NSW GOVERNMENT Planning & Environment

ASSESSMENT REPORT
Invincible Colliery
Southern Extension Modification
(07_0127 MOD 5)

Assessment Report
Section 75W of the
Environmental Planning and Assessment Act 1979

November 2017

Cover Photo: View from the site towards the Mount Piper Power Station
Source: Department of Planning and Environment

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EXECUTIVE SUMMARY

Castlereagh Coal owns the Invincible Colliery located approximately 25 kilometres (km) north-west of Lithgow. The mine has been on care and maintenance since 2012 when the coal reserves approved for extraction under the existing approval were exhausted. Castlereagh Coal is seeking a modification to the project approval under Section 75W of the *Environmental Planning and Assessment Act* (EP&A Act).

The proposed modification involves the recommencement of mining operations, including an extension to the life of mine by 8 years, development of a new open cut pit, and transportation of coal by road to the Mount Piper Power Station and the Shoalhaven Starches Plant near Nowra.

Under Section 75 of the EP&A Act, the Minister for Planning is the approval authority. However, the proposed modification falls within the Minister's delegation to the Planning Assessment Commission (the Commission) as there were more than 25 objections and the proponent has made reportable political donations. Consequently, the Commission must determine the application.

The Department exhibited the Environmental Assessment for the proposal from 27 September 2016 until 8 November 2016 and received 856 submissions, including 299 objections. None of the public authorities who made submissions objected to the proposed modification. However, each raised concerns and provided recommendations which have been addressed in the Department's assessment and incorporated into the draft conditions. The Department has also consulted further with the Applicant and key government agencies throughout the assessment process. This has resulted in changes to the proposal that would reduce potential impacts and ultimately lead to better outcomes for the environment.

There is an extensive history of prior planning applications for the Invincible Colliery, which have sought extensions to open cut and highwall mining. The Commission has previously raised concerns that these extensions were incompatible with the conservation significance of the rock pagodas and associated landscape that surrounds the site. While the proposed modification is of a much smaller scale compared to prior proposals and must be assessed on its individual merits, the Department has carefully considered the Commission's previous findings in its assessment of the proposal.

The key issues for this proposed modification still relate to potential impacts on the conservation, landscape, and biodiversity values of pagodas and the Ben Bullen State Forest. In this regard, the Department has found that the proposal to mine through steep wooded slopes on the eastern boundary of the site would be incompatible with the conservation significance of the pagoda landform complex. This aspect of the proposal would result in short-term visual impacts and induce risks for the rehabilitation of steep areas, including potential slope instability issues that would lead to long-term visual impacts on the landscape.

Consequently, the Department has recommended that mining is prohibited in the sensitive, steep wooded areas of the site. This recommendation would only allow mining in the flatter, less sensitive parts of the site, which would significantly reduce any visual impacts, increase the distance of mining from the sensitive pagoda landforms, and eliminate risks associated with rehabilitation of steep areas. It would also ensure there are no significant impacts to threatened foraging habitat for the Broad-headed Snake. Although the proposal would result in disturbance of up to 50 ha of native vegetation, these impacts would be compensated for by 368 ha of offset land and additional monetary payments.

With these measures in place, the Department is satisfied that the proposal would be unlikely to have any significant impacts on the conservation significance of the landscape. Further, the proposal would achieve a reasonable balance between ensuring the ongoing operation of the mine, the recovery of coal for use in the Shoalhaven Starches Plant, and the protection of landscape and conservation values.

While the removal of these areas would reduce the benefits of the proposal, the modification would still have a net benefit of around $68 million (net present value) and would provide increased energy security for the Shoalhaven Starches Plant and the Mt Piper Power Station over the next 8 years.

The Department has also comprehensively assessed potential impacts on water, noise, air quality, Aboriginal heritage and traffic. The Department is satisfied that there is unlikely to be any significant impacts subject to the implementation of a range of strict conditions that have been developed in consultation with Government agencies. These include requirements to comply with stringent noise, air and water discharge criteria, investigate measures to reduce the amount of clean water captured by the site, comply with limits on coal haulage, and consult with registered Aboriginal parties on the management of salvaged artefacts.

Based on its assessment, the Department considers that the proposed modification is approvable, subject to the recommended conditions.

1. INTRODUCTION

Castlereagh Coal owns the Invincible Colliery located approximately 25 kilometres (km) north-west of Lithgow in the Lithgow local government area. Castlereagh Coal is the trading name for Shoalhaven Coal Pty Ltd, which is part of the Manildra Group that owns and operates the Shoalhaven Starches Plant at Bomaderry (see **Figure 1**).

Figure 1: *Location of the Invincible Colliery and Shoalhaven Starches Plant*

1.1 Existing Operations

The Invincible Colliery has a long history of both underground and open cut mining.

Mining on the site recently involved extraction of coal by open cut and highwall mining methods under a project approval (07_0127) granted by the then Minister for Planning on 4 December 2008.

This approval, known as the Invincible Coal Project, has been modified on three occasions and allows:

- extraction of up to 1.2 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal;
- processing of coal in an on-site coal handling and preparation plant (CHPP); and
- transportation of coal to nearby power stations and other customers.

Under the approval, mining operations could only be undertaken until December 2016. Consequently, further planning approval would be required to facilitate any additional mining on site.

Accessible coal reserves under this approval were exhausted in 2012 and the mine has since been on care and maintenance. There are a number of areas of the site that are yet to be rehabilitated, including three final voids that must be backfilled under the approval. There is currently insufficient overburden material on the site to backfill these voids without the need to disturb already rehabilitated areas.

1.2 Strategic Context

Regional Setting and Land Use

Invincible Colliery, together with the neighbouring Cullen Valley Mine and Baal Bone Colliery form a mining cluster located predominantly within the Ben Bullen State Forest. Both the Baal Bone Colliery and Cullen Valley Mine are also currently on care and maintenance.

The area surrounding the mine has well-established native woodland and significant sandstone cliff lines and rock pagoda formations. The Ben Bullen State Forest has been used over a significant period of time for timber production and both open-cut and underground coal mining.

A number of conservation areas and National Parks are located in the general area of these mines. The Gardens of Stone National Park is located approximately 2 km north of the site and forms part of the Greater Blue Mountains World Heritage Area. The landscape contains rock pagodas, sandstone cliffs and canyons.

The nearest residential area to the mine is the village of Cullen Bullen. It is located between the Invincible and Cullen Valley mines. There are also several rural and rural-residential properties to the west of the mine with the nearest privately-owned residence located approximately 500 m west of the mine.

Mt Piper Coal Station

The nearby Mount Piper coal fired power station, owned by Energy Australia, is located approximately 3 km south of Invincible Colliery and provides approximately 11% of NSW's electricity.

Prior operations at Invincible Colliery supplied the Mt Piper Power Station for electricity generation, along with locally sourced coal from neighbouring mines Cullen Valley Mine and Baal Bone Colliery.

Given that all three of these mines are currently in care and maintenance, the Mount Piper Power Station currently relies solely on coal from the Springvale Mine.

Shoalhaven Starches Plant

The Shoalhaven Starches Plant, owned by the Manildra Group, is located at Bomaderry on the NSW South Coast. It is the largest wheat starch and gluten plant of its kind in the world and serves as a primary component of the Manildra Group's operations.

Manildra directly employs 1,600 people, of which approximately 75% reside in NSW.

Castlereagh Coal has stated that the reliability of supply and cost of coal coal are critical to the ongoing operation of Shoalhaven Starches Plant. The Shoalhaven Starches Plant is currently sourcing coal from Centennial's Clarence operation and Whitehaven's operations in the Gunnedah basin.

1.3 Previous Proposals

The Invincible Colliery has been the subject of a number of proposals to extend mining operations in recent times. The previous owner and operator of the mine, Coalpac, submitted a project application for the expansion of the Invincible and Cullen Valley Mine in 2010, followed by two modification applications in 2014.

Coalpac Consolidation Project
On 29 October 2010 Coalpac submitted a project application, known as the Coalpac Consolidation Project, which involved the expansion of mining areas into the Bullen Bullen State Forest, including a disturbance area of almost 800 hectares (ha).

