufficient information available to the Proponent to model accurately the potential cumulative impacts of the two additional proposed open-cut mines in the vicinity of the Coalpac proposal (Pine Dale Stage 2 Extension and Neubeck). However, the Commission considers that there is now sufficient evidence concerning health impacts of PM_{10} that the planning assessment process should take a considered position on whether there are risks of exceedences of the health criteria from existing and known potential developments in an airshed and provide the Determining Authority with the relevant advice. Some form of strategic assessment is clearly required. In addition, an equitable acquisition option should be available to private landholders if in practice monitoring shows air emission criteria are exceeded due to multiple developments.

5.1.7 Mine-owned Residences

The practice in NSW for health and amenity impacts from dust and noise has been for these to meet the acceptable air quality criteria at privately-owned residences, but not necessarily at mine-owned residences. This has raised several issues and NSW Health has highlighted the State's duty of care to occupants of mine-owned residences when dust and noise impacts are significantly above the relevant air and noise criteria. NSW Health has recommended that residences owned by Coalpac should not be leased or otherwise occupied for the period they are predicted have exceedences. It is worth noting that the mine-owned residences are usually ones that have been acquired by the Proponent because of predicted significant levels of exceedence of the air and/or noise criteria.

This issue has been canvassed recently in some detail by the Commission in its determination of the Ashton South East Open Cut Coal Project at Camberwell. [75] The relevant section of that Report is included here for information:

> *'This is a very difficult issue – particularly for children. The State accepts responsibility to control, or intervene in, the capacity of parents to expose children to risk in some aspects of life, but not in others (e.g. rigid requirements for child restraints in cars, but no protection from passive smoking). While it is true that a hierarchy of health risks for children would probably not have living in mine-owned houses near the top of the risk profile; it is a modifiable risk and failure to address it can lead to increased overall health costs to the community. In this respect the Commission considers that the concerns of NSW Health are valid.*
>
> *Recent mining approvals have partially addressed this issue, e.g. Warkworth Extension Project Approval 3 February 2012, Schedule 4, Conditions 2 and 3:*
>
> 1. *Prior to entering into any tenancy agreement for any land owned by the Proponent that is predicted to experience exceedances of the recommended dust and/or noise criteria, or for any of the land listed in Table 1 that is subsequently purchased by the Proponent, the Proponent shall:*

[75] NSW Planning Assessment Commission 2012, *Ashton South-East Open Cut Coal Project Determination Report*, 4 October, NSW Planning Assessment Commission, Sydney, Section 6.1

a) advise the prospective tenants of the potential health and amenity impacts associated with living on the land, and give them a copy of the NSW Health fact sheet entitled "Mine Dust and You" (as may be updated from time to time); and
b) advise the prospective tenants of the rights they would have under the statement of commitments of this approval, to the satisfaction of the Director-General.

2. As soon as practicable after obtaining monitoring results showing:
a) an exceedance of any relevant criteria in schedule 3, the Proponent shall notify affected landowners in writing of the exceedance, and provide regular monitoring results to each affected landowner until the project is again complying with the relevant criteria; and
b) an exceedance of the relevant air quality criteria in schedule 3, the Proponent shall send a copy of the NSW Health fact sheet entitled "Mine Dust and You" (as may be updated from time to time) to the affected landowners and/or existing tenants of the land (including the tenants of any mine-owned land).

In discussions between NSW Health and the Commission some additional steps were suggested including a requirement for prospective tenants to be given independent advice by a medical practitioner prior to entering into any tenancy agreement. The conditions have been strengthened to accommodate the issues raised (see Schedule 3 condition 24 and Schedule 4 conditions 1-3).

Management of the health and amenity impacts at mine-owned residences is evolving in NSW. However, on balance the Commission considers that the assessment of risk in relation to occupation of mine-owned houses should be left to the contracting parties. The mine clearly has obligations under the project approval to disclose risk and provide the prospective tenant with relevant information, access to independent advice, and penalty-free options to move away.'

That discussion is relevant to the current project and given similar circumstances where exceedences of the air and noise criteria at mine-owned residences are predicted for the current project the Commission agrees similar requirements should apply in this case.

Recommendation 4: The Commission recommends that any approval for the project should include the relevant condition from the Ashton South East Open Cut Coal Project determination relating to air quality exceedences at mine owned residences. These conditions relate to adequate notification of the tenant, termination of the tenancy without penalty, air mitigation measures and ongoing monitoring information and notification of the owners of the land with an option for acquisition.

Several submissions expressed concern about impacts, including health impacts of blasting fumes. NSW Health has recommended a Health Risk Assessment (HRA) for the potential impacts of blasting on Cullen Bullen and that measures to minimise any impact are implemented. The Proponent refers to studies of blast fume impacts (NOx) in the Hunter Valley and states that concentrations decrease rapidly between 200m and 2km from the source and are undistinguishable from the background at 5km. The RTS states that the school is a minimum of one kilometre from active mining areas.[76] The Proponent has committed to conduct blasting only when the school and Cullen Bullen are upwind of the blast area. Under these circumstances an HRA should not be necessary. In relation to other residents, the EA makes the commitment *'Blasting under favourable wind conditions when wind will transport fume away from the sensitive receptors'*.[77] Sensitive receptors are not defined but the

[76] RTS, Section 4.2.25
[77] EA, Vol.1, Section 8.3.4

Commission would consider these to be all occupied residences and this commitment should be confirmed as a condition if the project were to be approved.

Recommendation 5: The Commission recommends that blasting should only be conducted when the wind will transport fumes away from the Cullen Bullen school, Cullen Bullen village and any residences.

Some submissions expressed concern about potential contamination of rainwater tanks. The RTS refers to research in Queensland and in the mining areas of Camberwell and Muswellbrook, NSW, that concluded any leaching from coal dust was within the Australian Water Quality Guidelines and the Proponent concludes similar results for Cullen Bullen would result in tank water being considered safe for human consumption. [78] The Commission considers that providing all predictions are accurate; all proposed measures are implemented fully; and householders have a first flush system installed and perform normal routine maintenance of rainwater tanks; that there should be little likelihood of unacceptable contamination of rainwater tanks.

The EPA requested a more definitive set of key performance outcomes for air quality than was proposed in the EA. The RTS provided further commitments although these were more Key Performance Indicators rather than Key Performance Outcomes. The Commission considers the Air Quality Management Plan should have a specific set of key performance outcomes related to achieving the air quality criteria.

The Commission sought further clarification from the EPA on the proposed indicators and the EPA provided a response to the Commission dated 30 October 2012 listing the following additional dust related performance based outcomes;

> *'Wheel generated dust – the performance based outcome will be to achieve a wheel-generated dust control efficiency of 80 percent with the measurement of soil moisture, silt content, the frequency of haul road dust watering and the use of dust suppressants as the parameters to be assessed.*
>
> *Loading, Dumping and Bulldozing Overburden – the performance based outcome will be to not undertake these activities during adverse weather conditions, which are to be identified for each mine. Parameters that will be used to define avoiding adverse weather conditions include wind direction and strength, relationship to sensitive receptors, placement of meteorological stations, management response protocols etc.*
>
> *Wind erosion of overburden and exposed areas – the performance based outcomes are still to be developed as part of the Dust Stop Program'.* [79]

These performance outcomes when completed are measurable and should be included in any proposed Air Quality Management Plan.

Recommendation 6: The Commission recommends the proposed Air Quality Management Plan (AQMP) should include key performance indicators and outcomes across the full range of potential sources of air emissions. The AQMP should be developed in consultation with the EPA and be approved by the Director-General of the Department prior to commencement of works associated with the development. Specific attention should be given to the performance outcomes to achieve the air quality criteria.

[78] RTS, Section 4.2.27
[79] EPA, letter to PAC, dated 24 October 2012, p.4

The potential for particulate emissions increases dramatically as the area of disturbed surface is increased. The Proponent has committed to progressive rehabilitation to minimise the area of exposed surface at any time. The DRE has recommended active mining areas and un-rehabilitated areas be maintained at less than 180 hectares at any time. The EA predicts exceedences of air quality criteria even with all reasonable and feasible controls and given the high contribution from disturbed areas, the Commission considers this requirement to be reasonable.

Recommendation 7: The Commission recommends that the total area of active mining and un-rehabilitated dumps should not exceed 180 hectares at any one time.

5.1.8 Air Quality Management System

The Proponent in its RTS has committed to operate six continuous monitoring stations including at Cullen Bullen Public School and to make the monitoring information publicly available.[80] The proposed predictive meteorology system will provide hourly weather forecasts each day to identify high dust risk for up to two days in advance and this information will be used to modify operations as necessary.

The EA proposes a reactive Real Time Air Quality Management System (RTAQMS) as part of the mine operating system to minimise the dust emissions.[81] This system will be attended and will utilise predictive meteorological monitoring to proactively and reactively manage operations. The updated statement of commitments in the RTS states that this system will be installed prior to increasing production above currently approved limits.[82] The Commission notes the potential benefits of a real time air quality management system but also notes this is leading practice for coal mines and as yet has not been fully developed and evaluated. The Commission therefore has no evidence that the proposed system will be successful in achieving the air quality criteria. As this system is essential to achieving the required air quality standards for this project, the risks associated with the exceedence of the standards must be considered high.

The Commission supports the use of a real time air quality management systems and, should the project be approved, agrees this should be installed and be demonstrated to be effective prior to any increase in the currently approved production limits. This would be during year two based on the Proponent's letter to the Commission dated 30 October 2012.[83]

Recommendation 8: The Commission recommends that operational conditions are sufficiently rigorous to ensure the Real Time Air Quality Management System is used predictively and that failure to do this amounts to non-compliance.

Recommendation 9: The Commission recommends that auditing requirements are imposed to assess compliance and to assess whether additional management responses are required. It is also necessary to ensure long-term commitment to effective use of the Real Time Air Quality Management System.

Recommendation 10: The Commission recommends that shutting down of operations should be adopted as a management response in this airshed to ensure the air quality criteria are met.

[80] RTS, Section 4.2.18
[81] EA, Vol.1, Section 8.3.4
[82] RTS, Table 21, SoC 16
[83] Hansen Bailey, letter, 30 October 2012, Table 1: Annual ROM and Product Coal Volumes (available in Appendix D)

Recommendation 11: The Commission recommends restriction of hours as well as production limits to be included if the Real Time Air Quality Management System doesn't deliver all required outcomes.

In the broader context the Commission considers that a review of the use and effectiveness of Real Time Air Quality Management Systems would be useful to guide future planning decisions and the operational management of these systems.

Recommendation 12: The Commission recommends that an evaluation should be conducted of Real Time Air Quality Management Systems (RTAQMS) including their effectiveness in controlling emissions from open-cut mines. This should include investigation of the relationship between suppression of peak emission levels and the effect (if any) on annual average emission levels from open-cut mines in NSW.

5.1.9 Commission's Findings

The Commission has noted and discussed a number of concerns regarding the potential impacts of air emissions on the village of Cullen Bullen and rural residential properties. These can be summarised:

1. the reliability of existing air monitoring data given limitations of the existing monitoring network and length of time data were available;
2. the predicted number of exceedences of air quality criteria that require acquisition of residences or properties;
3. the issues raised by NSW Health about the direct linear relationship between increases in average PM_{10} particulate levels and adverse health impacts, particularly in the context of the social disadvantage and existing poor health of the local community;
4. the proposed Real Time Air Quality Management System will be targeted towards reducing particulate peaks but may do little to reduce the annual average levels associated with some health impacts;
5. the reliance on a suite of operational management actions including the proposed Real Time Air Quality Management System to achieve the air quality criteria and the fact that real time air management systems have not been fully evaluated for NSW; and
6. the potential for cumulative impacts from other projects has not yet been assessed.

The key question for the Commission is whether the issues raised above are of sufficient concern to recommend refusal of the project. Some of the individual concerns may well be manageable. However, combined they raise serious doubts that they can be controlled all the time to protect the community. The issues of most concern to the Commission are:

- the strong submissions by NSW Health predicting adverse health impacts on residents; and
- whether the proposed measures can reliably meet the air quality goals over the life of the project.

While the Commission accepts the advice that the WHO annual average goal of 20µg/m3 is based on health considerations, the criteria set under the national body in Australia (NEPC) and adopted by the NSW EPA is 30µg/m3. The Commission has already recommended that this requires review. However, the real significance of the issue raised by NSW Health is that this project will cause a large increase in PM_{10}s above the existing level in Cullen Bullen (even if it complies with the NSW criteria) and this will have a direct impact on the health of the community, a community that is already socially disadvantaged and with poor health statistics compared to the rest of NSW.

The Commission's concerns about the reliability of meeting the air quality criteria over the longer term arise from the reliance on a large number of proposed mitigation and operational measures, often with qualified commitments, the heavy reliance on the Real Time Air Quality Management

System and statements by the Proponent that they will adopt all reasonable and feasible measures. The acceptability of relying on reasonable and feasible measures was addressed in a recent decision by Preston CJ in the NSW Land and Environment Court where he found that: *"it is not sufficient to merely require the taking of 'reasonable and feasible avoidance and mitigation measures'"* and that instead the conditions *"should require compliance with the criteria for particulate matter and dust."*[84]

The Commission addressed this issue in the Maules Creek Coal Project Determination Report where it accepted that 'reasonable and feasible' had a place, but only if defined sufficiently to make it clear what the Proponent was expected to deliver in the context of these words.[85]

The above two matters are of sufficient concern to the Commission that approval of the project should not proceed unless a much greater degree of certainty can be provided that the project can meet the air quality criteria and the health of the residents in Cullen Bullen can be protected. Even if greater certainty of the predictions is achieved, the concern remains that NSW Health has recommended the WHO goal of 20µg/m3 for Cullen Bullen and remains concerned about the proposed increase in PM_{10} for the residents. Any further assessment of the project should identify those residents who would be subjected to an annual average of greater than 20µg/m3 and identify any additional measures that might be taken to achieve this level.

Late Submission by Proponent

Coalpac provided a late submission on 30 November 2012 following a meeting with the Commission on the same day. The submission included a document by Pacific Environment regarding air quality controls and a document by Coalpac providing a summary of air and acoustic compliance monitoring. The Pacific Environment document made the following points:

- There is room for adjustment in the air quality impact assessment for further reductions in emissions
- The EPA has implemented a Dust Stop Pollution Reduction Program requirement on Coalpac to investigate sources of particulate emissions and means for reduction. This has led to increased watering on the haul road.
- They are developing an Air Quality Management Plan using real time and forecasting tools to adjust activities on a daily basis.
- PM_{10} levels in Cullen Bullen are currently well below the air quality criteria. Predictions indicate that there will be no exceedences of the annual PM_{10} criteria and some slight exceedences in the town on a small number of occasions per year.

The Commission notes information in the document but considers it does not provide substantive additional information that would warrant changes to the Commission's recommendations.

The Commission also noted the air and noise compliance information provided by Coalpac.

5.2 Noise

5.2.1 Introduction

The current project proposes a substantial increase in open-cut and highwall mining with associated processing and transport infrastructure. Noise is a particular concern in this situation because of the nature of open-cut mining and the proximity of the Cullen Bullen village and surrounding rural

[84] Ironstone Community Action Group Inc v NSW Minister for Planning and Duralie Coal Pty Ltd [2011] NSWLEC 195

[85] NSW Planning Assessment Commission 2012, *Maules Creek Coal Project Determination Report*, 23 October, NSW Planning Assessment Commission, Sydney, , p.16

residences. The EPA and some public submissions referred to a poor track record of Coalpac with respect to implementation of environmental commitments or requirements. Many of the public submissions related to noise and particularly the proposal to operate 24-hours a day seven days a week and blasting impacts.

Even with the implementation of all reasonable and feasible noise mitigation measures the EA predicts that acceptable noise criteria would be exceeded for at least some time during the life of the project at nine residences during the day and 36 residences at night. The Proponent has committed to seek agreements with impacted landholders for additional noise mitigation measures at residences or acquisition of properties. Many submissions have made the point that if any of the predictions are incorrect or proposed measures fail in practice, it would likely result in greater impact on those residents or more residences being affected. Therefore the Commission has addressed noise issues in some detail.

The main noise issues raised in the EA and submissions are;

- selection of appropriate noise criteria,
- reliability of modelling predictions,
- predicted noise impacts,
- effectiveness of proposed noise attenuation measures, including real time noise quality management system,
- haulage of material by road,
- haulage of material by rail,
- cumulative noise,
- hours of operation,
- noise mitigation at residences and acquisition of properties, and
- monitoring and compliance

Blasting, including associated noise criteria and impacts, is addressed in section 5.3.

5.2.2 Noise Criteria

The most appropriate noise policy guidance in NSW is the Industrial Noise Policy, 2000 (INP) and this has been used as a basis for the bulk of assessment in the EA. The degree to which people are impacted by noise is related to the difference between the background noise level and the additional noise predicted to be produced by a new proposal. This is the basis for much of the guidance in the INP although there are many other factors that need to be taken into account because of the complexity of noise.

People generally do not perceive a noise increase of 1-2 decibels (dBA). They find an increase of 2 to 3dBA as noticeable, an increase of 6dBA as about 50 percent louder and an increase of 10dBA as a doubling of the noise level[86] . In general if the proposed noise is more than 5dBA greater than the background noise, a person could find the noise annoying or offensive. [87] Other factors also need to be taken into account such as the nature of the noise, the frequency of occurrence and the time of day. Different criteria are also used for construction, traffic and blasting noise.

[86] Department of Environment, Climate Change and Water NSW 2010, *Noise Guide for Local Government*, DECCW NSW, Sydney South, <http://www.environment.nsw.gov.au/noise/nglg.html>
University of NSW n.d, *What is a decibel*. School of Physics, Sydney.
<http://www.animations.physics.unsw.edu.au/jw/dB.html>

[87] NSW Environment Protection Authority 2000, *NSW Industrial Noise Policy*, NSW EPA, Sydney South, <http://www.environment.nsw.gov.au/resources/noise/ind_noise.pdf>

Once any adjustments have been made for these factors, the Project Specific Noise Levels (PSNL) are determined for the specific project[88] . Projects should be designed so they do not exceed the PSNL levels. The noise limits set in any approval or licence conditions may be set marginally higher than the PSNL if the PSNL is unable to be achieved with the implementation of all reasonable and feasible mitigation measures. Normal practice for mining has been to require an option for acquisition of a property if people are predicted to be exposed to levels more than 5dBA above the PSNL (i.e. more than 10dBA above the background noise level).

The EA has assumed a background noise level of 30dBA for all residences more than 500m from the Castlereagh Highway. This is consistent with the INP which adopts 30dBA as the lowest background level even if the actual level is below this. Submissions received, including from Lithgow City Council, argue this is unfair as some residents who have existing background noise below 30dBA will be subjected to project noise levels more than 5dBA above background and would not have an acquisition option until the noise level reaches 40dBA or more which could be substantially more than 10dBA above the background level.

The Commission wrote to the NSW Environment Protection Authority (EPA) seeking further clarification of the accepted 30dBA minimum level for background noise. The EPA replied in a letter dated 24 October 2012 suggesting the 30dBA minimum level was conservative based on World Health Organisation (WHO) information, and that the setting of a minimum background noise level of 30dBA would ensure that the vast majority of the community would be protected from unacceptable impacts on their amenity. The EPA also advised it is currently reviewing the INP and will take this issue into account when considering the latest acoustic research.

In the current project we are not dealing with the vast majority of people but a small subset of the population in the village of Cullen Bullen and surrounding residential properties. The level of mine related noise complaints from residents in rural areas where the background noise level is very low could suggest the current practice of setting the minimum background level at 30dBA is inequitable for this subset of the population in rural residential settings. The Commission supports early finalisation of the current review of the INP and recommends this issue be finalised before final determination of the project.

Recommendation 13: The Commission recommends the proposed review of the Industrial Noise Policy include a review of the minimum default background noise level of 30dBA.

The Commission has reviewed the proposed operational noise criteria in the EA and submissions from the public and agencies. The noise criteria proposed for this project are set out in Table 5-8.

Table 5-8: Noise Criteria

	Day 7 am – 6 pm LAeq(15 min)	Evening 6 pm – 10 pm LAeq(15 min)	Night 10 pm – 7 am LAeq(15 min)	Night 10 pm – 7 am LA1 (1 min).
Adopted Project Specific Noise Level (PSNL)	35 for land >500m from Castlereagh Hwy 37 for land <500m from Castlereagh Hwy.	35	35	45
Cumulative noise criteria	50	45	40	

[88] In the current project the term Project Operational Noise Criteria (PONC) is used. This has the same meaning as the PSNL however the Commission's report uses the more generally accepted PSNL

These criteria are generally consistent with other mining projects in NSW. The Commission accepts these criteria with the proviso that the proposed Night PSNL 35dB LAeq, which as discussed above, should be reviewed prior to final determination of the project.

The cumulative noise takes into account other non-project noise sources in the area, such as roads, other noise generating activities and natural noises. The proposed criteria in Table 5-8 are consistent with the INP for rural areas and are accepted by the Commission as appropriate for this project.

The criteria for acquisition are provided in Section 5.2.6.

The road noise goals are set by the NSW Road Noise Policy (2011) and the relevant criteria are in Table 5-9. These are relevant for freeways/arterial/sub-arterial roads where existing residences are affected by additional traffic on existing roads generated by land use developments.

At present there is no policy position on the most appropriate criteria for private rail spur lines although this is currently being reviewed by the EPA in conjunction with the Department. In other mining projects the Commission has treated private spur lines as part of the project and applied project operational noise criteria.[89] The Commission considers the operational noise criteria for the project should also be applied to the proposed private rail spur for this project. Rail noise criteria for operations on the public rail system are also under review. However, the current criteria are provided in Table 5-9.

Table 5-9: Road and Rail Traffic Noise Goals

	Road Traffic Noise Goals		Rail Traffic Noise Goals (currently under review)			
	Day 7 am – 10 pm	Night 10 pm – 7 am	Day 7 am – 10 pm		Night 10 pm – 7 am	
Adopted noise criteria	60 LAeq 15hr	55 LAeq 9hr	65 LAeq 15hr	85 LAmax	60 LAeq 9hr	85 LAmax

Note: The RNP (Table 4) recommends a maximum road traffic noise level in school class rooms of LAeq 40 1hr (internal when in use).

The NSW Health submission refers to the INP which recommends an acceptable noise level in a school classroom (internal) at the noisiest time of day should not exceed 35dBA LAeq(1hr) with a recommended maximum of 40 dBA LAeq(1hr). This level refers to the cumulative noise level. NSW Health accepts these criteria but notes that if the noise level approaches the adopted cumulative criteria of 50dBA in Table 5-8, then the level inside the classroom could exceed the 35 LAeq(1hr) level, assuming a reduction of 10dBA from outside to inside the classroom. It also points to increasing evidence that environmental noise exposure can cause long term health impacts and recommends further evaluation to reduce noise impacts.

In its RTS, the Proponent states that there will be no exceedence of the adopted PSNL of 37dBA LAeq(1hr) outside the school during the day and predicts the internal classroom noise level, due to the project will be at least 10dBA below this.[90] The Proponent has not predicted the cumulative noise level outside the school which is the main determinant of what the inside noise level will be. If we accept the Proponent's prediction the noise level inside the classroom from the project alone would be a maximum of approximately 27 LAeq(1hr). The Proponent advised that it omitted from discussion all properties that were predicted to be less than 35 LAeq(1hr) on the assumption that

[89] see PAC Boggabri and Maules Creek determination reports
[90] RTS, Section 4.5.7

they would comply with all requirements. While this is most likely the case, the Commission considers it prudent to require confirmation, by way of a condition, that the cumulative noise level at the school (ie outside the classroom) does not exceed 45 LAeq(1hr) .

Recommendation 14: The Commission recommends the cumulative noise, including the project and ambient noise, at the Cullen Bullen school should not exceed 45 LAeq(1hr) at any time during a school day.

As previously stated, blasting noise criteria and the project's blasting noise impacts are addressed in section 5.3.

Construction noise is by its nature for a limited time and is usually noisier than normal operations. The Interim Construction Noise Guidelines do not apply for mining operations because the construction period can be over an extended timeframe and the assessment has appropriately used the more stringent INP criteria for construction noise.

5.2.3 Predicted Noise Impacts

The Proponent has provided a list of all receivers predicted to be subjected to noise levels above the PSNL criteria at some stage during the life of the project[91]. These predictions assume the project adopts all reasonable and feasible noise mitigation measures, and the predictions are summarised;

- **Significant exceedences** (greater than 5dBA above the Project Specific Noise Level (PSNL))
    - 4 private residences
    - 4 properties where noise exceedence is over more than 25% of contiguous land ownership
- **Moderate exceedences** (greater than 2 and up to 5dBA above PSNL)
    - 18 private residences
    - 8 properties where noise exceedence is over more than 25% of contiguous land ownership
- **Mild exceedences** (up to 2dBA above PSNL)
    - 14 private residences
    - 13 properties where noise exceedence is over more than 25% of contiguous land ownership

5.2.3.1 Noise Mitigation Measures

The Proponent has proposed an extensive suite of noise mitigation measures to achieve the predicted noise levels, including;

- a series of earthen noise bunds;
- noise suppression of mobile equipment and stationary plant;
- a conveyor to Mount Piper Power Station to reduce truck haulage on local roads and;
- varying the timing of activities in relation to sensitive receivers.

In addition it is proposed to have real time proactive weather and noise monitoring with reactive feedback management system to achieve the predicted noise goals.

The EA has assessed the likelihood of temperature inversions when noise enhancement would occur and found that temperature inversions are common in winter months tending to occur on frosty mornings and days when fogs are present.[92] The Acoustics Impact Assessment concluded significant temperature inversions occur for more than 30 per cent of the time and were therefore taken into account in the assessment of predicted noise impacts consistent with the recommendations of the

[91] EA, Vol.1, Table 27
[92] EA, Vol.1, Section 2.4

INP.[93] The predicted levels are therefore likely to reflect noise levels under temperature inversion conditions.

5.2.3.1.1 Construction Noise

The EA describes the following measures to minimise noise during construction:

- noise bunds for the rail siding and other noisy areas will be constructed using noise controlled mining machines rather than by noisier machinery normally used by contractors. The noise bunds will be constructed early to assist with minimising noise from other construction activities. For example, construction of the rail siding will occur after the noise bunds have been completed;
- noise from pile driving will be 'minimised where possible'. Although alternatives are discussed, such as vibrated piles or mass concrete foundations, no firm commitment is made to use these. Pile driving is proposed to be limited to 0800 to 1600 Monday to Friday; and
- construction of the bridge over the Castlereagh Highway will be completed early to enable construction traffic to use the new bridge instead of the existing Private Road or the highway through Cullen Bullen.[94]

It is not clear to the Commission how the worst-case noise predictions were made where proposed measures are qualified and firm commitments are not made such as in the case of pile driving where the EA states *'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'*.[95] This should be confirmed prior to any final determination of the project.

5.2.3.1.2 Noise Management Zones

Three noise sensitive zones are proposed in which mining activities will be managed differently to reduce noise as follows:

- Zone 1: Mining activity within 2.4km of a receiver will generally have a bund to shield the overburden emplacement area (OEA) for use during the night. Where a bund has not been constructed, the OEA will be used during the day or at night when the weather is favourable.
- Zone 2: Mining within 1.8km of a receiver will have bunds to shield OEAs for use under all except neutral weather conditions during the day.
- Zone 3: Mining within 1.8km of a residence where a bund cannot be reasonably provided will only occur under neutral weather conditions during the day.

The EA states:

> *'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'.*[96]

The EA fails to provide adequate justification for this exemption for the highwall miner. The AIA shows the predicted sound power level for the highwall miner as 114dB which is the same level as for the overburden and coal trucks, dozers, graders and drills all of which are covered by the management zones.[97] Justification for the proposed exemptions of the highwall miner from some of

[93] EA, Vol.2, Appendix H, Section 4.3.2 and EA, Vol.1, Section 8.6.2
[94] EA, Vol.1, Section 8.6.4
[95] EA, Vol.1, Section 8.6.4, p.127
[96] EA, Vol.1, Section 8.6.4, p.128
[97] EA, Vol.2, Appendix H, Section 4.4.1

the management zone recommendations should be provided prior to any final determination of the project.

Recommendation 15: The Commission recommends that the proposed exemptions for the highwall miner from some of the management zone recommendations should be justified before any final determination of the project.

The EA also proposes real time weather and noise monitoring for Zones 2 and 3 to confirm the noise levels.

The Proponent says they will have management zones and will stop or modify operations under certain weather conditions, however they do not commit to stopping production if the noise criteria are exceeded. The EA states;

> '*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'*. [98]

The Commission sees two challenges with this approach. One is that the project is likely to be pushing up against the maximum noise levels day and night (simply because of the need to operate in this way) and secondly the practical implications of relocating some of the operations based on variations in the weather over a protracted period of time. In addition it would be difficult if not impossible to check compliance with this commitment as proposed in the EA. The Commission acknowledges that modification of operations could assist in achieving the noise criteria but considers there should be an overriding requirement to meet the criteria even if this means temporarily ceasing the relevant operation.

Recommendation 16: The Commission recommends the Proponent should stop or modify operations under certain weather conditions where noise criteria are predicted to be exceeded and should stop noise generating operations if acceptable noise criteria are exceeded. In addition the Proponent's performance should also be independently audited.

The EA also lists a suite of additional noise mitigation measures including:

- mining trucks and water carts will have leading practice exhaust silencers;
- tracked dozers to operate at slow speed in exposed areas or when weather is unfavourable;
- reversing alarms will produce 'lowest possible noise levels consistent with safe operation';
- equipment will be maintained in good condition;
- noise suppression will be included on the conveyor system, 'where practical'; and
- minimising or avoiding train wagon bunching noise during train movements.[99]

The Proponent expects to have the noise attenuated equipment on site in year two following approval and advises in the EA that production would not be increased until the acoustic works are on site in year two depending on delivery dates. This commitment is qualified and falls short of confirming that the equipment will be installed, operating and confirmed that it is meeting the noise criteria prior to increase in production. The Commission would expect this to occur prior to increases in production being permitted. Also completion of the proposed conveyor will not be until the second year. The EA does not adequately address the predicted noise impacts during this initial two year period prior to the acoustic works being completed. The EPA expressed concern about the

[98] EA, Vol.1, Section 8.6
[99] EA, Vol.1, Section 8.6.4

potential for greater noise impacts during this initial period and has recommended that night-time operations be restricted for at least the first two years. The project's hours of operation are addressed in section 5.2.5.

The Commission is concerned that the predicted noise levels will only be achieved if all these noise mitigation measures work and even if they do a number of properties will be exposed to excessive noise levels and will need to be acquired. The proximity of the proposed operations to Cullen Bullen means that if any of the proposed noise mitigation measures does not perform to the full extent then additional residences would likely be subjected to excessive noise levels, but would not necessarily have the same rights of acquisition as those who have been predicted to exceed the criteria.

5.2.3.2 Road Haulage

The bulk of product coal is currently transported by road, partly on a private haulage road that bypasses Cullen Bullen and then along the Castlereagh Highway to the MPPS. Some product is also transported by road to other destinations including coal to Shoalhaven Starches in Nowra. Positives for the project with respect to noise would be the construction of a conveyor between the colliery and the MPPS, and also a rail link to transport coal to Port Kembla for export. These initiatives will reduce the existing 404 Project related trucks a day along the Castlereagh Highway but this will be offset to some extent by additional trucks hauling sand and product coal to domestic destinations, primarily to the Sydney region. After year two there would be 230 truck movements a day carrying product coal and sand along the Castlereagh Highway and east along the Great Western Highway assuming, the conveyor to MPPS is operational and the coal for export through Port Kembla will be transported via the new rail facility.

The adopted noise criteria for traffic noise are taken from the NSW Road Noise Policy. The RNP recommends maximum noise criteria of 60 LAeq 15hr during the day and 55 LAeq 9hr during the night for residential receivers affected by additional traffic on existing freeways/arterial/sub-arterial roads for new developments.[100] Note these criteria apply to the noise level for total traffic.

The Acoustic Impact Assessment (AIA) states the existing traffic day time noise level is 58.7 LAeq 15hr at 50m (55.0 at 100m) and predicts construction of the conveyor will result in a reduction of 0.6dBA LAeq (15hr) at a distance of 100m from the Castlereagh Highway.[101] The reason for this minor reduction is the assumed level of current non-project traffic on the road, estimated to be 3006 vehicles. The assessment does not appear to differentiate between the noise levels of cars and trucks for the existing traffic. The Proponent intends to continue to haul coal by road to MPPS during the initial two year period until the conveyor is constructed.

The assessment concludes that the noise from all traffic, project and non-project, will meet the 60 LAeq 15hr traffic noise criterion from the INP and NSW Road Noise Policy, at 50m from the road and, since no non-Coalpac owned residences are within 50m of the Castlereagh Highway between Invincible Colliery and the MPPS, all residences will meet the criteria.[102] This assessment assumes that 90 per cent of the traffic occurs during the day and only 10 per cent at night. No prediction of the night-time noise is provided in the AIA because no night-time haulage is proposed.

Once the conveyor is constructed, the Proponent requests the right to continue to haul coal by road to MPPS in emergency situations for example if the conveyor is not operational. The EA states the Proponent would notify, rather than seek approval from, authorities in such situations. The

[100] EA, Vol.2, Appendix H, Section 3.6, NSW Road Noise Policy Table 3
[101] EA, Vol.2, Appendix H, Table 23
[102] EA, Vol.2, Appendix H, Section 4.10.5

Commission considers that an approval should be sought and received from the Department prior to recommencing any short term road haulage of coal to MPPS. Such approval should take into account noise and traffic considerations (see also section 8.2) and should be limited to the time restrictions in current approval for Invincible Colliery, that is no haulage during night time nor on Sundays or Public Holidays.

Recommendation 17: The Commission recommends that once the conveyor is completed, road haulage of coal to MPPS should only occur for a minimal period in emergency situations where there are no other reasonable options and only with written approval from the Department. Haulage should be restricted to 0700 to 2100, and none on Sundays or Public Holidays.

The Commission considers that any approval for the project should contain a condition restricting any further road haulage of export coal to Port Kembla once the rail facility is operational. This is implied in the EA but not definitive. The reason for this is to reduce the impact of traffic and noise from coal trucks travelling along the Castlereagh Highway, Great Western Highway and through the Blue Mountains.

Recommendation 18: The Commission recommends that road haulage of export coal to Port Kembla should not be permitted once the rail facility has been constructed.

Recommendation 19: The Commission recommends that road haulage of export coal to Port Kembla before the rail facility is operational should be not be permitted without further assessment of the traffic impacts.

5.2.3.3 Rail Transportation

The AIA states that on a worst case day, with 8 project related train movements, the 60LAeq criterion will be exceeded at a residence in Wallerawang but concludes the residence is already impacted by rail noise, it has been recently constructed and as residents chose to live there they would not be sensitive to train noise.[103] It predicts the peak noise levels would exceed the 85dBA LA max criterion at three of the four assessed residences but because they are already subjected to similar peak levels for other trains they would be no more affected as a result of the project.

The Commission does not necessarily agree with these assertions but does acknowledge that the Proponent should not by itself have to provide mitigation measures on the rail network that is used by several other operators. The AIA states that Coalpac would be prepared to contribute to and cooperate with rail managers and train operators in any regional train noise study that the operators may wish to complete in the future. The Commission agrees with this and recommends this be included in any approval as a condition.

Recommendation 20: The Commission recommends the Proponent should cooperate with rail managers and train operators, in consultation with the EPA, to develop a regional train noise study.

A rail siding off the Wallerawang- Gwabegar Railway Line (WGRL) is proposed to be built in year two. The AIA states that operation and loading of rail wagons on the rail siding will have no appreciable effect on received noise levels and are therefore omitted from the assessment.[104] It is proposed to operate the rail siding 24-hours a day.

It is difficult for the Commission to assess the reliability of this prediction as no assessment has been provided. Assuming the prediction is reliable then this would be acceptable provided noise levels do

[103] EA, Vol.2, Appendix H, Section 4.11
[104] EA, Vol.2, Appendix H, Section 4.5.1

not exceed the acceptable night-time criteria. This Commission considers any approval should contain conditions to ensure residents will be protected from noise impacts from the rail siding consistent with other project noise criteria.

Recommendation 21: The Commission recommends operational noise from the rail loading facility should not cause or contribute to exceedence of the relevant noise criteria at any time.

Recommendation 22: The Commission recommends the Proponent should demonstrate compliance with the predicted noise levels from the rail loading facility within six months of its commencement of operation.

Recommendation 23: The Commission recommends if evening or night time noise criteria are exceeded then loading should not occur in evenings or at night until rectification is complete and the noise criteria can be met.

5.2.3.4 Cumulative Noise Impacts

Potential sources of cumulative noise listed in the EA are; Baal Bone Colliery (until 2012), Ivanhoe North Colliery (until 2012), MPPS and the approved but unconstructed Western Rail Coal Unloader to the south of the MPPS. The EA states that no receivers should be subjected to cumulative operation, construction, sleep disturbance, road or rail traffic noise levels above the relevant criteria.[105] Where the cumulative noise criteria are predicted to be exceeded they are as a result of the project alone and therefore are subject to the more stringent intrusive noise criteria.

Some residents and special interest groups (including the Blue Mountains Conservation Society) challenged the conclusions of the cumulative noise assessment on the basis that it only looks at an increase in the maximum noise level from the combined sources but the real impact on people is an increasing number of times elevated noise levels are experienced even if these are below the maximum allowable noise level.[106]

The Commission acknowledges this concern that there could be an additional impact from other potential sources but needs to consider whether this would be unacceptable. On balance the Commission accepts the recommended criteria in the INP on the assumption that this issue has been taken into account in its development.

5.2.4 Reliability of Modelling Predictions

The exposed nature of open-cut mining and the proximity of the mining to Cullen Bullen and surrounding residences make it particularly difficult to control noise from this project. The Proponent has modelled worst-case noise levels for selected years at sensitive receivers. Reliability of modelling predictions is critical for this project given the predicted noise exceedences and reliance on predicted levels from equipment and extensive noise mitigation measures coupled with a real time monitoring system. For this reason the EPA has requested some form of assurance the proposed equipment will meet the predicted noise output levels. In the RTS the Proponent has advised that the manufacturer will provide a guarantee on its equipment noise levels. The EPA has requested an acoustic engineer test the noise levels of the equipment. The Commission considers noise levels of proposed new equipment should be tested by an independent acoustic engineer prior to delivery of the equipment.

[105] EA, Vol.1, Executive Summary, p.x
[106] Blue Mountains Conservation Society, submission to EA, 23 May 2012

Recommendation 24: The Commission recommends all new mining equipment should be independently tested by an acoustic engineer against predicted sound power levels prior to delivery and should not be put into operation until it meets the predicted level.

5.2.5 Hours of Operation.

The Proponent has provided a comparison of the existing approved and proposed hours of operation for mining and related activities[107] as reproduced below.

Table 5-10: Existing and Proposed Hours of Operation[108]

Cullen Valley existing approvals	Invincible Colliery existing approvals	Proposed consolidation
• 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 a 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 on public holidays without prior approval from OEH. • Coal and sand haulage via truck on Castlereagh Highway; o 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) o 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 Greater Western Highway from the Invincible Colliery site access after Year 2 – 7.00 am to 9.30 pm, no Sundays or public holidays.

Many submissions have expressed concern about the proposal to extend operating hours to 24-hours a day for the combined project particularly given the project cannot meet acceptable noise criteria without acquisition of several properties and mitigation treatments to many more. The EPA has suggested hours be restricted, at least for the first two years until all the acoustic measures, including the bunds and noise attenuated equipment, have been implemented and certified as meeting the predicted noise levels. For this initial period the EPA has recommended;

- Monday to Saturday
    - 7.00 am to 6.00 pm – for mining and all associated activities;
    - 6.00 pm to 10.00 pm – for haulage and transportation;
    - 10.00 pm to 7.00 am – non-audible equipment maintenance activities.
- Sunday
    - 8.00 am to 6.00 pm – for mining and all associated activities;
    - 6.00 pm to 7.00 am – non-audible equipment maintenance activities.
- And at no time on public holidays.

[107] EA, Vol.1, Table 8
[108] EA, Vol.1, Table 8

The Commission has reviewed the submissions from the community and public agencies and the Proponent and its consultants and considers that noise-generating operations should be restricted until all the proposed acoustic mitigation measures have been implemented and their effectiveness has been demonstrated over the full range of operating conditions. This recommendation is influenced by the extent of mitigation measures needed to achieve the predicted noise levels and the probability that failure of any of these measures may result in the project not meeting the noise criteria. These measures include the noise sound suppression on mobile plant and stationary equipment, earthen bund walls, conveyor, bridge over the Castlereagh Highway, location of infrastructure within the project footprint and the real time monitoring and management system.

The Commission put this concern to the Proponent and received a response dated 30 October 2012 which is available in Appendix D. In the response Coalpac committed to independent compliance auditing to confirm that all noise and dust mitigation and management measures are in place and independent compliance monitoring to confirm that predicted noise and dust criteria are met for a minimum period of three months.

The Proponent advised that if it was unable to meet the predicted criteria and was consequently restricted to operating only during the day and evening it would reduce the coal resource of the 21 year life of the project and impact on the viability of the project. It would also reduce the amount of coal that could be sold to MPPS and export to 1.875 and 0.75 Mtpa respectively and this would impact on the ability of the project to meet the requirements of customers.

The Commission considers that the Proponent, not the community, should bear the risk in this situation. However, the Commission considers it unlikely that Coalpac's concerns about a permanent restriction on night time noise for the 21 year life of the project would eventuate. This could only happen if the noise predictions in the EA are wrong and no way can be found to rectify the consequent compliance problems within the 21 year life of the project. The Commission considers it is important to condition this commitment in any approval given the significant impact night time noise can have on residents.