The project, as shown in **Figure 2**, would have recovered approximately 96 Mt of coal and would have extended mining operations for 21 years.

The project was reviewed by the NSW Planning Assessment Commission (the Commission), which recommended that the project should not be approved for a wide range of reasons. These included its unacceptable impacts on regional biodiversity values, the internationally significant rock pagodas that occur near the site, and the amenity of residents in Cullen Bullen (i.e. noise, dust and blasting impacts).

After assessing the merits of the project, and considering the findings of the Commission, the Department concluded that the site was unsuitable for such a large and elongated open cut coal mine, as it would significantly affect the significant conservation values of the area, and recommended that the project be refused.

Nevertheless, the Department acknowledged that there could be some merit in allowing a smaller extension that would avoid the more sensitive parts of the site, as this would enable some of the remaining coal reserves to be extracted and the existing mining voids to be filled and appropriately rehabilitated.

On 16 October 2013, Coalpac formally withdrew its application for the Coalpac Consolidation Project prior to it being determined by the Commission.

Expansion Modifications
Coalpac subsequently submitted two modification applications (Invincible Modification 4 and Cullen Valley Modification 2) to expand mining operations at the Invincible Colliery and the Cullen Valley Mine. The proposals included a combination of open cut and highwall mining to access a resource of approximately 9 million tonnes, adjacent to and beneath parts of pagoda landforms (see **Figure 2**).

The proposals significantly reduced the area of open cut mining compared to the Coalpac Consolidation Project with a disturbance area of approximately 150 ha within the Ben Bullen State Forest.

The Department recommended that the modification applications be approved on the basis that they would only affect a small portion of the pagoda landscape, they would be unlikely to result in any discernible subsidence and stability impacts, and that any residual impacts would be compensated for, or outweighed by, the benefits of the project.

However, the Commission refused the applications on 20 March 2014 on the basis that they would have significant impacts on the pagoda landform complex as a whole, including impacts on habitat for fauna species and scenic and landscape values, and they would pose too much risk to individual pagoda structures, particularly from subsidence associated with highwall mining.

The Commission also found that the site has significant conservation value and was not suitable for the scale of mining proposed as part of the modifications.

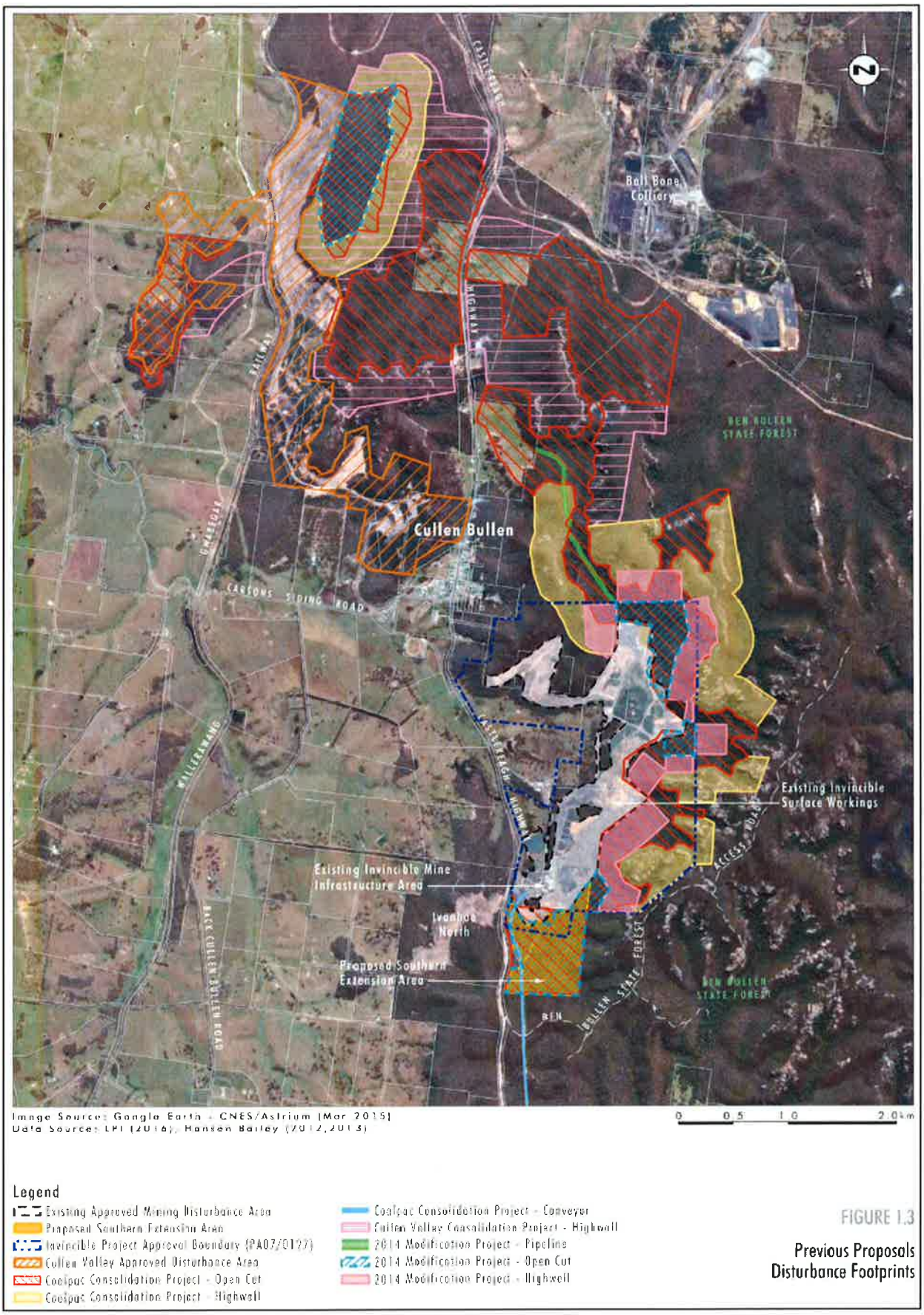

Figure 2: *Previous Proposals*

2. PROPOSED MODIFICATION

Proposal
Castlereagh Coal is seeking a further modification to the project approval for the Invincible Colliery under Section 75 W of the *Environmental Planning and Assessment Act* (EP&A Act).

The proposed modification comprises (see **Figure 3**):
- the recommencement of mining operations including an extension to the life of mine by 8 years;
- development of a new open cut pit (the Southern Extension Area) to the south of the existing mine;
- use of existing coal processing and surface infrastructure with minor upgrades;
- the transportation of coal by road to the Shoalhaven Starches plant near Nowra and to Mount Piper Power Station; and
- rehabilitation of the southern extension area and all existing disturbed areas on-site.

The proposal also involves the development of a range of ancillary infrastructure including the relocation of a 11kV transmission line and construction of additional surface and water management infrastructure to support mining. The proposed modification would not increase the approved extraction rate of the mine, which would remain at 1.2 Mtpa of ROM coal.

Since the exhibition of the EA, Castlereagh Coal has made changes to the proposal to reduce potential environmental impacts in response to concerns raised by the Department, government authorities and the community. These changes include:
- removing the need to discharge water intercepted by the Southern Extension Area;
- revising the final landform to reduce the gradient of slopes at the eastern boundary of the proposed southern extension area; and
- identifying a biodiversity offset strategy which would protect and conserve 368 ha of land and contribute $194,000 towards the conservation of the Broad-headed Snake.

The modification is described in detail in the attached Environmental Assessment (EA) (see **Appendix A**) and supplementary information provided by Castlereagh Coal (see **Appendix E**).

The primary justification for the Southern Extension Project is the requirement for a source of thermal energy for the continued operation of Manildra's Shoalhaven Starches Plant located at Bomaderry. The proposed modification would allow Castlereagh Coal to access a coal resource of approximately 2.7 million tonnes of ROM coal, 300,000 tonnes of which would be suitable for use as an energy source for the Shoalhaven Starches. The remainder would be sent to Mount Piper Power Station.