The Proponent has recommended a three month compliance testing period. However, this will not cover the seasonal changes over a year which will affect noise, and air, propagation. The Commission does not wish to restrict unnecessarily the length of time before Coalpac could operate legitimately at night time and so recommends an initial compliance check after three months. If that is satisfactory then night time operations should be permitted subject to a further compliance check after twelve months operation. Should the project fail to comply it must cease night operations until it can comply.

The Commission recognises the significant impact that restricted operating hours can have on operations and these are proposed only where there is uncertainty about capacity to meet the required performance outcomes, (in which case they may be temporary until capacity can be demonstrated), or because it is only possible to guarantee that performance outcomes can be met under the restrictions (in which case they may be permanent). Operational restrictions are not recommended where there is certainty that impacts will be below the relevant performance criteria. The consequences of failure to meet the performance criteria are relevant to the nature of any restrictions imposed.

The Commission considers that the predicted noise impacts from the project are significant. The additional impacts of any failures to meet the predicted levels will adversely affect a significant number of residences and the Commission considers this is not acceptable. Consequently the restrictions recommended are considered to be an entirely reasonable imposition on the project.

They will only have long-term implications for economic viability of the project if the project cannot achieve the required operational outcomes.

Recommendation 25: The Commission recommends that operating hours should be limited to the following times **until** all noise mitigation measures have been implemented and demonstrated to be effective and certified by an independent acoustic expert that they meet the noise criteria. These noise mitigation measures include; the noise sound suppression on mobile plant and stationary equipment, earthen bund walls, conveyor, bridge over the Castlereagh Highway, location of infrastructure within the project footprint and the real time monitoring and management system.

- Monday to Saturday
    - 7.00 am to 6.00 pm – for mining coal processing activities;
    - 7.00 am to 9.30 pm – for haulage and transportation from Invincible Colliery exit;
    - 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 – Coal haulage from Cullen Valley Mine, Hillcroft and East Tyldesley.
    - 10.00 pm to 7.00 am – non-audible equipment maintenance activities.
    - 9.00 am to 5.00 pm - blasting.
- Sunday
    - 8.00 am to 6.00 pm – for mining and all associated activities;
    - 6.00 pm to 7.00 am – non-audible equipment maintenance activities.
    - No blasting
- And at no time on public holidays.

Note: these times may be further restricted by specific recommendations, for example near the Cullen Bullen cemetery.

Recommendation 26: The Commission recommends that operating hours should be limited to the following times **after** all noise mitigation measures have been implemented and certified by an independent acoustic expert that they meet the predicted noise outcomes. These noise mitigation measures include; the noise sound suppression on mobile plant and stationary equipment, earthen bund walls, conveyor, bridge over the Castlereagh Highway, location of infrastructure within the project footprint and the real time monitoring and management system.

- Monday to Saturday
    - 24-hours – for mining (other than blasting) and coal processing;
    - 7.00 am to 9.30 pm – for haulage and transportation from Invincible Colliery exit;
    - Coal haulage from Cullen Valley Mine, Hillcroft and East Tyldesley only in emergencies with written approval from DOPI.
    - 10.00 pm to 7.00 am – non-audible equipment maintenance activities.
    - 9.00 am to 5.00 pm - blasting.
- Sunday
    - 24-hours – for mining (other than blasting) and coal processing;
    - No road haulage;
    - No blasting
- And at no time on public holidays.

Notes:

- Temporary night time operation should be permitted only after an initial compliance certification following three months operation. This should be repeated and reconfirmed following twelve months of operation before longer term night time operation is permitted.
- Where mining is carried out in different sectors and some sectors show compliance and others show non compliance then the above night operating times should be permitted for those sectors only where there is full compliance with the noise criteria.
- these times may be further restricted by specific recommendations, for example the cemetery.

5.2.6 Property Acquisition

The Proponent provided advice in the EA and further in the RTS regarding properties that have been acquired or are under negotiation for purchase or have agreements with the landowners or under negotiation for an agreement.

The INP states that acquisition of properties should be a last resort. The preference for any project is to meet the acceptable noise criteria, however it is acknowledged that where these criteria cannot be met, even with all reasonable and feasible mitigation measures, and the project as a whole is considered worthy of approval, then options should be provided for negotiated agreements or acquisitions of private properties.

While there is Departmental practice evident in past mining approvals, there is currently no documented government policy for negotiated agreements and acquisition of noise-affected properties in NSW. In its response dated 24 October 2012 to a request from the Commission for further clarification, the EPA advised in general it supports current practice of providing an option for acquisition if the noise level exceeds the Project Specific Noise Level by more than 5 dB(A) although a lower level may be appropriate in some specific circumstances.[109] For example, in the recent Boggabri Coal Project where any increase above the Project Specific Noise Level was used as the acquisition criterion.[110] The EPA also advised this issue is primarily a matter for the Planning authority but it is writing to the Department of Planning and Infrastructure seeking finalisation of a NSW policy clarifying when negotiated agreements for property acquisition would be warranted.

Table 5-11 (over the page) provides the Department's criteria that are generally consistent with previous assessment and approvals of mining activities and are considered to be appropriate for the Coalpac project. The Commission has however previously expressed its concerns in its Boggabri Coal Project determination report about the Note 2 that requires '*sustained*' exceedences of the noise criteria before acquisition relief is provided for residents.[111] This issue was discussed in detail in that report and it is sufficient here to refer to the Commission's recommendation that the relevant agencies produce a definition of 'sustained exceedences' that is equitable for residents and able to be audited for compliance purposes.

[109] EPA, letter to PAC, 24 October 2012 (available in Appendix D)
[110] Department application reference 09_0182
[111] PAC, 2012, Determination Report for the Boggabri Coal Mine Expansion Project, pp.13-14

Table 5-11: Recommended Noise Impact Acquisition Criteria for the Coalpac Project

Level of exceedence	Criteria	Response
Significant	greater than 5dBA above the PSNL at private residence or more than 25% of privately owned land.	Acquire property upon written request from landowner.
Moderate	greater than 2 and up to 5dBA above the PSNL.	Install noise mitigation measures at the receiver upon written request from landowner where negotiated agreement is not already in place.
Mild	up to 2dBA above the PSNL at private residence or more than 25% of privately owned land.	All reasonable and feasible noise mitigation measures at the project site. No specific additional noise mitigation measures at receiver.

Notes:

1. Acceptable noise criteria are the Project Operational Noise Levels.

2. These responses apply where noise levels are predicted to exceed the criteria or where they are predicted to be below the criteria but in practice they have been found to cause sustained exceedences of the criteria.

There are four private residences and four properties where noise exceedence is over more than 25 per cent of contiguous land ownership that fall into the significant exceedence category and are subject to acquisition based on the noise predictions. Coalpac advised it has purchased or is negotiating acquisition for private land owners listed as 'Significant' exceedences in Table 27.[112]

The Proponent has advised that Coalpac will install noise mitigation measures at the receiver (where no private agreement is already in place) where requested for all private landholders listed as 'Moderate' exceedences in Table 27 of the EA. There are 18 private residences and eight properties where noise exceedence is over more than 25 per cent of contiguous land ownership.

No additional measures are proposed for the properties listed as 'Mild' exceedences in Table 27 of the EA. These include 14 private residences and 13 properties where noise exceedence is over more than 25 per cent of contiguous land ownership.

The Commission supports early finalisation of an acquisition policy for NSW given the importance of this issue to residents surrounding coalmines and other similar industries. In the interim the Commission considers there are no special circumstances that warrant deviation from the current acquisition practice for this project. However, given the high number of properties in the Moderate and Mild categories, any small deviations from the predicted noise levels could result in a large number of properties moving from the Mild to the Moderate, or the Moderate to the Significant categories with substantial implications for the landowners and Coalpac. There are also properties predicted to be in the 30 to 35dBA contour. If any of the modelling or the noise mitigation measures fail to achieve the predicted noise levels in practice then some of these properties could move into the Mild, Moderate or Significant impact categories. It is difficult to identify the exact number of properties in the 30 to 35dBA contours from the Contour Maps in Appendix A of the Acoustics Impact Assessment but it appears to be greater than the number of properties in the Mild category. The additional difficulties faced by landowners in this situation are discussed in section 5.2.8.

[112] RTS, Section 4.5.5

Recommendation 27: The Commission recommends a NSW policy for acquisition of properties subjected to excessive noise or air emissions by new developments should be completed as soon as practical.

Recommendation 28: The Commission recommends the Proponent should be required to implement negotiated agreements, additional at-receiver noise mitigation measures or property acquisition consistent with the criteria in Table 5-11.

The issue of predicted exceedences of the noise criteria at mine-owned residences and the State's duty of care to protect those residents is covered in some detail in the air section of the report under 'Mine owned-residences' (section 5.1.7). Recommendations are made in that section to protect residents in mine-owned residences for both noise and air exceedences.

5.2.7 Monitoring and Compliance

The Proponent has committed to extensive noise monitoring including establishment of a real time reactive monitoring and management system.[113] This system will include a network of real time noise monitors with trigger levels to generate alarms for noisy operations that may require attention. They also propose quarterly attended real time noise monitoring with regular correlation of real time noise monitoring results with the meteorological station to proactively manage operations.

Lithgow City Council has requested that the response to the real-time monitoring should be reported on an annual basis so that Council and others can examine the cause of any potential exceedences. The Commission agrees this is a reasonable request and should be included as a condition of any approval.

Recommendation 29: The Commission recommends the responses to real time monitoring that show an exceedence or potential exceedence of noise requirements should be included in an annual report made available to Council, relevant agencies and the public.

The EPA submission recommended the Proponent clarify the roles and responsibilities of relevant staff for implementing the various noise mitigation commitments. This would not normally be required but the Commission considers it warranted for this project because of the heavy reliance on extensive equipment, management zones and procedural noise mitigation measures and management action resulting from the real time reactive monitoring system.

The Commission considers all monitoring information should be made available to the public and recommends conditions similar to those contained in the recent Maules Creek Coal Project approval be applied in any approval for the current project.[114]

5.2.8 Commission's Findings

The Commission has a significant concern that the project may not in practice meet the predicted noise outcomes. This is based on the need to manage an extensive, complex and leading-edge suite of noise control measures consistently throughout the life of the project. While real-time noise monitoring and management systems offer hope for better noise control from mines: (i) their introduction is relatively recent and there is as yet no proof that they will be effective in reducing noise impacts over an extended period under normal operation conditions; and (ii) the Proponent's commitments concerning operational responses to the likelihood of noise impacts identified by the RTNMS fall well short of a commitment to ensure that operations will cease if the criteria may be

[113] EA, Vol.1, Section 8.6.4
[114] PAC, 2012, Maules Creek Coal Project Determination, Schedule 5, Conditions 12 and 13

exceeded. Many of the proposed noise mitigation measures will impact on the day to day operations of the mine and there will be inevitable tensions between operational priorities to mine coal and constraints to operations arising from triggers from the RTNMS. For this reason the Commission is of the view that the proposed increase in production should be related to the success of the proposed RTNMS.

Given the increasing use and indeed reliance on real time predictive and reactive monitoring and management systems for air and noise, the Commission considers it would be beneficial to review the effectiveness of the systems currently in operation in NSW and their reliability in achieving the relevant performance criteria. If such a review were to show a high level of accuracy and reliability then this could translate into a higher level of confidence in the proposed use of these systems for new developments.

Further, the Commission's concerns relate to the high number of residences in the moderate and mild exceedence categories. If there are small errors in the modelling predictions they could have large implications for the residents and for the project. The real problem lies with those residents who would have been in the moderate or significantly affected categories under correct predictions, but now have to demonstrate 'sustained exceedences' of the criteria to move into the next highest category under the Department's standard approval conditions. As 'sustained exceedences' is not defined anywhere this could lead to disputes over interpretations. There is a question as to whether it is equitable to place the residents in this more onerous position when the risks of non-compliance are plainly evident to both the Proponent and the Determining Authority. The issue is discussed in more detail in section 8.9.1.

Noise control is important because of the proximity of the mine to the Cullen Bullen village and rural residences. Given the critical nature of the noise predictions the Commission considers the mine should proceed in stages only after the noise predictions are confirmed in practice. This is an unusual requirement, but this is not a usual project in that there is little or no room for leeway if any of the proposed measures do not achieve the predicted outcomes.

Recommendation 30: The Commission recommends there should be no increase in production until the Real Time Noise Management System is established and demonstrated to be operating effectively under all weather conditions, including temperature inversions.

Recommendation 31: The Commission recommends a comprehensive evaluation of the effectiveness of real time monitoring and proactive and reactive management systems used for air and noise management in mines in NSW.

Recommendation 32: The Commission recommends an independent audit should be conducted at the end of 12 months and then every three years to investigate and report on the effectiveness of the Real Time Noise Management System in maintaining noise levels within the relevant criteria. This should include measures taken in all meteorological conditions. The audit should report on any additional measures available to mitigate impacts.

Recommendation 33: The Commission recommends any approval for the project should include a condition that the mining only proceed in stages until it demonstrates compliance with the noise criteria.

The Commission is of the view that it is technically possible for the project to meet the predicted noise levels, but there is a reasonable likelihood of exceeding these levels because of the reasons given above. Noise alone may not be sufficient to recommend refusal of the project, but it should

be considered in conjunction with other impacts in making an overall recommendation for the project.

Late Submission by Proponent

Coalpac provided a late submission on 30 November 2012 following a meeting with the Commission on the same day. The submission included a document from Bridges Acoustics dated 29 November 2012.

This document provides a summary of the noise mitigation measures contained in the AIA and includes examples of other mines that have utilised various of these measures including Bengalla, Mt Arthur and Narrabri North Mines. The document also summarises the predicted noise levels from the AIA and states the noise control strategy is one of constant review and adjustment to suit the operating and atmospheric circumstance that occur at any point in time.

The Commission does not consider this document provides any substantive new information that would alter the Commission's recommendations.

5.3 Blasting

5.3.1 Blasting Noise

5.3.1.1 Blasting Noise Criteria

Blasting creates overpressure or sound waves that travel through air and is measured in decibels. Ground vibrations travel through land and are measured as mm/second. Ground vibration and airblast produced by blasting fall into two categories;

a) those causing human discomfort; and

b) those with the potential for causing damage to structures, architectural elements, services or natural features.

Blast criteria for amenity and structural impacts are prescribed in ANZEC 1990, *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* and the Australian Standard AS2187.2-2006. [115] These criteria are normally adopted for mining projects in NSW and are shown in Table 5-12 .

Table 5-12: Blast Criteria

Blast impact	Amenity Criteria*	Structural Damage Criteria**
Airblast overpressure	115dBL for 95% of blasts in any year 120dBL for 100% of blasts	133dBL
Ground Vibration	5mm/sec for 95% of blasts in any year 10mm/sec for 100% of blasts	10mm/sec

* ANZEC, 1990. Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZEC, 1990)

**Australian Standard (AS2187.2-2006 Explosives – Storage, Transport and Use (houses and low rise residential buildings)

[115] Australian Standard, 2006. *Explosives – Storage, Transport and Use (houses and low rise residential buildings)* (AS2187.2-2006). Referenced in Hansen Bailey, EA, Section 8.7.1.

The ANZEC Guideline also states '*Blasting should generally take place no more than once per day. (This requirement would not apply to minor blasts such as for clearing crushers, feed chutes, etc)*'.[116]

The Department has also adopted a blast ground vibration criterion of 50mm/s for all public infrastructure for similar mining projects and has been applied by the Commission, for example in the recent Maules Creek determination by the Commission.[117] This requirement also has a provision that an alternative limit may be determined to the satisfaction of the Director-General by the structural design methodology in AS 2187.2-2006 or its latest version.

The Proponent has adopted the amenity criteria for blasts. They have referenced the above Australian Standard and other guidance in relation to structural damage and potential damage to pagodas and cliffs, but not necessarily used these criteria in relation to Aboriginal rock shelters and the Cullen Bullen Cemetery. These are discussed further in Section 5.3.2.

5.3.1.2 Blasting Noise Impacts

The Proponent states that with no mitigation measures they can meet the blast noise amenity criteria '*at the majority of privately owned residences in the absence of noise enhancing weather conditions*'[118] and can meet the criteria at all residences by adjusting the maximum instantaneous charge (MIC) and times of blasts, taking weather conditions into account.

The EA states that the Project will limit blasting to 20 blasts per month but qualifies this by saying; '*except for those areas of the site closest to receivers and sensitive structures (see Table 30), where a greater number of smaller blast with limited MIC as presented in Table 30 may be required for limited time periods*.'[119] While the EA is silent on the number of additional blasts that may be needed the Acoustic Impact Assessment (AIA) stated that up to 40 blast events per week or 10 events per day may be required for limited periods.[120]

The EA states the blast criteria for either ground vibration or overpressure will not be exceeded at the village of Cullen Bullen.[121] It proposes that blasting will be conducted when the wind is away from sensitive receivers including the village of Cullen Bullen.

Table 30 of the EA also lists private residences that will be impacted, stating; '*All of the private residences identified in Table 30 as being the closest receivers to blast location have also been predicted to be impacted by noise levels greater then the relevant noise criteria*.' Most of these properties are identified for acquisition or mitigation measures and the RTS states that the blast impact criteria can be achieved by lowering the MICs and blasting in favourable weather conditions.[122]

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[116] Australian and New Zealand Environment Council, 1990 *Australian and New Zealand Environment Council Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration.* <http://www.environment.nsw.gov.au/resources/noise/ANZECBlasting.pdf >
Guideline 2.3.1

[117] PAC, 2012, Maules Creek Project Determination, Conditions Schedule 3 Condition 18

[118] EA, Vol.1, Section 8.7.3, p.129

[119] EA, Vol.1, Section 8.7.4

[120] EA, Vol.2, Appendix H, Section 4.12

[121] EA, Vol.1, Section 8.7.3, Table 30

[122] RTS, Section 4.6

5.3.2 Blasting Vibration

5.3.2.1 Residences

Blasting is permitted and currently conducted under existing approvals for Invincible Colliery and Cullen Valley mines. Some submissions and presentations by local residents stated that the blasting has had an impact on their properties. For example one resident submission stated; '*The vibration and shock wave created has already damaged properties in the Village by cracking walls, cracking driveways and other damage. The Mine, which has been contacted by home owners, is reluctant to inspect or in some cases talk to property owners*'. The Commission has noted but not verified the reliability of these allegations.

The EA predicts that blasting will meet the more restrictive amenity criteria at all privately owned residences, providing the MIC is properly controlled, and there is an extremely low likelihood of superficial or cosmetic damage to these residences or outbuildings. As the proposed blast criteria are similar to the criteria in existing approvals the previous performance should not have caused any damage or complaints. However, this is at odds with some public submissions and presentations from local residents as referred to above.

This again means that the reliance of not breaching the blast criteria relies on reducing the MIC on an ongoing basis.

The number of proposed blasts, up to 40 per week and 10 per day for limited periods of time, is significantly greater than the recommended maximum of one per day by the ANZEC guideline. Presumably the objective for the operator will be the maximum possible MIC (to satisfy operational imperatives) while not exceeding the maximum permissible blast noise or vibration criteria. This has two consequences. Some residents will be subjected to more than one blast per day and these are likely to be near the maximum permissible level. Second, as there will be more blasts closer to the maximum permitted level there will be an increased likelihood of exceedences above that level.

The Commission is concerned about the potential impact of multiple blasts on residents and considers that the number of blasts should not exceed one per day other than for misfires or for minor blasts where the effects of blasting are not perceived at noise sensitive sites. This is more consistent with the ANZEC guidelines.[123]

The Commission recommends there should be a maximum of one blast a day other than for misfires or for minor blasts where the effects of blasting are not perceived at noise sensitive sites.

5.3.2.2 Aboriginal Rock Shelters

The EA has proposed ground vibration criteria at the four identified Aboriginal rock shelters that are predicted to have some potential impact from blasting. These range from 20 to 100mm/s. While there are no generally adopted criteria for protecting rock shelters, these criteria can be compared to the 10mm/sec damage criterion generally adopted for buildings and structures or 50mm/sec for public infrastructure. Blasting is proposed to be conducted 130m to 190m from these rock shelters. Bridges Acoustics first suggested these criteria with the proviso that blasts should not occur within 400m of each rock shelter without prior further assessment by a geotechnical expert. The four rock shelters have been identified in the EA as low to moderate scientific significance.[124] This significance rating should be reviewed and verified by the OEH prior to any final determination. Blasting noise criteria is addressed in detail in section 5.3.1 and see also section 8.3 on Aboriginal Cultural Heritage.

[123] ANZEC, 1990
[124] EA, Vol.1, Section 8.12.3, Table 40

SCT Operations reviewed the Bridges recommendations in 2012 and confirmed these criteria were generally appropriate provided additional management measures were put in place although they concluded that one site (RCK2-10) is at high risk due to natural instability. This rock shelter was identified as low significance in Table 40 of the EA. The Proponent has committed to design blasts to a vibration level at half of the recommended limit and overpressure level at 3dB below the recommended overpressure limit, for each heritage site.[125] Even with this commitment the unstable Aboriginal heritage rock shelter (RCK2-10) could be subject to ground vibration of 10mm/s with blasting occurring at the proposed 130m. The SCT report considers a blasting distance of 100m to >250m would present a moderate risk and states; '*As collapse of this site is considered highly likely in any condition, no low risk distance is suggested.'* [126]

The Commission acknowledges that this rock shelter may be damaged even without mining due to its inherent instability and also notes the EA assessment of a low significance of this shelter and the commitment for a 130m buffer and low MIC. However, as damage to these shelters cannot be repaired the Commission considers it not appropriate to subject the shelter to a 'moderate' risk. As SCT was unable to advise the appropriate criteria to achieve a low risk, the Commission considers it is necessary to apply a negligible mining-induced damage criterion for RCK2-10 in a management plan that demonstrates how this will be achieved.

Recommendation 34: The Commission recommends ground vibration criteria for Aboriginal heritage rock shelters should not be greater then the criteria set out by the Proponent, that is half the recommended ground vibration criteria and 3dB below the overpressure criteria. The Blast Management Plan should demonstrate how blasting can occur with negligible mining-induced damage of the Aboriginal rock shelter RCK2-10.

An additional Aboriginal shelter with paintings was identified in August 2012. Detailed information was not made available to the Commission regarding this site. The site is being further investigated by OEH and the Proponent, and it will need to be considered along with any other newly discovered sites prior to any final decision on the project.

5.3.2.3 Cullen Bullen General Cemetery

There were several submissions from Cullen Bullen residents about the desire to protect the Cullen Bullen General Cemetery from blasting and other environmental impacts. Residents and Lithgow City Council have recommended any blasting be more than 500m from the cemetery. The Proponent argues they can blast up to 178m from the cemetery without damage with appropriate controls.[127] The EA has adopted a ground vibration criterion of 50mm/s and no amenity criteria. Fifty mm/s is significantly greater then the structural damage criterion of 10mm/s but consistent with the public infrastructure criteria of 50mm/sec. While 50mm/sec may be appropriate for stable graves, the Commission is unable to assess whether this would adequately protect any unstable headstones. From an operational perspective, it is also noted in Table 30 of the EA that any charge greater then the smallest MIC of 75kg would exceed 10mm/s.

The Commission accepts the importance the local community places on the cemetery and considers that the EA has not demonstrated that all graves and headstones, including any unstable ones and new ones during the life of the project, will not be damaged with the proposed 178m buffer. The EA states there will be a regular review of the vibration criteria at the cemetery by a suitably qualified person[128] but it may not be feasible to repair any graves or headstones if damage were to occur. The

[125] EA, Vol.1, Section 8.7.4
[126] SCT, 2012, Section 2.4.1
[127] RTS, Section 4.12.1
[128] EA, Vol.1, Section 8.7.4

Commission therefore recommends that there should be a negligible damage criterion for graves and gravestones and the Blast Management Plan should demonstrate how this would be achieved.

The residents also requested the amenity of the cemetery be protected during funerals and when gravesites are normally visited by family and friends. The EA does not adopt any overpressure criteria for amenity at the cemetery but has committed to no blasting on days when services are scheduled and no mining or haulage within 1.5km of the cemetery within two hours of services at the cemetery.[129] While this should protect amenity on days of funeral services, the Commission considers further protection is also warranted for weekends when the cemetery is most likely to be visited. The EA requests approval for blasting between 9am to 5pm Monday to Saturday with no blasting on public holidays '*without prior approval from OEH*'.[130] The current approval for Cullen Valley Mine limits blasting to between 0900 and 1500, Monday to Friday inclusive. The Commission considers the amenity of the cemetery should be adequately protected by also not mining or blasting within 1.5km of the cemetery on Saturdays.

Recommendation 35: The Commission recommends no mining-induced damage is to be caused to any grave or gravestones at the Cullen Bullen cemetery. The Blast Management Plan must demonstrate how this would be achieved.

Recommendation 36: The Commission recommends no mining or coal haulage occurs within a 1.5km radius of the Cullen Bullen cemetery on any Saturday, Sunday or Public Holiday.

5.3.2.4 Pagodas and Cliffs

The EA acknowledged the importance and the sensitivity of the pagodas and cliffs along the escarpment adjacent to the proposed mining area. Potential for impacts on pagodas is also covered in section 6.2 of the Commission's report.

There were many submissions from the public and agencies expressing concern about potential damage to pagodas and the escarpment from blasting and resulting impacts on biodiversity, geodiversity and visual impacts. Concerns were also expressed by bushwalkers and other recreational users of the Cullen Bullen State Forest. See also section 6 of the Commission's report on biodiversity impacts and section 5.4 on the visual impacts of the project.

The Proponent states that highwall mining has a lower potential for subsidence or damage to the pagodas or cliffs than open-cut mining but they need to open-cut mine as close as possible to the escarpment to be able to gain access to the coal seams using highwall mining equipment. The Proponent intends to open-cut mine up to 50m from the pagodas and then highwall mine under them. The consequence of this is that blasting will occur up to 50m from the pagodas.

Coalpac stated it has successfully undertaken open-cut mining and blasting within 170m of sandstone overhang formations (pagodas) at Cullen Valley Mine with no visible impacts[131] while another section of the EA[132] says they have mined up to 100m from cliffs and pagodas with no detrimental impacts. The Commission prefers to rely on more comprehensive expert assessments rather than these inconsistent anecdotal observations.

The blasting criteria aimed at protecting escarpments and pagodas were initially proposed by Bridges Acoustics. However as Bridges Acoustics are not geotechnical experts, SCT Operations was

[129] EA, Vol.1, Section 8.7.4
[130] EA, Vol.1, Table 8, p.42
[131] EA, Vol.1, Section 3.1.3
[132] EA, Vol.1, Section 8.2.3

engaged as part of the EA to conduct a desktop review of potential impacts. The EA refers to the SCT Operations 2011 review report but this was not included in the appendices to the EA. The Commission subsequently sought and received a copy of the SCT report.

SCT used available maps and aerial photographs to map the cliffs and sensitive areas. They point out the limitations of making conclusive recommendations based on a desktop review and suggest more detailed information is needed including high resolution digital terrain modelling, stereo air photo interpretation and field inspections. They refer to advice from Coalpac that open-cut mining has occurred up to 100m from the cliffs and pagodas without detrimental impacts and suggest that a 100m buffer would appear to be an appropriate buffer to manage the risk to areas of sensitive terrain. However they state this 100m buffer zone is based on the Proponent's site experience and SCT has not itself assessed the appropriateness of the buffer. This is a somewhat circular process. As stated above the Commission does not accept anecdotal observations of blasting distances as a reliable indicator for predicting blasting impacts on sensitive cliffs and pagodas.

SCT recommended the final open-cut boundary within a 100m buffer zone may be varied based on more detailed slope risk analysis at individual sites and performance of the adjoining area of mining. The Commission is concerned this relies in part on a trial and error approach. SCT makes no mention of a 50m buffer as proposed in the EA.

SCT also recommended before and after digital 3D photo documentation of the cliff faces be conducted to form a baseline of existing conditions.

The Proponent engaged Terrock Consulting Engineers for the purposes of preparing the RTS, to review the proposed blasting methods and provide further advice in relation to protection of the escarpment and pagodas. Terrock stated:

> *'Blast vibration, particularly ground vibration may or may not be upsetting the balanced equilibrium where gravity, friction and mechanical interlocking are holding rocks in place, but there is no evidence of the level of ground vibration required to cause rock falls.'* [133]

This and similarly qualified comments concerning protection of the escarpments and pagodas suggests that blasting in proximity to these natural features carries an unquantifiable risk of damage.

Terrock concluded that ground vibrations should be less then 100mm/s to protect the pagodas and suggested at a distance of 50m the proposed mining would generally meet 100mm/s except Upper Irondale to Moolarben Coal Seams where they might need a distance of 130m. The EA states they can meet the proposed criterion of 100mm/s in these seams if they carefully control decking and charge weights. The RTS states a geotechnical survey would be conducted before starting any blasting within 200m of sandstone formations (pagodas, escarpment) and geotechnical input would be provided into the final highwall design where open-cut mining is proposed within 100m of sandstone formations. If they are unable to achieve the criterion they would increase the buffer to greater than 50m.[134] The RTS commits to a geotechnical review at 500m distance from these features.[135]

The Commission witnessed the fragility of these features during a flight over an area adjacent to the project area where several recent rockfalls and escarpment collapses were observed. These were allegedly caused by underground mining. The Proponent advised the intended highwall mining was

[133] RTS, Appendix D, Section 7.1
[134] EA, Vol.1, p.109 and p.131
[135] RTS, p.147

less damaging than traditional underground mining. Natural erosion of the sandstone will also cause rock falls and landslips, but this occurs by isolated incidents over geological time.

Public submissions vary in their recommendations to protect these features. For example the Blue Mountains Conservation Society (BMCS) recommends a buffer of 310m and some suggest no highwall mining be permitted. During the public hearings, the BMCS acknowledged it does not have geotechnical expertise but it considers 310m a conservative recommendation based on information in the EA and supporting documents.

Geonet Consulting Group in Appendix F of the EA assessed the potential for subsidence from the proposed highwall mining as part of a broader assessment of highwall mining. This assessment did not review the impact of blasting on the pagodas or cliffs. A limited Peer Review of the Geonet assessment was conducted by Boyd Mining Pty Limited addressing some issues but this also did not further investigate the potential for blast damage to pagodas or cliffs.

Having given careful consideration to the EA and relevant consultants' reports, the Commission is not confident that the proposed minimum distance from the pagodas and cliffs; the proposed blasting charge weight and blasting criteria; and the geotechnical surveys will prevent damage to the sensitive pagodas and cliffs under all circumstances.

The Commission considers a precautionary approach should be taken to protect these pagodas and escarpments because of the uncertainty of impacts of blasting up to 50 metres, the high value of these features and the fact that they cannot be repaired once damaged. The issue of buffer distance is also addressed in detail in section 6 of the Commission's report. As noted in that section the increased size of buffers necessary to protect biodiversity should also protect these structures from blasting impacts.

5.3.3 Commission's Findings

The Commission has a number of concerns about blasting impacts and statements in the EA. These are summarised:

- Some residents have submitted that blasts from current operations have impacted their residences. While these allegations have not been validated by the Commission, the proposal is for a much larger and intensive open-cut mine than any previous operation near these residences. The Commission is of the view that blasting impacts on residences can be managed by adjusting the MIC, but this requires a high level of ongoing commitment by the Proponent which appears not to have been the case in the past if the residents' claims are to be taken as valid. This approach also creates a collateral problem (see below);
- Blast criteria for overpressure and ground vibration cannot be met at all private residences under normal operations without the need to reduce the blast charge and avoid blasting in certain wind conditions. These limitations create potential conflict with day-to-day operational efficiency and require a high level and long term commitment by the operator to ensure the blast criteria are not exceeded at any residence on any day;
- The number of proposed blasts, up to 40 per week and 10 per day for limited periods of time, is significantly greater than the recommended maximum of one per day by the ANZEC guideline. This is likely to result in some residents being subjected to multiple blasts per day and these are likely to be near the maximum permissible level. Second, as there will be more blasts closer to the maximum permitted level there will be an increased likelihood of exceedences above that level. The Commission considers this is likely to cause an unacceptable impact on some residents.

- The number of qualified statements in the EA, for example: *'Blasting will not occur within 500m of private land unless adequate controls are implemented to minimise the risk of fly rock'*[136]; *'Blasts will be delayed where possible during rainfall'*[137]*; 'Blasting in new mining areas in close proximity to heritage sites and residences (receivers) will commence furthest from the receiver (where possible…*[138] The consequence of the qualified statements is that there is no clearly defined predicted outcome and terms like; 'adequate', 'minimise', and 'where possible' are not able to be measured for compliance purposes.
- There is no guarantee that the sensitive cliffs and pagodas will be protected from blasting damage. Neither the EA nor the consultants' reports provide a sufficient level of confidence that the proposed measures will prevent damage to these sensitive structures under all circumstances. These structures cannot be repaired if damaged. See also section 6.2 of the Commission's report in relation to the pagodas.

Recommendation 37: The Commission recommends that the Proponent's approach to controlling noise and vibration from blasting at residences by reducing the MIC and increasing the number of blasts to be rejected as imposing an unreasonable impact on the residents. Any exceedence of the ANZEC guideline for blasting frequency should be strictly limited, particularly when the expected noise or vibration levels are likely to be at or close to the limits.

Recommendation 38: The Commission recommends that there should be no impacts to the pagodas and cliff lines from blasting. The Commission does not accept that a 50m buffer will guarantee this outcome, but is unable to determine a satisfactory buffer distance from the available information. To accommodate this situation the Commission recommends that no blasting occur within 300m of the pagodas or cliff lines without an independent geotechnical surveyor certifying that the blasting proposed will not cause impact to the pagodas or cliff lines. In any event a minimum stand-off distance of 100m must be maintained for blasting from all pagodas, cliffs and other rocky outcrops.

Recommendation 39: The Commission recommends that strict monitoring requirements which allow detection of any blasting-induced impacts to pagodas, cliff lines or rocky outcrops be required in the event that the project proceeds.

Recommendation 40: The Commission recommends that the Department review the mechanism used to assess complaints of blast damage to private property with a view to providing the residents with confidence that their claims are being assessed by a qualified person who is transparently independent from the Proponent.

5.4 Visual Impact

5.4.1 Scope of Visual Impacts

The visual impact of the mining operations largely concerns Cullen Bullen residents, visitors to Ben Bullen State Forest (BBSF) and the Gardens of Stone National Park, travellers along the Castlereagh Highway and local rural residents.

Lighting impacts have also been raised as an issue relating to night time mining and truck movement operations and the potential use of the Wallerawang-Gwabegar rail coal loader and coal trains.

The EA suggests a visual and lighting assessment was undertaken by Integral Landscape Architecture

[136] EA, Vol.1, Section 8.7.4
[137] EA, Vol.1, Section 8.3.4
[138] EA, Vol.1, Section 8.7.4

and Visual Planning in 2010 but the Visual Impact Assessment (VIA) report in Appendix I of the EA was prepared by JVP Visual Planning and Design (JVP) in December 2011.[139]

The visibility of the project area from the project boundary from all directions provided the basis of the assessment. Landscape and specific viewing locations were evaluated in terms of potential impact from the mining operations.

The study considered the level of visual effect (visual contrast and integration of the project with the existing landscape) and visual sensitivity (how change to the landscape is regarded) which together determine the visual impact. Lighting impacts were assessed separately, and are determined largely by the location and level/height of the night operations and the presence of natural or constructed barriers such as bunds, vegetation or other forms of screening.

The project area is located in large part within the Ben Bullen State Forest and the eastern landscape is dominated by open sclerophyll forest communities, moderate to steep slopes and ridges often consisting of sandstone escarpments while the northern area has more moderate slopes with no overtopping sandstone geological features. Baal Bone Colliery features in the northern landscape which also comprises some rural properties. Rural lands and residences tend to dominate some areas of the west and south western sector.[140]

The assessment concluded that from the northern view sector some receivers will experience significant visual impacts until the bund is constructed in the north to screen mining in the Cullen Valley area. East Tyldesley mining operations will have a high visual impact for northern residential locations for a period of 2 to 10 years and there is potential for similar impacts from parts of the Gardens of Stone National Park.

The consultants considered that due to limited visibility from the east there would be virtually no visual impact from that view sector. However, the EA acknowledges that there will be visual impacts but they will decrease as rehabilitation takes effect and develops into forest communities. This will, of course, take years to achieve despite the Proponent claiming the visual effect will be reduced by year 2.[141]

The southern view sector primarily has low sensitivity rural land uses. However, residences oriented towards Cullen Valley Mine such as those west of the Wallerawang- Gwabegar rail line will have a high visual effect initially but the Proponent claims this will reduce to moderate or low as the rehabilitation activities gain momentum.

The western view sector is dominated by rural lands but there are two residences that will experience high sensitivity to Cullen Valley Mine operations for a period of 2-3 years from commencement of the project. The Proponent claims the impacts will diminish as rehabilitation progresses. The Proponent does not commit to a time for the reduction to start to be effective, but given experience with other rehabilitation areas noticeable change will take considerably longer than 2-3 years.

The whole of the central view sector has high sensitivity and the highest level of visual impact.[142] The Castlereagh Highway runs through the centre of the spine and it includes Cullen Bullen, the cemetery and rural residences.

[139] EA, Vol.2, Appendix I
[140] EA, Vol.1, p.132
[141] EA, Vol.1, p.141
[142] EA, Vol.1, Section 8, p.147

The Proponent acknowledges that significant visual effects will include active mining operations while OEAs are being constructed, progressive mining activities adjacent to the Castlereagh Highway and views of mitigation bunds before rehabilitation. [143]

While the entire central view sector has high visual sensitivity some residents north of Cullen Bullen and north-west of Invincible Colliery will be more affected due to their proximity to mining areas. The cemetery is also in the central view sector. It is a highly sensitive area and it will be impacted by mining particularly in the East Tyldesley area. The Proponent redesigned the mine plan to reduce the impact, but there will still be some impacts. The impact of mining on the cemetery including visual impacts is also discussed in section 5.3.2.3.

The VIA carried out by JVP noted that most of the infrastructure associated with the project was approved as part of the existing operations with the exception of the ETCPP which has the potential for a high visual effect. The rail siding, roads, bridges, site offices and water infrastructure are not expected to cause undue concern in relation to visual impact due to the construction of bunds, location and, in the case of site offices, replicating buildings that are already in place.

5.4.2 Mitigation Measures

The layout of the mining operations and topography are important factors in mitigating visual impacts. Further to this, the Proponent proposes to reduce visual impacts through a number of measures including designing OEA outer-surfaces to reflect the surrounding landscapes, retaining a tree screen between the Castlereagh Highway and mining areas, the early establishment and rehabilitation of the outer-surfaces of bunds and OEAs particularly in the eastern section of the Cullen Valley mine and the western parts of East Tyldesley and Invincible Colliery.[144] Bund locations are shown in Figures 10 to 14 in the EA.[145]

Although the Proponent has provided some details in relation to the location and size of the bunds[146] Lithgow City Council (LCC) has expressed concern about the lack of information provided in relation to bund wall heights, widths, rehabilitation and construction material. Council is not satisfied it has sufficient information on the timing of the construction of the bunds nor the visual impact of the bunds particularly from the Castlereagh Highway.

A site inspection of the Invincible Colliery and Cullen Valley Mine areas demonstrated the work the Proponent has already undertaken as part of the existing approval to rehabilitate areas and reduce visual impacts. The Commission recognises the commitment by the Proponent to restore the landscape. However, it will take some years for the disturbed lands to have even a basic shrubby cover and many decades to return to anything like their natural state. As noted in section 6.3.4.2 there is no demonstrated mature rehabilitation of native forest on open-cut mines in NSW and as such there is no certainty that mature vegetation cover can even be established on the project area in the long term.

With the proposal for 24-hour operations light pollution becomes an issue. The Proponent acknowledges concerns from some residents but considers the topography, vegetation, established OEAs and haul road bunds will screen direct lighting impacts. There is potential for direct lighting effects from the ICPP and ETCPP. Lighting from the ICPP will impact sections of the Castlereagh

[143] EA, Vol.1, Section 8, p.147
[144] EA, Vol.1, Section 8, p.151
[145] EA, Vol.1, Section 4, pp.47-51
[146] RTS, pp.75-76

Highway but nearby residences will be screened. The actual location of the ETCPP will be screened by natural topography.

5.4.3 Commission's Findings

The Commission has considered all submissions and presentations at the public hearings relating to visual impacts and it has considered the Proponent's proposals and responses. The natural landscape will change and cannot be replicated. Rehabilitation will take many years and the results cannot be guaranteed. Undoubtedly the efforts of the Proponent, the viability of the mining operations into the future and if necessary compliance efforts to enforce conditions of approval will be important. But the most important factor is whether the characteristics of the deeper layers of the replaced landscape can provide the conditions necessary to support long term survival of mature forests. This is not known.

Well over 100 submissions raised concerns about the visual impacts to the pagodas and escarpment landscapes. The EA is virtually silent on the visual impact of mining close to pagodas. Even in the RTS visual impacts on the pagodas gives way to discussion on damage issues from blasting rather than visual issues. While the Proponent claims a commitment to ensuring visual and scenic values are preserved, there is little in the mitigation details to promote confidence that this will be the outcome. The Proponent is relying on rapid progressive rehabilitation but the fact remains that the views to and from the pagodas will be disturbed for many years as a minimum, with a real possibility of permanent scarring. While bunds and other mitigation measures might assist the position portrayed by the Proponent this is absolutely best case scenario. A number of submissions suggested the previous visual mitigation measures have not removed visual scarring of the landscape and this was the Commission's impression gained from its site visit.

The natural landscape is likely to shield residences from lighting and visual impacts in conjunction with the bunds but the Proponent is realistic in recognising that some visual impacts will remain. It is not possible to undertake open-cut and highwall mining without exposure of the operations to some extent. It is the extent which is the issue and whether it is acceptable to the community in general, including local residents and visitors.

JVP note that the visual effect of open-cut mining contrasts with the surrounding landscape creating strong form, shape and line characteristics. This contrast greatly decreases over distance and it is influenced by atmospheric conditions such as cloud cover, backlight and heat haze.[147] However, JVP acknowledge that the impact cannot be reduced until the final landform is created and rehabilitation takes effect.

Overburden emplacement areas will also create a strong visual effect in terms of their contrast with the landscape and some visual effects will be evident 'for a number of years' until rehabilitation activities start to reduce the impacts.[148]

Some submissions expressed concern that commitments given in EAs are not realised. The Lithgow Environment Group claim that in 2006 the Proponent indicated that the mining operations at that time would have a negligible visual impact but the scarring is still visible from the Castlereagh Highway.[149] The Colong Foundation followed the same theme by quoting the Proponent's assurance associated with the 7 September 2006 approval for Invincible Colliery that *'the open cut operations proposed would not be visible from the Castlereagh Highway due to the intervening topography and*

[147] EA, Vol.2, Appendix I, p.24
[148] EA, Vol.2, Appendix I, p.25
[149] Lithgow Environment Group, submission on EA, 28 May 2012, p.19

existing vegetation coverage'.[150] The Foundation provided a photograph taken from the Castlereagh Highway claimed to be taken in September 2011 which clearly shows steep cuts in the escarpment, the results of open-cut operations. Based on the photographs the visual impact has not been shielded by topography and vegetation.

These comments reinforce the Commission's view that, while mitigation measures might reduce the visual impact to some extent, the effects of mining will be seen from some sectors to varying degrees and will be visible for a period of years leading into decades. It is futile to suggest otherwise.

As noted earlier, the central sector has the highest visual sensitivity and the highest visual impact. Travellers on the Castlereagh Highway will be exposed to mining operations primarily from the eastern sector of the Cullen Valley mine, the western part of the East Tyldesley mining area and the Invincible Colliery mainly at the higher points where vegetation shielding will not mitigate the impact. The constant visual images of mining activities from the highway will serve to reinforce opposition to above ground mining by those concerned about this project.

Cullen Bullen appears to be sufficiently screened by vegetation from visual impacts except for a small number of residences in one particular section of the village although JVP claim that these houses do not have a strong orientation towards the Invincible Colliery mining areas.[151]

Rural residences along the Castlereagh Highway north of Cullen Bullen and adjacent to East Tyldesley mining operations will have a direct view of the proposed noise bund. The choice here is a view of the noise bund or the mining operations. The Commission expects residents to prefer no mining operations but, if approved, a bund would likely be the preferred option.

The visual impacts from the Cullen Bullen Cemetery have been assessed at section 5.4.

The proposal is for 24-hour operation in the mining areas, but not for transport of product on public roads which will be restricted to the hours of 0700 to 2130 Monday to Saturday. The proposed noise bunds and to some extent the existing vegetation and topography will minimise the impact of lights from trucks, other equipment, plants, rail coal loader and mine associated buildings. The Proponent claims that during the bund construction period equipment lights could impact residences but construction will not extend beyond 6pm. This commitment should be a condition of approval.

Lighting will be seen from the ICPP by sections of the Castlereagh Highway but residences will be screened from direct light. However, the ICPP and ETCCP will collectively create diffuse lighting impacts causing a glow. The Proponent claims that the glow will not create a significant visual effect.[152] While such a glow might not be an issue in a city or town of a reasonable size the impact on a village or rural residence might be more pronounced for people living in those locations.

The Commission noted the view expressed by the Institute of Sustainable Futures suggesting a nexus between health and visual impacts.[153] While a negative reaction to visual impacts might relate to stress levels in some people there was no evidence provided to demonstrate this was a universal or even common outcome.

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[150] Colong Foundation for Wilderness, submission on EA, 20 May 2012, p.8
[151] EA, Vol.2 Appendix I, p.60
[152] EA, Vol.1, Section 8, p.151
[153] UTS Institute of Sustainable Futures 2012, *Independent review of the Coalpac environmental assessment.* University of Technology, Sydney. Within the Total Environment Centre submission on EA, 22 June 2012, p.26

To attempt to determine what is and what is not visually acceptable involves a very subjective assessment. While some might argue for no disturbance others can accept an altered landscape for a period if there are benefits which in this instance will largely be economic in nature. Any development will have some visual impact. The question really comes down to whether the impacts, if determined as being negative, outweigh the perceived benefits.

The Commission accepts that there will be visual and lighting impacts for some residents and visitors travelling through the area as well as those walking or otherwise using the reserves outside the project boundary area. These impacts will vary depending on a range of factors including location and whether rehabilitation programmes are successful. Above ground mining will always produce visual effects but the sensitivity for this project is heightened because it is located in an accessible and popular recreational area.

In this context the Proponent has not been able to demonstrate to date that it can open-cut mine in the vicinity of the pagodas without leaving substantial scarring. This scarring significantly detracts from the visual values of the landscape. Substantial reliance is being placed on the rehabilitation of the scarred areas with native vegetation. However, even the shrubby cover takes more than three years to establish and there is no guarantee that mature stands of native forest can be maintained on the rehabilitated landscape because of the radically altered nature of the deeper soil profile and the altered hydrology. There is also acknowledgement by the Proponent's consultants that the current vegetation associations present in the vicinity of the pagodas cannot be replicated.

The Commission's conclusion is that there can be no certainty that the proposed rehabilitation can restore the visual amenity of the pagoda landscape – even to the casual observer. The Commission also concludes that at best the visual impacts would be evident for a minimum period of some decades.

The long term visual scarring of the landscape is incompatible with the Gardens of Stone Stage II proposal. While underground mining has the potential to co-exist with some categories of conservation areas, open-cut mining destroys the surface environment, a point made by the Blue Mountains Conservation Society in opposition to an extension of open-cut mining at the Invincible Colliery in 2006.[154] In reality the impact of these proposed mining operations may result in an area of public land having no real future value for conservation or recreation.

Above ground mining operations typically result in visual impacts, but mitigation measures can usually reduce the effects to a level where they would not result in a project being refused. However, this particular project involves open-cut mining in a State Forest that may eventually form part of the national park system, in proximity to pagodas which have a very high visual value, and there are major concerns about the effectiveness of rehabilitation. All of these factors make the visual impacts of this particular project highly sensitive.

5.4.4 Commission's Recommendations

The visual impacts of the project are significant and negative and they need to be factored into the overall assessment of the merits of the project. However, in the event that the project proceeds further the following should be addressed:

Recommendation 41: The Commission recommends that the Proponent should provide the Department with the construction schedule for the noise and visual mitigation bunds as well as specifications and other technical details prior to construction.

[154] Blue Mountains Conservation Society, letter to the Department, 9 May 2006

Recommendation 42: The Commission recommends that the onsite treatments outlined in the EA, Volume 1, Section 8, pp.151-152 be developed as conditions of approval.

Recommendation 43: The Commission recommends that the Proponent be required to report to the Department and the local community on a regular basis on the implementation of rehabilitation and mitigation measures, with the frequency and the extent of reporting to be determined by the Department.

Recommendation 44: The Commission recommends that the construction hours of operation should form a condition of any approval, in part to alleviate light pollution impacts on residents and other users of the area.

6 Biodiversity (Term of Reference 1(b)(ii))

6.1 Introduction

This section of the review report will deal with the significant geological features of the project area (the pagodas, escarpments and rocky outcrops) as well as the flora and fauna. The reason is that the geological features provide essential habitat components for some of the flora and fauna as well as being significant features in their own right.

The general description of the regional geography is contained in Volume 1 of the EA at pp.9-10. From a biodiversity perspective the region covers the western escarpment and so contains a crossover of species and associations from the tablelands and western slopes. The descriptions in the EA tend toward emphasising the Sydney bioregion affiliations, but OEH have questioned this and indicated that they consider that the vegetation associations are more typical of tableland communities. However, it is common ground that the project area and surrounds contain a complex array of vegetation associations and a rich species diversity. This perception was reinforced by the Commission's own site inspection.

The project area is largely located within the Ben Bullen State Forest. There are several other State Forests and conservation reserves in reasonably close proximity: the Gardens of Stone National Park is 2km north of the project area, Wolgan State Forest is some 8km north-east (but contiguous with northern areas of Ben Bullen State Forest that are outside the project area) and Newnes State Forest some 12km to the south-east. Blue Mountains National Park also lies to the east.

There has been a long-standing interest by the conservation lobby and by the state conservation agency (OEH) in extending the protection of the unique Triassic geological formations and the associated vegetation communities of the area by inclusion of Wolgan State Forest and Ben Bullen State Forest in the Gardens of Stone Stage II reservation proposal. This proposal would provide substantial regional conservation benefits by linking existing reserves with other existing high quality areas of native vegetation. This issue is dealt with in more detail below.

Section 6.2 deals with the unique geological features (the pagodas) and the escarpments and also with their associated physical and biological characteristics. The pagodas and surrounds are referred to as 'the pagoda landform' for the purposes of this review. Section 6.3 deals with other aspects of terrestrial ecology.

6.2 Pagodas and Associated Environments

6.2.1 Introduction

'Pagodas' is the common name given to the distinctive sandstone formations found in a limited area on the western escarpment of the Blue Mountains north-west of Sydney. There are two forms: smooth, beehive-like structures (smooth pagodas) and stepped, terraced structures known as platy pagodas. Platy pagodas are the ones potentially impacted by the proposed project.

Platy pagodas are massive, intricately patterned Triassic sandstone formations with ironstone banding. The scientific literature refers to them as '*distinct and significant features'*, with the authors

'*not aware of any other rock formations in Australia or overseas that mimic the geomorphology of platy pagodas'*.[155]

To the lay observer, platy pagodas are a spectacular landform (see Figure 6-1 and Figure 6-2).

Figure 6-1: Pagoda Landscape – Typical of the Project Area
(Source: K. Muir, 2010 in submission, 30 May 2012)

[155] Washington, H.G. and Wray, R.A.L 2011, *The geoheritage and geomorphology of the sandstone pagodas of the North-western Blue Mountains Region (NSW)*. Proceedings of the Linnean Society of New South Wales, pp. 131-144, p.134

Figure 6-2: Pagoda (Courtesy of Ian Brown)

This is evidenced by the large number of submissions emphasising that they must be protected. However, only around 50% of pagoda landforms are protected within the conservation reserve system.[156] Of the remaining 50%, there is already significant damage to some aggregations, principally from underground longwall mining. This damage consists of subsidence-induced cracking, fracturing and cliff falls.[157] Clear evidence of this type of damage was observed by the Commission during both aerial and ground inspections of the areas surrounding the project site.

Although much of the focus of both submissions and the relevant sections of the Proponent's EA and Response to Submissions is on the structural integrity of the pagodas themselves, it is important to note that they provide a complex of habitat types for both flora and fauna, some species of which are rarely found elsewhere (e.g. Pagoda Daisy). They are also set in a complex arrangement of habitats characterized by a convoluted line of towering rock faces containing numerous overhangs and crevices giving way to steep slopes (talus slopes). At the bottom of these slopes there are deeply dissected wet gullies between the pagoda formations and these in turn give way to a forest floor dominated by several eucalypt vegetation communities. This complex is referred to in this section as the 'pagoda landform'. A number of fauna species, including species listed under the NSW Threatened Species Act and/or the Commonwealth Environment Protection and Biodiversity Conservation Act, utilise multiple parts of this habitat arrangement either seasonally (e.g. the Broad-headed Snake) or for daily living requirements (e.g. Brush-tailed Rock Wallaby and Eastern Bent-wing Bat).

The pagodas and cliff lines also contain evidence of Aboriginal occupation, including rock-art sites.

[156] Colong Foundation for Wilderness, submission on EA, 30 May 2012, p.12
[157] Washington and Wray, 2011, p.133

The pagodas do not receive much specific mention in the EA. However, it is clear that the Proponent is aware of the significance of the pagoda landscape, even if the language is indirect (e.g. '*sensitive landscapes'*, '*Triassic formations'*, etc.). The Proponent's Response to Submissions provides specific recognition of the significance of the sandstone pagodas, escarpments and cliffs within and surrounding the project boundary[158] and notes that '*the Project mine plans and mitigation measures include a number of commitments specific to these features'*.[159]

The questions for the Commission are:

- What level of significance should be attributed to the pagodas themselves and to the pagoda landscape?
- What level of protection should be afforded to these features?
- What risks does the project pose to these features?
- Given these risks, what actions might be taken to avoid, mitigate or offset them?

6.2.2 Significance of the Pagodas Themselves and the Pagoda Landform

The pagodas cannot be considered as structures in isolation. As noted above, they are part of a landform consisting of multiple pagoda structures and intervening sections of cliffs, with steep slopes and dissected gullies below.

The paper by Washington and Wray[160] clearly identifies the pagodas as a unique landform on a world scale, identifies that their distribution is limited to a small section of the western edge of the Great Dividing Range, and notes that significant mining-induced impacts have already occurred to many of the formations located outside of the reserve system. Protection of the pagodas in the vicinity of the proposed project has long been on the agenda of the conservation movement of NSW.[161] The title of the proposed area for reservation (Gardens of Stone Stage II) indicates the importance attached to these features.

As noted above the pagodas also provide critical habitat for some flora species and key habitat features for threatened fauna including species identified under the relevant State and Commonwealth legislation. They also contain significant items of Aboriginal cultural heritage.

The Commission has previously canvassed the process for allocating levels of significance to particular natural features.[162] It noted that the process inevitably involves some degree of subjectivity, but that subjectivity decreases as the assessment approaches either end of the significance spectrum.

Based on the scientific literature, the international significance of the pagoda structures, the importance of the habitat, multiple submissions on the EA and at the public hearings, and the Commission's own observations during both aerial and ground inspections, the Commission concludes that the significance of the pagoda landform is at the top of the scale and thus the pagoda landform should be afforded special significance status and the highest possible level of protection. The Commission also notes that DRE supports this level of protection:

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[158] RTS, p.77

[159] ibid, p.77

[160] Washington and Wray, 2011, *op. cit.*

[161] *ibid*, p.133. The authors note that the proposals date back to 1985 with partial reservation of these landforms in 1994 and subsequent proposals for Gardens of Stone, Stage II dating from 2005.

[162] NSW Planning Assessment Commission 2010, *Bulli Seam Operations Review Report*, NSW Planning Assessment Commission, Sydney pp.101-102 which followed on from the work in Southern Coalfield Inquiry Report (NSW Department of Planning 2008)

'…the applicant needs to demonstrate the rock pagoda features will not incur mining-induced damage and most importantly, pillar stability is such that there is no risk of further subsidence after mining is complete.'[163]

Recommendation 45: The Commission recommends that the pagodas and the associated escarpments be considered natural features of special significance and that they be fully protected from any mine-induced impacts.

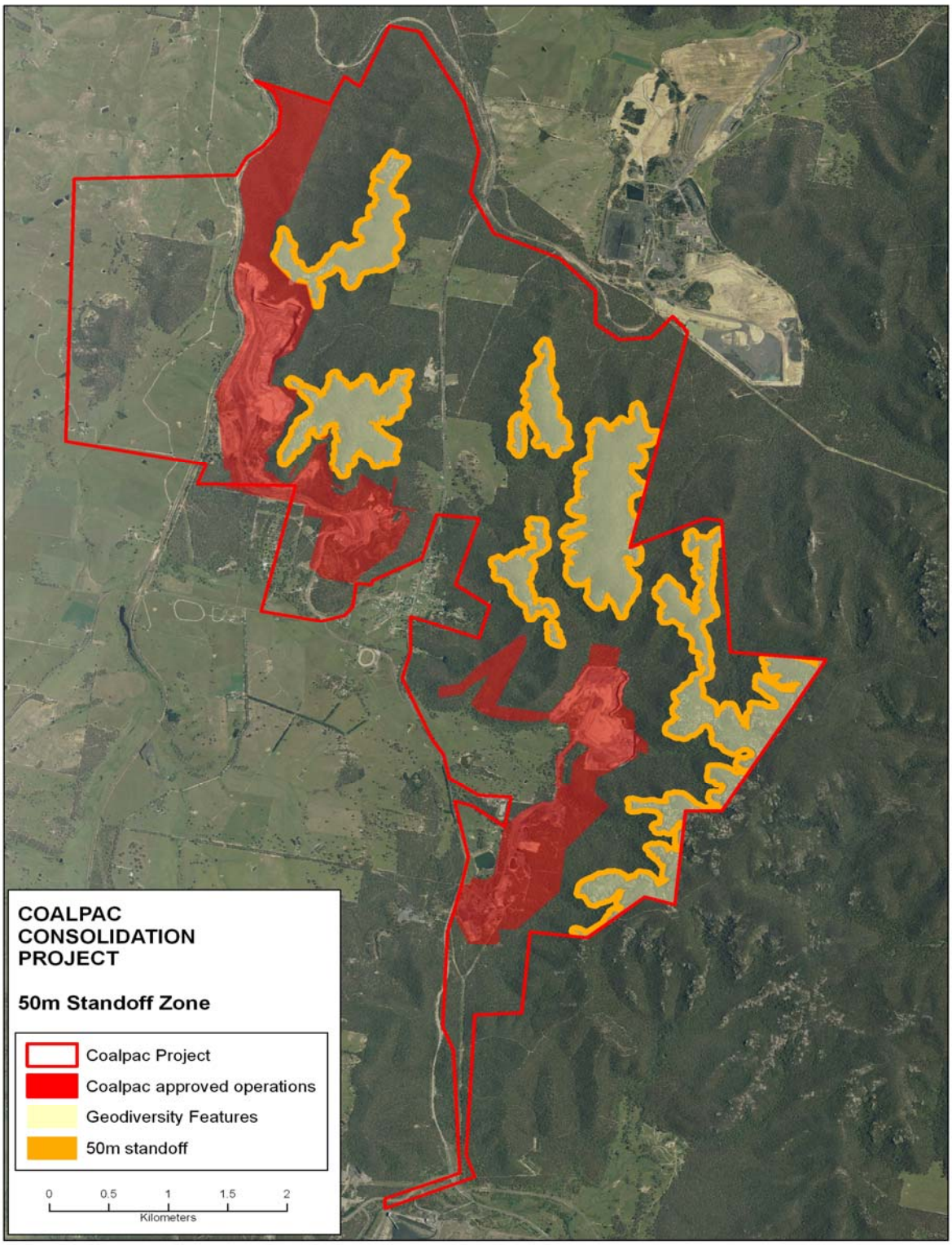
6.2.3 What Risks does the Project Pose to these Features?

Potential risks to the pagoda landform must be considered in the context of the activities proposed in the project. These include open-cut mining to within 50m of the pagodas themselves, blasting as an integral part of that process, and then highwall mining beneath the pagodas.

The 50m setback distance is referred to frequently in the EA (it is the only setback distance referred to in Appendix F, which is the relevant Appendix for consideration of stability and subsidence). However, the main report (EA p.45) refers to a standoff zone of only 20m from any significant exposed outcrop or formation that does not fall under the categorization of '*pagodas or significant sandstone cliffs or escarpments'*. The location of the '*sandstone pagodas and escarpments*' within the project area is outlined in Figure 5 of the EA.[164] However, there are some differences of detail between Figure 5, and Figure 6-3 in this report. The map in Figure 5 of the EA is of relatively poor quality. The map in Figure 6-3 over the page was produced by OEH using sophisticated equipment.[165] It should also be noted that the Colong Foundation asserts that the pagodas and escarpments have not been accurately mapped in the EA.[166]

[163] DRE (Mine Subsidence Board), letter to PAC, 7 December 2012 (available in Appendix D)
[164] RTS, p.74
[165] OEH, letter to PAC, 6 November 2012 (available in Appendix D). But note that OEH suggests that ground truthing is required to obtain a fully satisfactory result.
[166] Colong Foundation for Wilderness, submission on EA, 30 May 2012, p.12

Figure 6-3: 50m Standoff Distance (Source: OEH, letter dated 6 November 2012, Figure E1.1)



Since many of the sandstone landform arrangements in the project area are separated from the escarpment (see Figure 6-3), the definition of just what constitutes a 'pagoda or significant sandstone cliffs or escarpments' and what constitutes a 'significant exposed outcrop or formation' becomes a critical issue. OEH advises that it has been seeking this information from the Proponent for some time without success.[167]

The rest of this review section assumes a minimum setback distance of 50m from all pagoda landforms and a risk review buffer of 100m[168] combined with a geotechnical survey of any 'sandstone formation (pagoda)' prior to blasting within 200m.[169] Any further assessment of this proposed project would need to review these arrangements and settle the definitions.

The areas of risk can be summarised as:

(i) potential risks to structure of the pagodas and escarpments
- blast damage (primarily vibration)
- slope instability
- subsidence
- highwall pillar failure or other highwall impacts;

(ii) potential risks to flora and fauna
- direct impacts from the open-cut, blasting or other operational activity
- indirect impacts from noise, dust and lighting
- destruction of habitat; and

(iii) potential risks to the visual value of the pagoda landform
- structural damage to the pagodas or cliffs
- proximity of the proposed open-cut (50m) and clearing of slopes and forested areas below the pagodas
- limitations of rehabilitation in replacing key elements of the landform.

6.2.3.1 Risks to Structure

6.2.3.1.1 Blasting

The risks to pagoda structure from blasting are considered in detail in section 5.3.2.4. The risks associated with the proposed 50m setback are considered unacceptable.

6.2.3.1.2 Slope Instability

The risk from slope instability is considered in the EA (Volume 1, pp.109-110). This is based on a desktop review and fieldwork from previous studies. The EA acknowledges that the talus and scree slopes form an intermediate zone between the cliff faces and the valley floor and describes them as being '*composed of unconsolidated material in repose'* and that they '*form a natural batter against the cliff and escarpment faces'*.[170]

A number of risks associated with these slopes are identified:
- slope instability may increase due to the open-cut mining operations;
- vibration from blasting and potential slope failures '*could increase the risk of instability to the escarpment and pagoda rock formations'*; [171]

[167] OEH, letter to PAC, 6 November 2012
[168] EA, Vol.1, p.109
[169] EA, Vol.1, p.131. But note the commitment to a geotechnical review at 500m distance from these features at p.147 of the RTS.
[170] EA, Vol.1, p.109
[171] ibid.

- '*more detailed investigation is required at final highwall design stage in order to fully delineate these features and risk assess their stability*'; [172] and
- talus slopes '*can be steeper than the angle of repose (34 degrees) so they may not be able to be returned to their existing form after mining*'.[173]

The Commission considers that there is insufficient information available on which to judge the risks posed to the pagodas and cliff lines from mining-induced instability in the slopes and also that there is limited information on which to base assessment of the risks to the slopes themselves (as a component of the pagoda landform), including their rehabilitation if damaged. These information deficiencies should be rectified prior to any consideration of approval.

6.2.3.1.3 Subsidence

The risk from subsidence is significant. The proponent has used <20mm vertical subsidence as the limit of the allowable impact for protection of escarpment structures.[174] This is based on a mine subsidence plan previously approved by DRE in 2003. The Commission sought advice from DRE as to whether they remained confident that <20mm vertical subsidence would guarantee that pagoda structures would not crack, tilt or fall. DRE responded:

> *'In any event the applicant needs to demonstrate the rock pagoda features will not incur mining-induced damage and most importantly, pillar stability is such that there is no risk of further subsidence after mining is complete.'*[175]

The risk of subsidence impacts is primarily associated with the proposed use of highwall mining under the pagodas. The risks from subsidence and highwall mining will therefore be dealt with together. The general layout of the highwall mining process is set out in the EA.[176] The risk of subsidence has been assessed over a study area within the project area.[177] The Proponent argues that the assessment by GEONET (2011) '*found that Project highwall mining operations can be designed to ensure that no subsidence impacts will endanger surface features or ecology*'.[178]

More detailed examination of the material in the EA and Response to Submissions raises a number of issues that are of concern to the Commission.

The report notes a large number of 'unknowns' that could affect the analysis and conclusions.[179] These include *inter alia*:

- stability of the highwalls at Coalpac (p.2);
- limited geotechnical data means only a generic assessment is possible (p.5);
- calculation of coal mass strength is required for each seam to be mined, but is not available for the project. Substitute values from equivalent seams in other mines have been used in the analysis (p.17);
- effect of previous underground workings (GEONET has inserted a strength reduction factor in the analysis to accommodate this, but there is no justification provided for the number and no data to support it) (p.17);

[172] ibid.
[173] Colo Committee, submission on the EA, (undated) 2012
[174] EA, Vol.2, Appendix F, p.2
[175] DRE (Mine Subsidence Board), letter to PAC, 7 December 2012 (available in Appendix D)
[176] EA, Vol.1, Section 4.4.3 p.53 and Figs 16 and 17
[177] EA, Vol. 2, Appendix F, p.2
[178] RTS, p.7
[179] Page numbers included in the text in this section refer to page numbers in Appendix F of the EA

- groundwater status of previous workings is unknown, but could affect calculation of rockmass properties (p.19);

Each of these could have a significant bearing on the calculation of setbacks, width of coal seam pillars, etc. Failure to collect, analyse and interpret the relevant data properly could have serious consequences. For example, there was a pillar failure at Ulan mine using a similar highwall miner to the one proposed for the project. The failure occurred because there was a significant (27%) difference between the estimated strength of the coal seam and the actual strength of that seam (p.17).

Two key factors in controlling subsidence (and hence preventing damage to pagodas and escarpments) are the long-term stability of the coal seam pillars (the pillars of coal left between each entry of the highwall miner into the coal seam) and the long-term stability of the barrier pillars (much larger pillars located at intervals along the highwall mining face or at strategic points to ensure the coal seam pillars are sufficiently supported to remain stable).

The report goes on to discuss the principles of highwall mining, with the two identified being operational safety and maximizing resource recovery (p.20). The stability criterion used is a Factor of Safety (FoS) of 1.3. This is claimed to be adequate for safe mining operations, but '*may not be sufficient to maintain long-term stability because of unknown geological and operational variations. Long term stability is essential to minimise subsidence*' (p.23). However, despite this strong caveat concerning subsidence impacts, an FoS of 1.3 is used throughout the report.[180]

The report at p.47 also lists a range of factors that may affect the modelled values for coal seam pillar stability. These include:

- steep topography;
- underground workings;
- changes in confining stress when the open-cut is developed;
- sequential effect of highwall mining entries; and
- final backfilling against the open-cut walls.

All of these are present in the current proposal including very steep topography (described on p.75 as '*steep topography of the Coalpac Consolidation Project area and the convoluted profile of the highwall …*') and the presence of extensive old underground workings. In relation to these old workings the report suggests at p.53 that the earlier mining of the Lithgow Seam was at shallow depth and may have affected overburden strata and therefore reduced the overburden strength. Analysis confirms that subsidence did occur as a result of this mining activity.

The long-term stability of the coal seam pillars has already been noted as essential to preventing subsidence impacts to the pagodas. The original estimate for pillar width in the Katoomba seam based on the FoS of 1.3 had to be increased by >38% to avoid the risk of progressive failure. The report notes at p.68 that the proximity of this seam to the Triassic rock structures demands that stable conditions are provided and maintained into the future. However, the actual words used to describe the status of the increased-width pillars in this seam are '*indicating that the pillars <u>should</u> remain stable'* (emphasis added) and '*so that long term stability is <u>more probable'</u>* (emphasis added). The obvious question is – more probable than what?

[180] Reservation about this relatively low FoS was also expressed to the Commission by the DRE expert who briefed the Commission on 7 November 2012.

Another factor that can seriously affect pillar stability is the horizontal alignment of the highwall miner. The report notes at p.69 that some misalignment '*can generally be tolerated within the FoS of 1.3*', but this statement is not supported by any data. Comments in submissions at the public hearings and by an expert engaged by the Commission indicate that alignment accuracy is a known problem with highwall mining equipment.

While the Proponent has indicated '*design of pillars will take into account the likely entry azimuth deviations based on Original Equipment Manufacturer's advice; this will be further mitigated by a suitable guidance system*'[181] this falls well short of a guarantee that deviations in horizontal alignment may not compromise pillar strength and stability. This is exacerbated by the statement that the mitigation and management measures for the highwall mining include *'Design highwall mining panels to minimise the potential impact upon any nearby pagoda and escarpment formations' (emphasis added).*

The situation with the barrier pillars is also complex. These pillars are essential to provide support to the smaller coal seam pillars left between each highwall miner entry. The report notes that the optimal arrangement of barrier pillars depends on local conditions and these local conditions are described as complex for the project ('*steep topography … and the convoluted profile of the highwall …*' at p.75).

The indicative design is still built around an FoS of 1.3 (despite the earlier caveats) and there is some discussion of the sensitivity of the FoS to changes in overburden height, increasing (i.e. improving) as the overburden height reduces. However, the report also notes that this lower overburden height compensates for risks from blast damage and the stress-relief effects from the open-cut highwalls. The claimed net result is that the pillars should remain absolutely stable for the first 100m of entry.[182]

The other area of potential concern is the possibility of groundwater flow or seepage in the barrier pillars. The recommendation (p.70) is that highwall mining should not encroach within 20m of any flooded workings. How accurately these old Lithgow Seam workings have been mapped is unknown. More confusing in this context is the information on expected groundwater inflow to the Lithgow Seam highwall drives in the East Tyldesley area. These are expected to fill with water within one year.[183] The potential impacts of this on the permanency of the barrier pillars is not discussed.

The report also relies on historical stability data from bord and pillar operations in other NSW coalfields to demonstrate that groundwater impacts are not likely to pose a significant stability problem. However these data are only up to a maximum of 120 years old, whereas formation of the structures sought to be protected occurred some 250 million years ago and the guarantee of stability needs to extend well beyond the 120 years of current historical experience.

The subsidence predictions are claimed to be less than 20mm over most of the study area,[184] but some sections are up to 40mm, which is double DRE's original suggested safe level. Reliance is placed on the proposed 50m setback, stability surveys, modified blasting practices etc. to meet the target subsidence level of 20mm.

[181] RTS, p.8
[182] But note that the highwall miner is intended to mine >300m from the coal seam face.
[183] EA, Vol. 5, Appendix O, pp.55-56
[184] The subsidence study area is a portion of the project area in which the studies were conducted. It is shown in Fig. 7 of the EA (Vol. 1, p.40)

6.2.3.1.3.1 Commission's Findings and Recommendations in Relation to Subsidence Risks

- The Commission notes the limited and heavily qualified commitments made by the Proponent for protection of the pagodas and escarpment structures and finds that these are not commensurate with the standard required for protection of natural features of special significance.
- The Commission notes the numerous caveats and uncertainties evident throughout the subsidence report. Many of these have been highlighted in this report, in submissions, and at the public hearings. They arise from four sources:
  - risks associated with the highwall mining technique itself;
  - risks associated with the complex terrain in the project area and the possible impacts of previous mining activity on geological stability;
  - risks associated with the lack of data on multiple factors that are essential to calculate key parameters within which the highwall mining process can operate in the project area;
  - risks of groundwater inflow reducing the long-term stability of the pillars; and
  - risks associated with use of parameters designed to maximise resource recovery rather than guarantee long-term stability (e.g. the FoS of 1.3).

  The Commission finds that the risks of subsidence-induced damage to the pagodas and escarpments are real and that the level of uncertainty is such that no confidence can be placed in the assertion that the risks can be managed successfully at all times under all operating conditions. The Commission also notes that stability problems arising from highwall mining may only become apparent in the longer term.
- The strategy proposed to overcome the defects noted above is to collect the required data as part of the mine planning process and revise the estimates and detailed proposals as part of that process. The problem with this is that the Commission is being asked to recommend approval for extensive use of a specific mining technique that carries significant levels of impact risk for natural features of special significance within the project area without the data necessary to properly assess the magnitude of that risk. Deferring a decision of this nature to a subsequent planning process without public scrutiny has been rejected previously by both the Commission and the NSW Land and Environment Court.

  In this context the Bulli Seam Operations Report[185] noted at p.370:
  'It is clear that the Approval must be capable of controlling the nature and magnitude of the risks of impacts, even though subsequent processes (e.g. Extraction Plans) may fill in some detail. However, if 'filling in the detail' extends to obtaining information that was really required to make a sound approval decision in the first place then this could be construed as delegation of the approval function itself.'

  and at pp. 370 and 371:
  'The subsequent processes should be required to demonstrate to a very high level that the Performance Criteria and other conditions in the approval will be met by the proposed extraction. This may require considerable additional investigation. Some of these information requirements may themselves be laid out in the conditions of approval to guide the Extraction Plan process
  …
  the protections should be commensurate with the significance of the item or feature (or potential significance if there is inadequate information on the items or features themselves) and the potential adverse impacts. The case law on this clearly requires that the greater the uncertainty, the higher the level of protection'

[185] PAC, 2010, Bulli Seam Operations Review Report

The following cases were cited in support: *Telstra Corporation Limited v Hornsby Shire Council* [2006] NSWLEC 133; *Rivers SOS Inc v Minister for Planning* [2009] NSWLEC 213; and *Newcastle and Hunter Valley Speleological Society Inc v Upper Hunter Shire Council and Stoneco Pty Limited* [2010] NSWLEC 48.

- The Commission considers that the proposal by DRE[186] for a '*program of subsidence monitoring … for approval by the Department's Principal Subsidence Engineer*' falls well short of the action necessary to prevent any subsidence-related consequences to the pagodas. In this same vein the Commission notes the following conclusions in the EA[187]:
  '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 destabilizing cliff faces if subsidence related movement is initiated.'

  The Commission also notes the almost exclusive reliance by the Proponent on monitoring and subsequent management response in relation to these risks including:
  'To ensure slope stability for the Project, the following management measures 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;*
  - *…*
  - *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.'*[188]

- The Commission considers that, while it may be possible in some circumstances to design highwall operations *'to ensure that no subsidence impacts will endanger surface features'*,[189] the information provided is manifestly inadequate to establish this for this project and this project area. The Commission therefore finds, on the basis of the information available to it, that highwall mining under the pagodas poses unacceptable risks to the structural integrity of these features.

Recommendation 46: The Commission recommends that highwall mining not be permitted under the pagodas or escarpments in the project area.

[186] DRE, submission on the EA, 31 May 2012
[187] EA, Vol.1, p.109
[188] EA, Vol.1, p.110
[189] RTS, p.7

6.2.3.2 Risks to Flora and Fauna Associated with the Pagoda Landform

The pagoda landform was described briefly in 6.2.1 above in which it was noted that some flora species are restricted to this landform and others are usually only found in or adjacent to it.[190] It was also noted that some fauna species, including some on the State and/or Commonwealth lists of threatened species, utilize various parts of the pagoda landforms, either seasonally or to meet daily requirements.

The Proponent claims that highwall mining method will '*reduce impacts to the vegetation communities and habitat of the pagodas*'.[191] Presumably this is only if the alternative is open-cut mining, which would involve complete removal of the pagodas and their associated habitats.

Impacts across the pagoda landform are more problematic. Open-cut mining within 50m removes the lower section of this landform either completely (in the case of the gullies and forest floor) or partially (in the case of the talus slopes). Highwall mining will almost certainly add to the total impact. The total impacts on flora and fauna consist of direct impacts, e.g. blasting, habitat removal, direct operational impacts, etc., and indirect impacts, e.g. subsidence, altered hydrology, dust, noise, lighting, etc. The edge effects on remaining areas of habitat would be substantial because of these indirect impacts, plus exposure to increased wind effects. An additional and potentially significant impact is associated with management of any areas of underground combustion. This includes sealing the interface between the highwall face and the rehabilitated slope with an impervious clay barrier that requires both compaction and maintenance. This is likely to prevent effective establishment of vegetation on these areas during the rehabilitation phase.

The EA contains relatively little information on the flora and fauna of the pagoda landform. For example, no sampling quadrats were included of the pagoda rock shrublands and the description of this vegetation community in Appendix J totals 6 lines.[192] It is equally clear that little consideration was given at the EA stage to fauna species that utilize multiple elements of the pagoda landform, including those species listed under State and/or Commonwealth threatened species legislation. Some examples involving listed species are:

- The Brush-tailed Rock Wallaby is noted as potentially occurring in the project area, but is considered not to be impacted because the pagodas will be 'protected'.[193] No consideration is given to the fact that this species must utilise the whole of the pagoda landform to meet its shelter and foraging requirements;
- The Large-eared Pied Bat is noted as a cave-dependent microbat. The EA states that '*the project will not remove rocky escarpments and pagoda country which provides critical habitat features for these species*'.[194] The only concession to foraging habitat is the 50m setback from the pagodas; and
- The Broad-headed Snake is discussed in terms of its use of seasonal habitats in different parts of the pagoda landform, but the position taken is that the pagodas (winter habitat) will not be directly impacted and that some summer habitat will remain outside the project disturbance boundary.[195] Just how the snake is meant to travel between these changed areas of seasonal

[190] Washington and Wray, 2011, op. cit., p.133
[191] RTS, p.77
[192] EA, Vol.3, Appendix J, p.3.4. The basis for this treatment is presumably that these features are considered to be outside the project disturbance area for the purposes of the EA.
[193] EA, Vol.3, Appendix J, p.4.29
[194] EA, Vol.3, Appendix J, p.4.29
[195] RTS, Vol.2, Appendix F, A.5

habitat is not explained. Nor is the apparent fidelity of the snake to its existing home range considered.

The Commission considers that these three examples (there are others) are sufficient to demonstrate that the assessment in the EA of impacts on fauna utilising the pagoda landform are both superficial and inadequate. This applies both to listed threatened species and to common species.

In response to criticisms of the EA in a large number of submissions, the Proponent provided additional information in the RTS on some threatened species[196] of which two, the Broad-headed Snake and the Brush-tailed Rock Wallaby, are pagoda landform dwellers. The additional information for the Broad-headed Snake provided little by way of improved understanding as to how resident animals could utilize the remnant habitat and focused on protection outside the project boundary and monetary contribution for research. The additional information for the rock wallaby acknowledged the need for foraging habitat, but again focused on protection of this species outside the project boundary and monetary contribution for research.

Interestingly, Appendix F to the RTS provides more detail on species listed under the Commonwealth EPBC Act and the NSW TS Act, including species known to utilise the pagoda landform habitats that are not considered in the main text at pp.121-125. These species include the Large-eared Pied Bat, Spotted-tail Quoll and Eastern Bent-wing Bat. Additional information is also provided on the Broad-headed Snake and Brush-tailed Rock Wallaby.

Some of this more detailed material casts significant doubt on statements in the EA and main text of the RTS. For example, the material on the Large-eared Pied Bat[197] notes that foraging occurs within close proximity to the roost sites in caves and overhangs on sandstone cliffs. This means that the proposed protection of the roost sites combined with open-cut mining within 50m of the cliffs and pagodas will not provide the contiguous roosting and foraging habitat arrangement required and the claimed protection of the roost sites is therefore of little value. The same can be said for the Brush-tailed Rock Wallaby. Appendix F to the EA[198] indicates that the predicted forage habitat requirement for this species extends some 200m from the base of the cliff lines. The fact that the EA claims that suitable forage habitat exists away from these locations is irrelevant. Open-cut mining within 50m of the cliff lines and pagodas will ensure impacted pagoda landforms are unavailable to this species.

The RTS also responded to a number of submissions that raised the potential impacts of the project on the Superb Lyrebird.[199] The lyrebird is a species that makes extensive use of the pagoda landform, using the pagodas for nest sites and security, and the slopes and gully habitat for foraging. The RTS simply notes that it '*was not considered individually as it is not a threatened species …*' and that the mitigation and compensation measures proposed for listed species that occupy similar habitats will '*benefit other non-listed species such as the Superb Lyrebird*'.

The Commission has serious concerns with the quality of the information provided for both flora and fauna associated with the pagoda landform. This applies to both listed and common species.[200] The failure to address adequately the listed species is arguably a fatal flaw in the assessment. However,

[196] RTS, pp.121-125
[197] RTS, Vol.2, Appendix F, A.5
[198] RTS, Vol.2, Appendix F, A.9
[199] RTS, p.128
[200] Common species receive only cursory attention in the EA at pp. 3.45 and 4.34 and 4.35 and this information applies to the whole of the project site, not just the pagoda landform.

the cursory attention given to the broad suite of non-listed flora and fauna is equally disturbing. The adequacy of the ecological survey work is addressed more fully in section 6.3.

Given the Commission's concerns, the matter of fauna utilising the pagoda landform was raised with the Proponent at the meeting on 18 September 2012 and in writing.[201] The relevant extract from the Commission's letter to the Proponent is:

> *'At the meeting of 18 September the issue of the potential impacts on native species that utilise either the pagoda or gully habitats exclusively, or to those species (such as the broad-headed snake, brush-tailed rock wallaby and lyrebird) which require access to both habitat types either seasonally, or on some other basis was raised. The Commission noted that the focus on setback distances in the EA and Response to Submissions appeared to be on maintaining structural integrity of the pagodas and not on the impacts on the fauna that utilised the pagodas and adjacent slope and gully areas as habitat. The response was that the issue had not been given detailed consideration by Coalpac.*
>
> *What further consideration has Coalpac given to this issue and what, if any, proposals does Coalpac wish to advance to deal with it?'*

The Commission also raised the same issue with OEH in writing on 25 September.[202] The relevant extract is:

> *'(ii) the project as currently presented involves open-cut mining to within 50m of the pagodas and escarpment to enable access for the high-wall mining equipment to the upper level coal seams beneath these features. While there are arguments as to whether a 50m setback will preserve the integrity of the geological features, little consideration appears to have been given to the impacts on native species that utilize either the pagoda or gully habitats exclusively, or to those species (such as the broad-headed snake, brush tail rock wallaby and lyrebird) which require access to both habitat types either seasonally or on some other basis.*
>
> *The terms of reference for the review require the Commission to recommend appropriate measures to avoid, minimise and/or offset these impacts.*
>
> *While a recommendation for refusal may satisfy the avoidance component, in the Commission's view it must also consider options for more effective mitigation of impacts in the event that the project proceeds.*
>
> *The Commission would appreciate the considered views of OEH on what such mitigation options might entail in relation to the flora and fauna of the pagodas and adjacent areas and how any such options might be implemented. In this context the Commission notes that simply extending the 50m buffer (to some other fixed distance such as 100m or 310m as proposed by different Special Interest Groups) may be simplistic and that a more sophisticated assessment of the critical areas of habitat proposed for high-wall mining may be more appropriate.'*

The Proponent responded to the Commission's request in a letter dated 30 October 2012. Appendix A to that letter contains the relevant material. The first 5 pages of that Appendix deal with a description of the vegetation types that make up the pagoda landform and the extent to which those vegetation types exist outside the project area in reserves, State Forests or proposed offsets.