Comparison to Previous Proposals
While the proposed modification must be assessed on its individual merits, the Department believes that it cannot be considered in isolation and that relevant aspects of the assessment process for the Coalpac Consolidation Project, and the findings of the Commission in its determination of Invincible Modification 4, are important factors in the consideration of this proposal.

Castlereagh Coal claims that it has designed the proposed modification to address many of the issues raised in these assessments and to minimise the potential for any environmental impacts. In this regard, the proposal does not include any highwall mining that has previously been proposed on the site, and would not involve any subsidence related impacts to pagodas or geo-diverse features.

The proposal also includes far less open cut mining within close proximity to pagodas and geodiversity features (i.e. 6 ha within 300 m of pagodas compared with 57 ha for Modification 4 and 456 ha for the Coalpac Consolidation Project) and a much smaller disturbance footprint overall (i.e. 50 ha compared to 152 ha for Modification 4 and 794 ha for the Coalpac Consolidation Project). **Figure 2** shows the proposed modification (in dark yellow) compared to areas that were proposed to be mined as part of prior proposals.

Castlereagh Coal has also considered a number of alternatives including mining in other areas adjoining the existing Invincible mine. Castlereagh Coal claims that the proposed Southern Extension Area would have less impacts on the pagoda landscape and ecological and habitat values than other alternatives. A detailed description of the alternative options is provided in the attached EA (see **Appendix A**).

Figure 3: *Proposed Southern Extension Area*

3. STATUTORY CONTEXT

3.1 Section 75W

The Invincible Coal Project was approved under Part 3A of the EP&A Act. Although Part 3A was repealed on 1 October 2011, the mine remains a transitional Part 3A project under Schedule 6A of the EP&A Act, and any modification to the approval is to be made under the former Section 75W of the Act.

The Department is satisfied that the application can be characterised as a modification to the existing approval as the proposal would:

- result in a minor extension to the approved mining operations;
- not alter the approved mining method;
- not increase the approved production limit; and
- not alter the approved transportation methods or rate.

Given these considerations, the Department is satisfied that the proposal is within the scope of Section 75W, and may be determined accordingly.

3.2 Approval Authority

Under Section 75 of the Act, the Minister for Planning is the approval authority for the modification application. However, the proposed modification falls within the Minister's delegation to the Planning Assessment Commission (the Commission), as there were more than 25 submissions in the nature of objections and the Proponent has made reportable political donations. Consequently, the Commission must determine the application.

3.3 Site Verification Certificate

Under Clause 50A of the *Environmental Planning and Assessment Regulation 2000*, an application for mining in areas where a Strategic Agricultural Land Map has been prepared by the NSW Government must be accompanied by a gateway certificate or a site verification certificate that certifies that the land on which the proposal is to be carried out is not Biophysical Strategic Agricultural Land (BSAL).

Coalpac lodged an application for a site verification certificate with the Department as part of Modification 4 for the Invincible Colliery. The application was prepared in accordance with the requirements of the *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land.*

On 12 March 2014, the Department issued a site verification certificate confirming that the site, including the Southern Extension Area subject of the proposed modification, does not contain BSAL.

4. CONSULTATION

4.1 Exhibition

After accepting the modification application and accompanying EA, the Department exhibited the documents from 27 September 2016 until 8 November 2016 at the:

- Department's Information Centre;
- Lithgow City Council offices;
- Nature Conservation Council; and
- Department's website.

The exhibition was advertised in the Lithgow Mercury, and relevant State government authorities were notified of the exhibition.

4.2 Submissions and Agency Advice

During the exhibition period, the Department received 856 submissions (see **Table 1**), including:

- 7 from public authorities;
- 9 from special interest group and organisations; and
- 840 from individuals.

A summary of the issues raised in submissions is provided below. A full copy of the submissions is provided in **Appendix B**.

Table 1: *Summary of Submissions/Advice*

Submitter	*Number*	*Objecting/Supporting*
Public Authorities Roads and Maritime Services Office of Environment and Heritage Lithgow City Council Environmental Protection Authority Transport for NSW Department of Primary Industries Department of Resources and Energy	7	• No objections
Special Interest Groups and Organisations Cullen Bullen Progress Association Cullen Bullen Raceway Energy Australia Shoalhaven Starches Forsons Group Bella Investments Blue Mountains Conservation Society Colong Foundation for Wilderness The Colo Committee	9	• 6 supported • 3 objected
Community	840	• 544 supported • 296 objected

In February 2017, Castlereagh Coal submitted a detailed Response to Submissions (RTS) (see **Appendix C**). The Department placed a copy of the RTS on its website and forwarded a copy to key agencies for comment. A copy of the agency responses is provided in **Appendix D**.

The Department also consulted further with Castlereagh Coal and Government agencies. This resulted in changes to the proposal that have led to a design that would reduce the potential environmental impacts. In particular, the Department requested changes to the final landform to mitigate long-term impacts on the landscape. The Department has also consulted with OEH to improve the biodiversity offset strategy and with the EPA to resolve concerns about water management. The resulting changes are discussed further below and in the Department's assessment in **Section 5**.

The information provided by Castlereagh Coal to address the issues raised by the Department and other public authorities is provided in **Appendix E**.

4.3 Public Authorities

None of the public authorities objected to the proposed modification. However, they commented on specific aspects of the project and/or made recommendations relating to a range of matters relevant to their administrative and regulatory responsibilities. A summary of the issues raised by agencies is provided below.

The ***Office of Environment and Heritage (OEH)*** initially raised concerns about the biodiversity assessment report including the adequacy of surveys and the proposed biodiversity offset strategy. OEH noted that the assessment did not identify the full extent of Capertee Stringybark and that surveys undertaken for the Bathurst Copper Butterfly were inadequate to capture the peak flying season.

OEH also raised concerns that an offset strategy had not been provided in accordance the *NSW Biodiversity Offsets Policy* and that no offset had been identified for the Broad-headed Snake. In response to OEH's concerns, Castlereagh Coal undertook additional surveys for Capertee Stringybark and provided further justification for surveys of vegetation communities. It also strengthened its offset strategy by identifying a land based offset area and supplementary measures, including the payment of $194,000 towards the conservation of the Broad-headed Snake.

OEH is satisfied that its concerns have been addressed through the provision of this information and the Department's recommended conditions. This is discussed in more detail in **Section 5.2**.

The ***Environment Protection Authority (EPA)*** initially raised concerns that the noise assessment was undertaken in accordance with the *Draft Industrial Noise Guideline* and not the *Industrial Noise Policy*. However, EPA was satisfied that the project would comply with the existing noise criteria and advised that the current noise limits in the EPL would continue to comply.

EPA also raised concerns about the methodology used to estimate the volume of water to be dewatered from the Southern Extension Area and the environmental impacts associated the discharges from the site. In response to these concerns, Castlereagh Coal installed 2 bores in the Southern Extension Area to provide a more accurate estimate on the volume of water that would be dewatered from historical underground workings. It also revised its estimates based on detailed survey data and revised its water management strategy to ensure that this water would not be discharged off-site.

Although EPA noted that there is some residual uncertainty about the volume of water that would be dewatered, it recommended a number of conditions to address this issue. These conditions have been incorporated into the recommended conditions which include strict discharge criteria (see **Section 5.3**).

The former ***Department of Primary Industries (DPI)*** raised a number of concerns about water take and water management. As discussed above, Castlereagh Coal made a number of changes to the proposal to address concerns about water management.

Following the provision of this information, DPI raised some residual concerns about the need for groundwater licences, seepage towards the neighbouring Baal Bone Colliery and water management on site, including the need to divert clean water around the Southern Extension Area. DPI also recommended that the Water Management Plan be updated in consultation with its water division.

DPI also recommended that Castlereagh Coal consult with DPI Lands regarding bushfire management between the Invincible Coal Mine Biodiversity Offset Area and adjacent crown land.

DPI is satisfied that these issues have been addressed by the Department's recommended conditions (see **Section 5.3**).