[201] PAC, letter to Coalpac, 11 October 2012 (available in Appendix D)
[202] PAC, letter to OEH, 25 September 2012 (available in Appendix D)

The next 2.5 pages deal with the three species identified by the Commission as examples of species that utilise multiple elements of the pagoda landforms. No other species that utilise multiple elements are considered in the response.

The conclusion presented by the Proponent is essentially that the project's impacts on these three species are not of concern because the species are not currently present in any numbers on the site, are represented (in some unidentified quantity) elsewhere in the reserve system and are catered for in the proposed offsets (Broad-headed Snake and Brush-tailed Rock Wallaby) or are not listed as a threatened species and are relatively common over a wide area (Superb Lyrebird).

The Commission notes that no adjustment to the project is proposed in response to the Commission's invitation to provide any further proposals to deal with the potential impacts on flora and fauna dependent on the pagoda landform.

The recurring theme is that damage to the habitats of the pagoda landform is inevitable and extensive and that conservation of species occurring in this landform, or using parts of it, must be undertaken off-site. Repeated claims of the suitability of the proposed offsets are made in the EA, the RTS, the response to the Commission's questions and, most recently, in documentation on the 'Gulf Mountain' proposed offset.[203] Given the acknowledged shortcomings of the original offset proposals and the increase in proposed offsets over the period in which these claims have been made, the Commission considers that any claims by the Proponent in relation to the proposed offsets should be subjected to careful and independent scrutiny under the supervision of OEH before any of them are accepted as providing suitable alternative habitat areas.

OEH provided a comprehensive response to the Commission's question.[204] This covered the two listed species mentioned as examples by the Commission as well as two listed species of bats (Eastern Bent-wing Bat and Large-eared Pied Bat). OEH considered that three of these species must be considered as present on the site and that the site contained suitable habitat for the fourth (the Brush-tailed Rock Wallaby).

OEH advised that the Threatened Species Profile Database (TSPD) is the appropriate source of information for assessing the area that should remain free of disturbance for threatened species' habitat. For the Broad-headed Snake the prescription is '*No loss of breeding or foraging habitat within 500m of cliffs or escarpments*'. For the Large-eared Pied Bat it is '*No loss of breeding habitat. No loss of foraging habitat within 500m of breeding habitat*'. For the Eastern Bent-wing Bat it is '*No loss of natural breeding or roosting habitat. No more than 10% loss of foraging habitat within 500m of the breeding habitat*'. For the Brush-tailed Rock Wallaby it is '*No loss of breeding, foraging or shelter habitat*' with foraging habitat defined as being '*vegetation within 500m of shelter/breeding habitat*'.

OEH provides a table in its response that assesses the percentage of TSPD-prescribed habitat requirements that are met by different setback distances for the highwall crest from the pagodas and cliffs (Table E.1.1). At 50m only 19% of the habitat is protected,; at 80m there is a small increase to 28% protected; and at 318m, 76% is protected. The 318m distance is used because it is the mean distance travelled by the Broad-headed Snake between escarpment (winter habitat) and adjacent valley vegetation (summer habitat) in the Morton National Park study. It is also similar to the 310m setback sought in submissions by the Blue Mountains Conservation Society.[205]

[203] Cumberland Ecology on behalf of Proponent, letter to PAC, 2 November 2012 (available in Appendix D)
[204] OEH, letter to PAC, 6 November 2012 (available in Appendix D)
[205] Blue Mountains Conservation Society Inc., submission to PAC on the RTS, 5 September 2012, p.5

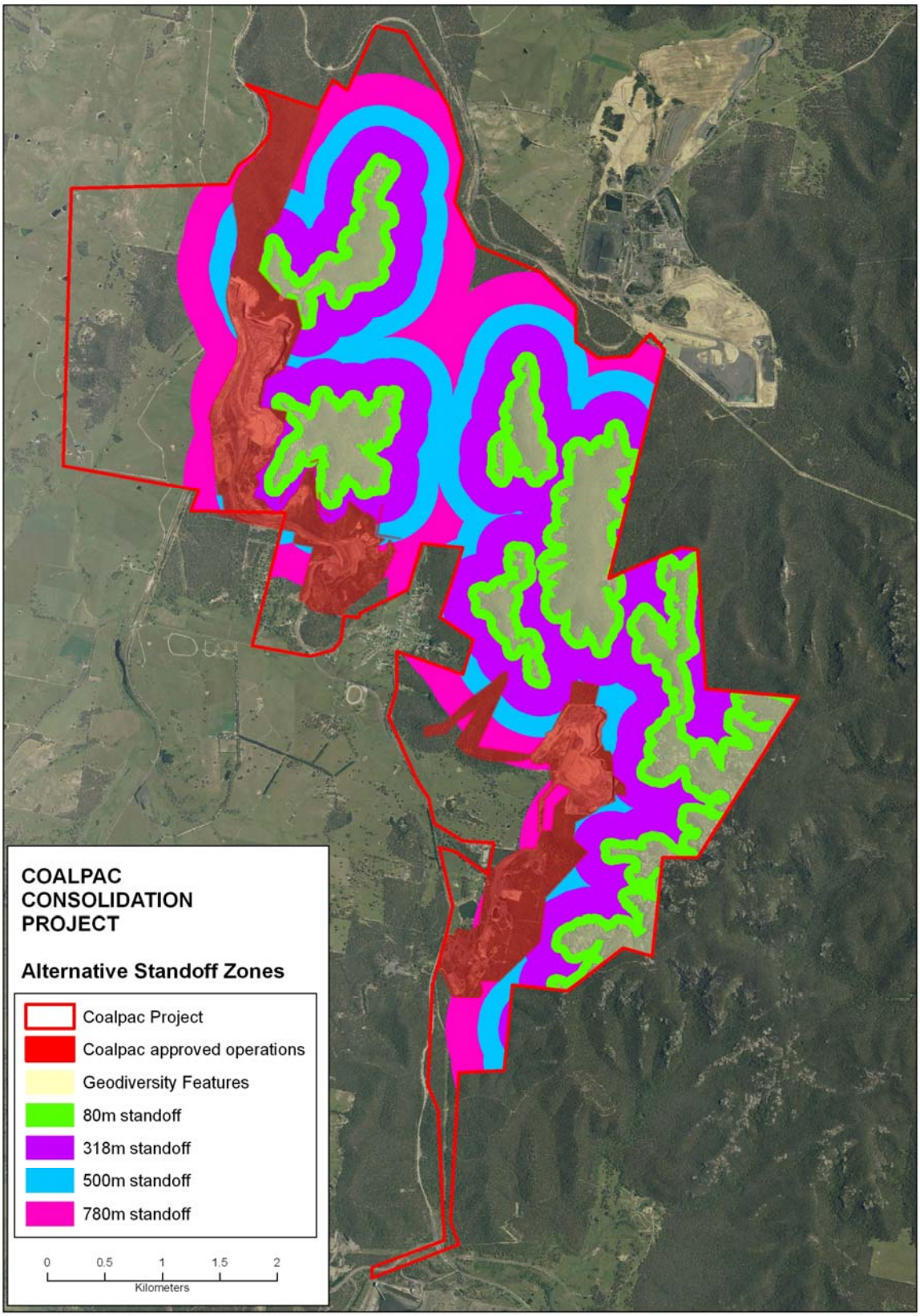
There are also rare plants in the pagoda landform of the project area, including four ROTAP species. One of these, the Pagoda Daisy, is virtually restricted to pagodas and the others are usually associated with them.[206] Whilst these are not listed under the State or Commonwealth threatened species legislation, OEH notes that they are rare and the status of three of them in the reserve system is uncertain. OEH also state that it is unlikely that these ROTAP species '*would occur within the offset areas currently proposed by the Proponent*'.[207]

6.2.3.2.1 Commission's Findings and Recommendations on Pagoda Landform Flora and Fauna

- The pagoda landform in the project area provides essential habitat components for a number of listed threatened fauna species and is potential habitat for some non-listed species that are of public significance such as the Superb Lyrebird;[208]
- These species use both the pagodas and the lower gully and forest floor areas for their breeding, shelter and foraging needs on either a seasonal or daily basis.
- The proposed 50m setback of the highwall crest from pagodas and cliff lines is manifestly inadequate for provision of the basic habitat requirements for these species and they cannot be expected to survive in the project area under these circumstances. Even if there is no impact from mining on the pagoda structures themselves, the edge effects would render the pagodas uninhabitable;
- There are rare species of plants recorded from the pagoda landforms of the project area. Because these are not listed as threatened species under the State or Commonwealth legislation they have been largely ignored in the EA. They are unlikely to occur in the proposed offset areas;
- Mapping increasing setback distances from the pagodas and cliff lines to meet essential habitat requirements for listed threatened species demonstrates just how much the pagodas and clifflines divide up the project area. A full 500m setback (as per TSPD requirements) would eliminate much of the open-cut (see Figure 6-4 over the page). This suggests that open-cut mining may not be the optimum use for this area which has such high scenic, conservational and recreational value;
- The proposed offsets are best described as a 'work in progress'. The initial proposals were considered inadequate by the relevant agencies and the more recent propositions have yet to be evaluated. The Commission considers it highly unlikely that appropriate offsets can be provided to replace the pagoda landform either at all, or in any quantity that could be considered reasonable. The Proponent's efforts to date as described in the RTS at pp.103-120 confirms this view;
- The Proponent's claims for offset suitability are considered to warrant full and independent verification under the supervision of OEH before they can be considered further in the assessment process.

[206] Washington and Wray, 2011, *op.cit*. p.133
[207] OEH, letter to PAC, 6 November 2012
[208] As evidenced by multiple submissions on the EA and by submitters at the public hearing.

Figure 6-4: All Standoff Distances (Source: OEH, letter dated 6 November 2012, Figure E1.2)



Recommendation 47: The Commission recommends that to provide adequate protection for threatened species and other fauna that use the pagoda landform, a minimum setback distance of 300m be maintained from the open-cut highwall to the pagodas and the escarpments.

This will provide a significantly improved[209] habitat buffer for the listed threatened species that utilise the pagoda landform and are either present on the project area or could potentially use this landform within the project area. A buffer of this size will also lessen the risks to the pagodas and escarpments from blasting[210] and slope instability and lessen the visual impact on the landform.

Recommendation 48: The Commission recommends that, given the significance and sensitivity of the pagodas and the pagoda landform environment, before the project is submitted for determination the uncertainties in the Proponent's supporting information identified in section 6.2 are resolved and the caveats and qualifications on the various commitments are removed so that the Determining Authority has an unequivocal understanding of what the outcomes will be and the risks associated with them.

6.2.3.3 Risks to Visual Amenity Associated with the Pagoda Landform

This is dealt with in detail in section 5.4. The conclusions are that the visual impacts would be significant and sustained over very long periods (decades at a minimum).

6.2.3.4 Resource Implications for the Project in the Absence of Highwall Mining

The previous section has determined that the pagoda landform is a natural feature of special significance deserving of the highest level of protection from mining-induced impacts. It has also established that a real but unquantifiable risk exists that highwall mining could damage this landform. The implications for production for the project if highwall mining is restricted or prohibited must now be considered.

There has been a level of confusion evident in submissions on the EA and at the public hearings concerning the proportion of the resource proposed to be extracted by highwall mining. This arises because the extraction figures quoted in the EA are estimates for the subsidence study area only, not for the whole project area. Because these are the only quoted figures, some submitters have taken these to be the figures for the whole project area and have then calculated that the proportion of total estimated production attributable to highwall mining is very low (around 3%).[211]

The question of how much of the total production is expected to be extracted by highwall mining was put to the Proponent at the meeting of 18 September 2012. While the Proponent could provide the proportion of the area that would be mined by highwall mining (approximately 50%), the proportion of production was not available at that time. The Commission formally requested the information on 11 October 2012. The information was subsequently provided on 30 October 2012.[212]

Using the figures provided by Coalpac, the percentage of total ROM coal to be sourced by highwall mining is approximately 13%.

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[209] A 300m buffer will provide 70-75% of the recommended undisturbed area for these species to allow for movement, foraging and seasonal occupation.

[210] A minimum setback of 100m was recommended for protection of the pagodas from blasting subject to a geotechnical survey being required within 300m. As noted in section 5.3.2.4 it was considered likely that a larger setback would be required for biodiversity protection purposes and that this would also cover the blasting protection requirements.

[211] e.g. see TEC Canopy Native Forest Committee Submission, Colo Committee Submission

[212] see Appendix D (Coalpac Response dated 30 October 2012 pp.1-2 which contains both the Commission's request and Coalpac's response).

The Proponent has indicated to the Commission at both the meeting on 18 September 2012 and in writing that any limitations on production other than those in the Proponent's existing commitments would jeopardise the viability of the project. This was discussed specifically in relation to setback distances from the pagodas and the consequent reduced access to coal seams, but also applies to hours of operation, etc.

In response the Commission would make the following points:

- project non-viability is a common initial response by Proponents to any suggestion that a proposal may need to be modified;
- most major projects are modified during the assessment and approval processes; and
- the percentage of production lost if highwall mining does not proceed (approximately 13%) is small in comparison to the potential impacts of allowing it to proceed. In the Commission's view the level of impact to gain a relatively small amount of very poor quality coal cannot be justified.

6.3 Terrestrial Ecology

6.3.1 Introduction

Potential impacts from the project on flora and fauna is a major focus of many of the government agencies, special interest groups and individuals in their submissions on the EA and RTS. These submissions are generally highly critical of the potential impacts, the Proponent's identification and evaluation of them and also of the Proponent's proposals to avoid, mitigate or offset them.

This report will approach the issue by:

1. identifying the likely sources and magnitude of the potential impacts on flora and fauna from the project, including identifying what is being impacted (such as threatened species, endangered ecological communities, areas of high quality non-listed vegetation communities, etc):
2. identifying the nature and consequences of the impacts; and
3. identifying and evaluating proposed measures to avoid, mitigate or offset potential impacts.

6.3.2 Sources of Potential Impacts and What is being Impacted

6.3.2.1 Introduction

The principal impact is open-cut mining. This inevitably involves clearing large areas of vegetation and all other surface and sub-surface habitat features. The project will clear 957.98 ha of vegetation, most of which is native vegetation in Ben Bullen State Forest. Open-cut mining also has substantial edge effects, with negative impacts on habitats from dust, altered hydrology and exposure to wind effects; and impacts on fauna from noise, blasting and lighting.

Rehabilitation of open-cut mining is also often poorly executed including failure to restore pre-existing landform or soil profiles and introduction of weed species, non-local native species and feral animals.

This project also proposes to use highwall mining. This has been dealt with in detail in section 6.2 and it is sufficient to note here that the potential impacts from highwall mining include impacts on fauna from noise, lighting, dust and subsidence and impacts on habitats from localised hydrological change, dust and subsidence.

Other potential impacts on flora and fauna include *inter alia* surface fires, underground combustion, introduction of weeds, various forms of contamination from acid drainage, and spills of fuels and chemicals.

6.3.2.2 Vegetation Clearing

There is disputation over the amount of native vegetation proposed to be cleared, and an even greater level of disputation over the characterisation of some of these vegetation communities. In terms of the amount, the Commission accepts the Proponent's figures in the RTS[213] concerning the amount of forest and woodland to be cleared (836.85 ha), but cannot see why the OEH concerns[214] about the need to include higher diversity Derived Native Grasslands in the total native vegetation identified to be cleared by the project are not valid. The Proponent has attempted to justify its position in the RTS, but the explanation is unconvincing. The Commission therefore concludes that the amount of native vegetation to be cleared is 914.4 ha.[215]

The EA summarises in Table 46 the vegetation communities present in the project area, their status under the relevant State and Commonwealth legislation and the area (and percentage) to be cleared.[216] Edge effects are not included in this table (see 6.3.2.3 below). Two communities are identified that are listed as critically endangered / endangered under the Commonwealth and State Acts (Capertree Rough-barked Apple-Red Gum-Yellow Box Grassy Woodland and Capertree Rough-barked Apple-Red Gum-Yellow Box Grassy Woodland Derived Native Grassland) and one community as endangered under the NSW Threatened Species Act (Capertree Rough-barked Apple-Red Gum-Yellow Box Grassy Woodland Derived Native Grassland).

OEH raised a number of issues with the accuracy of the Proponent's vegetation community descriptions in its response to the Commission's questions.[217] OEH states that it has access to more sophisticated vegetation mapping equipment than the Proponent and this may account for some of the discrepancies. OEH also raises the poor conservation status of some significant areas of vegetation communities within the project area including 21.1 ha of Ribbon Gum grassy forest on alluvial flats, 65.5 ha of Mountain Gum Apple Box Blakelys Red Gum grassy forest on small drainage lines and footslopes, and 192.5ha of Broad-leaved Peppermint Brittle Gum Red Stringybark grassy forest on small rises. OEH suggests that impacts on these vegetation types within the project area should be avoided.

The Commission is not in a position to resolve these differences definitively without commissioning further independent assessment. However, the Commission would make three points:

- the assessment is flawed if the vegetation communities are not accurately described and mapped: it is a nonsense to allocate levels of impacts, significance of impact and to assert what off-site alternatives exist if the starting point is an inaccurate record of the existing vegetation communities on the site;[218]
- given the controversy over this issue, any further survey work to establish the occurrence and distribution of vegetation communities on the site should be fully independent or directly oversighted by OEH at the Proponent's cost; and
- in the absence of further independent assessment the Commission considers that the OEH description of vegetation communities should prevail.[219]

Recommendation 49: The Commission recommends that concerns about the adequacy of the flora assessment and identification of the vegetation associations present in the project area be resolved

[213] RTS, p.100
[214] OEH, submission on the EA, 1 June 2012, p.12
[215] Amount becomes a consideration in calculation of offsets
[216] EA, Vol.1, p.191
[217] PAC, letters, 25 September 2012 and 11 October 2012 and OEH, letter to PAC in response, 6 November 2012 (available in Appendix D)
[218] A point also made by several submissions and at the public hearings.
[219] The Commission's concerns with flora survey work and impact assessment are discussed in more detail in sections 6.3.2.5

to the satisfaction of OEH prior to approval of any extension to open-cut mining in the project area and prior to any assessment of adequacy or otherwise of the biodiversity offset package.

The EA is strongly focussed on vegetation communities listed under the relevant legislation. Assessment of impacts on these listed communities will need to be reviewed once the vegetation communities present on the site are definitively established. However, overall the project area contains a substantial area of highly diverse native vegetation in generally good condition and with few exotic species present. Whilst there has been some impact from past use for low intensity forestry, substantial areas of high quality habitat remain and these contain a full suite of habitat features, including mature, hollow-bearing trees. In the Commission's view the strong focus by the Proponent on a limited number of EECs fails to consider properly the significant biodiversity impacts of the project.[220]

Recommendation 50: The Commission recommends that, given the acknowledged high quality and species richness of the native vegetation present in the project area, the assessment focus should be on the overall quality of the habitat under threat and its biodiversity value rather than just on the threatened species component which is the focus of the EA.

6.3.2.3 Edge Effects

Edge effects also have a significant impact on retained areas of vegetation. While this is acknowledged by the Proponent[221] only the *Persoonia marginata* habitat has a calculated edge-effect impact provided by the Proponent and this is based on a 20m edge effect. However, the references cited by the Proponent[222] refer to edge effects of between tens to hundreds of metres, suggesting that the absolute minimum value has been used for the purposes of calculating this particular edge effect.

OEH has also noted the lack of calculated edge effects and the generalised nature of the Proponent's proposals to mitigate them.[223] The Proponent's response is unconvincing, including '*the impacts of the edge effects were not quantified in the EIA, as these are by nature highly variable and problematic to accurately calculate*'.[224]

The Commission's conclusion is that the Proponent's information regarding direct impact of clearing is an under-estimate of the total impact on vegetation communities, including listed communities under the relevant State and Commonwealth legislation. This needs to be rectified as part of any further assessment of this project proposal.

Recommendation 51: The Commission recommends that calculation of edge effects be required to the satisfaction of OEH before the project is submitted for determination.

6.3.2.4 Threatened Species

A very substantial number of submissions raised concern about the potential impacts of the project on flora and fauna listed under the NSW Threatened Species Act and the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act. These included submissions from government agencies, special interest groups, and individuals.

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[220] An example of this approach (although in this particular case not concerning forest or woodland vegetation) is the statement on p.119 of the RTS to the effect that '*These communities do not have conservation significance in their own right as they are not an EEC'.*

[221] EA, Vol.3, Appendix J, p.4.19

[222] EA, Vol.3, Appendix J, p.4.25

[223] OEH, submission on the EA, 1 June 2012, pp.3-4

[224] RTS, p.129

The level of concern is not surprising since there were three listed flora species found and the EA records that potential exists for another five to be present.[225] Thirty-eight (38) listed fauna species were also either found or suitable habitat exists for them within the project area.[226] In addition to these 38 there are some additional species classified as having low potential to occur. One of these is the Bathurst Copper Butterfly, which is listed under both the State and Commonwealth Acts and for which host plants have been found within and immediately adjacent to the project area. A population of this butterfly occurs in Ben Bullen State Forest within 5km of the host plant record, so the omission of any strategies to conserve this species is of concern.[227] None of the proposed offset areas are known to contain habitat for this species.

OEH also requested targeted flora surveys for a further six threatened plants in addition to the eight identified by the Proponent.[228] OEH argues that the chances of finding threatened flora species increases substantially with targeted surveys. The Proponent's response does not really address this issue, focussing instead on the low likelihood of the species being present in the project area and the fact that they were not excluded from the survey work.[229] In this context the Commission notes that one of the basic characteristics of threatened species is rarity and their likelihood of detection in any given project area will be increased by targeted surveys.

The Commission does not intend in this report to go through the threatened species individually. At this point it is sufficient to note that there are a substantial number of threatened species either present or potentially present in the project area and that open-cut mining is probably the most destructive impact possible for these species because of its direct and indirect impacts. The Commission also notes that the failure to calculate edge effects for all except one of these species means that the impacts will generally be understated in the EA. The comments by the Proponent to the effect that fauna species will become accustomed to noise and light (and blasting) should be treated with some scepticism.[230]

6.3.2.5 Non-Listed Species in the Project Area

The Proponent acknowledges that the project area contains a substantial area of highly diverse native vegetation in generally good condition and with few exotics present.[231] The Proponent records over 400 species of plants from the project area using data from previous studies and from surveys conducted for this project proposal.[232] The special interests groups' survey work has added a further 123 species to this list,[233] including some Rare or Threatened Australian Plants (ROTAP) species that were not included in the Proponent's list. The Lithgow Environment Group submission is also highly critical of the errors contained in the Proponent's list. The net result is that some 570+ species have been recorded within the project area.

The Proponent's response to what can only be described as scathing criticism of the flora assessment by the special interest groups (and, to a lesser extent, by OEH), is simply to note that the special interest groups 'make mention' of unidentified species, note that none of these are threatened species, note the four ROTAP species identified (but point out that these have no legal

[225] EA, Vol. 1, p.186, Table 44
[226] EA, Vol. 1, p.189-90, Table 45
[227] OEH, letter to PAC, 6 November 2012, pp.10-11
[228] OEH, letter to PAC, 6 November 2012, p.10
[229] RTS, p.132
[230] RTS, p.129
[231] Less than 20%. EA, Vol.3, Appendix J, p.3.22
[232] Stated to be 478 in Appendix A of Appendix J of the EIA at p.131 of the RTS
[233] Lithgow Environment Group, submission on EA, 28 May 2012, p.4. See also Blue Mountains Conservation Society, submission, 27 December 2010, Appendix B; and Colong Foundation, submission, 30 May 2012, p.11

status), describe the flora survey effort and note that it isn't possible to identify everything.[234] The EA contains the usual caveats about difficult terrain, lack of access, etc. but states the survey effort was comprehensive enough to record '*the majority of species present*'.[235]

There is very little comment in the EA about impacts on non-listed fauna[236] except to note that removal of foraging and breeding habitat '*is likely*' to have an impact on them.

A number of points need to be made concerning the assessment of biodiversity as it relates to non-listed flora and fauna:

- While the Commission acknowledges that some species will not be detected in surveys, the Proponent's failure to detect 123 flora species amounts to a substantial under-reporting of biodiversity for the project area. The Commission therefore finds it difficult to accept the Proponent's proposition that the survey effort was comprehensive enough to record '*the majority of species present*'.[237] The Commission agrees with the special interest groups that this level of under-reporting must cast doubt on the validity of the assessment.
- The Commission does not agree that ROTAP species can be dismissed simply on the basis that they are not listed species. They are accepted as being rare by the scientific community and OEH advises that they are species of conservation concern. The Commission considers that they must be considered fully in any assessment of biodiversity impacts of the project.
- The Commission considers that the diversity of vegetation types and flora species present in the project area, in conjunction with the acknowledged quality of the vegetation, provides a strong case for protection irrespective of the presence or otherwise of listed vegetation communities and threatened species of flora and fauna.

6.3.3 Nature and Consequences of the Impacts

The direct and indirect impacts of open-cut and highwall mining have been discussed elsewhere in this review report. Within the project disturbance area it appears to be accepted by all parties that the impact on flora and fauna will result either in destruction or movement away from the impacted area. The Proponent's emphases for impacts in the project disturbance area are on rehabilitation and offsets. These are discussed in section 6.3.4 below.

As indicated above, the EA appears to underplay the significance of edge effects and the significance of ancillary aspects of the project such as noise, dust and lighting.

The cumulative impacts of the project with other existing and proposed projects is outlined in Appendix J of the EA.[238] It states that '*On current information publically [sic] available the surrounding projects are not seeking approval to clear large areas of vegetation … Collectively, the Project makes up a large proportion of the cumulative impacts*'.[239]

The Commission has some difficulty with this position. Appendix J of the EA is dated 23 March 2012 and the Director-General's Requirements (DGRs) for the Stage 2 extension of Pine Dale were issued on 10 February 2012, with the proposed extension being notified publicly as early as March 2011. The Stage 2 extension proposal involves substantial open-cut mining impacts on Ben Bullen State Forest and the proposed projects are in relatively close proximity to each other.

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[234] RTS, pp.130-133
[235] EA, Vol.3, Appendix J, p.2.14
[236] Approximately one page in total covering invertebrates, amphibians, reptiles, birds and mammals. EA, Vol.3, Appendix J at pp.4.34 and 4.35
[237] Unless it is defined as a 'technical' majority of 51%
[238] EA, Vol.3, Appendix J, pp.4.40-4.41
[239] ibid, p.4.41

Whatever the reason for the failure to identify the full extent of the potential cumulative impact on Ben Bullen State Forest, the Commission considers that the impacts of both projects on biodiversity must be considered carefully before assessment of the Coalpac Consolidation Project can progress. Failure to do so would mean a significant aspect of any comprehensive assessment of biodiversity impact was being ignored. The Commission has already indicated that the diversity of the project area, combined with the extent of the proposed impact of the Coalpac project alone, is cause for considerable concern.

Recommendation 52: The Commission recommends that the cumulative impacts on the biodiversity values of Ben Bullen State Forest and the region of this project, together with the proposed Pine Dale Stage 2 Extension, be considered before any assessment of this project is finalised.

Destruction of a substantial area of high quality habitat in Ben Bullen State Forest also has significant implications for the Gardens of Stone Stage II reservation proposal. As noted in section 6.1 this has been a high priority for the conservation movement in NSW for many years and is also a high priority for the State conservation agency (OEH). There are in fact two proposals on foot: the first is the Colong Foundation proposal which dates formally from 2005 and the second is the larger OEH proposal. Only the first was able to be considered by the Proponent at the time of preparing the EA.

The Proponent argues that the direct impact on the Gardens of Stone Stage II proposal is small and that rehabilitated lands could be incorporated into the proposal post-mining. [240] Whilst the direct impact on the area proposed in the 2005 Colong Foundation proposal is relatively small,[241] the visual impact is substantial and there is little likelihood that the mine rehabilitation would be suitable for incorporation into the reserve system. The OEH proposal is for reservation of the whole of Ben Bullen State Forest and the direct impact of the project on this proposal is much more significant.[242]

The Commission considers that any realistic assessment of the potential impacts of the project on either version of the Gardens of Stone, Stage II reservation proposal would have to conclude that the project and reservation are incompatible.

The EA places significant emphasis on the notion that mining is a transient impact and that rehabilitation will somehow make all the negative impacts disappear in the medium to long-term, e.g. *'… all mines in the region propose to rehabilitate mined areas and return them to their original forest and woodland state. The mined landscape will be progressively returned as flora and fauna habitat in the medium to long term*.'[243] This is at odds with reality. Open-cut mining can only be considered a transient impact in a timescale well beyond the human lifespan. Rehabilitation is discussed in more detail in section 6.3.4 below. However, the essential point here is that the rehabilitated area cannot be expected to return to its pre-mining ecological state.[244] It may be re-vegetated, but the composition of the vegetation communities will be different.[245] It thus cannot be

[240] EA, Vol. 1, p.195
[241] A brief description of the proposal and impact is included in the EA, Vol. 1 at p.95
[242] OEH, submission on the EA, 1 June 2012
[243] EA, Vol.3, Appendix J at 4.41. See also similar comments at p.4.43
[244] A point also made by the UTS Institute for Sustainable Futures report titled 'Independent Review of the Coalpac Environmental Assessment' dated 22 June 2012 and appended to the TEC Submission on the EA of the same date.
[245] The Proponent argues that re-creation is 'possible' at Appendix J, p.4.43, but uses expressions such as 'appropriate effort', 'is likely to be possible', 'has the potential to reduce the impacts of habitat removal', etc, all of which fall well short of convincing the Commission of the validity of the argument.

argued that the rehabilitated area can substitute for the existing habitat in the area of the State Forest proposed for reservation.

The Commission makes the following findings concerning the impacts of the project on biodiversity and the potential consequences of those impacts:

- the impacts are substantial on listed threatened species and communities and on non-listed species and communities, some of which are rare and of conservation concern;
- the impacts are understated in the EA;
- the cumulative impacts of the project on biodiversity have not been considered in conjunction with the potential impacts of the Pine Dale Stage II extension. This is a significant omission and must be rectified before the full extent of the biodiversity impacts can be properly assessed;
- the impacts are long term and the generalised claims made concerning returning the project area to its pre-mining ecological values lack scientific rigour; and
- the impacts on biodiversity are incompatible with reservation of either of the existing proposals for Gardens of Stone, Stage II.

Recommendation 53: The Commission recommends that the following three principles be accepted as underpinning assessment of biodiversity impacts for this project:

- rehabilitation cannot restore the existing vegetation associations or ecological balance of the area;
- rehabilitation to mature woodland is unproven for open-cut mines in NSW; and
- the impacts on biodiversity from this project are incompatible with reservation proposals for Gardens of Stone Stage II.

6.3.4 Measures to Avoid, Mitigate or Offset Biodiversity Impacts of the Project

As already noted, the impacts on biodiversity within the project disturbance area are acknowledged by all parties. While the bulk of submissions opposing the project include these impacts as a key reason for rejecting the proposal, the Proponent has advanced a suite of strategies to avoid, mitigate and offset these impacts as a means of allowing the project to proceed. Under the Minister's Terms of Reference the Commission is required to consider these proposed strategies.

6.3.4.1 Avoidance

The Proponent states in the EA that various mine plans were examined with a view to reducing impacts on the pagoda habitat (by introduction of highwall mining and a 50m buffer), on the Box Gum Endangered Ecological Community (EEC) and on two listed threatened flora species (*Eucalyptus cannonii* and *Persoonia marginata*).[246] No additional avoidance measures are identified in the RTS[247] and none in response to the Commission's questions.[248]

6.3.4.2 Mitigation

Mitigation strategies for open-cut mines are essentially limited to (i) pre-clearing surveys, translocation activities, collection of seed, etc. (ii) proper surveying, storage and management of soils (sub-soil and topsoil) and (iii) rehabilitation. The Proponent has indicated that it will undertake the usual activities associated with (i) and(ii) and these would usually be covered by a comprehensive set of 'standard' conditions by the Department. As such, they will not be considered further. However, it should be noted that (i) will do little, if anything, to alter the biodiversity impacts of the project.

[246] EA, Vol.3, Appendix J, p.5.2
[247] RTS, pp.146-148
[248] PAC, letter to Coalpac, 11 October 2012

The Proponent's mitigation focus is on rehabilitation. Rehabilitation of the project's disturbance areas is discussed in several places in the EA and in the RTS. The general impression gained is that:

- the intent is to return the mined areas '*to their original forest and woodland state'* and that they '*will be progressively returned as flora and fauna habitat. …*';[249]
- the effort is substantial;[250]
- the early indications of success are good;[251] and
- the results will be compatible '*with the objectives of the GOS2 proposal in the long term*'.[252]

However, when the rehabilitation sections of the Proponent's proposal are examined carefully, the claims for rehabilitation outcomes are in fact much more circumspect than the overall impression that could be gained from the material cited above. Some examples of carefully chosen words are set out below.

The words in Appendix J of Appendix J[253] under the heading of 'Limitations' are probably the most telling:

> *'The native vegetation communities in the surrounding lands has favored specific geologies and hydrological preferences over very long periods of time (eons), and the preparation of the rehabilitation sites after mining is unlikely to support entirely consistent landforms. As such the complexity derived from native vegetation remnant can only be an indicative target.'*

What this means in lay terms is that:

- the vegetation communities on the site are present because of the geological and hydrological characteristics of the site;
- it is not possible to reconstruct these characteristics; and
- it is therefore not possible to restore the existing vegetation communities post-mining.

However, there are other examples, including:

> *'It is difficult to predict how long it will take a given rehabilitation area to regenerate into a fully functioning ecosystem …';*[254]
>
> *'There is little information currently available on the long term ecological development of rehabilitated communities.';*[255]
>
> *'it is difficult to accurately predict the composition and structure of vegetation beyond 10 years';*[256]
>
> *'… it has been assumed that high quality mine rehabilitation of forest and woodland in the long-term can be equivalent to ratios accredited to offsets';*[257] and

[249] See footnote 30 above - EA, Vol.3, Appendix J at 4.41. See also similar comments at p.4.43
[250] See RTS pp.136-144 and 148-154
[251] See EA, Vol.3, Appendix J to Appendix J and RTS p.149
[252] RTS, p.154
[253] EA, Vol.3, Appendix J to Appendix J at J.6
[254] RTS, p.139
[255] ibid
[256] ibid
[257] EA, Vol.3, Appendix J, p.5.18

'… Plan will be developed for this Project that prescribes the progressive rehabilitation of all mine disturbed areas. The key objectives of this plan are to restore where possible, the pre-mining biodiversity within a safe and stable landform'[258] [emphasis added].

The Commission's assessment of the real position regarding rehabilitation for this project is:

- the Proponent's efforts to revegetate previously mined areas is reasonable within the limitations discussed below and the Commission is not critical of this effort. However, it is noted that the earliest rehabilitation age class (2002) has been significantly damaged by underground combustion from previous mining activity on the site;
- the project area terrain precludes returning the landscape to the pre-existing landform, particularly close to the pagodas and escarpments;
- even with good management of topsoil and subsoil it is not possible to replicate the deeper soil profiles or the pre-existing hydrology in the rehabilitated landform;
- the biodiversity in the rehabilitated areas cannot replicate the pre-mining biodiversity in the forest and woodland areas. Some biodiversity outcomes will be delivered, but these will be different. Almost certainly there will be a decrease in diversity and quality;
- there is as yet no mature vegetation regeneration on open-cut mined areas in NSW. Therefore it is pure speculation to claim that rehabilitation can or will progress to a point where it provides a full range of habitat features, connectivity between conserved areas, or compatibility with conserved areas. The real test may come when maturing trees develop roots that move beyond the areas of the soil profile that have been replaced and compacted; and
- even if there is successful establishment of mature vegetation, development of a full range of habitat features such as tree hollows is over 100 years away.

As noted in section 8.1, underground combustion may further complicate the rehabilitation effort for this project. There are two aspects: a conflict between actions required to manage underground combustion and the rehabilitation of affected areas, and the impact of existing (or new) areas of underground combustion on rehabilitated areas. In relation to the first aspect, there is a fundamental incompatibility between the recommendations by Professor Cliff to suppress underground combustion and the proposals in the EA to facilitate rehabilitation. Key to the management of underground combustion is the effective rework of the back filled area, removing and treating any near surface heatings, regrading the face slope and capping with a clay barrier. This clay barrier may well need to be reinforced and repaired regularly to ensure all surface cracks are closed.[259] However, for rehabilitation 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.[260] Consistent with existing practices, rehabilitated areas will initially be deep ripped to promote infiltration and allow vegetation to become established.[261] In relation to the second aspect there are already areas of 10 year old vegetation dying from the effects of underground combustion.

In the Commission's view it is essential that projects proceeding to approval should be required to undertake best practice rehabilitation on areas of native vegetation that are to be mined.[262] However, this is quite different to considering rehabilitation as potentially neutralising the biodiversity impacts of a project on native vegetation communities. In fact, given the current lack of scientific knowledge concerning the likelihood of long-term success of rehabilitation in NSW, the

[258] EA, Appendix J, p.5.20
[259] Cliff D 2012, p.6 (available in Appendix E)
[260] EA, Volume 1, Section 8.18.4
[261] RTS, Section 4.8.10
[262] See for example the recent approval conditions for the Boggabri Coal Project and the Maules Creek Coal Project.

only tenable position is that rehabilitation may provide some (as yet unknown) biodiversity outcomes in place of the known biodiversity outcomes that will be destroyed.

Recommendation 54: The Commission recommends that, given the considerable uncertainties concerning the likelihood of rehabilitation on this project area being capable of delivering a satisfactory biodiversity outcome, rehabilitation not be given credence as a mitigation strategy in the assessment.

The reasons for the recommendation are:

- rehabilitation is unable to reproduce the existing vegetation associations or species diversity;
- it is not possible to reproduce the existing landform or soil profile across the project area;
- there is no demonstrated mature woodland rehabilitation in NSW and it is likely that the disturbance to the deeper layers of the soil profile and the altered hydrology will limit the capacity for mature woodland to develop; and
- this project is further complicated by the interaction between underground combustion and its management and rehabilitation.[263]

For this project rehabilitation is also planned for areas not disturbed by mining that have previously been cleared for agriculture, infrastructure or otherwise degraded. The majority of these areas are on offset properties. The likelihood of success is improved in such situations because the soil profile is largely undisturbed and the hydrology, whilst possibly altered, may not be fatal for development of mature vegetation communities. The expectations are also different. The objective is usually not re-creation of an existing identified landscape and its suite of vegetation communities, but a more modest target such as increasing the biodiversity of an area to provide buffering for the edge effects on remnant vegetation, providing movement corridors for fauna, establishing stands of endangered flora, or providing food trees for endangered fauna.

6.3.4.3 Offsets

The Proponent's primary strategy for addressing biodiversity impacts of the proposal is offset proposals. Two broad types are proposed:

- purchase of properties to be conserved/rehabilitated for conservation purposes; and
- provision of funding for research, management, etc.

There have been multiple versions of each of these during the assessment process.

6.3.4.3.1 Property Offsets

The proposed property offsets are an integral part of the project proposal and take up a substantial part of the ecological assessment in the EA[264] and the RTS.[265] The offsets in the EA include four small existing offsets[266] and four proposed offsets.[267] The four proposed offsets are:

- 'Hillcroft' – a property of 1097ha with 107ha of this within the project disturbance area (leaving 987ha). The eastern half of this has been cleared for agriculture and requires rehabilitation;
- 'Yarran View' – a property of 450ha on which the lower areas have been cleared for agriculture, are weed infested and require rehabilitation;

[263] This does not mean that the Commission is not committed to ensuring that best practice rehabilitation is required. What it means is that the Commission cannot accept that there is any certainty that rehabilitation on this site will deliver appropriate biodiversity outcomes or that it will meet the Proponent's claims concerning such outcomes.
[264] EA, Vol.1, pp.197-213 and Appendix J, pp.6.1-6.54
[265] RTS, pp.100-119, 121-128, 132-136, 142, 145, 148 and 154-156
[266] EA, Vol.1, p.197
[267] EA, Vol.1, p.199-210

- 'Hillview' – a property of 83ha of which over half has been cleared for agriculture and requires rehabilitation; and
- 'Hyrock/Hartley' – a property of approximately 240ha, most of which appears to be in good condition, but is located 40km from the project area.

The proposed offsets are claimed by the Proponent to possess a number of attributes including *inter alia*:

- good condition vegetation communities comparable or better than those to be cleared for the project;
- extensive areas of high quality habitat for threatened species '*including all species to be impacted by the project*';
- broad areas suitable for regeneration and improvement to provide additional woodland communities in the medium term;
- possible use as habitat corridors linking existing State Forest and Conservation Reserves; and
- potential habitat for threatened species in addition to those impacted by the project.

It is fair to say that submissions on the EA were negative about the offsets package.[268] This included both State and Commonwealth government agencies, special interest groups and individuals. The range of reasons given can be broadly classified as follows:

- objection to the offset concept in general and its applicability to this project in particular. The argument is essentially that allowing an area of high quality native habitat to be destroyed in exchange for 'protection' of areas of vegetation that are themselves not under threat makes little sense. The Commission would also note that there have been several recent applications to mine areas previously committed as offsets, one of which is currently the subject of proceedings in the NSW Land and Environment Court.[269] Until this issue is settled, 'protection' of offsets must be viewed as a flexible concept;
- concerns about the adequacy of the offsets in terms of quantum and coverage of the species of flora and fauna in the project area. These concerns relate to shortfalls in habitat for specific species (e.g. Broad-headed Snake), and shortfalls in specific vegetation communities. But they also extend to the likely absence of rare species in the proposed offsets (e.g. the four listed ROTAP species reported by Lithgow Environment Group that were not recorded in the EA) and the listed threatened Bathurst Copper Butterfly.[270] Numerous other examples are contained in submissions. There is a strong theme that the proposed offsets are not 'like for like' (but see below on this point);
- there are also concerns about the quality of the proposed offsets, the extent of cleared land requiring rehabilitation and the extent of weed infestation;
- strong objections based on the perceived inadequacy of the Proponent's descriptions of the vegetation communities to be impacted and on the perceived inadequacies of the flora surveys and assessment. The argument is that if you don't know what is there now, you cannot claim that the offsets will provide it – either at all, or in quantities commensurate with the existing populations;[271]
- technical issues with the calculation of offset ratios, etc;
- the unsuitability of the offset properties for inclusion in the reserve system;[272] and
- the uncertainty that the proposed offset properties will be acquired.[273]

[268] A point acknowledged by the Proponent in the RTS at p.102
[269] Bulga Milbrodale Progress Association Inc. v Minister for Planning & Ors., NSWLEC, No 10224 of 2012
[270] OEH, letter to PAC in response to questions, 6 November 2012
[271] LEG, submission to the public hearing, 19 September 2012; BMCS, submission on RTS, 5 September 2012.
[272] OEH, submission on EA, 1 June 2012
[273] UTS Institute of Sustainable Futures 2012, pp.24-25

The Proponent's response to these criticisms was, in many instances, simply a re-statement of material from the EA or defence of their previous position (e.g. see inadequacy of offsets at pp.102-103 of the RTS, impacts to threatened species at pp.121-122, edge effects at p.129, ecological impacts to pagodas from highwall mining p.129. inadequate flora surveys at pp.130-132, targeted surveys for threatened flora species at p.132, etc.). This drew a predictably negative response from some submitters, but in at least some of these instances it would have been difficult for the Proponent to do more.

The most significant change was the proposal of an additional offset property, 'Gulf Mountain'. This property is located approximately 24km North-East of the project boundary. It is described as '*1277ha of native forest and woodland*'.[274] From the limited survey work to date it appears that 'Gulf Mountain' has significant habitat values and a range of threatened species, including some species that would be impacted by the project. However, the wording used in the material submitted to the Commission is strongly qualified in terms of the value of the property as replacement habitat for those habitats to be impacted by the project (e.g. *'somewhat similar to'*,[275] *'has affinities with'*,[276] *'although different in species composition'*[277]). OEH has yet to visit the property, so no assessment of its reservation potential is available. However, it does not adjoin any reserved lands.

The Commission also notes that a number of properties were investigated by the Proponent prior to selecting 'Gulf Mountain', including properties on a list provided by OEH. Comments on this process and the results are contained in the RTS at pp.103-115.

6.3.4.3.2 Non-Property Offsets

The Proponent originally advanced a number of propositions for non-property offsets (indirect offsets) including a per tonne levy to be paid to OEH to support progressive establishment of the Gardens of Stone Stage II proposal. These non-property offsets have now been revised by the Proponent to focus on a $300,000 total contribution to research on the Broad-headed Snake, Koala, Woodland Birds and Brush-tailed Rock Wallaby.

6.3.4.3.3 Biodiversity Offset Management Plan

The Institute for Sustainable Futures also raises the issue of the critical importance of the Biodiversity Offset Management Plan (BOMP). This is stated in the RTS to have a very wide range of functions, including functions that would appear to reside more appropriately in an approval than in a subsequent planning document. [278] The Institute points out that, as there is no substantive information available that could guide the decision-maker in relation to the content of the BOMP, there is insufficient certainty.[279] It is arguable that the decision-maker is, in reality, being asked to delegate the approval function.

6.3.4.3.4 Commission's Findings and Recommendations on Offsets

- Assessment of the appropriateness of offsets depends on accurate knowledge as to what is being impacted by the project and the potential consequences of these impacts. The

[274] Cumberland Ecology (on behalf of Proponent), letter, 2 November 2012 in response to questions at the meeting of 18 September 2012 and containing results of preliminary flora and fauna surveys, Appendix D at p.1.
[275] ibid, p.A.11
[276] RTS, p.109
[277] Cumberland Ecology (on behalf of Proponent), letter, 2 November 2012 in response to questions at the meeting of 18 September 2012 and containing results of preliminary flora and fauna surveys, Appendix D at p.3
[278] RTS, p.135
[279] UTS Institute of Sustainable Futures 2012, pp.25-26

Commission considers that the weight of evidence strongly supports a finding that this test has not been met.

- The offset package was clearly identified as inadequate at the EA stage (a point acknowledged by the Proponent). The only significant change is the addition of the property 'Gulf Mountain'. While 'Gulf Mountain' may have significant habitat values in its own right, the Proponent's heavily qualified language indicates that it cannot be described as a like-for like substitute for impacted areas in the project area. It is also 23km from the project area.
- Without commissioning its own survey work, the Commission's assessment of the offset package is limited to review of the Proponent's material and taking note of the concerns raised by submitters or responses to the Commission's questions. On the basis of its assessment of all of this material the Commission is unable to support the revised biodiversity offset package as adequate. This is particularly the case in relation to the obvious differences in landform and vegetation composition between the project area and the offset properties.
- The Commission notes that the proposed offset package, when stripped to its bare essentials, is designed to exchange a number of fragmented areas that generally require extensive rehabilitation work and are currently not considered suitable for reservation, for a single area of high quality habitat that adjoins other areas of high quality habitat and is already proposed for reservation.

Recommendation 55: The Commission recommends that, until the baseline biodiversity characteristics of the site have been resolved to the satisfaction of OEH, assessment of the adequacy or otherwise of the revised offset package should not proceed. The Commission also recommends that particular attention be given in the assessment to the essential nature of the trade-off being proposed, i.e. it is a proposal designed to exchange a number of fragmented areas that generally require extensive rehabilitation work and are currently not considered suitable for reservation, for a single area of high quality habitat that adjoins other areas of high quality habitat and is already proposed for reservation.

7 Water (Term of Reference 1(b)(iii))

7.1 Existing Situation

The project area drains to a number of unnamed tributaries that flow into Cullen Creek, Dulhuntys Creek and Jews Creek and then into the Turon River. The existing catchment area draining to the mine's Water Management System is approximately 850 hectares which is about 13 percent of the catchment area for Dulhuntys Creek upstream of the Turon River. The project is outside the Sydney Water Catchment except for part of the proposed conveyor to MPPS.[280]

At Invincible Colliery surface water is managed via a series of dams including; the Main Colliery Dam for mine water, Environmental Dam for tailings water storage, three active and four inactive fine-reject dams and a number of sediment dams along the roadside. Most rainfall and runoff is collected in these dams and is used for operational purposes or seeps into the underground workings. Some water is discharged under Licence by the EPA during wet weather. Similar water management occurs at Cullen Valley mine. Makeup water is supplied from the flooded Tyldesley underground mine.

Groundwater also affects the surface water flows because it is pumped to the surface for operational use including dust suppression. The previous underground mining has resulted in accumulation of a large volume of water, approximately 6,245 Megalitres within the abandoned underground working of the Tyldesley and Invincible Collieries.

7.2 Surface Water

It is predicted that flows in Cullen and Dulhuntys Creeks will reduce for the first two years and then increase above the current flow rates as rehabilitation progresses. Flows in Jews Creek will be reduced by two percent.[281]

The underground Tyldesley Colliery is currently flooded and modelling in the EA predicts that inflows to all the underground workings is likely to exceed extractions for each year of the project.

The project intends to use water from underground workings and collected rainfall for its mining and processing operations, including dust control. The maximum process water demand for the project is 926ML/yr.[282] On-site collection of rainwater is predicted to be 341ML/yr with the remainder topped up from the underground workings. The NSW Office of Water (NOW) submission advised that Coalpac would need a licence under the Water Management (General) Regulation 2011, if they collect more than the Maximum Harvestable Right Dam Capacity (MHR) for on-site usage. The response to submissions (RTS) states that an excess water licence under the Water Management Act 2000 will not be required for water collection as they intend to collect less rainwater for the site than the MHR which is estimated to be 341ML/year.

The NOW submission noted the lack of regional water data in EA and suggested the water balance presented in the EA does not clearly define groundwater ingress into the pits, the amount of groundwater to be pumped from the mine voids for operational use and how much water from the storage dams will be placed into the mine voids. The RTS says that groundwater inflows to active pits

[280] EA, Vol.1, Section 8.9.1
[281] EA, Vol.1, Section 8.9.1
[282] EA, Vol.1, Section 8.9.3

were excluded from the modelling because they are likely to be negligible (0.2 ML/m seepage face/yr) when compared with inflows from surface water catchments and the predicted extraction rates.[283]

7.3 Water Quality

The project intends to adopt generally accepted and existing water management practices of separating clean and dirty water catchment areas and where possible utilising the dirty water for operational purposes and discharging the clean water to natural watercourses. The EA says that discharges from the dirty water system would not be discharged off-site in dry weather and if any discharge is required the water will be treated to comply with EPA licence requirements for water quality.

Two new mine water dams are proposed for the project and these have been sized to prevent any discharges except during severe extended wet periods.[284] Modelling shows this should only occur during year two. The EA makes qualified statements about the potential discharges such as; '*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'.*[285]

The EA states that no exceedences of water quality criteria have occurred for discharges from the Invincible Colliery licensed discharge points LD001 or LD002. Discharges from Cullen Valley mine are '*generally within the discharge water quality criteria'* with some high Total Suspended Solids (TSS) and some low pH levels being recorded.[286] However, this is at odds with some submissions including the Lithgow Environmental Group referring to breaches of licence discharge levels by Coalpac. The Commission sought clarification from the EPA on this issue who advised in its letter dated 24 October 2012, that Invincible Colliery exceeded the TSS limit in 2008 and Cullen Valley Colliery exceeded TSS limit and breached the pH limit in 2012. The EPA said these were minor breaches and in summary it was satisfied with the performance of Coalpac regarding compliance with its Environment Protection Licence. Questions have been raised about whether the EPA licence requires an adequate suite of potential pollutants to be monitored. This is discussed further in section 7.5.

The EA predicts that releases from the mine storage water dams are unlikely but it is proposed to maintain the current Environment Protection Licences for the project. The Proponent stated that the Licence Discharge from Invincible Colliery to Long Swamp LD001 in Ben Bullen State Forest has not been used since 2008, it is of good quality and it meets the licence water quality criteria, and the Proponent intends to maintain its licence for this discharge point in case it is needed in future. However, the Blue Mountains Conservation Society provided photos showing deep orange staining near the outlet allegedly caused by discharges from LDP001. OEH has also stated that the discharges from this point has caused channelling and erosion in Long Swamp. No relevant water quality monitoring for metals has been provided in the EA.

The Commission considers there is not sufficient justification to maintain a licence for this discharge point and requested further information from the EPA. In its response dated 24 October 2012, the EPA advised it intends to withdraw the licence for this discharge point following determination of the project. In response to a request from the Commission for further justification for keeping this licensed discharge point the Proponent advised the Commission in its letter dated 30 October 2012

[283] RTS, Section 4.8.15
[284] EA, Vol.1, Section 8.9.3
[285] EA, Vol.1, Section 8.9.3
[286] EA, Vol.1, Section 8.9.1

that the red staining is likely to be a result of oxidation of iron and manganese by the slightly acidic pH water in the underground workings. The Proponent advised the Commission it will not seek to renew this licence and planning approval is no longer sought for this discharge.

Recommendation 56: The Commission recommends the discharge from Invincible Colliery, Licensed Discharge LDP001, should be discontinued.

The project is outside the Sydney Water Catchment area apart from a section of the overland conveyor to MPPS. The Sydney Catchment Authority submission recommended that the construction and operation of the conveyor is included in the proposed Water Management Plan. In its RTS the Proponent suggested there should be no coal spillage from the conveyor as it is to be fully enclosed. The Commission agrees the conveyor should not be a significant source of sediment once operational but agrees it would be prudent to include its construction and operation in the Water Management Plan.

Recommendation 57: The Commission recommends the Water Quality Management Plan should incorporate management of impacts from the construction and operation of the conveyor to the MPPS.

The Proponent proposes to mitigate the potential impact of the project by implementing a Site Water Management system backed up by an Erosion and Sediment Control Plan and a Surface Water Monitoring Program. The key components of the project Water Management System are listed in the EA.[287] The Commission is satisfied that the system is capable of meeting water quality criteria with the proposed measures.

7.4 Groundwater

The EA states that a 21 year water balance predicts inflows to the underground workings should exceed extractions for all project years and commits to preparation of a Water Management Plan to address potential impacts and outline management responses throughout the project.[288]

An assessment of groundwater was based on a conceptual groundwater model of the project using geological and topographical information and from previous studies in the area.[289] This assessment acknowledged the long history of underground mining in the area and the accumulated large volume of water in underground workings, estimated to be some 6.2 Gigalitres. This underground water will continue to be used to augment surface water needs for the project.

The Proponent has committed to prepare a Water Management Plan, if the project is approved, to conduct monitoring for two to five years and develop trigger levels and if a problem arises with surface or groundwater resources they will take all '*reasonable and feasible*' measures to minimise environmental harm. The Commission considers a greater level of assurance is required that environmental harm will not be caused prior to any final determination of the project. For example the commitment should be to take all necessary measures to prevent environmental harm.

The EA predicts the impact of groundwater is likely to be minor and the zone of depressurisation in the coal seams is not likely to impact on adjacent landholders' bores or nearby alluvial aquifers.[290]

[287] EA, Vol.1, Section 8.9.4
[288] EA, Executive Summary, p.xiv
[289] EA, Vol.1, Section 8.10 and EA, Vol 5, Appendix O - Groundwater Assessment by Australasian Groundwater and Environmental Consultants
[290] EA, Vol.1, Section 8.10.3

The Commission notes the proposed Cullen Valley and East Tyldesley mining areas are proximal and down gradient from the flooded Tyldesley mine and it is concerned it may be too late or indeed not possible, to fix a groundwater problem after it occurs. The EA suggests this will be protected by retaining minimum buffers between the Lithgow coal seam and the flooded underground workings of 50 metres for open-cut mining and 20 metres for highwall mining from previous underground mining operations. However, NOW advised there is limited data to support this conclusion and suggested further monitoring and modelling is needed to assess depressurisation and groundwater inflows. The Commission considers a greater level of confidence should be provided prior to any approval.

Recommendation 58: The Commission recommends the Proponent should reassess predicted depressurisation and groundwater inflows, in consultation with NOW to provide a greater level of confidence that problems will not arise with groundwater or surface water resources. If this cannot be achieved because of insufficient monitoring then production should not be increased for two years while additional monitoring and modelling is carried out to confirm the predictions in the EA.

Several submissions from local residents expressed concern about impacts on their bores from the proposed mining operations. The EA states there are 27 registered bores within three kilometres of the project boundary of which three bores within one kilometre are registered for stock and domestic uses.[291] These bores access water at least 50m beneath the Lithgow Coal Seam and Marangaroo Formation and remove an insignificant amount of water from the Permian coal measure aquifers are therefore are not predicted to be impacted by the project.

The Commission is satisfied that private bores should not be adversely impacted but in the event that any of the predictions are wrong, for example during extreme drought, the Commission recommends any approval contain a condition requiring ongoing monitoring of bores and compensation in the event of any water loss.

Recommendation 59: The Commission recommends the Proponent should be required to conduct ongoing monitoring of bores and provide compensation to private bore holders in the event of any water loss.

The EA states that the Coxs River and Jews Creek swamps will not be affected by groundwater variations resulting from the project as they are some 2 to 3.5 km from the project boundary. The Commission accepts this advice.

7.5 Monitoring

The Proponent has provided results of existing water quality monitoring, and has committed to install additional bores, and carry out monitoring, and will develop a Water Management Plan.

The Proponent stated that it is generally compliant with licence discharge and monitoring requirements set by the EPA. However, several submissions, including NOW, the Lithgow Environment Group, the Blue Mountains Conservation Society, and the Colong Foundation for Wilderness suggest the extent of surface water quality monitoring either conducted to date or proposed for the future is insufficient. The Lithgow Environment Group suggested the suite of pollutants to be regularly monitored should include aluminium, manganese, iron, nickel, zinc, hydrogen sulphide, and PCB's.

[291] EA, Vol.1, Section 8.10.2

The RTS commits to expanding the current monitoring requirements (i.e. Total Suspended Solids (TSS), pH and Oil and Grease) to include Total Dissolved Salts (TDS), Turbidity and Electrical Conductivity and advises further; '*Should other pollutants of concern be identified by site environment staff or the regulators, the proposed monitoring program will be amended to include these pollutants (including heavy metals)*' [292]

The Commission sought further advice from the EPA regarding future licence requirements. In its response the EPA advised that the current suite of monitoring requirements for Invincible Colliery and Cullen Valley surface water, (oil and grease, pH and total suspended solids) is adequate given the discharges are usually associated with wet weather and are infrequent. The Invincible underground mine water licence will be cancelled as it has not been used since 2008 and the Cullen Valley mine water licence requires additional monitoring including Electrical Conductivity, iron and manganese and these requirements are adequate for those discharges.[293]

The Commission is not convinced the existing or proposed suite of water quality monitoring conditions provide sufficient confidence that surface waters will be protected and agrees with the assessment by NOW and its recommendations for a baseline study of the creeks to determine the existing pollutant levels and appropriate trigger levels that can be used to determine future monitoring and limit conditions for any mine discharges.

Recommendation 60: The Commission recommends two years of baseline monthly monitoring should be conducted in Cullen and Dulhuntys Creeks for the following parameters.

- Physical/chemical - pH, temperature, electrical conductivity, turbidity, dissolved oxygen, total suspended solids, oil and grease, major cations and anions, and
- Dissolved metals - iron, manganese, nickel, cobalt and zinc.

Recommendation 61: The Commission recommends trigger levels should be developed based on ANZECC guidelines.

Recommendation 62: The Commission recommends the Proponent should collaborate with other surrounding operations to develop and implement a coordinated monitoring program and report exceedences of trigger levels.

The Blue Mountains Conservation Society recommended the water modelling take into account future changes as a result of climate change predictions. The Proponent's response that the modelling was based on 121 years of historic data and did not address this issue. While the impact of climate change should not be large during the life of the project, it should at least be addressed and the available predictions for climate change in the region should be built into the modelling.

Recommendation 63: The Commission recommends the predicted changes in weather due to climate change in NSW should be included in the water balance modeling for the life of the project unless it can be demonstrated the modelling to date has been conservative enough to account for this.

[292] RTS, Part 1, Section 4.8.9
[293] EPA, letter to PAC, 24 October 2012

7.6 Acid Mine Drainage

Acid mine drainage is caused when excavated material containing acid forming elements, such as sulphur are exposed to air and rain or other water.

The EA and Response to Submissions assess the potential for acid mine drainage and mitigation measures to minimise impacts. The EA states that most overburden is less than 0.2% sulphur and therefore not acid-forming. Coal reject material is generally non acid forming, except the Lithgow rejects which have high acid forming capacity. The tailings are non acid-forming. Some Marrangaroo Sandstone contains 0.82% sulphur and has moderate potential for acid formation.[294]

The Proponent has committed to bury the potentially acid forming material in the mine pit and ensure acid forming rejects are covered under five metres of inert material within a few weeks of placement. All potentially acid-forming water will be collected and treated if necessary prior to discharge.

Several submissions raised concerns about the treatment of acid forming materials in the EA. There are existing acid mine drainage issues at Invincible Colliery as evidenced by low pH levels in mine water dams and this is confirmed by DRE in its submission. A submission by Dr Hayden Washington dated 6 September 2012 referred to acid forming material of 0.8% sulphide in overburden at Wallerawang Colliery and he suggested leaching tests should be conducted by Coalpac to inform the proposed management plan for managing potential acid forming material.

The Proponent responded to these concerns by repeating commitments in the EA including acknowledgement that coal reject material from the Lithgow Seam has a relatively high total sulphur content and negligible buffering capacity and therefore this reject material will be buried deeply in the pit and covered with five metres of material.[295] In addition they will use data from kinetic leach column tests to determine the optimum length of time to cover the material.[296]

The DRE submission suggested the proposed separation of potential acid forming reject material from the Lithgow seam would be difficult to manage on a practical basis through the coal processing system. DRE has suggested there should be a comprehensive monitoring and management plan for acid forming materials and has suggested the potential for acid forming in the Marangaroo Sandstone and inter-burden requires further scrutiny. It also recommended the current acid mine drainage problem at Invincible be rectified within three years.[297]

The Commission considers there is a potential for acid mine drainage but this can be managed adequately provided testing is conducted to accurately determine the PAF material and excavated material is excluded from oxidation by burial and covering.

Recommendation 64: The Commission recommends that the acid generating material located at the existing Invincible Colliery Tailings Drying Area should be remediated, in consultation with DRE within three years and in accordance with the approved Rehabilitation Management Plan.

Recommendation 65: The Commission recommends that all washery rejects are treated as potential acid forming material and managed separately from general overburden emplacement in accordance with the Rehabilitation Management Plan.

[294] EA, Vol.1, Section 8.11.3
[295] RTS, Section 4.10.1
[296] RTS, Section 4.10.2
[297] DRE, submission, 4 October 2012 (available in Appendix D)

7.7 Commission Findings

Most of the issues raised in the submissions can be adequately managed with some additional information or by conditions in any approval. The main concern for the Commission is the proximity of the proposed Cullen Valley and East Tyldesley mining areas to the flooded Tyldesley mine and the potential for depressurisation. It is important this issue is adequately assessed prior to any final determination to expand mining into this area to provide a greater level of confidence in the size of the buffers needed to prevent depressurisation.

8 Other Potentially Significant Issues

As well as the issues specifically mentioned in the Minister's terms of reference (discussed above), the Minister also requested the Commission assess all issues raised in submissions on the project. Of the issues raised, the Commission has selected some that it considers are sufficiently significant to warrant detailed comment in this review report. These are included in this section. Other issues raised have been considered by the Commission and are noted in Appendix B.

8.1 Underground Combustion

8.1.1 Background

The project area has been previously subject to underground mining, and underground combustion has been in evidence in some of these underground workings since at least the 1970s. In 2003 the abandoned underground workings were intersected by open-cut excavation exacerbating the underground combustion. Impacts attributed to underground combustion have included health and safety risks, odour complaints and death of rehabilitation vegetation.

Some submissions expressed concern about underground combustion, underground and aboveground heating and odours. One resident at the public meeting told the Commission her back fence at Cullen Bullen had caught fire from spontaneous combustion at the nearby Cullen Valley mine. The Commission viewed some of the impacts of underground combustion on surface revegetation in its inspection of the area on 18 September 2012.

8.1.2 Request for Specialist Advice

Underground combustion is highly specialised and the Commission therefore engaged Professor David Cliff of The University of Queensland to review the risk of underground combustion associated with the project. As part of his review process Professor Cliff met with the Commission members and officers from DRE on 1 November 2012, and he also visited the site and met with the Proponent on 2 November 2012. The Commission put a number of specific questions to Professor Cliff, and he has set these out together with his findings in his report dated 6 December 2012 which is available in Appendix E.

8.1.3 Summary of Professor Cliff's Findings

Professor Cliff identified two distinct heating areas, being:

1. carbonaceous material that has been buried in the loose material used to backfill the open-cut;
2. the old underground workings adjacent to the highwall of the old open-cut mining.[298]

Professor Cliff's findings in relation to these two distinct heating areas are summarised as follows:

1. Backfill of the Open-cut

- The hot spots are primarily on the interface between the existing underground workings, and the highwall and in the backfilled area. The hot spots in the backfill appear to be localised.
- The backfill area where there is still some activity has not been compacted, or capped with any clay layer and so it is porous. Therefore, simply covering and compacting directly above a hot spot encourages the hot spot to migrate to another location.
- To resolve this issue, Coalpac plans to dig out the backfill, quench any hot spots in the backfill, rebury it and then cap it with clay. This is considered to be a reasonable work-in-progress approach.

[298] Cliff, D 2012, p.4 (available in Appendix E)

2. Underground Workings

- The heating in the underground workings is quite extensive and entrenched although there have been no reports of underground combustion in the Invincible mine.
- The Lithgow seam (and the other coal seams in the project area) do not appear particularly prone to spontaneous combustion. Anecdotal evidence is that the underground combustion was likely triggered by an external source (e.g. bushfire).
- It is difficult to identify and control this type of underground combustion, and a number of possible methods (e.g. filling each underground roadway or hot spot, quenching with water, inertisation of the underground workings) are likely to be prohibitively expensive and may not be successful.
- Coalpac's plan to rework the back filled area, regrading the face slope and capping with a clay barrier seems reasonable with a good chance of success. In particular, it will be important to ensure a good seal along the surface interface between the highwall and the backfill area and also over the flopping face of the backfilled area. The clay barrier will likely need regular reinforcement and repair to ensure the surface cracks are closed, especially on the highwall/back fill interface.

Professor Cliff has identified the following main risks associated with the project:

- if the project highwall mining in the area to the north of the current area of concern was to mine into the abandoned underground workings it could create an air path exacerbating and spreading the existing underground combustion;
- in a similar vein, if highwall mining was to mine into the abandoned underground workings it could cause the water currently covering the majority of the underground workings to drain away increasing potential for underground combustion to develop;
- Professor Cliff advised it was not possible for him to assess the adequacy of the Proponent's suggested 50m barrier between the underground workings and the highwall mining, although as this activity would not commence for at least ten years it provides the Proponent sufficient time to confirm separation distances. Professor Cliff notes this is essentially consistent with DRE's requirement for extinguishment before getting within 1km of the old underground workings;
- it is also not possible to assess the adequacy of the 15m barrier between open-cut mining in seams overlying the old workings, which although solid sandstone will require due care to ensure no cracking which would allow the water to escape from the underground workings;
- potential that the old mine plans are inaccurate;
- the risk of odour impacts on residents is minor, but a potential impact if a significant sized hot spot is uncovered and allowed to vent. This risk can be managed through rapid quenching of hot spots, being cognisant of wind directions, and plugging any fissures adjacent to the highwall. The creation of dust from reworking the backfill is more likely to be an issue if not adequately managed;
- it is unlikely the underground combustion could create significant surface heatings that would in turn trigger bushfires. The main method to minimise this risk is careful management of the treatment of hot spots within the backfill area, including rapidly quenching these areas with water and avoiding high wind days;
- it has been suggested the current failure of revegetation on the sloping ground is due to heat from the underground combustion. The heat impact should be resolved and the slope reduced both assisting in rehabilitation, however the clay barrier used to do this may work against promotion of vegetation growth; and
- there is a potential risk of subsidence and collapse due to weakening of underground pillars from underground combustion, with those most likely to be affected nearest the highwall and its airsupply. It is thought this risk is most appropriately managed by treating and burying deeply

the reactive material in the backfill. Pillar stability in itself and hence the extent of this risk is beyond the scope of the brief and expertise of the author.[299]

Professor Cliff advises that the management plan is reasonable as a work-in-progress providing it is conscientiously applied and monitored, and that there would be the opportunity to insert review triggers as set out on p.8 of his report. Notwithstanding this, it is recommended a formal review of the effectiveness of the plan should be undertaken in conjunction with external stakeholders within five years.

8.1.4 Division of Resources and Energy (DRE)

The DRE has met with the Commission twice during this review process, and the first meeting was also attended by Professor Cliff and focussed primarily on underground combustion.[300] DRE has also been working with the Proponent to resolve the mines' underground combustion issue. DRE provided two submissions in response to the EA and RTS, both recommending conditions of consent to manage and extinguish underground combustion.[301] DRE is currently in the process of reviewing the Proponent's draft Plan of Management for Subsurface Heating dated 27 September 2012. Additional information was also provided by DRE to the Commission on 7 December 2012 (available in Appendix D).

DRE recommends a requirement for extinguishment of all subsurface combustion in overburden emplacement areas and underground mine workings before mining is conducted within 1 km of these areas.[302] DRE prefers to require extinguishment, rather than relying on the flooded workings to provide a barrier due to a number of uncertainties. Under the mine plan, the area affected by underground combustion in the emplacement areas would not be mined until year 12. In DRE's view this would allow sufficient time to resolve the matter (i.e. extinguish the heated areas), and that the imposition of the 1km barrier provides a 'trigger' to ensure action has been taken and the results can be reviewed in discussion with DRE.[303]

8.1.5 Commission's Findings

The Commission has reviewed and is satisfied with Professor Cliff's report. In particular it notes the underground combustion is localised within a relatively small portion of the backfill area but extensive and entrenched in the underground workings. He suggests that with appropriate management the underground combustion and associated issues should be able to be resolved.

Notwithstanding the above, the Commission's remains concerned that the method used to extinguish the underground combustion (i.e. the clay barrier and constant reworking) will have a detrimental effect on the short and long-term vegetation rehabilitation of the project area. It is acknowledged the geographical area of this impact is currently limited, however with the main risk being the interface of the highwall and backfill, any inability to successfully rehabilitate these areas may well result in a permanent visual scar. This matter has been discussed in sections 5.4 and 6.3.4.2.

8.1.6 Commission's Recommendations

From Professor Cliff's findings, discussions with DRE, and its own review the Commission makes the following recommendations in relation to underground combustion:

[299] Cliff, D 2012, pp.1-10 (available in Appendix E)
[300] DRE, Meetings with the PAC on 1 November 2012 and 7 November 2012
[301] DRE, submission on the EA, 12 May 2012 and submission on the RTS, 4 October 2012.
[302] DRE, submission on the EA, 12 May 2012 and submission on the RTS, 4 October 2012.
[303] DRE, submission on the EA, 12 May 2012 and submission on the RTS, 4 October 2012.

Recommendation 66: The Commission recommends that the Proponent's Plan of Management dated 27 September 2012 forms part of any approval, subject to:

- inclusion of monitoring and auditing requirements;
- targets such as those set out by Professor Cliff in his report dated 6 December 2012;
- odour management controls;
- bushfire management controls; and
- DRE's approval.

Recommendation 67: The Commission recommends endorsement of DRE's requirement for extinguishment of all subsurface combustion in overburden emplacement areas and underground mine workings to occur before mining is conducted within 1 km of these areas.

8.2 Traffic and Transport

8.2.1 Existing Situation

Invincible Colliery is located on the eastern side of the Castlereagh Highway about 3kms north of the Mount Piper Power Station (MPPS) and 2 km south of Cullen Bullen. The access point for all vehicles is from an intersection on the Castlereagh Highway opposite the now closed Ivanhoe North Mine.

The Cullen Valley Mine is situated immediately north-west of Cullen Bullen and its access point is a private haul road intersecting the western side of the Castlereagh Highway immediately south of the village within the speed restriction zone.

Current activities at both mines generate local area heavy traffic on the Castlereagh Highway between Cullen Bullen and the MPPS, and to a lesser degree easterly on the Great Western Highway through Lithgow. Both mines are about 25kms north-west of Lithgow.

Current traffic volumes are determined by existing development approvals for the extraction of 1.2 Mtpa of product coal from Invincible Colliery and 1.0 Mtpa from Cullen Valley Mine. For the Invincible Colliery up to 0.2 Mtpa may be supplied to domestic destinations other than MPPS with the Cullen Valley Mine being limited to no more than 0.25 Mtpa in the same circumstances.

Assuming the maximum volume is supplied to other domestic users, of the total 2.2 Mtpa extracted 1.75 Mtpa would be trucked to MPPS. Approval also exists within the current extraction limits for Wallerawang Power Station (WPS) to receive emergency supplies of coal on no more than two weeks every three months. If the supply rate to the MPPS and other users is consistent with the approved limits the MPPS contract would generate 202 one way truck movements (404 two way) on each of the 290 haul days per annum based on a 30t payload per truck.[304] Using the same rationale Invincible Colliery would account for 115 (230) movements to MPPS and for 87 (174) movements to Cullen Valley Mine. [305]

Trucks leaving the Invincible Colliery exit left onto the Castlereagh Highway before proceeding south for about 3kms to an intersection at Boulder Road. From the exit for about half of the journey of 1.5km the road is dual lane southbound converging to single lane for the balance of the trip to Boulder Road. The trucks turn right into Boulder Road from a dedicated lane to access the MPPS. The process is reversed for the homeward journey. Turning left from Boulder Road onto the highway it is dual lane northbound for 1.5kms forming into a single lane from there to Invincible Colliery and

[304] EA, Vol.5, Appendix Q, Payload and haul days assumed by Hyder Consulting Pty Ltd

[305] EA, Vol.1, Table 8. Based on Cullen Valley Mine producing 1 Mtpa product coal, with no more than 250,000 tpa to other destinations; and Invincible Colliery producing 1.2 Mtpa product coal, with no more than 200,000 tpa to other destinations.

the private haul road for the Cullen Valley Mine. On arrival back at the Invincible Colliery there is a dedicated right turn lane into the site. There is also a dedicated left lane for the vehicles that formerly serviced Ivanhoe North Mine.

Traffic leaving Cullen Valley Mine follows the main private access road to its intersection with the Portland-Cullen Bullen Road. From that point trucks travel on a 1.3km private haul road located on the south western outskirts of Cullen Bullen before turning right on to the Castlereagh Highway (left on return) just south of the village. It is about 5kms to MPPS and once past the Invincible Mine access point the same route is followed as the Invincible Colliery trucks.

From a total of 2.2 Mtpa of product coal, 0.45 Mtpa goes to non-MPPS users primarily located on the east coast. This coal is transported south on the Castlereagh Highway past the Boulder Road intersection for a further 12km to join the Great Western Highway about 7km immediately west of Lithgow. From that point trucks travel east over the Blue Mountains. A total of 51 (102) truck movements a day are undertaken on this route for 290 haul days each year. Based on the same Hyder Consulting Pty Ltd (Hyder) assumed payload and using the maximum supply rates to non-MPPS users, up to 23 (46) trucks leave Invincible Colliery each day on this journey and Cullen Valley Mine sends 28 (56).

The number of truck movement attributed to each of the two mines on the two routes may vary depending on the volumes provided to the MPPS and other customers. For example, if supply to the MPPS exceeds 1.75 Mtpa, truck movements on the Castlereagh Highway to Boulder Road will increase but the numbers travelling beyond that point would reduce. This could explain the variation in truck movement numbers contained in the EA.

For example, in the EA the Proponent indicates up to 17 trucks will continue to transport product coal up to year 2 via the Cullen Valley private haul road or the Invincible Colliery site access while the MPPS conveyor and rail siding are being constructed.[306] It is not known whether this truck movement is hourly or daily and in what context it relates. In the same section, the EA claims the Cullen Valley Mine will continue to transport coal to MPPS up to year 2 with 140 (280) movements per day. The Statement of Commitments attached to the existing development approval restricts hourly truck movements to 12 (24) but also in the same section of the EA it claims approval exists to have 16 (32) trucks per hour.

In essence the differences are not great and do not change the Commission's observations or comments. For the purposes of the review 253 (506) movements each day will be used inclusive of those 51 (102) supplying coal to users other than MPPS.

Approved hours for the transport of coal from Cullen Valley Mine are 0700 to 1730 Monday to Friday, 0700 to 1700 on no more than 30 Saturdays annually and no Sunday transport. For Invincible Colliery the hours are 0700 to 2130 Monday to Saturday and at no time on Sundays and Public holidays.[307]

Overall, 253 (506) trucks travel on the Castlereagh Highway between both mines and Boulder Road with 51(102) of those proceeding past that point to travel over the Blue Mountains to the coast. According to the Proponent, trucks do not generally operate out of Invincible Colliery up to the approved limit of 2130 hours but tend to cease at around 1700 hours or 1800 hours. Based on an average day of 10 hours, about 20 (40) movements an hour take place on the Castlereagh Highway

[306] EA,Vol.1, Sections 4.8, 4.8.1 and 4.8.2
[307] EA, Vol.1, Sections 4.8, 4.8.1 and 4.8.2

from the Invincible and Cullen Valley Mines to Boulder Road and then to the MPPS and a further 5 (10) trucks an hour proceed past that point to travel east across the Blue Mountains.

Coal is currently not transported by rail.

8.2.2 Predicted Traffic Generation

The Coalpac Consolidation Project seeks to increase extraction of coal from 2.2 Mtpa from both mines to 3.5 Mtpa plus 0.64 Mtpa of sand annually. Up to 1.0 Mtpa of coal is identified for export, up to 2.6 Mtpa for the MPPS and up to 0.45 Mtpa for other domestic users.[308] This amounts to more than the 3.5 Mtpa being sought for approval and the implications of this for truck movement are unknown.

8.2.2.1 Truck Haulage

The Proponent seeks approval to construct an overland conveyor from Invincible Colliery to the MPPS following an existing power infrastructure corridor and crossing over the Castlereagh Highway close to the MPPS. The conveyor is expected to be operational after year 2, and it would reduce the road transportation of coal.

A road overpass will be constructed over the Castlereagh Highway north of Cullen Bullen to link by private haul road the western Cullen Valley Mine and Hillcroft resource with those operations on the eastern side of the highway. A rail crossing for haul trucks will be constructed over the Wallerawang-Gwabegar rail line and a crossing of Red Springs Road developed to allow access to the already approved Hillcroft resource. This infrastructure is expected to be available after year 2.

After year 2 all coal to the MPPS will be transported by conveyor except in emergencies for example when the conveyor is not operational and coal will then be transported by road. Coal from the Hillcroft and Cullen Valley Mine areas will be transported by truck via the private haul road network over the Castlereagh Highway (and in some cases over the Wallerawang-Gwabegar rail overpass) to Invincible Colliery where it will be either conveyed to the MPPS or transported east by truck via the Great Western Highway past Lithgow to the coast. Fifty-one (102) trucks each day for an expected 290 days each year will undertake this journey. The Proponent has advised that the Bells Line of Road will not be used.

The project also seeks approval to extract sand from the northern mining area of the Cullen Valley Mine. Up to 0.64 Mtpa of sand will be mined annually for the Sydney market. The sand will be transported across the Castlereagh Highway overpass to exit the Invincible Colliery access point along the same route taken by the coal trucks over the Blue Mountains except the sand is planned to be delivered to the Granville/Parramatta area near James Ruse Drive. However, the Proponent has indicated that its market for the sand has yet to be fully developed and therefore delivery points might change to other Sydney locations. For the purposes of the review the location identified in the EA will be used [309], but it is recognised that customers outside the metropolitan area may be identified including those with rail access.

Up to 64 (128) truck movements each day for 290 haul days each year from year 2 to year 14 of the project are anticipated. Sand product will also not be transported over the Blue Mountains via the Bells Line of Road.

[308] EA, Vol.5, Appendix Q, p.20
[309] EA, Vol.5, Appendix Q, Section 3.2.4

8.2.2.2 Rail Transport

A rail siding at the northern end of the project boundary on the Wallerawang-Gwabegar rail line is proposed for construction by year 2.

Up to 1.0 Mtpa of coal will be transported by rail to Port Kembla. Loading of the rail trucks will be undertaken at the rail siding and no public roads will be used for any part of this operation.

The Proponent expects export coal demand to require one train movement a day (plus one return journey) for the same haul period of 290 days annually.

Rail transport from the Western Coalfields to Port Kembla relies on two routes both of which use the Wallerawang-Gwabegar southbound line and then the western line over the Blue Mountains. One route, identified by Hyder as the primary route, then tracks through Lidcombe, Campsie to Tempe and then by the Illawarra line to Port Kembla. The secondary route goes from Harris Park to Moss Vale, Unanderra and north to Port Kembla.

Both routes have physical and operational constraints. Hyder prefers the primary route as it is shorter but it does have limitations.[310] The Proponent will continue to liaise with the Australian Rail Truck Corporation (ARTC) and the Department regarding the preferred route. This review has not assessed the options in that regard as they are matters for resolution by the Proponent with the service providers.

It is evident from the EA that the Proponent has yet to finalise arrangements to transport coal for export by rail to Port Kembla. Should these arrangements not proceed for any reason the transport of this coal by road should not be considered as an alternative. Road haulage would place another 115 (230) trucks each day on the public road network across the Blue Mountains and south to Port Kembla and this would be an unacceptable increase in heavy vehicle traffic from one source. It would effectively double the proposed vehicle movement on the Great Western Highway through the villages and townships that line that route. The impact beyond the Blue Mountains has not been assessed.

8.2.3 Predicted Impacts

8.2.3.1 Baseline

The EA suggests that the base case or baseline for comparative purposes should, in effect, be the existing transport operations associated with both mines. Traffic studies commissioned by the Proponent used this position to assess the impacts of the project.

If this project application was not approved and coal resources were no longer available beyond 2012 as suggested by the Proponent, then the baseline might be assumed to be zero traffic from both mines. This view was suggested by the Institute of Sustainable Futures (ISF) on behalf of the Total Environment Centre which indicated truck movements and associated impacts based on a comparison of what occurs under existing approval is misleading. The ISF suggest that truck movement comparisons should be using a 'no mine' scenario as the base.[311]

Traffic and transport was not a primary issue raised by presenters at the public hearings and those making submissions. The Commission assumes that one reason for this is that the local community accepted the baseline as being at the existing level of traffic and as the project involves a reduction in road transport associated with the mines, the impact was regarded as being an improvement over

[310] EA, Vol.5, Appendix Q, Section 6.1

[311] Total Environment Centre, submission, 22 June 2012

the existing situation. If the comparative assessment was based on a 'no mine' scenario the response might have been different. Also, the increase in truck traffic will occur outside the local Cullen Bullen area basically from Lithgow across the Blue Mountains into the Sydney basin and these communities would not have been advised of the project. The response from Blue Mountains City Council mentioned later confirms this view.