Lithgow City Council (Council) raised concerns and/or made comments in relation to:

- *Blasting* – including a request for road closures to be undertaken outside of school bus hours;
- *Noise* – the implementation of mitigation measures to affected receivers;
- *Social* – in particular, that Castlereagh Coal negotiate a Voluntary Planning Agreement (VPA) with Council and that this be required as a condition of any approval;
- *Traffic* – requested a management program for covering and washing of coal trucks; and
- *Visual* – requested that visual impacts be minimised through progressive rehabilitation.

These concerns and comments are addressed in the relevant sections of this report.

The ***Roads and Maritime Services (RMS)*** – initially objected to the proposal and raised concerns about potential impacts to the Castlereagh Highway. RMS also requested additional information including a geotechnical assessment and an assessment of the risks to the Castlereagh Highway and measures to minimise the impacts of vibration and frequency of road closures.

Castlereagh Coal provided a detailed response to the concerns raised by RMS, and RMS subsequently withdrew its objection subject to a number of conditions being included in any approval. These include recommendations for Castlereagh Coal to enter a Deed of Agreement about the maintenance of the Castlereagh Highway, avoid hauling coal during school bus times and prepare and implement a driver's code of conduct.

The former ***Department of Resources and Energy (DRE)*** raised no objection subject to conditions requiring progressive rehabilitation of the site.

At the request of the Department, the former DRE also provided advice on whether there would be sufficient material available on site to enable the proposed landform to be achieved. In summary, DRE advised that the proposed modification would have the capacity to fill all the voids on site and that rehabilitation would be addressed in more detail through mining lease conditions.

Transport for NSW did not raise any concerns about the proposal.

4.4 Community and Special Interest Groups

Of the 849 submissions from special interest groups and individuals, 299 objected to the proposed modifications and 550 supported the proposal.

Of the 840 submissions from individuals, 12 were from residents of Cullen Bullen, 75 were from residents in the Lithgow Region and the remaining 753 were from other parts of NSW.

All of the submissions received from residents of the Cullen Bullen area support the proposal.

Around 65% of the submissions supported the proposal, including 6 special interest groups (Cullen Bullen Progress Society, the Cullen Bullen raceway, Energy Australia, Shoalhaven Starches, Forsons Group and Bella Investments).

The key reasons given to support the proposed modification related to employment opportunities, local expenditure and broader economic benefits to the region and state, including those associated with the supply of coal to the Mount Piper Power Station.

A large number of submissions in support were from residents from the South Coast of NSW (approximately 216). These submissions raised the long-term sustainability of Shoalhaven Starches and flow on employment opportunities as reasons in support of the proposed modification.

Of the 299 objections to the proposal, 296 submissions were from the general public and 3 from special interest groups, including the Blue Mountains Conservation Society, Colong Foundation for Wilderness, and The Colo Committee.

A summary of the issues raised by special interest groups and individuals is provided in **Table 2**.

Table 2: *Summary of Issues Raised in Submissions*

Issue	
Economic	- Scepticism about the predicted increase in local jobs - Claims that Castlereagh Coal can source coal from other operating mines. - Mount Piper Power Station already has a source of coal for electricity generation. - Concerns that the proposal would only extract 300,000 tonnes of coal for Shoalhaven Starches. - Concerns that the benefits of the proposal would not justify the potential impacts.
Landscape and Biodiversity	- Potential impacts on the Ben Bullen pagoda land system. - The Ben Bullen State Forest and pagoda landform complex have been recognised as being internationally significant by the Commission as part of prior assessments, and worthy of the highest level of protection. - The proposal would reduce the buffer to nearby world heritage areas and reduce biodiversity connectivity. - Potential impacts to grassy woodland. - Potential impacts to the recreational uses of the Ben Bullen State Forest. - Concerns that the proposed biodiversity offsets would not adequately replace the values of the Ben Bullen pagoda landscape.
Rehabilitation	- The rehabilitation of historical open cut areas should not be used as justification for the proposal. - Rehabilitation would not restore impacts to the landscape. - Concerns about existing rehabilitation on site and the ability to rehabilitate the southern extension area.
Approvals	- Concerns that an approval would be used to justify further extensions. - Concerns about incremental increases to mining that do not consider cumulative impacts.
Visual	- Potential increase in visual impacts from the highway. - Concerns about existing impacts of the mine. - Potential impacts to the visual character of the area including recreational areas in the Ben Bullen State Forest.
Aboriginal Heritage	- Potential impacts to significant Aboriginal sites surrounding the proposal.
Air Quality	- Further mining would have adverse impacts on local residents and the Gardens of Stone National Park.
Social	- Mining in the area may have contributed to social disadvantage.

5 ASSESSMENT

In assessing the merits of the proposal, the Department has considered:
- the modification application and supporting information;
- the EA and conditions of approval for the Invincible Coal Project;
- submissions from government authorities and the community;
- the response to submissions and additional information provided by Castlereagh Coal;
- relevant environmental planning instruments, policies and guidelines; and
- the requirements of the EP&A Act.

In addition, while the proposed modification must be assessed on its individual merits, the Department has also considered relevant aspects associated with the assessment of the Coalpac Consolidation Project and the findings of the Commission in its assessment of Invincible Colliery – Modification 4.

5.1 Landscape

Introduction
The landscape and geo-heritage values associated with the pagodas and escarpments of the Ben Bullen State Forest and nearby National Parks and World Heritage Areas have been canvassed in detail in prior assessments from the Department and the Commission. In summary, these assessments have considered that the rock pagodas adjacent to the site form an internationally significant landscape that warrants the highest level of protection from mining.

In considering any potential impacts of the proposal, it is important to consider both:
- the Department's definition of the pagoda landform complex as including the pagoda rock formations, the wet gullies, and the wooded slopes below the pagodas; and
- the Commission's previous recommendations to reduce mining impacts on landscape values.

As part of its review of the Coalpac Consolidation Project, the Commission recommended a minimum 300 m buffer from pagoda formations to reduce risks to pagoda structures from blasting and slope instability, reduce the visual impacts on the landscape and provide a buffer that would limit impacts to threatened species habitat associated with the pagodas.

However, in more recent assessments, the Commission found that no evidence had been found that any setback would ensure the structural integrity of geo-diverse features from mining-related impacts. The Commission also found that the highest and best use of the area is for conservation purposes.

With these findings in mind, the Department considers that the proposed modification has the potential to impact landscape values in three key ways. These include:
- risks to pagodas and geo-diversity features, including impacts from blasting;
- risks associated with mining and rehabilitation of steep slopes, including visual impacts; and
- impacts on threatened species that rely on habitat created by pagodas and associated slopes.

The risks to pagodas and landscape values associated with visual impacts and rehabilitation are discussed below. Biodiversity impacts are discussed further is **Section 5.2**.

Risks to Pagodas and Geo-Diversity Features
The proposed mine plan includes a buffer of around 210 m between open cut mining associated with the proposal and a pagoda formation to the east of the site, and a buffer of approximately 200 m to an isolated cliff line (see **Figure 4**).

Unlike previous proposals, the proposed modification does not include any highwall mining and, as a result, the proposal would not have any subsidence impacts on pagodas. Consequently, the only risk to the structural integrity of pagodas and the isolated cliff line located in proximity to the proposed Southern Extension Area, is associated with potential impacts from blasting.

The EA includes a detailed blasting assessment which considers the structural integrity of pagoda landforms and the isolated cliff line, and includes an analysis of damage criteria for sandstone, and other comparative features. In summary, the assessment concludes that blasting impacts could be mitigated by managing ground vibration to 50 mm/s for pagodas and 25 mmm/s for the nearby cliff line. These targets would be achieved using an maximum instantaneous charge (MIC) of 175 kg.

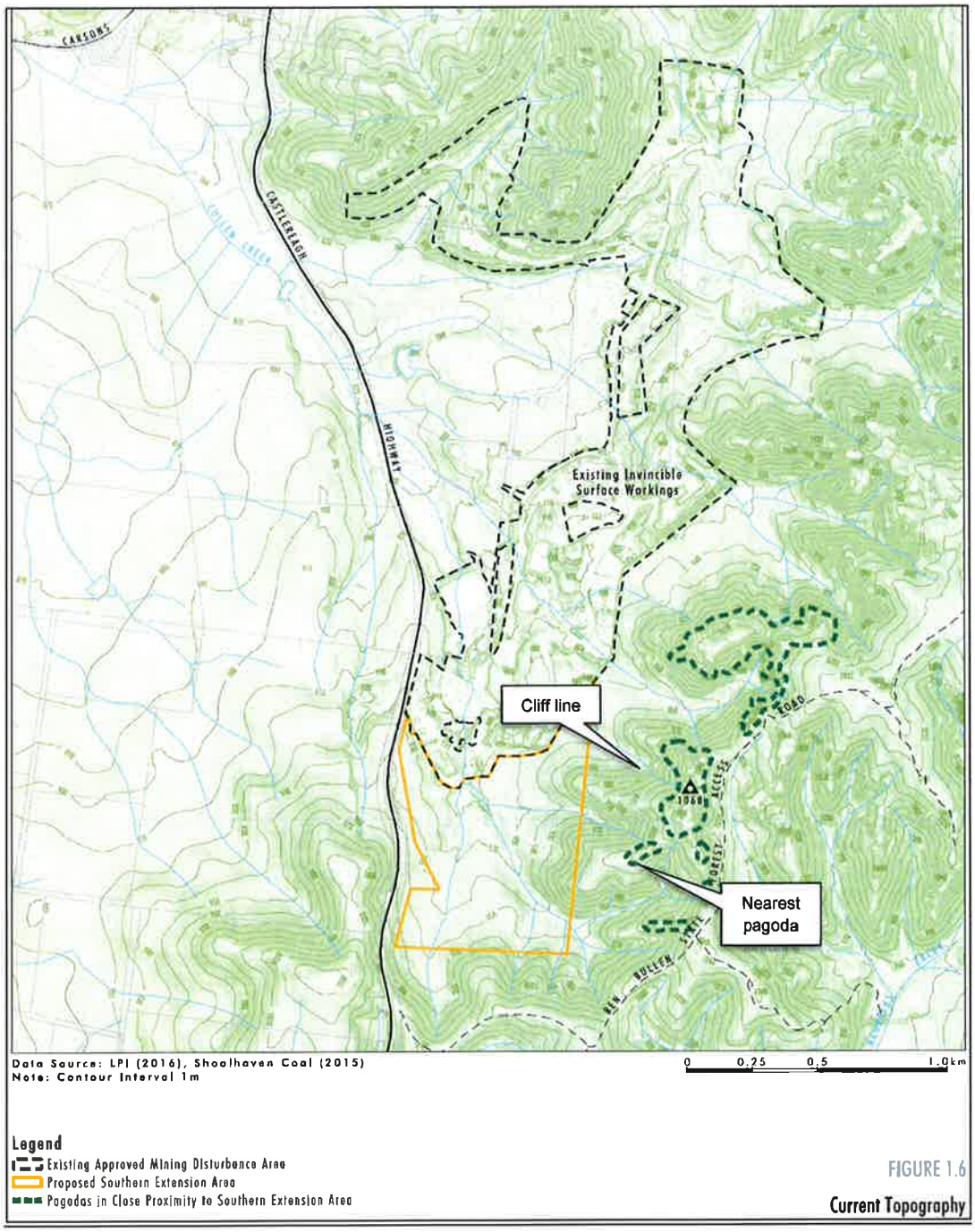

Figure 4: *Nearby Pagodas and Geo-Diversity Features*

While flyrock also has the potential to impact pagodas and geo-diverse features, Castlereagh Coal considers that any impacts could be managed through appropriate blast design and that flyrock could be controlled to approximately 50 m from blasting.

The Department considers the proposed vibration thresholds to be very low, and acknowledges that they have been developed in recognition of the features and structural stability of individual sites. Castlereagh Coal has also committed to ongoing monitoring of blast vibration levels at the nearest pagoda sites, and an ongoing assessment of the structural integrity and condition of these features over the life of the proposal.

Nevertheless, the Department recognises the Commission's prior concerns with blasting in proximity to pagoda features. In particular, the Department notes that the Commission had previously raised concerns that even very low vibrations could impact on the integrity of geo-diversity features.

Mine Plan and Rehabilitation

The proposed mine plan includes open cut mining through two steep sloped areas (up to 35 degrees) which are associated with ridgelines extending from pagoda formations to the east of the site (identified as 'Northern Ridgeline' and 'Southern Ridgeline' in **Figure 5**). This includes approximately 50 ha of native vegetation adjacent to a pagoda formation and within the Ben Bullen State Forest.

While not as steep or visually prominent as some other areas in the vicinity of the current Invincible mine, the Department believes that these wooded slopes form part of the pagoda complex and contribute to the significance of the landscape as a whole. On this basis, the Department is concerned about mining in these areas and the long-term visual and geotechnical impacts from rehabilitation, and short-term impacts visual impacts from mining areas.

The Department raised concerns during the assessment process about the inherent risks associated with rehabilitation of steep areas including erosion, preferential flow paths developing between natural and rehabilitated land, operational constraints in creating the final landform due to technical limitations and resulting long-term visual impacts. Importantly, the rehabilitation undertaken in other parts of the Invincible site, particularly the West Pit Area, has been sub-optimal due to the steep sloped nature of the post-mining landform.

In June 2017, Castlereagh Coal provided a written response to these concerns, which included consideration of a number of options to minimise steep slopes as part of the final landform (see **Appendix E**). These are shown in **Figures 5 and 6** and include options to:

- reduce slopes to a maximum of between 15 and 20 degrees (Option 1);
- retain a highwall to reduce the need to rehabilitate the steep slope areas (Option 2);
- avoid mining the steeper sections of the south-east portion of the site (Option 3A); and
- avoid mining steep slopes over the length of the eastern boundary of the proposal (Option 3B).

Castlereagh Coal's preferred rehabilitation option (Option 1) for the application is shown in **Figure 5**. This option seeks to reduce the gradient of slopes relative to the rehabilitation strategy presented in the EA (through the use of surplus overburden) and would maximise the benefits of the project (including resource recovery) relative to the alternative rehabilitation options.

Castlereagh Coal has also mounted arguments that the rehabilitation proposed as part of the modification is substantially different to prior rehabilitation undertaken on the site (see **Appendix E**). In particular, that the final landform would result in much shallower slopes than the West Pit Area (which has slopes up to 30 degrees) and that the proposed rehabilitation would not be constrained by the same factors that delayed and limited rehabilitation in this area.

Notwithstanding the above, the Department remains concerned with the proposal given that it still involves mining through the steep wooded slopes of the landscape and also includes a rehabilitated landform with relatively steep slopes (i.e. between 15 and 20 degrees). Option 1, in particular, has the potential to impact on the value of the landscape as open cut mining through these steep wooded slopes would be visible from the Castlereagh Highway and publicly accessible areas of Ben Bullen State Forest.

It is noted that the Southern Extension Area does not contain visually prominent pagodas and geo-diverse features (including the nearest pagoda landform and isolated cliff line) and views from the Castlereagh Highway would be intermittent due to screening from existing vegetation.

Nevertheless, the Department notes that the Commission has previously considered the suitability of the site with regard to open cut coal mining and concluded that the highest and best use of the land (including the area subject of this proposed modification) was for conservation purposes given the significance of the landscape and geo-heritage values.

Furthermore, open-cut mining undertaken in other parts of the Invincible site, particularly the West Pit Area, have left substantial visual impacts which continue to detract from the values of the pagodas and the landscape.

Given the above, the Department considers that any further short-term or long-term impacts associated with mining and the rehabilitation of steep wooded slopes would be incompatible with the significant conservation value of the site.