8.2.3.2 Truck Haulage

When the conveyor to the MPPS is constructed and operational after year 2 and the Castlereagh Highway overpass is completed no coal will be transported by truck to the MPPS except under emergency conditions. This will effectively reduce the number of coal trucks using the Castlereagh Highway from the Cullen Valley Mine exit and the Invincible Colliery access point to Boulder Road from 202 (404) per day to zero.

For years 1 and 2 while the conveyor and other infrastructure projects such as the Castlereagh Highway overpass are being constructed, truck movements will be kept at the current approved level.[312] However, if the conveyor is not operational from year 3 the EA does not indicate whether truck movements would increase to cope with increased production until the conveyor is available, or whether production would be constrained.

Also, trucks from Cullen Valley Mine will no longer use the private haul road on the outskirts of Cullen Bullen which joins the Castlereagh Highway just south of the village, again unless emergency conditions prevail. After year 2 this private haul road will only be used by light vehicles and limited trucks making deliveries .This will not only reduce noise impacts but it will also improve safety as it will avoid the existing 115 (230) trucks on haul days turning right into oncoming traffic. As noted earlier the EA suggests that up to 140 (280) trucks use this route each day.

Several submissions expressed concern about health and amenity issues from traffic on the private haul road.[313] However the assessment of road traffic noise during current operations and the construction phase carried out for the Proponent found that noise criterion would be met for any residence 50m or more from the highway. After year 2 this private haul road will only be used by light vehicles and limited trucks making deliveries.

Transport by road of coal to other domestic users via the Castlereagh Highway and Great Western Highway will continue at the existing rate of 51 (102) trucks per day for 290 days each year. Additional to that will be up to 64 (128) trucks hauling sand each day from the Invincible exit south to the Great Western Highway and then east to Sydney. This effectively doubles the Blue Mountains traffic from these mines for years 2 to 14.

The Castlereagh Highway from the project to Wallerawang is a gazetted B-double route and as such anticipated it will be able to accommodate the additional traffic. The Great Western Highway does not permit B-doubles. It has had substantial work completed in relation to widening to four (4) lanes between Penrith and Katoomba although it travels through a number of residential areas where there are a significant number of traffic signals and school zones. Some upgrade work west of Katoomba is currently underway, but there does not seem to be any evidence that conversion to four (4) lanes for most of the journey is likely in the foreseeable future.

The Bells Line of Road from Lithgow to Windsor is primarily single lane each way with little prospect of widening.

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[312] EA, Vol.5, Appendix Q, p.20
[313] RTS, p.63

Lithgow City Council has expressed concern with the proposed increase of 64 (128) trucks on the Great Western Highway between South Bowenfels and Mount Victoria which it considers to be dangerous and subject to uncertainty in relation to a future upgrade. However, LCC informed the Commission that it would rely on the opinion of the NSW Roads and Maritime Service (RMS). The Commission notes that the RMS has not provided a specific comment in relation to traffic generation.

Blue Mountains City Council (BMCC) was asked by the Commission for comments in relation to the impact of additional trucks on the Great Western Highway through its Local Government Area. Council responded that it considered the proposed additional 102 coal and 128 sand trucks per day as being *'totally unacceptable'*. While Council's comments related to the proposed total number of truck movements of 115 (230) rather than the additional 64 (128) the comments provided have nevertheless been taken into account.

Blue Mountains City Council was concerned that the Blue Mountains already has 1018 truck movements per day based on a 2011 assessment (nearly 360,000 per annum) and this proposal would increase that volume by 23%. Based on the 2011 figures the Proponent already contributes 115 (230) truck movements a day and, if approved, the project would increase heavy vehicle traffic by up to 13%.

Council cited concerns about resident amenity and traffic impacts as well as highlighting strategic State Government plans to improve rail infrastructure particularly for freight purposes. It also considered that if the project went ahead improvements to the road infrastructure should be a factor in any approval and that the objectives of the Great Western Highway Management Plan should not be compromised.

Rail transport would be the preferred means of transporting large quantities of product coal but the location of the Proponent's customers other than the MPPS and Port Kembla makes this option impracticable at this time. In relation to road safety, Hyder's modelling indicates that there would be a reduction in accidents between Cullen Bullen and Boulder Road of 0.319 MVKT per year and 0.482 more accidents between Boulder Road and the Great Western Highway. This increase equates to an additional accident every 25 years.[314] No modelling was undertaken for the Great Western Highway from Lithgow to the east.

The Roads and Traffic Authority (now RMS) monitored traffic on the Castlereagh Highway north and south of Boulder Road. Survey results for seven years between 1980 and 2002 indicated between 2200 to 3500 vehicles/day travelled north and for six years between 1980 and 1996 between 2500 to 4000 vehicles/day travelled south of Boulder Road. The trend analysis indicated a growth of 1.3% per annum north and 1.9% south. The traffic studies carried out for the Proponent used a 2% growth factor.

The reduction in truck numbers from year 2 north of Boulder Road by over 50% will improve traffic flows both ways whereas the increase to the south of this intersection from 51 (102) to 115 (230) may have a minor impact, a view which is supported by Hyder's traffic assessment which confirmed that there are unlikely to be any significant traffic impacts resulting from the project.[315]

The closure of the Ivanhoe North Mine has potentially improved the safety of the intersection at the access point for the Invincible Mine. Previously Ivanhoe North Mine trucks were not permitted to exit right to head south on the Castlereagh Highway for safety concerns but crossed the highway to

[314] EA, Vol.5, Appendix Q, Table 5.1
[315] EA, Vol.5, Appendix Q, p.43

do a U-turn in the Invincible Colliery site before exiting left. The Ivanhoe North Mine entrance is now closed apart from vehicles undertaking rehabilitation work. The limited use effectively makes the intersection a T-section rather than the previous 4-way configuration.

The EA acknowledged the concerns with the existing intersection access and in the RMS submission dated 29 May 2012 it was suggested that the Proponent assess the intersection in conjunction with the RMS.[316]

The Proponent will need to continue discussions with LCC, landowners and RMS regarding the Red Springs Road crossing. Lithgow City Council has already indicated its support for the preferred option being temporary road realignment into the railway reserve which would underpass the proposed railway overpass road.

The construction of infrastructure which interacts with public roads such as the Castlereagh Highway overpass, overland coal conveyor and the Red Springs Road crossing will require roads authority consent (LCC for local roads and RMS for the Castlereagh Highway). Section 75V of the EP&A Act requires road authority approval to be granted if it is necessary to carry out an approved project and the work is substantially consistent with the approval. For that reason the infrastructure projects are included in the project description.

The project forecasts an increase in staff numbers by 30 above the current approved operations level. Up to 70% of those would need to access the project boundary for the day shift. Even if each of the 21 additional staff made the trip in individual vehicles from the south the traffic impact on the Castlereagh Highway and Invincible Colliery access point roads would be minimal.

The only point at which slight delays might be experienced is at the Invincible Colliery intersection. With the closure of the Ivanhoe North Mine the opportunity now exists for this access point to be redesigned to provide improved egress and ingress to the site and for enhanced flow of traffic north and south for other motorists. As noted earlier the RMS has invited the Proponent to discuss options to improve this intersection.

One issue raised by several residents in the Cullen Bullen area related to trucks leaving mud on the highway which later dried and became a source of dust. A solution to this problem would be to have a tyre wash facility near the access gate of the Invincible Colliery if one is not available. A presenter at the Lithgow public hearing told the Commission that the Baal Bone Colliery had such a facility and it proved successful.

Hours for coal and sand haulage on public roads after year 2 will largely mirror the existing schedule and it will not be a 24-hour operation unlike the private haul roads operations.[317] The Proponent is relying on the construction of bunds to mitigate noise impacts as well as other measures including the acquisition of noise attenuated equipment.

8.2.3.3 Rail Transport

The proposed rail transport of up to 1.0 Mtpa of export coal from the proposed new rail siding to Port Kembla by either one of the two nominated routes is unlikely to have any significant impact on Cullen Bullen or other residences except several close to the siding and the Wallerawang-Gwabegar rail line.

[316] RMS, letter to Department, 29 May 2012
[317] EA, Vol.1, Table 8

One presenter at the public hearing presented a submission raising issues about trains sounding sirens at road crossings near their residence which woke their children, disturbance from train lights, and the proposed rail siding being likely to create dust and noise. Another resident close to the siding expressed concern about the noise from rail trucks bunching together as they prepared to depart.

The proposed bund beside the rail siding is designed to reduce noise, visual and lighting impacts and that solution will be assessed in that part of this review. Train lights and siren sounding at level crossings are safety requirements and are difficult to mitigate.

Coal is not transported by rail currently, and the Commission heard of broad community support for rail transportation of product coal and sand on environmental grounds and to reduce truck movements on the public highways.

Hyder consider that the proposed rail traffic volume of one (two) trains per day is not likely to significantly impact the existing rail network.[318] Finalisation of the rail arrangements are matters for the Proponent to negotiate with the service providers and the Commission has made no enquires of these agencies. The Proponent has indicated that it will continue to discuss the options with ARTC and the Department regarding the planning and schedule of rail track improvements and related issues.

8.2.3.4 Construction Period

Until the overland conveyor to MPPS, the Castlereagh Highway overpass, rail siding, Red Springs Road crossing, Wallerawang-Gwabegar railway line overpass and haul roads are completed and operational after year 2 coal will continue to be transported by truck in accordance with existing approvals. The Proponent has indicated there will be no additional traffic during this period.

While a 15-18 month construction period is envisaged, Hyder note that the Castlereagh Highway overpass and haul roads will be constructed by month five (5).[319] It is suggested that this will offer early benefits for both construction vehicle access between both sides of the highway as well as providing access to the ICPP for haulage trucks. Additionally, product coal could be dispatched through the Invincible Colliery access point reducing or eliminating use of the Cullen Bullen bypass haul road.

Construction traffic for the Castlereagh Highway and Wallerawang-Gwabegar overpass to the Hillcroft resource is estimated to involve less than one truck movement per hour. Month four (4) is forecast to generate the highest number of construction truck movements.

Construction workers are expected to generate 60 (120) car trips to site offices per day as a worst-case scenario. The site offices will be accessed through the Invincible Colliery site gate. This level of traffic on the Castlereagh Highway and at the Invincible Colliery intersection is not significant and will in any case be for a two year period only.

Although the Proponent is seeking approval for the continuation of coal transport by road to MPPS after year 2, this would only occur in emergency situations such as when the conveyor is not operational. This is expected to be an infrequent event and for relatively short periods. The Proponent has committed to provide the relevant agencies with prior notice in these cases and to limit haulage volumes to the existing approval levels.

[318] EA, Vol.5, Appendix Q, p.57
[319] EA, Vol.5, Appendix Q, pp.14, 20

8.2.4 Commission's Findings

The project provides for the continuation of the existing approved number of truck movements post approval until the conveyor to MPPS becomes operational after year 2. However, if the construction of this facility is delayed for any reason, it is not clear from the EA whether the Proponent would seek to increase truck movement numbers to cater for increased coal production or curtail supply to maintain the pre-approved or current limits. A condition of approval would need to be provided to cover this situation and the Commission's recommendation is for production to remain at the current approved levels until both the conveyor and the rail facility and all associated infrastructure relating to coal transport are operational.

The hours being sought by the Proponent are confusing. Table 8 of the EA indicates that for the consolidation project coal and sand from all areas will travel on the Castlereagh Highway from 0700 to 2130 Monday to Saturday and product from Cullen Valley Mine, Hillcroft and East Tyldesley on Monday to Friday 0700 to 1730 and on no more than 30 Saturdays annually from 0700 to 1700 'after' year 2. However the Commission believes that this should read 'before' year 2. The table then outlines the intention to transport sand after year 2 from 0700 to 2130 Monday to Saturday and no Sunday or Public Holiday haulage. The Commission understands that sand will be mined from the Cullen Valley area and therefore it finds the intended hours being sought somewhat contradictory.

In essence the Proponent seems to be seeking to maintain the existing approved hours of operation up to year 2 and for emergency situations but to have sand and all coal transport subject to the same hours as now apply to coal from the Invincible Colliery going to destinations other than MPPS. In reality this is an extension of hours for product from areas other than Invincible Colliery after year 2 but this is defensible on the basis that all coal and sand going by road will exit the Invincible access point avoiding the private haul road through the south west of Cullen Bullen.

Both Blue Mountains City Council and Lithgow City Council expressed concern about the proposed increase in truck movements across the Blue Mountains. Council views must be taken to represent the community and as such the concerns of both Councils providing comments have been factored into the Commission's considerations. The Commission shares those concerns particularly in relation to increased traffic congestion on single carriageway sections of the Great Western Highway and the amenity issues associated with trucks travelling through the centre of a large number of villages and towns lining the highway.

Additional coal trucks on the Great Western Highway have the potential to contribute to traffic delays for other motorists particularly in the single lane carriageway sections. In general there is no regulatory control to limit the number of road users other than by size or load limit such as B-doubles as most users are not seeking an approval for a particular project. In this particular case the Commission is being asked to comment on an increased impact for other road users and communities along the Great Western Highway.

Blue Mountains City Council is concerned about an increase in heavy vehicle traffic (which is an additional 13%) due to the nature of the existing Highway and its capacity to absorb that type of increase without adverse effects on communities. The decision by the Proponent to not use the Bells Line of Road is strongly supported as its capacity to absorb heavy trucks is extremely limited but that does not mean that the nominated route is any more favourable.

The Commission considers that further assessment must be given to the proposed 13% increase in heavy vehicle movements on the Great Western Highway. This increase is specifically associated with the transport of sand, which is an ancillary part of the project proposal. The appropriate way to

address this issue is to provide the RMS with the positions of LCC and BMCC and seek its views on the proposed increase. This should be done as part of the assessment process before any final determination is made.

It is recognised that trucks and other vehicle/equipment have the potential to contribute to health and amenity issues for people in close proximity to the type of operations proposed. The extent of air quality, noise and lighting impacts will be assessed in the relevant sections of this review but several observations are appropriate at this point.

The potential for dust from haul roads and noise particularly at night were concerns that were raised but not quantified. Responding to a submission suggesting that the haul roads should be sealed, the Proponent considered this option impractical due to the transient nature of the road and the type of surface needed to facilitate the movement of trucks. The Proponent has committed to watering haul roads but the effectiveness of this mitigation measure cannot be guaranteed given the length of the road network and the likelihood that the roads cannot be maintained in a damp condition for the duration of the period of use.

The Commission considers that the effectiveness of watering needs to be monitored by the Proponent to ensure the generation of dust is confined to a level which meets the standards set out in the Commission's review on dust pollution in section 5.1. In relation to road traffic noise, Bridges Acoustics provided a noise assessment for the Proponent. That study concluded that the noise criterion would be met at any residence 50m or greater from the Castlereagh Highway which, of course, is used by other heavy transport vehicles not associated with mining operations.

Trains already use the Wallerawang-Gwabegar line including freight, coal and passenger and as such the Proponent concluded that there would be no change in noise levels which is a reasonable argument. However, while the level of noise from trains travelling on the line might be the same, the frequency will increase by one train a day and the rail siding coal loading operation will create noise, potential dust and lighting impacts.

The proposed bund west of the rail siding which has largely been completed is designed to assist in mitigating impacts but those residents close to the facility have reservations about its effectiveness. Issues relating to noise, dust, visual and lighting impacts are being addressed by the Commission's review in other sections. The project if approved as submitted would result in the elimination of all truck coal transport to the MPPS. But the volume of traffic on the Castlereagh Highway from the Invincible Colliery site to the Great Western Highway and east to the coast over the Blue Mountains will effectively double from 51 (102) movements now to 115 (230) movements for years 2 to 14. Prior to that the current volumes will remain and beyond year 14 the volume on the Blue Mountains route will revert to 51 (102.) The capacity of the Great Western Highway to cope with this additional traffic is marginal at best and there will be an impact on local residents along the route.

The use of rail transport to transport up to 1.0 Mtpa of coal from the project to Port Kembla is supported from an environmental and safety perspective. The Commission does have some concerns that the rail transport proposal for export coal has not been fully developed and approved by the relevant providers to the extent that it could be regarded as a firm commitment. This situation prevails despite the Commission being informed at a site meeting that the viability of the project depends on the capacity to export coal.

The EA considered the options for suitable routes but as far as the Commission can determine nothing has been concluded. If the project viability depends on export and rail transport is not available or appropriate for whatever reason a later approach for road haulage may be

contemplated. The proposal being currently considered by the Commission would result in a doubling of truck movements across the Blue Mountains. If export coal is then also transported by road rather than by rail, it would quadruple the number of truck movements compared to the existing situation. The Commission considers this to be an unacceptable impact, a view likely to be supported by Blue Mountains City Council and Lithgow City Council both of whom have concerns about truck movements on the public road network.

The Proponent was asked if the sand bound for Sydney could also be transported by train but this would rely on rail unloading facilities near the destination and that is not the case for the identified market at the moment. However, a late development has seen Boral in the Southern Highlands express an interest in being supplied sand and this potential customer does have rail access.

For coal going to other domestic users, the quantities and locations make rail transport impracticable.

The Commission is not convinced that rail transport of sand to Western Sydney should be dismissed as an option without being further explored by the Proponent. To support an additional 64 (128) heavy vehicles each day over the Great Western Highway between Lithgow and Penrith without a detailed assessment of the viability of using rail is difficult to justify given the very significant impacts of having additional trucks to the numbers proposed on the highway for 290 days each year.

8.2.5 Commission's Recommendations

Recommendation 68: The Commission recommends that the concerns about the proposed 13% increase in heavy vehicle movements on the Great Western Highway raised by Blue Mountains City Council and Lithgow City Council be referred to the RMS for advice as part of any further assessment of the project.

Recommendation 69: The Commission recommends that until the conveyor to MPPS is operational, the current truck movement limits are retained.

Recommendation 70: The Commission recommends that during any periods of unavailability of the conveyor to MPPS after it has been commissioned, truck movement to MPPS remain within the current limits.

Recommendation 71: The Commission recommends that the Proponent satisfies the Department that transport of sand cannot be undertaken by rail in whole or in part.

Recommendation 72: The Commission recommends that no export coal is permitted to be carried by road to Port Kembla without further assessment of the potential traffic impacts.

Recommendation 73: The Commission recommends that approved hours for the transport of coal and/or sand by road be restricted to between 0700 and 2130 hours Monday to Saturday with no transport on Sundays or Public Holidays.

Recommendation 74: The Commission recommends that tyre washing is implemented for trucks leaving the project site to travel on public roads.

Recommendation 75: The Commission recommends that all trucks leaving the project site have their loads covered so as to prevent the spillage of coal and emission of coal dust.

8.3 Aboriginal Cultural Heritage

8.3.1 Scope of Assessment

Aboriginal cultural heritage (ACH) is considered in various sections of the Proponent's EA and RTS, including:

- AECOM's Aboriginal Archaeology and Cultural Heritage Impact Assessment (AACHIA) dated 9 November 2011 forming Appendix K of the EA;
- Bridges Acoustics' advice on blasting restrictions for items of heritage significance dated 21 December 2011, which forms Appendix H of the EA.
- SCT Operations Pty Ltd's (SCT) geotechnical review of the stability of the Aboriginal rock shelters dated 16 January 2012, which is available as Appendix L of the EA.
- Terrock Consulting Engineers (Terrock) subsequently prepared a report dated 7 August 2012 in part on mitigating the effects of blasting on the rock shelters which forms Appendix D of the RTS.

The Commission has assessed potential impacts from blasting and subsidence in sections 5.3 and 6.2 respectively, including consideration of impacts on the Aboriginal rock shelters from blasting.

Consultation for the project specifically in relation to ACH was separately conducted by Hansen Bailey in accordance with the OEH's Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010.[320] Aboriginal stakeholder groups were identified and requested to comment on the proposed survey methodology, proposed fieldwork programme and to raise any concerns in relation to the project's potential impact on cultural heritage.[321]

8.3.2 AECOM's Assessment Process

AECOM carried out a desktop review of prior surveys, searched the DECCW's Aboriginal Heritage Information Management System (AHIMS) database and carried out site surveys to identify and assess the scientific significance of Aboriginal sites and artefacts and any impacts from the project.

Six of the seven Aboriginal groups consulted indicated they supported the proposed survey methodology and did not raise any other issues. [322] The seventh stakeholder group, being the Wellington Valley Wiradjuri People (WVWP) raised concern about deficiencies in the proposed survey methodology, and specifically that it would use previous surveys completed in the area that may not have involved Wiradjuri people.[323] Hansen Bailey advised further communications to the WVWP did not result in any response.

The primary fieldwork was completed over 20 working days during the period 15 November to 10 December 2010, in two separate stages to allow all five Aboriginal stakeholder groups who had registered an interest to participate.[324] Hansen Bailey advised that an archaeological survey of the ridgelines was also undertaken on 12 October 2011 following a request by the Department, with AECOM's archaeologists again accompanied by Aboriginal stakeholder groups.[325]

The draft Aboriginal Archaeological Assessment Review prepared as a result of the fieldwork and desk-top investigations was referred to all stakeholders who had expressed an interest in the project. Three of the five respondents indicated agreement with the contents and the proposed

[320] EA, Vol.1, Section 6.5, p.94
[321] EA, Vol.1, Section 6.5
[322] EA, Vol.1, Section 6.5, p.96
[323] EA, Vol.1, Section 6.5, p.96
[324] EA, Vol.1, Section 6.5, p.96
[325] EA, Vol.1, p.174

management measures.[326] As set out in section 6.5.3 of the EA, two of the stakeholder groups raised the following concerns:

- a request for further discussion in relation to the subsurface potential of site CV-AS4-10;
- the need for arrangements to secure long term storage onsite of any collected artefacts;
- the need to preserve sites within the existing ecological offset areas for the Invincible Colliery; and
- concern with regard to the ongoing monitoring arrangements for indirect impacts on the rock shelters.

AECOM found that CV-AS4-10 (an open artefact scatter) would not be impacted directly or indirectly by the project.[327] AECOM advises that the other matters would be included in the Aboriginal Heritage Management Plan (AHMP), the preparation of which is one of its recommendations for the project.

8.3.3 AECOM's Assessment Findings

Following its review and survey AECOM confirmed that within the project area six sites had previously been recorded, and nine new sites were recorded during the survey and together these comprise the following:

- 1 x isolated find;
- 9 x open artefact scatter;
- 2 x potential Aboriginal rock shelter sites;
- 2 x rock shelter sites with potential archaeological deposits; and
- 1 x rock shelter site with deposit.

Four of the 15 identified Aboriginal sites would not be impacted by the project, being open artefact scatters with scientific significance evaluations of 'low' (1), 'moderate' (2) and 'high' (1). No specific management is recommended for these sites.

AECOM identifies that of the 15 identified Aboriginal sites, six would be destroyed by the project being an isolated find and open artefact scatters.[328] All six have a 'low' scientific significance and AECOM recommends surface artefact collection prior to commencement of works, with the strategy to be set out in an AHMP for the project.

The remaining five sites, all of which are rock shelters, have been identified by AECOM as being potentially indirectly impacted by mining activities that result in blast vibration and/or subsidence.[329] These five sites are all identified as being either of 'low' or 'moderate' scientific significance. AECOM recommends a monitoring regime for these sites before, during and after proposed open-cut and highwall mining activities within the project area, and for details to be set out in the AHMP as discussed in further detail in section 8.3.4.

8.3.4 Impact of Mining Operations on Rock Shelters

AECOM proposes a schedule of monitoring for the rock shelters that is consistent with that recommended by SCT (2011) which carried out a geotechnical review of their stability. The key elements set out by AECOM are:

- the trigger for any detailed assessment is prior to commencement of any mining operations within 500m of identified rock shelters;
- prior to commencement a detailed assessment of site-specific subsidence and vibration modelling of each identified shelter is required. This would include modelling of maximum

[326] EA, Vol.1, Section 6.5.3, p.97
[327] EA, Vol 4, Appendix K, Section 10.4
[328] EA, Vol 4, Appendix K.
[329] EA, Vol 4, Appendix K, p.73

predicted values for subsidence, travelling tilt, travelling tensile strain, travelling compressive strain and peak particle velocity;
- prior to commencement baseline recording is carried out including inspection, a detailed photographic recording and elevation plans of structural and surface features;
- the baseline and data generated would then be monitored throughout the life of the project with the number and frequency determined by the results and from consultation;
- upon completion of open-cut and mining operations a final impact assessment for identified rock shelter sites should be undertaken;
- assessments are to be carried out by qualified geo-technicians and archaeologists;
- Aboriginal stakeholder representatives are to be consulted throughout the process including being invited to attend inspections and to provide their views on the monitoring schedule; and
- the outcomes of any assessments and modelling should be provided to both OEH and the Department, and the agencies consulted in relation to the monitoring schedule.[330]

The EA does not contain a copy of a 2011 SCT report. A report by SCT dated 14 December 2011 was subsequently supplied to the Commission at its request, being *Desktop Review of Slope Type Distribution within the Coalpac Consolidation Project – Identification of Slope at Risk and Potential Slope Hazard*. This report consistently makes reference to 100m being an appropriate buffer risk management zone, and the report states:

> *"the Cullen Valley Mine has successfully mined to topography …….. as close as 170m from a sensitive Aboriginal heritage site with no detrimental effects"*. [331]

Bridges Associate prepared an Acoustics Impact Assessment report dated 21 December 2011 that considers blast overpressure and vibration. Table 16 sets out vibration criteria for potentially sensitive heritage sites including the four[332] rock shelters that may be impacted by the project, as follows:

- CV-RCK 1-10 – Moderate significance, large overhang: 20mm/s
- CV-RKPAD 1-10 – Moderate significance, moderate overhang: 50mm/s
- CV-RCKPAD 2-10 – Low significance, small overhang: 100mm/s; and
- CV-RCK 2-10 – Low significance, large overhang: 20mm/s

For each of the above Bridges Acoustics recommends that the suggested vibration criteria should be reviewed by a geotechnical expert based on a detailed assessment of each site. Bridge Acoustics concludes that:

> *'A detailed review of blast criteria and blast management measures, by a suitably qualified geotechnical expert, should be completed before any blast occurs within 400m of an indigenous heritage site'.* [333]

Subsequently, SCT Operations Pty Ltd (SCT) prepared a *Geotechnical Review of Stability of Aboriginal Rock Shelters, Coalpac Consolidation Project* dated 16 January 2012. SCT inspected and reviewed the stability of the five rock shelters with Aboriginal heritage significance, being those identified by AECOM in its AACHIA as being potentially impacted by blast vibration and/or subsidence associated with the project's mining activities. Table 4 of SCT's (2012) report set out vibration criteria that are consistent with that provided by Bridges Acoustics.

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[330] EA, Vol.4, Appendix K, p.73

[331] SCT Operations Pty Ltd 2011, *Desktop Review of Slope Type Distribution within the Coalpac Consolidation Project – Identification of Slope at Risk and Potential Slope Hazard,* 14 December, p.5.

[332] Excluding C-S-1 – refer to SCT advice further down in this section.

[333] EA, Vol.2, Appendix H, p.45

SCT makes the following recommendations for each of the five identified rock shelters:

- CV-RCK 1-10 – Maintain reduced blast hole weights and depths within a 125m radius, and to meet the adopted ground vibration criterion of 20mm/s a reduced charge weight or additional mitigation would be required;
- CV-RCKPAD 1-10 - Maintain reduced blast hole weights and depths within a 125m radius.
- CV-RCKPAD 2-10 - Maintain reduced blast hole weights and [depths][334] within a 50m radius.
- CV-RCK 2-10 –The site is naturally at high risk of collapse at any time and hence no recommendation for a safe pit distance or blast technique. SCT recommends preparation of a Hazard Management Plan to further analyse the site and devise a practical resolution;
- C-S-1 – The site is adjacent to a previously mined area with no impact evident, and minimal risk from future damage due to the distance between the proposed open-cut mining and the site. [335]

In essence, SCT recommend limiting the force of blasting where charge weight results would exceed Bridges Acoustics' adopted vibration criterion.[336] Further to applying these restrictions, SCT recommends monitoring as an appropriate method for on-going management of the site including baseline photo documentation, development of a monitoring schedule, risk assessment, survey station monitoring and preparation of Hazard Management Plans. In the SCT report there is no reference to a generic (e.g. 500m) risk buffer zone and the maximum distance where reduced blasting is applied is 125m, although CV-RCK 2-10 has been identified as requiring further consideration due to its current fragility.

Terrock Consulting Engineers (Terrock) further considered mitigation measures that might be employed to protect (amongst other features) the rock shelters with Aboriginal cultural heritage significance. Terrock states:

> *'The effect on structures is controlled by designing blasts to comply with 'safe' ground vibration limits based on frequency-dependant damage criteria or other limits set by the owner/managers and of assets, and managers of the rock formations'.*[337]

This report suggests a vibration limit of 100mm/s at the sandstone escarpment, the base of which is 50m horizontally from the pit edge.[338] But the report then refers to the ground vibration limits for the rock shelters having been established by SCT (2011), and Terrock endorses the recommendations of SCT (2011) which are at 100mm/s and below. Terrock does not suggest any additional mitigation measures in relation to blasting and its impacts on the rock shelters.

8.3.5 Adequacy of the Aboriginal Cultural Heritage Assessment

Some submissions raised concern about the impact of the project on ACH and the scope of the ground survey. For example, the Lithgow Environment Group (LEG) raised concern regarding the accountability of previous heritage assessments for other mines within Ben Bullen State Forest, with an example cited of Baal Bone. The LEG submission suggests that the NSW Government should call for a comprehensive independent heritage assessment. [339]

[334] From the Commission's reading it appears 'depth' may have been accidently omitted from this recommendation.
[335] EA, Vol.4, Appendix L, Section 4
[336] EA, Vol.4, Appendix L, Table 4
[337] RTS, Appendix D, p.23
[338] RTS, Appendix D, p.23
[339] Lithgow Environment Group, submission, 28 May 2012, pp.18-19

The OEH provided a submission dated 4 June 2012 in which it advises the EA is adequate in relation to its assessment for this project.[340] Further to this, OEH confirmed it is satisfied with the field survey methodology used, the significance assessment of the artefact scatters and rock shelters, and management options for the artefact scatters.[341] OEH does state *'it remains uncertain whether the shelters will survive the blasting and underground mining'* and as such it recommends retrieving information from the shelters to mitigate any loss from roof fall collapse.[342] OEH did find the ACHMP was inadequate in terms of providing clear and relevant instructions for the management of ACH artefacts in the project area. [343]

The Commission notes that following its review of the draft Aboriginal Archaeological Assessment Review, one Aboriginal stakeholder group (the Mingaan Aboriginal Corporation) indicated that there were additional sites within the project area which had not been identified; however the location and significance of these sites have not been able to be verified by the Proponent with the Corporation.[344]

Since the application was referred to the Commission for its review, one additional rock shelter site has been discovered within the project area, and referred to the OEH and the Commission in September 2012 by the Blue Mountains Conservation Society.

OEH registered this site on the AHIMS database, and subsequently the site was inspected on 20 September 2012 by representatives from NSW Parks and Wildlife Service (a traditional owner), NSW Forests and Coalpac. [345] The Commission has been advised that the traditional owners would prefer that the rock shelter location is not disclosed, and as such no specific information identifying its location will be released by the Commission. However, its location is relevant to any potential impacts arising from mining operations, and the Commission can advise the rock shelter is within the project boundary, and it is approximately 400m from the open-cut boundary and approximately 100m from the nearest highwall mining activity.

The Commission met with OEH on 7 November 2012 and in this meeting ACH including the rock shelter discovery was discussed,[346] and OEH followed up with correspondence dated 4 December 2012 which is available in Appendix D. OEH advised Coalpac is to provide a thorough investigation of the ACH site to determine its significance and any required mitigation measures, with details set out in its correspondence.[347] OEH had previously advised that Aboriginal art sites are more numerous in the Blue Mountains than other parts of NSW, and that *'specialist investigations are required in order to form a modern interpretation of the site and its regional context'*.[348] More broadly, OEH believes a regional study of Aboriginal art sites in the Blue Mountains would be worthwhile.[349]

A second Aboriginal rock shelter was then also discovered in November 2012 and details were provided to the Commission by the Colong Foundation for Wilderness. This information was forwarded to the Department and OEH by the Commission, although the Commission notes this rock shelter is approximately 2 kilometres outside of the project boundary.

[340] OEH, submission, 4 June 2012.
[341] OEH, letter to PAC, 4 December 2012, p.2 (available in Appendix D)
[342] OEH, letter to PAC, 4 December 2012, p.2
[343] OEH, submission, 4 June 2012
[344] EA, Vol.1, Section 6.5, p.97
[345] Coalpac, email to Department, 21 September 2012
[346] All meeting minutes are available in Appendix C
[347] OEH, letter to PAC, 4 December 2012, p.2
[348] OEH, letter, 6 November 2012, p.1 (available in Appendix D)
[349] OEH, letter, 6 November 2012, p.1

8.3.6 Coalpac's Commitments

Coalpac's Revised Statements of Commitment are set out in section 5 of the RTS. Commitments 41, 42 and 43 relate to ACH as follows:

- *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;*
- *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;*
- *Coalpac will conduct relevant monitoring at all rock shelters with deposit sites as shown on Figure 40 when blasting within 500m 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.*

In the EA, the Proponent has also provided the following management procedure to be adopted in a Blast Management Plan which relates to the rock shelters:

> *"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".*[350]

AECOM has also set out a number of matters to be addressed in a subsequent Aboriginal Heritage Management Plan (AHMP) particularly mitigation measures for surface collection of artefacts and monitoring of the rock shelters.

8.3.7 Commission's Findings

In the Commission's view AECOM's assessment of the scientific significance of the identified ACH sites is reasonable, and it notes efforts to consult with the Aboriginal communities although clearly this consultation will need to continue and be meaningful particularly in relation to collection, storage and access to ACH sites. The Commission has also given weight to OEH's submission dated 4 June 2012 and subsequent correspondence dated 4 December 2012 confirming it is satisfied with the ACH assessment and field survey methodology as set out in the Proponent's EA.

OEH has advised that the Aboriginal cave discovered in September 2012 needs to be fully assessed to ascertain its scientific significance, risk of impacts from the project and any management measures (e.g. blasting criteria) required to protect the rock shelter. The Commission notes that all five other rock shelters also within the project area with Aboriginal cultural heritage are closer to the open-cut and highwall mining areas than this cave. It is expected that AECOM will also consider the November 2012 Aboriginal cave discovery as part of this process, although it is noted this is some distance outside of the project area. The Commission recommends that assessment of the Aboriginal rock shelter within the project area is carried out prior to any recommendation for approval.

The Commission has given significant consideration to blasting and vibration impacts on the cliffs, pagodas and the Aboriginal rock shelters as set out in sections 5.3.2.2 and 6.2.3.1.1. It is unacceptable that mining operations lead to the collapse of the identified Aboriginal rock shelters and the application of arbitrary buffer zones is not supported. As discussed in section 8.3.4 a number of different reports have been carried out to assess the current stability of the rock shelters and to establish vibration, subsidence and blasting criteria to mitigate potential impacts. These reports largely reinforce each other, and in particular the vibration criteria established by Bridges

[350] EA, Vol.1, p.131

Acoustics (2011) is taken forward into SCT's assessments, and SCT's (2012) recommendations specific to each rock shelter are then endorsed by Terrock. Each report refers back to prior blasting and lack of impact cited by the Proponent, and it is clear to the Commission there is some level of estimation being applied which is inevitable to some extent due to the number of interacting variables from any given impact. In this regard, Terrock's report states that blasting vibration *'may or may not'* accelerate erosion or cause rock falls and that the manager or owner of assets determines risk.[351] As referred to above, OEH also states *'it remains uncertain whether the shelters will survive the blasting and underground mining'* and therefore recommends gathering information in the event of a roof fall.[352] The Commission's concern is that these features are irreplaceable and public assets.

Terrock advises that ground vibration can be controlled by limiting the mass of the charge, and using a non-reinforcing initiation sequence and firing direction. [353] The Commission accepts this, and it considers that the ground vibration criteria for the Aboriginal rock shelters should not be greater than the criteria set out by the Proponent in section 8.7.4 of the EA. However SCT (2012) concludes that one rock shelter (CV-RCK 2-10) is inherently unstable, and commitments have been made for a 130m buffer zone and low maximum instantaneous charge (MIC) to achieve a 'moderate' risk. However, the Commission recommends that impacts in relation to the rock shelter should be managed to achieve 'negligible' mining-induced damage.

The Commission also notes the assessment of scientific significance of individual sites appears to be entirely in the hands of the Proponent's consultants. How these sites are rated (low, moderate or high) may well determine the level of protection they are afforded. Whilst the accuracy of the assessments in this EA are not under challenge, it appears to the Commission that a process whereby some of these assessments are subjected to peer review by the relevant authority would provide some level of confidence in the ACH assessment process. Peer reviews by consultants engaged by the Proponent are not considered by the Commission to have the required level of credibility for this task.

8.3.8 Commission's Recommendations

Recommendation 76: The Commission supports AECOM's recommendation that a detailed assessment of identified rock shelters is required prior to commencement of any mining operations within 500m of each identified rock shelter.

Recommendation 77: The Commission recommends that Aboriginal rock shelters in the project area should not be exposed to mining-induced impacts that could produce more than negligible consequences for the rock shelters. The Aboriginal Cultural Heritage Plan and the Blast Management Plan must contain measures to ensure that this outcome is achieved. Failure to achieve this outcome should be clearly identified as a breach of the approval and operations in the vicinity should cease until the project is compliant.

Recommendation 78: The Commission recommends that a monitoring regime is required that establishes the current condition of the rock shelters, that is capable of detecting any mining-induced impacts and that includes comprehensive reporting requirements.

Recommendation 79: The Commission recommends that prior to any approval of the project application that the Proponent provides OEH and the Department with an assessment of the scientific significance and structural stability of the recent Aboriginal cave discovery within the

[351] RTS, Appendix D, p.12
[352] OEH, letter to PAC, 4 December 2012, p.2 (available in Appendix D)
[353] RTS, Appendix D, p.23

project area. Any associated management recommendations should be incorporated into the Aboriginal Cultural Heritage Management Plan in accordance with OEH's directions in its letter dated 4 December 2012.

Recommendation 80: The Commission recommends that if the Department recommends approval an Aboriginal Cultural Heritage Management Plan (ACHMP) should be required by way of a recommended condition to protect ACH sites and artefacts including the rock shelters. The ACHMP should include elements set out by AECOM (2011), address matters raised by the OEH in relation to the scope of the ACHMP in its submission dated 4 June 2012 and also address relevant matters set out in OEH's letter dated 4 December 2012 including retrieval of information from the rock shelters.

8.4 Non-Aboriginal Cultural Heritage

8.4.1 Existing Situation

AECOM Australia Pty Ltd (AECOM) was commissioned to undertake a heritage assessment of the site and assess the impacts of the project on non-Aboriginal cultural heritage on behalf of the Proponent.[354] The study was undertaken in accordance with the NSW Heritage Office Guidelines for Heritage Impact Studies.

The study identified two historic heritage items within the project boundary. These were the Cullen Bullen General Cemetery, listed on the Register of the National Estate and National Trust of Australia and the 'Carleon Coach House' listed on the City of Lithgow Heritage Study Inventory. Neither is located within the project disturbance area.

Additionally, an archaeological survey was undertaken in late 2010 within the project boundary. It assessed previously identified sites as well as seeking further items. The survey identified three additional historic heritage items being an underground mine adit, a surface scatter of broken historic bottle glass and a sandstone assemblage of unknown origin.[355] This survey was undertaken in conjunction with, but separate to, the Aboriginal cultural heritage assessment.

Outside the project boundary but within 500m a number of historic heritage items were identified. These include sandstone building footings, miners' cottages, Cullen Bullen Public School, Royal Hotel, Beaumaris, Blackman's Flat Roman Catholic Cemetery and two cottages. Descriptions of these items are provided at Appendix M of the EA.

The consultant's report also provided a heritage assessment of the cultural and natural landscape[356]. This report is an historical overview and presents the area in its current form but does not make any assessment about the impact of the project.

8.4.2 Predicted Impacts

An Impact Assessment Summary prepared by AECOM predicts direct impacts from open-cut mining to the mine adit and sandstone assemblage as they are in the direct path of the mining operations. Indirect impacts predicted by AECOM involve:

- vibration to the Cullen Bullen Cemetery (located about 170m from the open-cut), the Carleon Coach House (within 250m of open-cut operations) and sandstone formations;
- visual impacts to the cemetery and sandstone formations; and
- potential damage to the sandstone footings.[357]

[354] EA, Vol.4, Appendix M
[355] EA, Vol.4, Appendix M, p.13
[356] EA, Vol.4, Appendix M, Section 6.0, pp.19-25
[357] EA, Vol.4, Appendix M, pp.38-39

Cullen Bullen Cemetery and the Carleon Coach House are located within the project boundary, with the sandstone building footings being located outside the project boundary.

The sandstone building footings were located near the intersection of the Castlereagh Highway and Boulder Road. Little is known about the footings. A search of Department of Lands aerial photos from the 1950s to 2010 shows no structure so it is reasonable to assume the footings pre-date that time.[358] Concern has been expressed about the potential for damage to this site from construction activities for the MPPS coal conveyor.

Although the footings are located outside the boundary and their significance has not been identified, because of the risk of damage the Proponent proposes to fence off the area with a 20m buffer. The fence will be removed when construction is completed.

AECOM also observed that there is the possibility for the mining operations to impact on natural elements of the cultural landscape such as the sandstone formations, presumably a reference to the pagodas.[359] The project's impacts on the pagodas are given extensive consideration in section 6.2.

The bottle scatter will not be impacted by the project. All other heritage sites outside the project boundary will not be impacted being 1km to 5km from the open-cut.