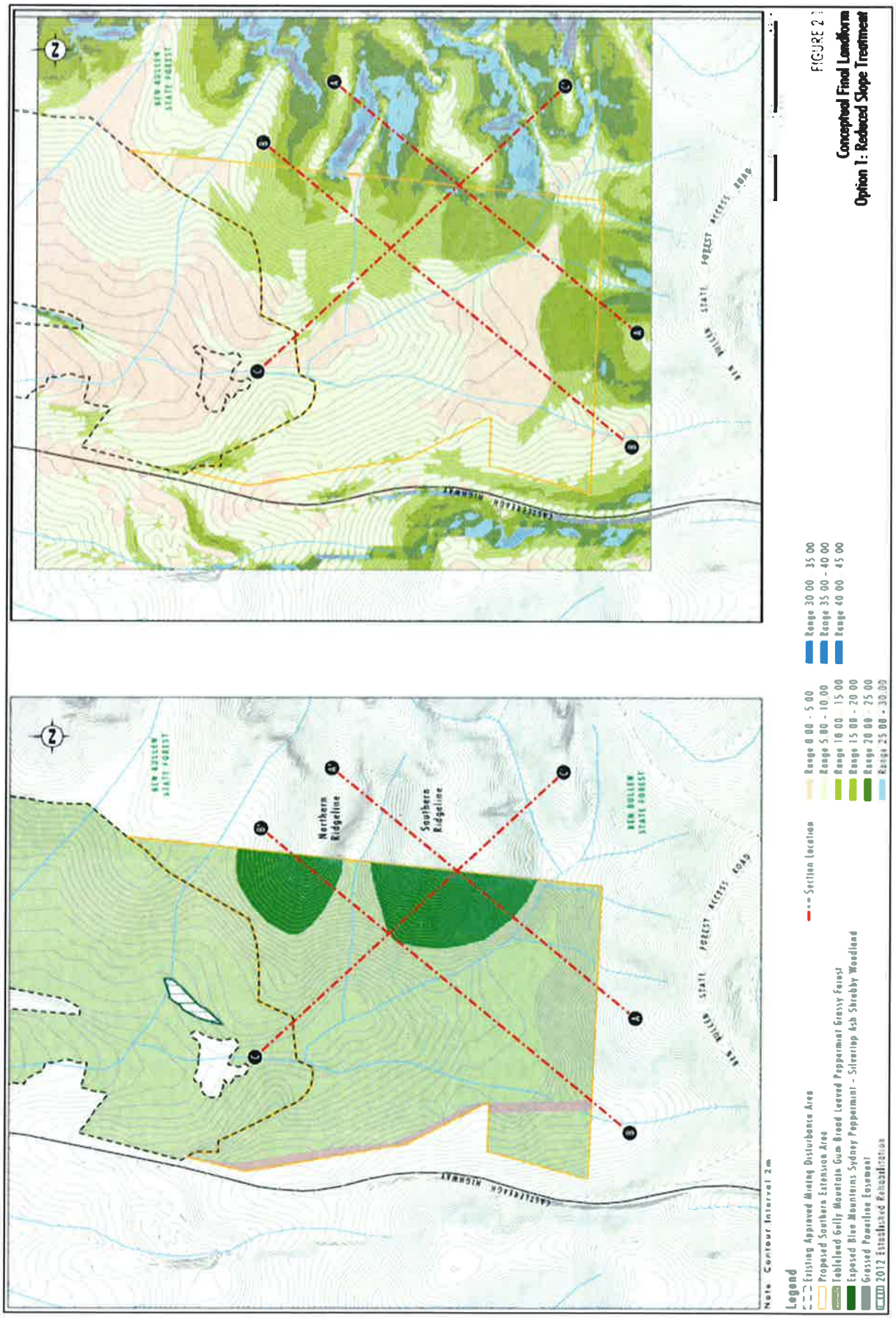

***Figure 5**: Castlereagh's Preferred Conceptual Final Landform (Option 1)*

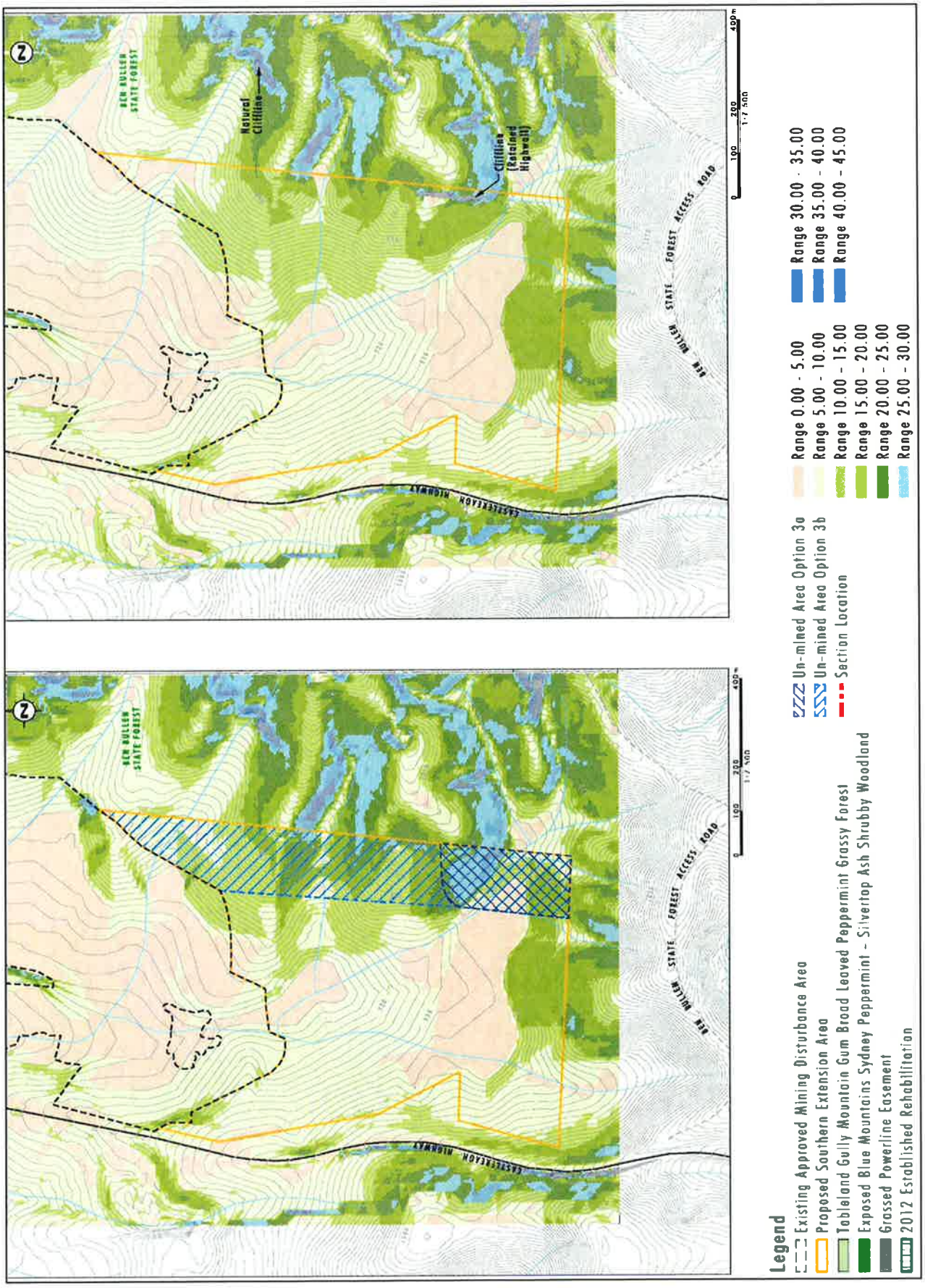

***Figure 6**: Alternate Final Landform Options*

Consideration and Recommendation

The Department has considered Castlereagh Coal's justification for mining within approximately 220 m of a pagoda formation, an isolated cliff line and on the wooded slopes associated with the broader pagoda landscape. The Department has also considered the options presented for the rehabilitation of the site and the prior findings of the Commission about potential impacts to landscape values associated with further open cut mining on the site.

The Department acknowledges that the proposal has been designed to minimise impacts to the landscape. In particular, the proposal does not include any highwall mining and has included a range of measures to mitigate any potential blasting impacts on pagodas including developing less open cut mining in close proximity to pagodas and very low blasting thresholds.

Nevertheless, the Department considers the broader landscape has high conservation value and notes the Commission's findings that the landscape and pagoda formations should be protected from mine-induced impacts. The Department considers that mining in steep wooded areas would be incompatible with the high conservation significance of the landscape and that further mining in these areas should be restricted.

Consequently, the Department has recommended a condition restricting mining operations from being undertaken in the steep areas of the site that are located closer to pagoda formations and the isolated cliff line. The Department's recommendation is consistent with Option 3b provided by Castlereagh Coal in its option analysis for avoiding steep slopes. (see **Figure 6**).

Response from Castlereagh Coal

Castlereagh Coal have mounted several arguments in response to the Department's recommendation (see **Appendix E**). These primarily include:

- the proposed mining is justified on the basis that the modification would deliver economic benefits while incorporating a 300m buffer from pagodas;
- the modification application is substantially different to prior proposals;
- steep areas of the site are able to be rehabilitated; and
- there are benefits associated with mining the full extent of the Southern Extension area s it would facilitate improved rehabilitation and the creation of a stable landform across the site.

While the Department acknowledges these arguments, it considers that the costs outweigh the potential benefits in this case. An analysis of the Department's recommendation is provided below.

Benefits of Reducing the Scale of the Proposal

The benefits associated with the Department's recommendation would be threefold.

First, the recommended setback would ensure that no open cut mining occurs within the 300 m buffer previously recommended as a minimum setback by the Planning Assessment Commission and would inherently reduce any risks associated with open cut mining in proximity to these features. That is, Castlereagh Coal would have more flexibility to design blasts to meet vibration thresholds and potential impacts from flyrock could be managed more easily and potential for any of these impacts would be extremely low.

Secondly, the open cut mining area would be restricted to relatively flat areas of the site and would avoid steep sloped areas. This would have the benefit of:

- eliminating areas of open cut mining from wooded sloped areas that have been identified as contributing to the significance of the pagoda landform;
- reduce the risks associated with long-term rehabilitation of steep slopes;
- significantly reduce any visual impacts from the Castlereagh Highway such that any residual impacts would be insignificant in the context of the existing mining operation; and
- reduce visual impacts from other areas including publicly accessible areas of the Ben Bullen State Forest.

Finally, the recommendation would significantly reduce the biodiversity impacts of the proposal, including impacts to potential Broad-Headed Snake habitat and other threated species (see **Section 5.2**).

Costs of Reducing the Scale of the Proposal

The Department recognises that its recommendation would impact the viability of the proposal in a number of ways, including:

- sterilising approximately 500,000 tonnes of coal, 46,000 tonnes of which would be used at Shoalhaven Starches;
- reducing the economic benefits of the proposal; and
- reducing the available overburden to be used in rehabilitating the site.

Based on Castlereagh's cost-benefit analysis, the Department has conservatively estimated that the proposal would still result in net benefits of approximately $68M compared to $80M associated with the modification as originally proposed. The economic benefits are discussed in more detail in **Section 5.7**.

With regard to the rehabilitation of the site, the quantity of overburden available to rehabilitate and fill historical mining voids would be reduced. Castlereagh Coal argues that a reduction in material would result in the need to disturb previously rehabilitated areas of the site and create a final landform with steeper slopes. However, there is a pre-existing requirement for Castlereagh Coal to rehabilitate the site and fill the existing voids. Consequently, the Department does not consider that this is a relevant consideration in determining the merits of the proposed modification.

Nevertheless, the Department notes that the proposal, as recommended by the Department, would still contribute approximately 700,000 cubic metres of excess overburden, which could be used to backfill at least one of the final voids left by prior mining operations. Importantly, the proposal would generate sufficient material to backfill the Southern Extension Area.

Conclusion

The Department is satisfied that its recommendation to restrict mining operations from steep slopes would strike an appropriate balance between ensuring the ongoing operation of the mine, the recovery of coal for use in Shoalhaven Starches, and the protection of landscape and conservation values associated with the surrounding pagoda landscape and the Ben Bullen State Forest.

The Department has also recommended a range of other conditions to mitigate and mange potential impacts including conditions requiring Castlereagh Coal to:

- ensure that blasting does not impact pagoda formations, cliff lines and escarpments;
- comply with a range of rehabilitation objectives aimed at the recreation of a stable, free draining landform with no final voids;
- progressively rehabilitate the site; and
- prepare and implement a revised Blasting Management Plan and Rehabilitation Management Plan in consultation with relevant public authorities.

With these measures in place, the Department is satisfied that the proposal would not have any significant impacts on individual pagoda landforms or their conservation significance as a whole.

5.2 Biodiversity

Introduction

The EA includes a Biodiversity Assessment Report (BAR), which has been prepared in accordance with the *Framework for Biodiversity Assessment – NSW Biodiversity Offsets Policy for Major Projects* (FBA) to assess the impacts of the proposed modification and identifies several avoidance and mitigation measures to reduce or minimise these impacts (The *Biodiversity Conservation Act 2016* does not apply to modifications made under Section 75W of the Act). A biodiversity offset strategy has also been proposed to address residual impacts.

The Department notes that the impacts identified in the BAR are associated with the mine plan proposed in the EA. The Department's recommendation to remove approximately 15 ha of the open cut to minimise landscape impacts of the proposal would serve to further reduce the biodiversity impacts. Importantly, this would significantly reduce impacts to potential foraging habitat for the Broad-headed Snake and also reduce impacts on other threatened species, including Capertee Stringybark.

In the absence of detailed information about how the Department's recommendation would reduce biodiversity impacts, the figures presented in the BAR have been conservatively used for purpose of the Department's assessment.

Flora Impacts

The BAR found that the proposal would result in the disturbance of approximately 50 ha of native vegetation within the Ben Bullen State Forest consisting of 2 biometric vegetation types (BVTs) (see **Table 3** and **Figure 7**).

None of the vegetation types are defined as Endangered Ecological Communities (EECs) under the NSW *Threatened Species Conservation Act 1995* (TSC Act) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

However, the assessment identified one threatened flora species, Capertee Stringybark (*Eucalyptus cannonii*), listed as vulnerable under the TSC Act. In response to concerns raised by OEH, Castlereagh Coal undertook additional surveys for Capertee Stringybark within the Southern Extension Area (see **Appendix E**). Both the Department and OEH are satisfied that the survey effort for this species provides a suitable basis for predicting impacts to Capertee Stringybark.

***Table 3**: Vegetation Clearing and Offsets for the Proposal*

Biometric Vegetation Types	***Disturbance Area (ha)***	***Disturbance Area***	***Offset Area***
		(ecosystem credits)	
CW117- Brittle Gum – Broad-leaved Peppermint – Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion (moderate/good condition)	8.24[1]	542	1,586
CW263 – Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW Central Western Slopes (moderate/good condition)	36.50	2,714	3,197
CW263 – Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW Central Western Slopes (moderate/ good_high condition)	0.62	30	
CW263 – Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW Central Western Slopes (moderate/good_medium condition)	2.25	99	
CW263 – Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW Central Western Slopes (moderate/good_other condition)[2]	1.65	50	
Total	**49.26**	**3,435**	**4,783**

1. Impacts on this BVT would be significantly reduced by the Department's recommendation to minimise the extent of the open cut.
2. This area forms part of the existing power line easement which is managed to restrict over-story regrowth.

Fauna Impacts

A total of 8 threatened fauna species were recorded within the disturbance area or have the potential to occur. The majority of these species are identified as ecosystem credit species under the FBA and therefore the impacts to these species are accounted for in the ecosystem credit calculations above. However, the Squirrel Glider and the Broad-headed Snake require species credits under the FBA.

The proposed modification would clear approximately 47.6 ha of habitat for the Squirrel Glider which equates to 1,047 species (impact) credits.

The BAR has considered the likely impacts on the Broad-headed Snake, even though the assessment indicates that the modification area is unlikely to be habitat for the Broad-headed snake. This snake generally frequents the rocky escarpments that would not be disturbed by the modification, but relies on foraging habitat on the slopes below the rock escarpments and pagodas during the summer months, up to approximately 500 m from the base of these escarpments.