Blasting is proposed within 178m of the cemetery which is opposed by LCC and Cullen Bullen residents. Lithgow City Council resolved in May 2012 to not oppose the project but to object to mining taking place within 500m of Cullen Bullen, residences outside the village, and the cemetery.[360]

The Proponent does not propose to blast within 500m of the village and will seek agreement from rural residences within that perimeter before blasting. However, the Proponent remains committed to blasting within 500m of the cemetery and Coalpac is confident that with monitoring and vibration management any adverse impacts can be avoided. Although the Proponent has committed to only blasting when burial services are not scheduled, no detail has been provided as to how this commitment can be achieved. Furthermore, comments made by Cullen Bullen residents at the public hearings indicated that visits to graves in the cemetery often occurred outside of burial services. No commitment has been made in relation to managing the potential impacts of blasting during these visits. These issues are addressed further in section 5.3.

The Proponent has committed to the completion of a full archival recording of the cemetery and Coach House prior to blasting within 500m and to develop a Historic Heritage Management Plan (HHMP) for the project in consultation with relevant agencies, the Department, and relevant stakeholders.

The Coach House is located 700m north of Cullen Bullen on private land on the western side of the Castlereagh Highway. It is located within 250m of open-cut operations and although the EA suggests the risk to this item is minimal, the HHMP will include this site.

The HHMP will include, in addition to other measures, a photographic and archival recording of the adit and assemblage prior to disturbance. In relation to the latter, a further archaeological investigation will be undertaken prior to any impact on the site due to insufficient information being

[358] EA, Vol.4, Appendix M, Section 6.0, pp.19-25
[359] EA, Vol.4, Appendix M, Executive Summary
[360] Lithgow City Council, submission, 1 June 2012

available about the nature of the assemblage. AECOM has recommended that for this site a Section 140 application to permit test excavation be completed and submitted to the NSW Heritage Office prior to any impact to the site by the project.

AECOM has also recommended that to mitigate impacts to both the cemetery and the Coach House it is necessary to prepare a detailed Statement of Heritage Impact, archival recording to establish a baseline for monitoring, a program for site monitoring, and a remediation strategy for potential impacts. For the Coach House, a structural assessment is recommended for inclusion in the HHMP.[361]

For the sandstone formations AECOM suggests a baseline condition assessment be prepared prior to mining activities and for the assessment to form the basis of an annual review. A minimum 50m boundary between the formations and all highwall or open-cut mining was recommended. This is the standard setback proposed by the Proponent, and there is no rationale expressed by the consultants for this depth of setback to the sandstone formations.

8.4.3 Commission's Findings

Bridges Acoustics undertook a vibration assessment for the EA. That assessment found that, apart from the cemetery, all other heritage sites were unlikely to be affected by vibration due to the distances from blasting activities.[362]

The assessment calculated the effects of vibration on the cemetery to be below ANZEC guideline criteria and as such vibration impacts were not anticipated. Bridges Acoustics did, however, recommend a regular review of vibration criteria for the cemetery and ongoing monitoring within 1500m of blasting.

The primary issues for the Commission in relation to heritage, apart from the sandstone formations and pagodas in particular, concern the cemetery and the Coach House and the possible vibration and overpressure impacts from blasting. The visual impact of open-cut mining close to the cemetery and the potential damage to graves and headstones from blasting were issues raised at the public hearings.

While the Bridges Acoustics study and the Proponent's commitments to monitor and manage blast impacts provide a level of reassurance, there can be no guarantee that there will be no impact on the cemetery or the Coach House. Blasting will come within 178m of the cemetery and 250m of the Coach House.

Damage to the Cullen Bullen historic cemetery is a potential outcome that could have a pronounced impact on the local community and visitors.

Bridges Acoustics adopts the ANZEC guideline vibration criteria at 5mm/s PPV and overpressure at 115dBL.[363] This guideline also recognises that blast effects cannot always be controlled accurately and therefore allows a higher limit of 10mm/s PPV and 120dBL for up to 5% of blasts in a 12-month period.

In relation to the impacts of open-cut mining the AECOM assessment indicates a "cautious approach" to the Coach House prior to quoting Bridges Acoustics as finding that there "was a low

[361] EA, Vol.4, Appendix M, Executive Summary
[362] EA, Vol.4, Appendix M, Executive Summary
[363] EA, Vol.2, Appendix H p.17 and EA Vol 1 Section 8 Table 29

likelihood for Carleon (Coach House) to be impacted by vibration".[364] AECOM then proceeds to list both the cemetery and the Coach House as potentially being impacted indirectly by the project.

The Bridges Acoustics report lists 16 indigenous and European heritage items as "potentially sensitive" to blasting impacts including the cemetery and the Coach House.[365] Of the non-Aboriginal heritage items these are the only two within 500m of blasting.

The Commission was assured by the Proponent that controlling the impacts of blasting is now a very precise technique and it could manage vibration. Blasting is an issue addressed in detail in section 5.3 of this review. In relation to the heritage items the Commission supports a 'negligible damage' outcome from blast vibrations, noting remediation is not always possible. The question remains as to what distance and/or quantities of blast material and other factors would ensure the risk of damage is so remote to be acceptable. Five hundred metres (500m) was suggested by LCC but without supporting data.

The Department of Primary Industries in Victoria notes that a significant factor in determining the impact of blasting on sensitive sites is the separation distance between the blast site and the site.[366] That Department acknowledges that in some cases operators might need to move closer to a site but the Department will not lower its limits for 95% of blasts beyond 5 mm/s (ppv) for vibration and 115 dB (Linear Peak) for airblast.

The impact of a blast is also affected by a number of factors including blast design, weather, topography, and geology and soil water content.[367] Accordingly, while distance is a factor it is not the sole determinant of impact. Blast impact research and conditions placed on other mining operations suggest that effective control can be obtained through the setting of proper vibration and overpressure criteria as part of a well developed Blast Management Plan with proper measurement, monitoring and reporting. Provided the management plan includes the cemetery and Coach House as well as other heritage items with an objective of negligible damage (cosmetic or structural) from blast impacts, the proposal to blast within the distances planned appears to be acceptable.

The criteria adopted by the Proponent are supported by the ANZEC Guideline and it is noted that there is a commitment to design blasts to achieve a vibration level at half the recommended limit and an overpressure level 3dBL below the limit for each heritage site. Also blasting in new mine areas will start furthest from the sensitive receivers and advance towards those receivers so that a history can be developed from the measurement and monitoring. A number of other mitigation measures are outlined in the EA.[368]

The mitigation and management measures outlined by the Proponent indicate that blasting will not occur within 500m of private land unless adequate controls are in place to minimise the risk of fly rock. It is assumed the same controls will be adopted for the cemetery although it occupies public land. If not, compliance with the same commitment is recommended by the Commission.

8.4.4 Commission's Recommendations

Recommendation 81: The Commission recommends that the standard for blasting to be applied to both the Carleon Coach House and the Cullen Bullen General Cemetery is for 'negligible impact', and

[364] EA, Vol.4, Appendix M, p.36
[365] EA Vol.2 Appendix H, p.18
[366] http://www.dpi.vic.gov.au/__data/assets/pdf_file/0019/21286/5_Blasting_Limit_Guidelines.pdf
[367] http://www.dpi.vic.gov.au/__data/assets/pdf_file/0019/21286/5_Blasting_Limit_Guidelines.pdf
[368] EA Vol.1, Section 8 p.131

this standard and the method to achieve it should be included in any conditions of approval and the relevant management plan(s).

Recommendation 82: The Commission recommends that the sandstone footings are fenced prior to construction of the conveyor, and this should be addressed in any conditions of approval and relevant management plan(s).

8.5 Social Impact Assessment

The Social Impact Assessment included in the EA consists largely of a description of the characteristics of the nearby population centres, limited demographic and economic data and a strong focus on employment prospects arising from the project and the consequent (and very limited) increase in requirements for local housing and use of community facilities.[369] In this context it should be noted that a very small proportion (3%) of the existing Coalpac workforce live in Cullen Bullen.

There is no analysis of the social disruption arising from the acquisition of properties, the likelihood that other impacted community members will seek to escape from the area, or the increased community health impacts identified by NSW Health. Community members raised concerns about lifestyle impacts including access to currently enjoyed recreational opportunities in Ben Bullen State Forest and the loss of a peaceful village atmosphere. They also raised concerns about negative impacts on their property values and pointed out that for many in this economically depressed area their only asset was their residence. Some submitters sought access to acquisition rights based on loss of amenity, even though they were outside the predicted levels of impact for acquisition for noise and air quality. The real question is whether Cullen Bullen will go the way of other villages in rural NSW that have been exposed to open-cut mining in close proximity to their boundaries. Examples are Camberwell, Warkworth and Ravensworth.

In reality the project does have difficulty in claiming social benefits in the local context since most of the significant potential benefits are distributed elsewhere. However, the Proponent has agreed to make a financial contribution to Cullen Bullen through Lithgow City Council of $250,000 per annum of which $200,000 will go towards the cost of a sewerage reticulation system and the other $50,000 to fund local projects. The Commission notes that Council already has a responsibility to provide the very projects for which the Proponent's contribution will be used. Nevertheless, if Cullen Bullen does receive these benefits earlier than Council could provide them the village will benefit.

8.6 Economic Issues

8.6.1 Introduction

The Proponent's version of the justification for this project is set out in the EA[370] and is summarised in sections 4.3 and 4.4 of this report. The economic analysis supporting the project is included in Appendix J to the EA and a peer review of the analysis is included as Appendix G to the RTS.

The Proponent in the RTS indicated that during the exhibition of the EA 133 public responses expressed support for the project.[371]

Economic benefits listed by the Proponent were direct employment, benefits to new and existing service providers, investment in the site, contributions to the local community and the NSW

[369] EA, Vol.1, pp.231-237
[370] EA, Vol.1, pp.261-272
[371] RTS, Section 4.22, p.207

economy and the continued supply of coal to MPPS. There is no doubt that the proposed project provides employment and an economic multiplier effect in the local economy. The level of employment is predicted to be 120 if the project is approved and there will also be employment generated for contractors and suppliers.

Many of those making submissions supporting the project had an economic reason for doing so being employees, contractors and suppliers, or users of the product coal such as Shoalhaven Starches and TRUenergy.

Gillespie Economics suggest that the annual regional economic direct and indirect impact is $219m in regional output or business turnover, $105m in value added, $30m in household income and 293 jobs ranging to 519 jobs for the State economy.[372] Gillespie also claims that cessation of the project may lead to a reduction in regional economic activity. However, the Commission notes that the project has a finite 21-year life and that employment and economic activity directly associated with this project will cease, potentially leaving the regional economy with significant negative legacies in community health costs, environmental degradation, and long-term limitations on alternative land-use options.

The Proponent's justification for the project has been the subject of numerous criticisms in written submissions and in presentations at the public hearings. These criticisms have covered a wide spectrum: from rejection of the alienation of public land for private profit, to specific concerns with aspects of the economic analysis, to rejection of the mining of coal to fuel coal-fired power stations. Many of the criticisms at the EA stage have been responded to by the Proponent in the RTS.[373] However, aspects of these responses have received further criticism at the public hearings and in written responses on the RTS provided to the Commission.[374]

The Commission does not propose to deal in detail with all of these criticisms in this report. Rather, the focus will be on the economic analysis supporting the project and on the claims concerning impacts on wholesale and retail electricity prices in NSW.

8.6.2 Economic Analysis

The economic analysis uses standard techniques and the approach is supported by the peer reviewer. However, the analysis has been subjected to close scrutiny by researchers at the Institute for Sustainable Futures at UTS, Sydney who question many of its assumptions and conclusions.[375] Some of the issues raised go to the appropriateness of the analytical approach. For example, if the Department's move in 2011 to triple bottom line cost benefit analysis should have been employed in the economic analysis for this project, then the analysis in the EA is described as falling well short of achieving this.[376] The RTS avoids discussion of this issue, relying instead on simply re-stating the earlier (2002) Departmental guidelines and arguing that the analysis is consistent with those guidelines.[377]

A number of issues are raised concerning the rationale for the project including *inter alia* the failure to recognize the declining trend in electricity consumption (particularly in NSW) which is at odds

[372] EA, Vol.5, Appendix T, pp.3-4
[373] RTS, pp.176-197
[374] Written responses are available on the Commission's website: www.pac.nsw.gov.au
[375] UTS Institute for Sustainable Futures, Report titled 'Independent Review of the Coalpac Environmental Assessment' appended to the TEC submission on the EA dated 22 June 2012
[376] Ibid, pp.10-12
[377] RTS, pp.178-179

with the EA position which describes *'the inevitable increase in demand for electricity'* as requiring increased production of thermal coal. [378] A couple of points are relevant here.

- the International Energy Agency (IEA) predicts that international energy demand will continue to rise largely driven by developing nations;
- the Australian demand trend is downwards and this is particularly the case in NSW. This trend is not anticipated to change in the short-medium term; [379] and
- the majority of the coal from this project is poor quality coal not suitable for export. Only 1 Mtpa of the better quality coal is able to be exported and transport and market arrangements are not yet in place for this. Since over 70% of the annual production is for domestic use, the evidence does not support justification of this particular project by reference to increased energy demand.

The Commission also notes that the world parity price of coal has been used in calculating the benefits of the project.[380] This is noted in the peer review and justified on the basis that it *'recognises the scarcity value of the coal resource as is required in the analysis of economic efficiency'.*[381] However:

- the coal to be supplied to MPPS is not suitable for export and world parity does not therefore appear to be particularly relevant;[382]
- the Proponent has a contract to supply around 70% of the product coal from the project to MPPS at a price substantially below current world parity;[383]
- this contract extends to 2029, which covers 17 of the 21 years of a possible approval for this project; and
- the claimed threshold benefits of $1,519 million for the project are particularly sensitive to the coal price. A 20% reduction in coal price reduces the threshold benefits 42% to $881 million.

The Commission's conclusion is that, even though the economic analysis may be acceptable in theoretical terms, for this particular project it appears to grossly overstate the real financial benefits.

The Institute for Sustainable Futures report also criticises the analysis on the basis that benefits and costs are not accounted for consistently – spatially, temporally, or in terms of whether the project is an expansion or a new project.[384] The RTS responds to most of these criticisms, albeit not always convincingly. For example, the response on spatial scales emphasizes the national scale at which the economic analysis should occur,[385] but then argues that the project should be evaluated in terms of its own specific benefits and costs – many of which are identified as being local or regional.[386] The use in various elements of the analysis of different base cases (existing mine vs no mine) is also defended, but an equally plausible explanation is that the base case providing the most favourable outcome for the Proponent's case has been the one utilised.[387] The bottom line is that the criticisms

[378] EA, p.261
[379] UTS Institute for Sustainable Futures, *op cit*, p.13. But note that some other commentators forecast a slight increase in demand over the coming decade.
[380] EA, Vol.5, Appendix T, p.9
[381] RTS, Vol.2, Appendix G, p.1
[382] The Commission is aware of other coal supplies that fit this description in NSW and most of these supplies are also used or intended for use in domestic power generation.
[383] The actual figures are Commercial-in-Confidence. While contract prices would usually not be relevant to this type of economic analysis, the fact that the coal is not suitable for export means that some figure other than the world parity price must be considered when the claimed benefits of the project are being scrutinised. The contract price may be an appropriate benchmark in these circumstances.
[384] UTS Institute for Sustainable Futures, *op cit*, pp.15
[385] RTS, pp.189-190
[386] RTS, pp.190-191
[387] RTS, pp.194-195

of the economic analysis have not been convincingly rebutted and an independent review may be necessary if the project is to be assessed further.

Comments on the economic analysis in the area of assessment of impacts are also of concern. In relation to comments on Greenhouse Gas emissions, it should be noted that there has been substantial debate between experts for the special interest groups and experts for the Proponent on the calculation of the Greenhouse Gas impacts of the project. The Proponent has conceded that the figures in the EA must be amended (see section 8.7 of this report). The Commission is unsure at this stage what adjustments (if any) need to be made to the economic analysis to deal with this.

However, the assertion in the economic analysis that the biodiversity impacts of the project are fully accounted for in the rehabilitation and offset proposals[388] is clearly wrong. Not only does it not stand up to any level of scrutiny from a biodiversity protection perspective,[389] but there have also been substantial changes to these proposals in response to criticism of the EA. The RTS simply adds $1m to the project costs and reasserts the Proponent's original position.[390] The problem is that the Commission does not consider that there is any credible evidence available that the rehabilitation will work in the longer-term and there is no conclusive evidence that even the revised Biodiversity Offset Package is adequate.[391]

It is also arguable whether property offsets can be seriously asserted to *'offset the biodiversity values that will be lost from the Project'* and that there *'would be no additional ecological costs for inclusion in the BCA'*[392] This may be a convenient economic fiction, but the fact is that destroying biodiversity in one area cannot be compensated for by 'protecting' it in other areas where it was not under threat.[393]

8.6.2.1 Commission's Findings

Although the economic analysis may have been conducted within the applicable guidelines and bounds of economic theory, the facts of this particular project are sufficiently unusual to test the limits of the approach. There are clearly strong differences of professional opinion as to the approach that should have been taken to various aspects of the analysis. How material these differences might be to the outcome is beyond the scope of this review to determine. However, the Commission notes that in areas that it has examined for other purposes in this review (e.g. Greenhouse Gases and Biodiversity Impacts), the positions taken in the economic analysis do not appear robust. An independent expert review may be an appropriate step as part of further assessment of this project. An alternative to further review is to adjust the weight to be given to the analysis in the assessment process. In the Commission's view the unresolved contested nature of the approach to, and results of, the analysis mean that it can be accorded little weight. Consequently, the Commission considers that, contrary to the views expressed by the peer reviewer employed by the Proponent, key results of the analysis, such as the project benefits, may not present a sufficiently reliable platform for decision-making.

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[388] EA, Vol.5, Appendix T, p.10

[389] See section 6.3.4 re the flaws in the rehabilitation and offset proposals

[390] RTS, pp.181-182

[391] See Section 6.3.4.3 of this report. Note that, as far as the Commission is aware, the additional large property proposed as an offset has not yet been assessed by anyone other than the Proponent's consultants – and their assessment is only preliminary.

[392] RTS, p.182

[393] Note that applications to mine previously committed offset areas have also been made and one recent approval is currently under appeal in the NSW Land and Environment Court.

8.6.3 Electricity Costs

8.6.3.1 Introduction

The issue that will dominate reporting on the outcome of this review will be the alleged increase in NSW wholesale and retail electricity prices if the project does not proceed. The headline figures claimed are:

- wholesale price increase of 35% by 2022; and
- retail price increase of 13% by 2022.[394]

The Commission has examined this issue carefully. That examination casts substantial doubt on the claims.

8.6.3.2 Basis for the Claims

The Commission wrote to TRUenergy (now Energy Australia) on 25 September 2012 seeking substantiation for the generalised claims made in submissions and at the public hearing and asking some specific questions. The Commission met with Energy Australia on 17 October 2012 and received a written response dated 2 November 2012. At the meeting, and annexed to the letter of 2 November 2012, Energy Australia also made available some Commercial-in-Confidence material.[395] The Commission then also held a telephone-conference with Energy Australia on 30 November 2012 to discuss aspects of the information supplied to the Commission in the prior meeting and on 2 November 2012.

A number of factors must be understood to make sense of the claims and the proposed justification for them:

- the cost of coal is only one input to the cost of producing electricity from a power station (generator). Other inputs include thermal efficiency, maintenance and other operating costs and the cost of capital. The price the generator must charge the grid for electricity generated is known as the short run marginal cost (SRMC+) which includes a notional capital charge;
- NSW generators can be ranked in order of their SRMC+. In the context of this project MPPS has a very low SRMC+ (near the best) and Wallerawang has a relatively high SRMC+ (near the worst). Wallerawang is older and less efficient than MPPS;
- NSW generators only dispatch power to the grid when there is demand and they dispatch in the order of their SRMC+. On this basis MPPS dispatches a high percentage of its generating capacity and Wallerawang much less;
- If a generator's dispatch rate drops to the point where it is no longer profitable to operate, then it will be closed down either partially (part year) or completely. The other major internal factor that might drive such a decision (or influence it) is the need for major capital investment to upgrade the plant;
- The price charged by generators (the wholesale electricity price) contributes approximately one third to the retail price of electricity; and
- Demand for electricity is falling in NSW and that trend is expected to continue.

Scrutiny of the Energy Australia claims and the material supplied raised the question of whether the claimed increases in electricity prices were based on MPPS or on the whole of the Delta West generation capacity, which includes Wallerawang. Energy Australia confirmed that it was Delta West generation that was used to calculate the increases. This is important for a number of reasons:

- the Project Application is principally for supply of coal to MPPS, not to Wallerawang;

[394] Energy Australia, letter to PAC, 2 November 2012

[395] The correspondence between the Commission and Energy Australia is included as Appendix D. The Commercial-in-Confidence material is excluded.

- there are factors other than coal price that will affect decisions on the longevity of Wallerawang; and
- in the supporting material provided by Energy Australia the effect on prices is stated to be due primarily to decisions relating to Wallerawang, not to MPPS.

The justification for the figures for cost increases is based on modelling the impact of increased coal prices to Delta West generators in the absence of coal from Coalpac. The model is a simple one that adjusts the position of these generators on the SRMC+ table and from this determines their likely dispatch rate given the projected demand. As profitability falls, a decision is made to retire Wallerawang in 2015 and MPPS in 2018, with all Delta west generation ceasing in June 2018.[396]

There are a number of concerns with the model:

- it shows only a small increase in the NSW wholesale price (pool price) between 2013 and mid-2018 when the Delta West generation is said to cease. That increase is approximately 15%, which translates to 5% in retail prices;
- there is then a steeper increase between mid-2018 and mid-2022, when NSW pool prices are said to be 35% higher. It is this higher figure that is used by Energy Australia to calculate the 13% retail impact.

  Energy Australia argued (teleconference 30/11/12) that there is a flow-on effect of the cessation of Delta West generation in the period 2018-2022 that causes this increase. However, the Commission's view is that, while the small increases projected to 2018 may have a relationship with coal price increases to MPPS[397] there can be no direct relationship between Delta West generation and price increases in the 2018-2022 period. The 2018 base will have an element of cost increase due to Delta West cessation, but beyond that the grid must source its supplies from elsewhere and any increases are solely due to behaviour of the alternative suppliers. A claim that Delta West would have maintained existing prices in the face of increases by all other competitors in the market in the period 2018-2022 has not been made.
  The likelihood of market adjustment in the period 2013-2018 is also evident from the material supplied by Energy Australia. The decline in supply to the grid from Delta West occurs over the whole 2013-2018 period, which would indicate that alternative supply costs would be factored in gradually and be fully evident by 2018.

- the model assumes no significant changes other than the price of coal to MPPS over the period. No change is allowed for:
  - in the behaviour of other generators;
  - in the behaviour of regulators; nor
  - in the behaviour of markets.
- none of these scenarios are plausible. Major changes in the electricity industry have been foreshadowed recently including substantial reductions in retail power bills[398] and changes to regulatory arrangements between the Commonwealth and States. In the Commission's assessment any issues arising from coal supply to MPPS will almost certainly be dwarfed by these impending changes; and

[396] Note that this is a model and does not necessarily represent final corporate decisions by Energy Australia. However, it is this model that has been used in calculating the price increases for electricity claimed by Energy Australia and the assumptions about closure are key elements of the calculation.
[397] And even that relationship is tenuous given that the primary driver of cost increase relates to Wallerawang, not MPPS
[398] Coorey, P 2012, 'Power bills to fall $250 with electricity reforms', *Sydney Morning Herald*, 18 October, pp.1-2.

- the substitute coal price used to calculate the impact on MPPS of loss of Coalpac coal is the world parity price. This is the worst-case scenario. It is based on market conditions in which all product coal suitable for export can find export markets and therefore there is no opportunity to negotiate lower-priced contracts for domestic supply. Given the geographical location of Delta West generators this may prove to be the case. However, as noted in the economic assessment for the EA *'there is great uncertainty around both the availability and price of alternative sources for MPPS'*.[399]

A second confidential analysis of potential price increases due to failure of Coalpac supply to Energy Australia was also produced for consideration by the Commission. This was intended to support the first analysis.[400]

Again the Commission has considerable concerns with this analysis:

- the principal impact on the increased prices is stated in the analysis to be due to impacts on Wallerawang. However, the Project Application is for supply of coal to MPPS, not to Wallerawang (except in emergencies and then only a small tonnage);
- the dispatch pattern for MPPS changes only marginally over the 6-year period in stark contrast to the earlier analysis which shows rapid and relatively sustained decline between mid-2013 and mid-2018. On these figures it is difficult to detect any really significant effect of the altered coal price on MPPS productivity. Delta West generation does not cease in this analysis; and
- Energy Australia noted in the teleconference (30/11/12) that there would still be some price impact even if the dispatch rate for MPPS remained constant, since the SRMC+ for MPPS would be higher. The Commission accepts that there would be some increase, but that this should be capped at the 2018 level since the market will have fully adjusted by that date to the impact of coal prices to MPPS.

One other issue raised by the Commission in its questions to TRUenergy was the relationship between the cost of coal and the wholesale electricity price in NSW.[401] The response was that, whilst there was a high correlation between the cost of coal and wholesale electricity prices across all NSW generators, the impact on these prices was less clear if the coal price increase was isolated to only MPPS. The reason given was that other variables, such as coal prices to other generators, the willingness of these generators to cut profit margins, and supply/demand conditions, would mask the effect of the MPPS situation.

8.6.3.3 Commission's Findings

- The claims that absence of Coalpac coal will cause major increases in NSW wholesale and retail electricity prices are not substantiated on the evidence presented.
- Although the claim in the TRUenergy submission on the EA is based on increased cost of coal to MPPS *'Increased costs would need to be reflected in the wholesale prices bid into the National Electricity Market by Mt Piper'*,[402] questioning of Energy Australia revealed that they are in fact based on changes to Delta West Generation as a whole (which includes Wallerawang). Supporting documentation[403] indicates that the primary driver of the claimed cost increases is in fact changes to Wallerawang and that there are significant factors other than the price of coal to MPPS involved in decisions about the future of Wallerawang.
- The case for a causal relationship between cessation of supply of Coalpac coal to MPPS in 2013 and any further increases in electricity prices beyond the 2018 price is not made out.

[399] EA, Vol.5, Appendix T, p.14
[400] Energy Australia, letter, 2 November 2012, p.1
[401] PAC, letter to TRUenergy, 25 September 2012
[402] TRUenergy, submission on EA, 30 May 2012 (TRUenergy is now Energy Australia)
[403] Energy Australia, Commercial-in-Confidence

- There would be expected to be a small increase in wholesale prices if there was a significant increase in coal price to MPPS. The magnitude of any such increase is speculative in the current market conditions and the flow through to retail costs will almost certainly be swamped by other market forces and the foreshadowed reforms to the electricity industry.
- Close scrutiny needs to be applied to any claims of price increases that include Wallerawang as a factor in the analysis. The project application is principally for supply of coal to MPPS, not to Wallerawang.

8.6.4 Short-term Supply of Coal to MPPS

The Commission sought advice from Energy Australia as to what provision it had made to obtain sufficient coal to operate MPPS in the event that a decision on the project application was delayed beyond the expected date of completion of mining by Coalpac under its current approvals.

Energy Australia advised that it would have 2 million tonnes stockpiled by the time that Coalpac supplies ceased. This is equivalent to one year's supply by Coalpac under the current arrangements. There is no short-term crisis.

8.6.5 Supply of Coal to Shoalhaven Starches P/L

Shoalhaven Starches P/L is a member of the Manildra Group of companies. It is located at Bomaderry, near Nowra. Shoalhaven Starches is a user of coal from Invincible Colliery. The coal meets the ash and size requirements for their boilers and the company advises that the contracted price from Coalpac is significantly below the cost of alternative supplies.[404]

Appendix D of the EA contains a letter from Shoalhaven Starches dated 7 November 2011 stating that when Coalpac ceases supply from Invincible Colliery after 1 July 2012 (sic) the additional cost for alternative coal will be approximately $5 million per annum.

Shoalhaven Starches made a submission on the EA dated 9 May 2012 and also appeared at the public hearing at Lithgow on 19 September 2012. The concluding statement at the public hearing was *'the coal from Invincible Colliery is absolutely essential for the continued competitive operations of our Shoalhaven Starches facility at Bomaderry'*. The Commission wrote to Shoalhaven Starches on 25 September 2012 seeking further details in connection with the claims made, including whether the facility would close in the absence of coal from Invincible Colliery.[405]

The detailed response from the company makes it clear that there are a wide range of cost pressures on the company and, because a large part of the product is exported, the high $A is adding to these pressures. While any increase in fuel cost is an unwelcome addition to the overall pressures on the business, it is clearly not the most significant cost-driver.

Shoalhaven Starches advised the Commission that they have secured alternative suitable coal supplies for the period 1 January 2013 to 30 June 2013 in anticipation that Coalpac coal will not be available. The additional cost for this six month period is stated to be $1.35m. This is substantially less than the estimate of $5 million per annum in its earlier letter. Whether a longer term contract could be negotiated at a better price is not known by the Commission.

[404] Manildra Group, letter to PAC, 10 October 2012 in response to the Commission's letter of 25 September 2012 (both available in Appendix D)
[405] PAC, letter to Shoalhaven Starches P/L, 25 September 2012

8.7 Greenhouse Gas Emissions

8.7.1 Scope of Assessment

Appendix G of the EA includes a Greenhouse Gas (GHG) assessment undertaken by PAE Holmes forming part of its Air Quality Impact Assessment. The assessment was undertaken in accordance with the then applicable GHG guidelines, including the Commonwealth Government's *National Greenhouse Accounts Factors* (2010).

PAE Holmes's assessment calculates GHG emissions associated with the project under three 'scopes' of emissions as follows:

- 'Scope 1' emissions – Direct GHG emissions from sources controlled by Coalpac, being:
    - Fuel consumption during mining operations;
    - Release of fugitive methane (CH_4) during mining.
- 'Scope 2' emissions – Indirect GHG emissions resulting from consumption of purchased energy on the site by Coalpac;
- 'Scope 3' emissions – Indirect GHG emissions that are a consequence of the activities of Coalpac, but that arise from sources not owned or controlled by Coalpac, being:
    - Production and transport of fuels;
    - Transmission and distribution losses from electricity supply;
    - Coal transportation emissions; and
    - Emissions from burning of the product coal. [406]

8.7.2 Submissions

A number of submissions were received objecting to the increase in GHG emissions and associated climate change impacts that would be generated by the project, and raising concern that continued reliance on coal delays the development and use of renewable energies. A number of submissions also challenged aspects of the GHG assumptions, calculations and exclusions which the Proponent's RTS in part addressed. A submission from the Total Environment Centre including a review by the Institute for Sustainable Futures (both dated 22 June 2012) considered GHG emissions and implications for the economic assessment. The Commission has addressed economic issues in detail in section 8.6.

The EPA, in its submission on the EA dated 4 June 2012 considered the GHG emissions and assessment. The EPA queried the site specific measurements that resulted in PAE Holmes's estimate of the Scope 1 - fugitive gas emission, which the Proponent addressed.[407] The EPA also queried the emissions related to rail trips, on the basis emissions from return rail trips did not appear to have been calculated. In the RTS the Proponent corrected this error and calculated it corresponds to an average per annum increase from 2,348 t CO_2-e up to 3,838 t CO_2-e (the difference being 1,490 t CO_2-e per annum) from rail transportation of coal.[408] The EPA was satisfied with the Scope 3 calculations, which the Proponent advised did not include emissions from the shipping of coal. [409]

The EPA submitted a second submission in response to the RTS dated 18 September 2012. In this, the EPA does not raise any further concerns with regard to GHG emissions and generally endorses the update of the Proponent's Statement of Commitments (SoC) although updated Commitments 16-19 primarily relate to local air quality matters rather than GHG emissions.

[406] EA, Vol.2, Appendix G, pp.98, 99 and 102
[407] RTS, Section 4.4.1
[408] RTS, Section 4.4.4
[409] EA, Vol.2, Appendix G, p102

Following release of the Proponent's RTS and at the public hearing, Dr Haydn Washington of the Colo Committee continued to raise concerns about the GHG emissions calculations supported by correspondence from Prof D Karoly and G Cawley.[410] The Commission wrote to the Proponent noting submissions have been made querying the greenhouse gas calculations presented in the EA. The EA estimates the greenhouse gas emissions from the project at 0.0069 Gigatonnes of carbon dioxide equivalent per annum. A claim made is that the EA then compared this to the total CO_2 amount in the atmosphere, rather than against total annual anthropogenic emissions of greenhouse gases, and hence vastly underestimated the project's proportional generation of global greenhouse gases. The Proponent responded on 30 October 2012 and this letter is available in Appendix D. In this additional information, the Proponent advised typographical errors were made in the EA and concurred that if the project's estimated annual contribution is compared against the estimated global anthropogenic annual emissions (~28.9 Gt CO_2-e/annum) this project represents 0.02% rather than the comparison against global emissions as stated in the EA at 0.0003%.[411] The Proponent does not agree that the project in isolation represents a 1.3% increase to the Australian carbon footprint, and notes that a significant proportion of the Scope 3 GHG emissions would be captured within the current Scope 1 emissions associated with the base-load power generation.[412] The Proponent asserts that *'the coal produced annually by the Project is likely to replace 1.3% of Australia's total current annual GHG emissions, when combusted at a base-load power station'*.[413] This is also over-estimated should a portion of the coal be exported.

8.7.3 Predicted GHG Emissions

The summary of the total GHG emissions associated with the project is set out in Table 12.8 of Appendix G of the EA. The correction of the coal transportation contribution would result in a slight increase to the figures in this Table, however the Proponent's estimated per annum GHG emissions would remain approximately 7,000,000 t CO_2-e and the total over 21 years would be approximately 146,800,000 t CO_2-e. The burning of product coal will be by far the most significant source of GHG emissions in relation to the project representing approximately 98.7% of its total GHG emissions. Coalpac's position is that these indirect (Scope 3) emissions are not under the control of Coalpac and therefore can not be minimised or reduced by the company.[414]

8.7.4 Commission's Findings

The Commission notes that since preparation of the PAE Holmes report a carbon pricing mechanism has been implemented by the Federal Government. In brief, the Federal Government implemented a carbon pricing mechanism from 1 July 2012 applying to liable entities, which typically would include businesses emitting more than 25,000 tonnes of CO2-e.[415] The price of a permit for one tonne of carbon is currently fixed at $23 (2012-2013 financial year) although this will increase in the future and then transition to a market-based emissions trading scheme from 1 July 2015.[416] As such, a financial cost for emissions is attached to both the production and use of the end product coal that would be factored into operating costs, price and encourage greater efficiencies. This carbon pricing mechanism would apply to the domestic power stations (including MPPS and WPS) and major users that burn Coalpac's coal, although not to any exported coal.

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[410] NSW Planning Assessment Commission http://www.pac.nsw.gov.au/Projects/tabid/77/ctl/viewreview/mid/462/pac/238/view/readonly/myctl/rev/Default.aspx

[411] Hansen Bailey, letter dated 30 October 2012, p.11 (available in Appendix D)

[412] Hansen Bailey, letter, 30 October 2011, p.11

[413] Hansen Bailey, letter, 30 October 2011, p.12

[414] EA, Vol.2, Appendix G, p109

[415] Clean Energy Regulator, http://www.cleanenergyregulator.gov.au/Carbon-Pricing-Mechanism/Liable-entities/Pages/default.aspx

[416] Clean Energy Regulator, http://www.cleanenergyregulator.gov.au/Carbon-Pricing-Mechanism/About-the-Mechanism/Pages/default.aspx.

In addition to the carbon pricing mechanism, 'Scope 1' direct emissions can be controlled to some extent by Coalpac and the carbon pricing mechanism provides a greater incentive to do so. A selection of GHG emission management measures are set out in section 12.6 and Table 12.9 of the EA.[417] The Proponent's Statement of Commitment 13 commits to calculation of GHG emissions and to annually review energy efficiency initiatives with the objective of minimising Scope 1 emissions.

The Commission has reviewed the Proponent's estimates of its GHG emissions, as corrected. The Commission notes the contribution from this individual project is by itself a small proportion of both Australia's and global GHG emissions, and that a benefit of this project is that its proximity to its major end-user would reduce transport-related GHG emissions compared to coal sources further afield from MPPS. It has also heard and understands the community's concerns about GHG emissions, climate change and the need to shift to renewable energy. Although there clearly is concern, in the Commission's view GHG emissions can not be addressed on a case-by-case basis and the issue is far bigger than this individual project. The Federal Government's carbon pricing mechanism has introduced a direct financial cost on the project's GHG emissions, however the broad measurement, management and mitigation of GHG emissions (including for example methane capture) requires NSW State Government policy to provide guidance to the Commission and community.

8.7.5 Commission's Recommendation

Recommendation 83: The Commission recommends that in the event of an approval appropriate conditions are included requiring compliance with the Proponent's Statement of Commitment 13 and for Coalpac to minimise its Scope 1 greenhouse gas emissions.

8.8 Extraction of Sand

8.8.1 Introduction

The Proponent proposes to extract approximately 5Mbcm of sand from beneath the Lithgow Seam for processing in a mobile crushing and screening plant and transportation by road to markets in Western Sydney. The proposed extraction rate is 0.45 Mbcm per annum ROM sand. Some of this sand will require wet screening (estimated 0.2 Mbcm per annum) and this will require 4,000-5,000l of water per tonne of product sand. The process water will be recycled where possible, although the product sand will contain 5-9% of water after processing. Where water is not suitable for recycling, it is proposed to be pumped into the abandoned Tyldesley Colliery underground workings.[418]

As can be seen from the limited references to the EA in the previous paragraph, there is not a lot of information available on the proposed sand extraction. This point was made in submissions on the EA, at the public hearings held by the Commission and also in meetings with government agencies and Lithgow City Council. The RTS responded to the submissions on the EA,[419] but only by repeating the already limited information in the EA (and almost verbatim).

There are a number of issues with the sand extraction proposal. They include the traffic impacts of hauling the product by road to western Sydney via the Great Western Highway (estimated as a 13% increase in heavy vehicle traffic and strongly opposed by Blue Mountains City Council). This issue is dealt with in detail in section 8.2 of this review.

[417] EA, Vol.2, Appendix G, p.111
[418] EA, Vol.1, pp.53, 57, 59 and 61
[419] RTS, pp.213-214

They also include the risks of acid mine drainage. The Marangaroo sandstone contains 0.82% sulfur and has moderate potential for acid formation. It is not clear from the EA whether extensive testing of the sandstone proposed for extraction has been undertaken. If there is any potential for significant sulfur content then there will be issues with the process water and waste from washing of this sand. The somewhat obscure comment in the EA that waste from the washing of the sandstone product will need to be analysed before it can be disposed of to the abandoned underground workings suggests at least a possibility that a problem may be found to exist. The RTS confirms that this is the case and suggests that it may be necessary to treat the sand washing waste as PAF material and dispose of it in accordance with the relevant protocols in the OEAs. DRE confirmed that it had ongoing concerns with the risks from acid formation in the sand washery waste and that it would be necessary to manage these wastes separately to general overburden emplacement.[420]

There is a high water requirement for the washing of the product sand. This is acknowledged by the Proponent but, as the Proponent points out, most of the water will be recycled through the crushing plant although some will also be lost with the exported product.

8.8.2 Commission's Findings and Conclusion

As noted above, there are a number of issues to be resolved with this proposal and very little information available to assist with the resolution. The Commission's initial reaction was to recommend that the sand extraction component be deferred until issues with management of waste water could be properly assessed, the road transport issue had been assessed by the RMS and the potential markets had been better defined (particularly with a view to the possibility of rail transport). However, the location of the sand resource in relation to the mine plan requires commencement of sand extraction early in the life of the project.

The options appear to be:

- defer or refuse the sand mining component;
- alter the mine plan to give more time to resolve the outstanding issues and better define the proposal;
- attempt to resolve the issues during the assessment process supported by strong performance criteria and rigorous monitoring requirements in any approval.

The last of these could be pursued with the proviso that if the issues remained unresolved by the time the project was submitted for determination then it may be advisable to adopt either of the first two options at that stage.

8.9 Miscellaneous

8.9.1 Landholder Agreements and the Land Acquisition Process

The Proponent has advised it is attempting to reach agreements with all landowners anticipated to be impacted by mine operations beyond relevant criteria. As at 30 November 2012 this process was continuing and the Proponent advised that it had acquired properties or reached agreement with a much higher number of landholders than when the EA was submitted.

Lithgow City Council is concerned about how impacts will be mitigated if agreements cannot be reached and, where there are agreements but a dispute subsequently occurs, how this will be mediated. Council is also concerned about monitoring and compliance issues associated with the agreements. The Proponent has responded by indicating that copies of the agreements (excluding commercial-in-confidence information) will be made available to the Department and LCC.

[420] DRE (Mine Subsidence Board), letter to PAC, 7 December 2012 (available in Appendix D)

Lithgow City Council also raised the issue of landowners not identified in the EA as being likely to experience noise and air quality impacts that would exceed the relevant criteria and trigger acquisition rights, but that may subsequently fall into that category after operations commence.

This is an area of the approval process that is of concern to the Commission. The problem for a resident who was not predicted to be impacted by the results of the Proponent's studies is that they must demonstrate 'sustained exceedences' of the relevant impact criteria before the Proponent is required to take action. This places the resident at considerable disadvantage compared to residents who were predicted to be impacted and have automatic rights to mitigation or acquisition. However, the Proponent, not the resident, is the party entirely responsible for the problem: their predictions were wrong and/or they have not performed at the required standard. The resident is simply an innocent bystander. The Commission considers that residents impacted in this way need ready access to relief and that penalty provisions would be an appropriate sanction for the Proponent in addition to appropriate operating restrictions until compliance is achieved or relief is provided.

If the project proceeds, conditions of approval should establish the level and frequency criteria above which action by the Proponent is required as well as setting out the operational and other consequences for the Proponent.

8.9.2 Location of the Proposed MPPS Conveyor

Centennial Coal objected to the path of the conveyor to MPPS since it traverses two areas which form part of its proposed Neubeck Open-cut Project. Centennial's concerns related to the possible impact on its capacity to mine the area under the conveyor. Centennial also expressed concern that the conveyor route appeared to cross the Coal Link Haul Road from Angus Place Colliery to MPPS which it leases and operates. The EA indicates that the Proponent is currently discussing Centennial's concerns[421] and at a site meeting the Commission was advised that it was likely agreement could be reached. The Proponent advised the Commission on 30 November 2012 that the issue had been resolved.

8.9.3 Fish River Pipeline Relocation

Lithgow City Council indicated that at some time in the future the project would require the Fish River water supply pipe line to be relocated. The Proponent has accepted that the pipeline will need to be realigned prior to year 14. This should also be included as a condition of any consent.

8.9.4 Coalpac's Environmental Record

Concerns were raised about the environmental record of the Proponent in submissions and at the public hearings. The Commission considers that the Proponent's environmental record is only relevant to the extent that it provides evidence of a capacity or lack of capacity to achieve the mitigation or management strategies necessary for the project to comply with any proposed conditions of approval. In the case of this project, which is so heavily reliant on mitigation strategies operating to full effect to meet the relevant noise and air quality criteria, the track record is considered relevant.

In the Response to Submissions the Proponent has provided a record of non-compliance and prosecutions for both Cullen Valley Mine and Invincible Colliery.[422] The Proponent claims that a number of submissions supported the existing environmental management record. This is a contentious point. One submitter claimed that the Proponent had a series of convictions for breaches of environmental laws including one for exceeding the approved extraction rate which

[421] RTS, pp.212-213
[422] RTS, pp.214-217

resulted in a fine of $200,000.[423] The Proponent has listed breaches at the Cullen Valley mine and Invincible Colliery from 1999 and 2000 respectively and suggests that it has a good record with only minor and technical non-compliance issues being involved.[424] The EPA listed multiple concerns with implementation of mitigation strategies in one submission, but in another maintained that the compliance record was adequate. Overall the Commission is of the view that the record is of concern in the context of what needs to be achieved to meet the required performance outcomes.

One other submitter at the Lithgow public hearing presented a list of non-compliances for multiple mining operations in the Western coalfield and referred to weak or absent regulatory activity in relation to many of these non-compliances. As it is beyond the scope of this review to investigate this broader issue of possible regulatory failure, the Commission has drawn the concern to the attention of the EPA as the relevant authority for most of the examples presented.

8.9.5 Project Conditions of Consent

Two main issues were raised: one relating to the opportunity to comment on conditions prior to finalising any approval and the other relating to risks of subsequent significant modifications to the approval by officers of the Department without the benefit of a full public process.

Lithgow City Council would like the opportunity to comment on the draft conditions of consent prior to approval. Lithgow City Council was also concerned to ensure it was clear as to what works would require a Construction Certificate.

In the Commission's view this is would be encompassed within the Department's standard practice. It is also noted that the Department's assessment and recommendation would be referred to the Commission for determination and at that point in time any recommended draft instrument would be available. It is also common practice for the Commission to meet with local planning authorities if they maintain any concerns about a project.

On the second issue, one submitter at the Lithgow public hearing presented an extensive list of major modifications to mining approvals that had allegedly been authorised by Departmental officers without the benefit of a full public process.

This is not the first time this issue has been raised with or by the Commission in relation to mining projects.[425] The concern raised is that limits on the scale of the project and any protections contained in conditions attached to the original approval are not likely to be maintained if the Proponent seeks to change them at a later date in consultation with the Department. The point made by the community representatives is that it is a waste of time to participate in the original process if substantial modifications can be made subsequently without their involvement.

Informal advice from the Department is that this is not a fair representation of the modification process. However, the Commission notes the strength of the community views on this issue and the frequency with which it is raised in public hearings and public meetings. If it is not a fair representation of the process, some community education may be required.

[423] Justin McKee, submission, 1 June 2012
[424] RTS, Section 4.22.7.1, pp.214-217
[425] For example, see Maules Creek Coal Project Determination Report 2012, p.8

9 Commission's Consideration of the Overall Merit of the Project

9.1 Introduction

The Commission has addressed each term of reference in this review. The purpose of this section is to summarise the significant findings and to consider the merits of the project as a whole (Term of Reference 1(b)).

As pointed out by the Proponent's principal consultant this is a very complex proposal.[426] It involves two different mining techniques (open-cut and highwall) in an area that has already been extensively mined by underground methods for over 100 years. It is set predominantly in Ben Bullen State Forest which contains a large number of examples of an internationally recognised unique geological formation (platy pagodas) and high quality examples of a wide range of vegetation associations. This State Forest is proposed for reservation in the Gardens of Stone Stage II reserve proposal by conservation groups and by the State conservation agency.

The proposed project is also in close proximity to the village of Cullen Bullen and will have impacts on that village. Some of these impacts will be perceived as positive (primarily economic benefits, reduced heavy vehicle traffic and infrastructure contributions) but the majority will be negative (primarily health impacts, amenity impacts from dust, noise and blasting, visual impacts and social impacts). It is also only one of a number of open-cut mining proposals in the valley.

9.2 Project Benefits

The positive aspects of the proposal have been discussed extensively in the EA and the RTS and in sections 4.4 and 8.6 of this review report.

The principal benefits are:

- employment – 120 jobs for the life of the mine and flow-on employment to local contractors and suppliers elsewhere in the State;
- economic benefits claimed in the EA are net financial benefits of $1,519 million. These benefits are considered by the Commission to be over-estimated based on the calculation using world parity pricing which is substantially higher (approximately 30%) than the product price that will be received by Coalpac and the fact that the project's impacts have not been fully accounted for in the calculations. The Commission also notes in this context that these claimed threshold benefits are very sensitive to changes in the price of coal. A sensitivity analysis in Appendix T of the EA shows that a decrease of only 20% in the price of coal causes a 42% decrease in the threshold benefit to $881m. However, as with all cost-benefit analyses conducted for coal mines in NSW using standard methodology, the economic balance produced is likely to favour the project proposal;
- the project will provide a cheap source of low quality coal to MPPS. This will have some impact on wholesale electricity prices in NSW and may prolong the economic viability of MPPS beyond the date at which it would cease to be competitive under level fuel price conditions. Energy Australia has made claims that substantial increases will occur in wholesale and retail electricity prices in NSW if the project does not proceed. However, Energy Australia has failed to substantiate a direct causal relationship between the magnitude of those claimed increases and the absence of a Coalpac coal supply to MPPS (see section 8.6). Just how an increased cost for part of the fuel supply to this one power station, that at its maximum capacity supplies approximately 7.5% of the wholesale market in NSW, can directly generate a 42% increase in the total wholesale price for NSW was never satisfactorily explained. Furthermore, the models used

[426] Meeting with the Commission, 30 November 2012

to support the claims are simplistic and do not allow for the multitude of other factors that will affect decisions by generators and retailers, including decisions to be made concerning MPPS and Wallerawang Power Station;

- the Proponent has entered into a VPA with Lithgow City Council that could provide funding for infrastructure and community projects in Cullen Bullen. Council has indicated this funding would be used to provide reticulated sewerage to Cullen Bullen;
- the proposal to mine the sand under the Marangaroo formation and supply it to the Sydney market has positive economic benefits for the project and may have some (unquantified) benefits in augmenting the supply of building sand for Sydney. However, the proposal as it stands has one known substantial disbenefit (a 13% increase in heavy trucks on the Great Western Highway through the Blue Mountains) and may have others associated with acid mine drainage. The Commission considers that this part of the proposal is relatively under-developed and lacks the information necessary for proper assessment; and
- the project will reduce the current heavy vehicle road traffic in the vicinity of Cullen Bullen once the proposed conveyer to MPPS is completed in year 2. There is some disagreement between the Proponent and submitters as to whether the comparator should be the current vehicle traffic or a zero base (i.e. no mine) situation. Given that Coalpac has indicated that it is not economic to mine the approved resources beyond early 2013, the argument for zero base has some merit.

9.3 Project Impacts

The local health and amenity impacts of the project, particularly dust, noise and blasting impacts, have been considered in detail given the proximity of the project to the village of Cullen Bullen (Term of Reference 1(b)(i)). The Commission has substantial concerns about impacts arising from each of these sources on the health and amenity of residents of Cullen Bullen and the surrounding district. Notwithstanding the Proponent's claim that the EA is based on worst-case assessment the Commission also has substantial concerns about the capacity of the project to achieve the predicted levels for noise and air quality either at all, or for the extended period over which the mine is intended to operate.

9.3.1 Air Quality Impacts

NSW Health has provided the Commission with unequivocal advice that the predicted increases in PM_{10} levels from the project will lead to increased morbidity and mortality in the Cullen Bullen community from respiratory and cardiovascular disease. It is the increase, not the final level of PM_{10}, that produces this outcome. In this context NSW Health noted that in their experience the magnitude of the predicted increase was extremely high. NSW Health also emphasized the relatively poor health and socio-economic status of this community compared to NSW averages.

The project cannot meet NSW air quality criteria at all residences and for the project to proceed acquisition of some properties is required. This indicates that the project is predicted to be at the limit of acceptability for air quality impacts. The Commission is concerned that this situation already assumes that all controls are in place and operating effectively and that the predictions are accurate. There is little margin for error and no capacity to adjust other than by placing further restrictions on production.

The situation produced is one where:

- there is no room for new entrants into the impacted airshed (i.e. no additional impacts can occur);
- there are potential long-term restrictions on project operations; and
- further property acquisitions may be necessary.

The Commission considers this to be an unusually high-risk situation and that substantial gains and a substantial reserve capacity to adjust would have to be demonstrated to make the risk acceptable. Neither of these is evident on the information available to the Commission.

9.3.2 Noise Impacts

There are strong similarities between air quality impacts and noise impacts from the project insofar as the project cannot meet the accepted NSW noise criteria at all residences. Acquisition is required for some residences and mitigation for others. There are also a substantial number of residences close to the limit at which mitigation treatments for noise impacts would be required.

The Proponent has modelled the noise impacts with all controls in place and operating effectively. There is no room for error either in the predictions or in the operational implementation of the controls. Based on experience of mining across NSW it is unlikely that this outcome can be delivered 100% of the time for the life of the project.

The Proponent has already committed to no night-time operations until the controls are in place and operating. To this the Commission has added a requirement that, if the project proceeds, no night-time operations be permitted until the predictions are met at all times and the results have been independently audited.

The potential consequences of either an error in modelled predictions or a failure of equipment or operational controls to deliver predicted outcomes are that operating hours will remain restricted (a situation that the Proponent claims will make the project unviable) or a significant number of additional residences will need to be treated and/or acquired, causing further social disruption to the village and surrounding district.

9.3.3 Blasting Impacts

The project cannot meet the blasting impact guidelines without a significant increase in the number of blasts above the national criteria for blast frequency. This situation arises because the proximity of blasting to residences is such that multiple smaller blasts must be used to stay within the standard blast overpressure and vibration levels at residences. The national criteria limit blasts to one per day with some minor exceptions for minor blasts. This project seeks up to 40 per week, which is approximately a seven-fold increase.

Increased frequency may be acceptable where the residential impact is significantly lower for each blast. What is not so obvious for this project is that, although the charges would be smaller, the impact at the residences would remain close to or at the maximum allowable level. The Commission considers the proposed level of impact from blasting to be unacceptable and recommends that exceedence of the national accepted blast frequency should not be allowed.

The Commission is also concerned about the number of complaints received at the public hearings from residents about blasting damage to residences and the alleged poor response from the Proponent to complaints. If the project is to proceed in any form this issue will need to be addressed.

9.3.4 Biodiversity Impacts

Biodiversity impacts of the project have been considered in detail in section 6 of this report (Term of Reference 1(b)(ii)). The impacts are acknowledged to be substantial by the Proponent and by the submitters to the Department and to the Commission at the public hearings. For ease of consideration the Commission has divided the biodiversity impacts into those affecting the pagoda landform and those affecting other aspects of the ecology of the project area.

9.3.4.1 Pagoda Landform

The Commission considers that there are risks to the pagoda structures themselves and to the flora and fauna associated with the structures and adjacent habitat features. The pagodas are considered to be internationally significant geological features some 250 million years old and worthy of total protection. No mining-induced damage should be permitted to these structures.

The risks to these structures come from two principal sources: blasting to within 50m for the open-cut component of the project and subsidence from highwall mining directly beneath the pagodas. The Commission's findings are that the risks from both sources are real and that they are unacceptable in the context of the level of protection required. The Commission notes the heavily qualified statements concerning possible sources of risk to the pagodas in the various consultants' reports used in support of the project.

The Commission has recommended that highwall mining in the vicinity of the pagodas be prohibited and that the minimum setback for mitigating blasting risk to the pagodas be increased significantly from the proposed 50m.

Risks to flora and fauna of the pagoda landform are also significant. This is particularly the case for species that utilise the pagoda structures and the slopes, gullies and forest floor vegetation associations that sit below them. These species utilise the various parts of the landform for shelter, breeding sites and feeding areas and they do this on either a daily or seasonal basis. Some of these species are listed as threatened species under the relevant NSW and Commonwealth Acts.

Apart from the general impact on these species associated with mining operations (traumatic injury, dust, noise, vibration, lighting, etc.), the proposal to mine within 50m of the pagodas and escarpments will have an unacceptable impact on their foraging ability. The Threatened Species Protection Database specifies a minimum non-disturbance distance of 500m from shelter or roosting sites for the threatened species present or potentially present in the project area. The Commission considers that a setback of 300m would provide 70-75% of the foraging area required and should be adopted as a minimum.

9.3.4.2 Other Biodiversity Impacts

The project will clear 957.98ha of vegetation – mostly in Ben Bullen State Forest. There is some disagreement between the Proponent and OEH over the description of some of the vegetation associations that will be cleared and the special interest groups have been highly critical of the adequacy of the flora survey. The net result is that the Commission considers that there is sufficient doubt over the accuracy of the biodiversity assessment for there to be uncertainty about levels of impact, the significance of impacts and the suitability of proposed offsets. Edge effects, although recognised as an issue in the EA, have not generally been factored into the impacts. Given the known extent of edge effects and the very fragmented nature of the project site this will mean that the real impact of the project on native vegetation will be much greater than the 914.4ha of native vegetation to be directly impacted by clearing.

The project area contains numerous species listed under the State and Commonwealth threatened species legislation and potential exists for many others to be present. However, the real value of the area from a biodiversity perspective is that it contains a wide diversity of vegetation associations and a very high species richness. Despite low intensity forestry in the past the vegetation is generally in good condition and there is a full range of habitat features available such as tree hollows. It adjoins areas of similar status such as the rest of the Ben Bullen State Forest and Wolgan State Forest and the Gardens of Stone National Park is immediately to the north of the Ben Bullen State Forest.

There is substantial emphasis in the EA and RTS on rehabilitation as a mitigation strategy for the impacts on biodiversity. Many of the claims are generalised. However, when scrutinised closely there is considerable uncertainty about the validity of these claims. Some issues are:

- the rehabilitated areas cannot be returned to their pre-existing landforms across the project area;
- the biodiversity characteristics of rehabilitated areas cannot replicate the existing characteristics and will inevitably be less diverse and less species rich;
- there is no guarantee that mature woodland can develop on rehabilitated areas. While early age classes may develop on the replaced sub-soil and topsoil, the substantially altered deeper layers and the altered hydrology may prevent further development. There is no example of rehabilitated mature woodland on an open-cut mine in NSW;
- even if woodland could reach maturity, development of the full range of habitat features is over 100 years away; and
- there is a direct conflict between the management of rehabilitation and the management of the underground combustion which is present in the project area.

The heightened significance of rehabilitation in this project arises because:

- the impacts are occurring in an area already proposed for inclusion in the conservation reserve system;
- the Proponent is claiming that rehabilitation will make the area suitable for inclusion in the reserve system in due course; and
- the visual impacts of the project are very substantial and rehabilitation is essential to provide cover for highly visible areas of scarring.

The Commission is not in a position to comment on the merits or otherwise of the Gardens of Stone Stage II reservation proposal. However, the Commission is in a position to conclude that the project and reservation of Gardens of Stone Stage II are incompatible if reservation is intended to include Ben Bullen State Forest, either now or in the forseeable future. The Commission is also of the view that significant scarring of the landscape will remain for decades, if not permanently.

The nature of the biodiversity impacts of this project mean that, for the project to proceed, adequate biodiversity offsets must be secured to compensate for the impacts. Given that at this stage the offset package is best described as 'a work in progress', the Commission cannot regard it as adequate. There are a number of issues:

- there is uncertainty about the biodiversity characteristics of the project area, so there can be no certainty as to whether the offsets are suitable or not;
- given the characteristics of the project area, finding offsets that provide genuine like-for-like will be very challenging;
- some of the major proposed offsets are distant from the project area;
- the most recent addition to the revised offset package 'Gulf Mountain' has had only preliminary survey work and has not been inspected by OEH or by the Commission;
- several of the proposed offsets require substantial rehabilitation; and
- none of the proposed offsets are at this point considered suitable for inclusion in the conservation reserve system.

The Commission's conclusion on the offset package is that it is designed to exchange a number of fragmented areas that in some instances require extensive rehabilitation and are not considered suitable for reservation for single area of high quality habitat that is already proposed for reservation and which adjoins like areas of high quality habitat.

9.3.5 Water Impacts

While there are some issues to be resolved with both surface water and groundwater the Commission is of the view that these ought to be able to be managed by conditions of approval and management plans. The main areas of concern are the monitoring and licensing requirements for surface water discharges and the risks associated with depressurisation of groundwater in the old underground workings. Should the latter occur there is a real possibility that significant increases in underground combustion could occur.

9.3.6 Potential Cumulative Impacts

The issue of potential cumulative impacts from this project, combined with existing mining projects and two known potential open-cut projects (Pine Dale Stage 2 Extension and Neubeck) was raised at the public hearings and by the Department in the meeting on 17 September 2012. The EA does not deal with the potential cumulative impacts from either Pine Dale Stage 2 Extension or Neubeck, even though the former was on the formal agenda before the EA for this project had been finalised. This creates a problem for the Commission because it is probable that Pine Dale Stage 2 Extension will have both air quality and biodiversity impacts that are relevant to consideration of impacts from the Coalpac project.

At the time of completing this review the Pine Dale Stage 2 Extension EA had not been lodged, so the Commission has not been able to provide comment based on detailed consideration of the possible interactions.

What is known is that the Coalpac Consolidation Project takes up all the available airshed capacity for PM_{10} emissions for Cullen Bullen and the surrounding area and exceeds this capacity in some places. The Commission has indicated that it already considers the health impacts to be unacceptable. Allowing another PM_{10} emitter into the airshed that might contribute to PM_{10} exceedences is therefore not considered an option.

The Commission also notes the locations of the existing and proposed open-cut mines along the spine of the valley from Lithgow to Cullen Bullen (particularly toward the northern end). The valley is relatively narrow. The Commission's view is that if a project by project approach is taken without stepping back and taking a view of the valley as a whole, there is a possibility of replicating the Hunter air quality situation in this valley.

The Commission strongly recommends that the Department consider the implications of all existing and proposed mines in this airshed with a view to making considered recommendations to the Determining Authority that ensure air quality impacts remain compatible with sound long-term health and amenity outcomes for the residents.

The cumulative impacts on biodiversity are also of considerable concern since the Pine Dale Stage 2 Extension also impacts directly on the Ben Bullen State Forest. There is no detail available to the Commission as to which features, vegetation associations or species are potentially impacted by this proposal.

Again, what is known is that the quality of the habitat under threat from the Coalpac proposal is high and the area is suitable for inclusion in the reserve system. In the absence of better information it is reasonable to assume that the habitat value of the rest of Ben Bullen State Forest is similar (OEH have proposed the whole for reservation).

Based on this the Commission considers that the assessment must cover the total impact from the two proposals before a comprehensive understanding of biodiversity impacts is possible. This is particularly the case in relation to the Gardens of Stone Stage II proposal, since the proposed Pine

Dale Project may have a lesser impact on that reservation proposal than the Coalpac proposal. The Commission has already indicated that it considers Gardens of Stone Stage II and the Coalpac project are incompatible.

9.3.7 Other Impacts

There are other impacts associated with visual scarring in the vicinity of the pagodas and escarpments and significantly increased heavy vehicle traffic on the Great Western Highway. There are also significant risks to Aboriginal rock shelters and for increases in underground combustion if the proposed management strategies do not work.

None of these are sufficient on their own to result in a recommendation for the refusal of the project. However they have been considered along with the other impacts in assessing the merits of the project as a whole.

9.4 Other Major Issues

As indicated in the sections dealing with air quality, noise, blasting and biodiversity there are many heavily qualified statements in the EA and RTS by the consultants preparing reports and also heavily qualified commitments by the Proponent on key issues. A number of these have been highlighted as examples, although there are many more available.

Careful scrutiny by the Commission indicates that in many cases there is no certainty that important outcomes can be delivered or that commitments will be met. The Commission is sufficiently concerned about the extent of this problem in the project documentation to recommend that any further assessment process require the stripping away of the caveats and qualifications so that the decision maker is presented with unequivocal statements as to what will or will not be achieved and unambiguously enforceable conditions and commitments to consider.

The Commission also notes the propensity for some consultants to base their conclusions on the work (and assumptions) of other consultants who have in turn based their assessment in part on anecdotal observations by the Proponent. A number of these examples have also been highlighted. The Commission has little confidence in the rigour of this process or the conclusions drawn from it.

9.5 Conclusion

The Commission has conducted a thorough review of the project within the Minister's terms of reference. After considering the benefits and the impacts of the project as a whole the Commission is in no doubt that the impacts substantially outweigh the benefits and the Commission recommends that the project not be approved.

The Commission was requested to *'recommend appropriate measures to avoid, minimise and/or offset these impacts'* (Term of Reference 1(c)). The Commission has provided a suite of recommendations under the individual sections to address this request. These recommendations were prepared as each individual issue was considered and before the Commission determined its position on the merits of the project as a whole (Term of Reference 1(b)). The recommendations therefore represent the minimum requirements or limitations that the Commission considers necessary to deal with the individual impacts identified.

The full set of recommendations is set out below.

Air Quality (Section 5.1)

Recommendation 1: The Commission recommends that the emission estimate predictions should be updated and reconfirmed using the most relevant emission variables as recommended by the EPA prior to any determination of the project.

Recommendation 2: The Commission recommends the current acquisition criterion for PM_{10}s, 150 $\mu g/m^3$ 24-hour average from all sources, should be reviewed from a health perspective given the NEPC criteria of 50 $\mu g/m^3$ and more recent advice from NSW Health about mortality and morbidity impacts. This should be done in consultation with NSW Health and the EPA prior to any final approval for the Coalpac project.

Recommendation 3: The Commission recommends the NSW long-term acquisition criterion for annual average particulate matter less than 10 microns (PM_{10}) of 30 $\mu g/m^3$ should be reviewed against the WHO goal of 20 $\mu g/m^3$ for this parameter.

Recommendation 4: The Commission recommends that any approval for the project should include the relevant condition from the Ashton South East Open Cut Coal Project determination relating to air quality exceedences at mine owned residences. These conditions relate to adequate notification of the tenant, termination of the tenancy without penalty, air mitigation measures and ongoing monitoring information and notification of the owners of the land with an option for acquisition.

Recommendation 5: The Commission recommends that blasting should only be conducted when the wind will transport fumes away from the Cullen Bullen school, Cullen Bullen village and any residences.

Recommendation 6: The Commission recommends the proposed Air Quality Management Plan (AQMP) should include key performance indicators and outcomes across the full range of potential sources of air emissions. The AQMP should be developed in consultation with the EPA and be approved by the Director-General of the Department prior to commencement of works associated with the development. Specific attention should be given to the performance outcomes to achieve the air quality criteria.

Recommendation 7: The Commission recommends that the total area of active mining and un-rehabilitated dumps should not exceed 180 hectares at any one time.

Recommendation 8: The Commission recommends that operational conditions are sufficiently rigorous to ensure the Real Time Air Quality Management System is used predictively and that failure to do this amounts to non-compliance.

Recommendation 9: The Commission recommends that auditing requirements are imposed to assess compliance and to assess whether additional management responses are required. It is also necessary to ensure long-term commitment to effective use of the Real Time Air Quality Management System.

Recommendation 10: The Commission recommends that shutting down of operations should be adopted as a management response in this airshed to ensure the air quality criteria are met.

Recommendation 11: The Commission recommends restriction of hours as well as production limits to be included if the Real Time Air Quality Management System doesn't deliver all required outcomes.

Recommendation 12: The Commission recommends that an evaluation should be conducted of Real Time Air Quality Management Systems (RTAQMS) including their effectiveness in controlling emissions from open-cut mines. This should include investigation of the relationship between suppression of peak emission levels and the effect (if any) on annual average emission levels from open-cut mines in NSW.

Noise (Section 5.2)

Recommendation 13: The Commission recommends the proposed review of the Industrial Noise Policy include a review of the minimum default background noise level of 30dBA.

Recommendation 14: The Commission recommends the cumulative noise, including the project and ambient noise, at the Cullen Bullen school should not exceed 45 LAeq(1hr) at any time during a school day.

Recommendation 15: The Commission recommends that the proposed exemptions for the highwall miner from some of the management zone recommendations should be justified before any final determination of the project.

Recommendation 16: The Commission recommends the Proponent should stop or modify operations under certain weather conditions where noise criteria are predicted to be exceeded and should stop noise generating operations if acceptable noise criteria are exceeded. In addition the Proponent's performance should also be independently audited.

Recommendation 17: The Commission recommends that once the conveyor is completed, road haulage of coal to MPPS should only occur for a minimal period in emergency situations where there are no other reasonable options and only with written approval from the Department. Haulage should be restricted to 0700 to 2100, and none on Sundays or Public Holidays.

Recommendation 18: The Commission recommends that road haulage of export coal to Port Kembla should not be permitted once the rail facility has been constructed.

Recommendation 19: The Commission recommends that road haulage of export coal to Port Kembla before the rail facility is operational should be not be permitted without further assessment of the traffic impacts.

Recommendation 20: The Commission recommends the Proponent should cooperate with rail managers and train operators, in consultation with the EPA, to develop a regional train noise study.

Recommendation 21: The Commission recommends operational noise from the rail loading facility should not cause or contribute to exceedence of the relevant noise criteria at any time.

Recommendation 22: The Commission recommends the Proponent should demonstrate compliance with the predicted noise levels from the rail loading facility within six months of its commencement of operation.

Recommendation 23: The Commission recommends if evening or night time noise criteria are exceeded then loading should not occur in evenings or at night until rectification is complete and the noise criteria can be met.

Recommendation 24: The Commission recommends all new mining equipment should be independently tested by an acoustic engineer against predicted sound power levels prior to delivery and should not be put into operation until it meets the predicted level.

Recommendation 25: The Commission recommends that operating hours should be limited to the following times **until** all noise mitigation measures have been implemented and demonstrated to be effective and certified by an independent acoustic expert that they meet the noise criteria. These noise mitigation measures include; the noise sound suppression on mobile plant and stationary equipment, earthen bund walls, conveyor, bridge over the Castlereagh Highway, location of infrastructure within the project footprint and the real time monitoring and management system.

- Monday to Saturday
    - 7.00 am to 6.00 pm – for mining coal processing activities;
    - 7.00 am to 9.30 pm – for haulage and transportation from Invincible Colliery exit;
    - 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 – Coal haulage from Cullen Valley Mine, Hillcroft and East Tyldesley.
    - 10.00 pm to 7.00 am – non-audible equipment maintenance activities.
    - 9.00 am to 5.00 pm - blasting.
- Sunday
    - 8.00 am to 6.00 pm – for mining and all associated activities;
    - 6.00 pm to 7.00 am – non-audible equipment maintenance activities.
    - No blasting
- And at no time on public holidays.

Note: these times may be further restricted by specific recommendations, for example near the Cullen Bullen cemetery.

Recommendation 26: The Commission recommends that operating hours should be limited to the following times **after** all noise mitigation measures have been implemented and certified by an independent acoustic expert that they meet the predicted noise outcomes. These noise mitigation measures include; the noise sound suppression on mobile plant and stationary equipment, earthen bund walls, conveyor, bridge over the Castlereagh Highway, location of infrastructure within the project footprint and the real time monitoring and management system.

- Monday to Saturday
    - 24-hours – for mining (other than blasting) and coal processing;
    - 7.00 am to 9.30 pm – for haulage and transportation from Invincible Colliery exit;
    - Coal haulage from Cullen Valley Mine, Hillcroft and East Tyldesley only in emergencies with written approval from DOPI.
    - 10.00 pm to 7.00 am – non-audible equipment maintenance activities.
    - 9.00 am to 5.00 pm - blasting.
- Sunday
    - 24-hours – for mining (other than blasting) and coal processing;
    - No road haulage;
    - No blasting
- And at no time on public holidays.

Notes:

- Temporary night time operation should be permitted only after an initial compliance certification following three months operation. This should be repeated and reconfirmed following twelve months of operation before longer term night time operation is permitted.
- Where mining is carried out in different sectors and some sectors show compliance and others show non compliance then the above night operating times should be permitted for those sectors only where there is full compliance with the noise criteria.

- these times may be further restricted by specific recommendations, for example the cemetery.

Recommendation 27: The Commission recommends a NSW policy for acquisition of properties subjected to excessive noise or air emissions by new developments should be completed as soon as practical.

Recommendation 28: The Commission recommends the Proponent should be required to implement negotiated agreements, additional at-receiver noise mitigation measures or property acquisition consistent with the criteria in Table 5-11.

Recommendation 29: The Commission recommends the responses to real time monitoring that show an exceedence or potential exceedence of noise requirements should be included in an annual report made available to Council, relevant agencies and the public.

Recommendation 30: The Commission recommends there should be no increase in production until the Real Time Noise Management System is established and demonstrated to be operating effectively under all weather conditions, including temperature inversions.

Recommendation 31: The Commission recommends a comprehensive evaluation of the effectiveness of real time monitoring and proactive and reactive management systems used for air and noise management in mines in NSW.

Recommendation 32: The Commission recommends an independent audit should be conducted at the end of 12 months and then every three years to investigate and report on the effectiveness of the Real Time Noise Management System in maintaining noise levels within the relevant criteria. This should include measures taken in all meteorological conditions. The audit should report on any additional measures available to mitigate impacts.

Recommendation 33: The Commission recommends any approval for the project should include a condition that the mining only proceed in stages until it demonstrates compliance with the noise criteria.

Blasting (Section 5.3)

Recommendation 34: The Commission recommends ground vibration criteria for Aboriginal heritage rock shelters should not be greater then the criteria set out by the Proponent, that is half the recommended ground vibration criteria and 3dB below the overpressure criteria. The Blast Management Plan should demonstrate how blasting can occur with negligible mining-induced damage of the Aboriginal rock shelter RCK2-10.

Recommendation 35: The Commission recommends no mining-induced damage is to be caused to any grave or gravestones at the Cullen Bullen cemetery. The Blast Management Plan must demonstrate how this would be achieved.

Recommendation 36: The Commission recommends no mining or coal haulage occurs within a 1.5km radius of the Cullen Bullen cemetery on any Saturday, Sunday or Public Holiday.

Recommendation 37: The Commission recommends that the Proponent's approach to controlling noise and vibration from blasting at residences by reducing the MIC and increasing the number of blasts to be rejected as imposing an unreasonable impact on the residents. Any exceedence of the

ANZEC guideline for blasting frequency should be strictly limited, particularly when the expected noise or vibration levels are likely to be at or close to the limits.

Recommendation 38: The Commission recommends that there should be no impacts to the pagodas and cliff lines from blasting. The Commission does not accept that a 50m buffer will guarantee this outcome, but is unable to determine a satisfactory buffer distance from the available information. To accommodate this situation the Commission recommends that no blasting occur within 300m of the pagodas or cliff lines without an independent geotechnical surveyor certifying that the blasting proposed will not cause impact to the pagodas or cliff lines. In any event a minimum stand-off distance of 100m must be maintained for blasting from all pagodas, cliffs and other rocky outcrops.

Recommendation 39: The Commission recommends that strict monitoring requirements which allow detection of any blasting-induced impacts to pagodas, cliff lines or rocky outcrops be required in the event that the project proceeds.

Recommendation 40: The Commission recommends that the Department review the mechanism used to assess complaints of blast damage to private property with a view to providing the residents with confidence that their claims are being assessed by a qualified person who is transparently independent from the Proponent.

Visual Impact (Section 5.4)

Recommendation 41: The Commission recommends that the Proponent should provide the Department with the construction schedule for the noise and visual mitigation bunds as well as specifications and other technical details prior to construction.

Recommendation 42: The Commission recommends that the onsite treatments outlined in the EA, Volume 1, Section 8, pp.151-152 be developed as conditions of approval.

Recommendation 43: The Commission recommends that the Proponent be required to report to the Department and the local community on a regular basis on the implementation of rehabilitation and mitigation measures, with the frequency and the extent of reporting to be determined by the Department.

Recommendation 44: The Commission recommends that the construction hours of operation should form a condition of any approval, in part to alleviate light pollution impacts on residents and other users of the area.

Pagodas and Associated Environments (Section 6.2)

Recommendation 45: The Commission recommends that the pagodas and the associated escarpments be considered natural features of special significance and that they be fully protected from any mine-induced impacts.

Recommendation 46: The Commission recommends that highwall mining not be permitted under the pagodas or escarpments in the project area.

Recommendation 47: The Commission recommends that to provide adequate protection for threatened species and other fauna that use the pagoda landform, a minimum setback distance of 300m be maintained from the open-cut highwall to the pagodas and the escarpments.

Recommendation 48: The Commission recommends that, given the significance and sensitivity of the pagodas and the pagoda landform environment, before the project is submitted for determination the uncertainties in the Proponent's supporting information identified in section 6.2 are resolved and the caveats and qualifications on the various commitments are removed so that the Determining Authority has an unequivocal understanding of what the outcomes will be and the risks associated with them.

Terrestrial Ecology (Section 6.3)

Recommendation 49: The Commission recommends that concerns about the adequacy of the flora assessment and identification of the vegetation associations present in the project area be resolved to the satisfaction of OEH prior to approval of any extension to open-cut mining in the project area and prior to any assessment of adequacy or otherwise of the biodiversity offset package.

Recommendation 50: The Commission recommends that, given the acknowledged high quality and species richness of the native vegetation present in the project area, the assessment focus should be on the overall quality of the habitat under threat and its biodiversity value rather than just on the threatened species component which is the focus of the EA.

Recommendation 51: The Commission recommends that calculation of edge effects be required to the satisfaction of OEH before the project is submitted for determination.

Recommendation 52: The Commission recommends that the cumulative impacts on the biodiversity values of Ben Bullen State Forest and the region of this project, together with the proposed Pine Dale Stage 2 Extension, be considered before any assessment of this project is finalised.

Recommendation 53: The Commission recommends that the following three principles be accepted as underpinning assessment of biodiversity impacts for this project:

- rehabilitation cannot restore the existing vegetation associations or ecological balance of the area;
- rehabilitation to mature woodland is unproven for open-cut mines in NSW; and
- the impacts on biodiversity from this project are incompatible with reservation proposals for Gardens of Stone Stage II.

Recommendation 54: The Commission recommends that, given the considerable uncertainties concerning the likelihood of rehabilitation on this project area being capable of delivering a satisfactory biodiversity outcome, rehabilitation not be given credence as a mitigation strategy in the assessment.

Recommendation 55: The Commission recommends that, until the baseline biodiversity characteristics of the site have been resolved to the satisfaction of OEH, assessment of the adequacy or otherwise of the revised offset package should not proceed. The Commission also recommends that particular attention be given in the assessment to the essential nature of the trade-off being proposed, i.e. it is a proposal designed to exchange a number of fragmented areas that generally require extensive rehabilitation work and are currently not considered suitable for reservation, for a single area of high quality habitat that adjoins other areas of high quality habitat and is already proposed for reservation.

Water (Section 7)

Recommendation 56: The Commission recommends the discharge from Invincible Colliery, Licensed Discharge LDP001, should be discontinued.

Recommendation 57: The Commission recommends the Water Quality Management Plan should incorporate management of impacts from the construction and operation of the conveyor to the MPPS.

Recommendation 58: The Commission recommends the Proponent should reassess predicted depressurisation and groundwater inflows, in consultation with NOW to provide a greater level of confidence that problems will not arise with groundwater or surface water resources. If this cannot be achieved because of insufficient monitoring then production should not be increased for two years while additional monitoring and modelling is carried out to confirm the predictions in the EA.

Recommendation 59: The Commission recommends the Proponent should be required to conduct ongoing monitoring of bores and provide compensation to private bore holders in the event of any water loss.

Recommendation 60: The Commission recommends two years of baseline monthly monitoring should be conducted in Cullen and Dulhuntys Creeks for the following parameters.

- Physical/chemical - pH, temperature, electrical conductivity, turbidity, dissolved oxygen, total suspended solids, oil and grease, major cations and anions, and
- Dissolved metals - iron, manganese, nickel, cobalt and zinc.

Recommendation 61: The Commission recommends trigger levels should be developed based on ANZECC guidelines.

Recommendation 62: The Commission recommends the Proponent should collaborate with other surrounding operations to develop and implement a coordinated monitoring program and report exceedences of trigger levels.

Recommendation 63: The Commission recommends the predicted changes in weather due to climate change in NSW should be included in the water balance modeling for the life of the project unless it can be demonstrated the modelling to date has been conservative enough to account for this.

Recommendation 64: The Commission recommends that the acid generating material located at the existing Invincible Colliery Tailings Drying Area should be remediated, in consultation with DRE within three years and in accordance with the approved Rehabilitation Management Plan.

Recommendation 65: The Commission recommends that all washery rejects are treated as potential acid forming material and managed separately from general overburden emplacement in accordance with the Rehabilitation Management Plan.

Underground Combustion (Section 8.1)

Recommendation 66: The Commission recommends that the Proponent's Plan of Management dated 27 September 2012 forms part of any approval, subject to:

- inclusion of monitoring and auditing requirements;
- targets such as those set out by Professor Cliff in his report dated 6 December 2012;
- odour management controls;

- bushfire management controls; and
- DRE's approval.

Recommendation 67: The Commission recommends endorsement of DRE's requirement for extinguishment of all subsurface combustion in overburden emplacement areas and underground mine workings to occur before mining is conducted within 1 km of these areas.

Traffic and Transport (Section 8.2)

Recommendation 68: The Commission recommends that the concerns about the proposed 13% increase in heavy vehicle movements on the Great Western Highway raised by Blue Mountains City Council and Lithgow City Council be referred to the RMS for advice as part of any further assessment of the project.

Recommendation 69: The Commission recommends that until the conveyor to MPPS is operational, the current truck movement limits are retained.

Recommendation 70: The Commission recommends that during any periods of unavailability of the conveyor to MPPS after it has been commissioned, truck movement to MPPS remain within the current limits.

Recommendation 71: The Commission recommends that the Proponent satisfies the Department that transport of sand cannot be undertaken by rail in whole or in part.

Recommendation 72: The Commission recommends that no export coal is permitted to be carried by road to Port Kembla without further assessment of the potential traffic impacts.

Recommendation 73: The Commission recommends that approved hours for the transport of coal and/or sand by road be restricted to between 0700 and 2130 hours Monday to Saturday with no transport on Sundays or Public Holidays.

Recommendation 74: The Commission recommends that tyre washing is implemented for trucks leaving the project site to travel on public roads.

Recommendation 75: The Commission recommends that all trucks leaving the project site have their loads covered so as to prevent the spillage of coal and emission of coal dust.

Aboriginal Cultural Heritage (Section 8.3)

Recommendation 76: The Commission supports AECOM's recommendation that a detailed assessment of identified rock shelters is required prior to commencement of any mining operations within 500m of each identified rock shelter.

Recommendation 77: The Commission recommends that Aboriginal rock shelters in the project area should not be exposed to mining-induced impacts that could produce more than negligible consequences for the rock shelters. The Aboriginal Cultural Heritage Plan and the Blast Management Plan must contain measures to ensure that this outcome is achieved. Failure to achieve this outcome should be clearly identified as a breach of the approval and operations in the vicinity should cease until the project is compliant.

Recommendation 78: The Commission recommends that a monitoring regime is required that establishes the current condition of the rock shelters, that is capable of detecting any mining-induced impacts and that includes comprehensive reporting requirements.

Recommendation 79: The Commission recommends that prior to any approval of the project application that the Proponent provides OEH and the Department with an assessment of the scientific significance and structural stability of the recent Aboriginal cave discovery within the project area. Any associated management recommendations should be incorporated into the Aboriginal Cultural Heritage Management Plan in accordance with OEH's directions in its letter dated 4 December 2012.

Recommendation 80: The Commission recommends that if the Department recommends approval an Aboriginal Cultural Heritage Management Plan (ACHMP) should be required by way of a recommended condition to protect ACH sites and artefacts including the rock shelters. The ACHMP should include elements set out by AECOM (2011), address matters raised by the OEH in relation to the scope of the ACHMP in its submission dated 4 June 2012 and also address relevant matters set out in OEH's letter dated 4 December 2012 including retrieval of information from the rock shelters.

Non-Aboriginal Cultural Heritage (Section 8.4)

Recommendation 81: The Commission recommends that the standard for blasting to be applied to both the Carleon Coach House and the Cullen Bullen General Cemetery is for 'negligible impact', and this standard and the method to achieve it should be included in any conditions of approval and the relevant management plan(s).

Recommendation 82: The Commission recommends that the sandstone footings are fenced prior to construction of the conveyor, and this should be addressed in any conditions of approval and relevant management plan(s).

Greenhouse Gas Emissions (Section 8.7)

Recommendation 83: The Commission recommends that in the event of an approval appropriate conditions are included requiring compliance with the Proponent's Statement of Commitment 13 and for Coalpac to minimise its Scope 1 greenhouse gas emissions.

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