The BAR concluded that the potential rocky habitat areas within 500m of the Southern Extension Area did not contain very specific "rock on rock" features that is required for this species. Nevertheless, the assessment conservatively assumed that the modification area includes Broad-headed Snake foraging habitat. The Department and OEH support the approach taken to determine impacts on this species.

Using the conservative method, the BAR identifies that the proposed modification would clear 11.76 ha of potential foraging habitat for the Broad-headed Snake, which equates to 388 species credits.

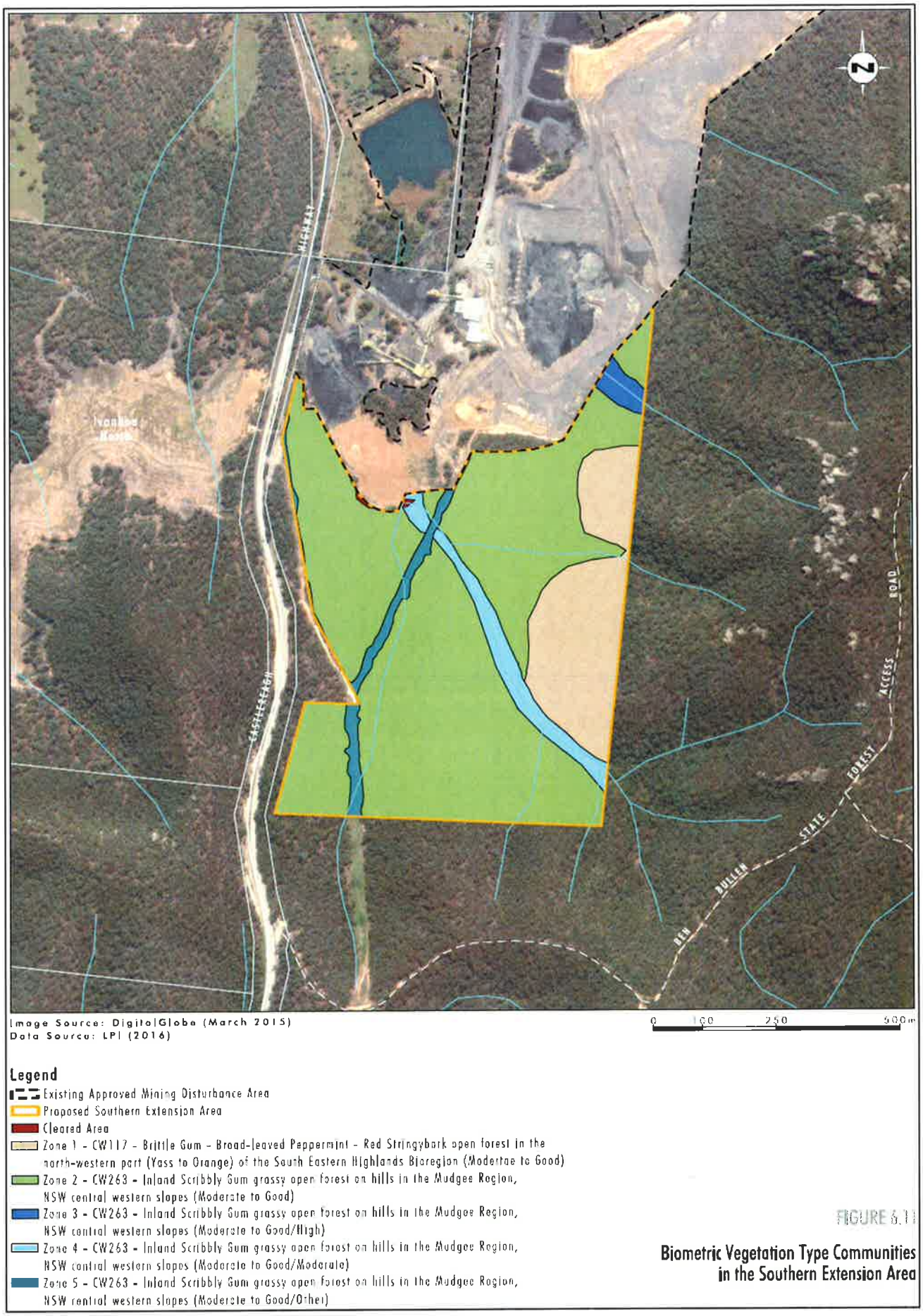

Figure 7: *Vegetation Communities*

OEH also noted that the modification area may represent habitat for the Bathurst Copper Butterfly *(paralucia spinifera),* a species credit species under the FBA. This is because of the presence of *Bursaria spinosa* which is feeding habitat for the Bathurst Copper Butterfly.

OEH raised concerns that the surveys were inadequate as they did not correctly identify all patches of *Bursaria spinosa* and did not undertake targeted surveys for the Copper Bathurst Butterfly during the flying season (i.e. from late October to late November). Castlereagh Coal has been unable to undertake these surveys given that these concerns were raised after the Bathurst Copper Butterfly flying season.

To address this issue, the Department has recommended a condition requiring Castlereagh Coal to undertake targeted surveys during peak flying season and prepare a Bathurst Copper Butterfly Survey Report in consultation with OEH, prior to the recommencement of mining operations. In the event that the Bathurst Copper Butterfly is identified, Castlereagh Coal would be required to offset any impacts in accordance with the *NSW Offsets Policy for Major Projects.*

With these measures in place, the Department and OEH are satisfied that any impacts to Bathurst Copper Butterfly can be appropriately identified and compensated for if necessary.

Biodiversity Offsets

Castlereagh Coal proposes to offset the residual biodiversity impacts of the proposal by using a combination of a land based offset and supplementary measures.

The proposed Hillcroft Biobanking Site would be used to meet the ecosystem and species credit liabilities of the modification application. The Hillcroft Biobanking Site is approximately 368 ha in area and is located approximately 5 kilometres north west of the Invincible mine (see **Figure 8**).

Castlereagh Coal proposes to offset impacts to habitat for the Broad-headed Snake through the use of supplementary measures, including funding of $194,000.

Ecosystem Credits

Table 3 above compares the impact ecosystem credits and offset ecosystem credits calculated using the FBA. The Hillcroft Biobanking Site would generate sufficient credits to offset the impacts to the two BVTs that would be impacted by the proposed modification. OEH has accepted the ecosystem credit calculations.

Species Credits

As described above, the proposed modification requires species credits for these threatened species. **Table 4** below summarises the impact credits required against the credits available in the Hillcroft Biobanking Site and identifies a credit shortfall for the Broad-headed Snake.

Table 4: *Credits for Threatened Species*

Species	Credits Required	Likely Credits Generated	Credit Shortfall
Capertee Stringybark	468	468	0
Squirrel Glider	1047	2613	0
Broad-headed Snake	388	0	388

Supplementary Measures

Under the FBA, supplementary measures can be used to offset impacts to the Broad-headed Snake if all reasonable steps have been taken to secure the number and type of species credits impacted.

To this end, the Department notes that Castlereagh Coal has attempted to identify properties that may contain suitable habitat in the region and has also sought interest for credits on OEH's Credits Wanted Register. No suitable properties have been identified through this process.

The Department also notes that any proposed offsets are required to have survey records of the relevant species within the habitat to generate species credits and that the likelihood of detecting an individual within a suitable site is considered to be low.

Figure 8: *Proposed Hillcroft Biobanking Site*

Given these reasons, and the fact that the assessment has adopted a conservative approach for offsetting impacts to Broad-headed Snake foraging habitat, the Department and OEH are satisfied that Castlereagh Coal has used all reasonable endeavours to locate offsets and considers that supplementary measures may be used to offset the credit shortfall.

OEH and the Department have agreed that the funding for the credit shortfall should be based on $500 per credit. This figure has been derived using species credit costs for the Broad-headed Snake as part of the land management and biodiversity conservation reforms that commenced on 25 August 2017. This equates to the residual credits providing $194,000 towards supplementary measures which are likely to include direct contributions to the NSW Government's Saving Our Species program.

It is noted that the Department's recommendation to minimise the open cut would significantly reduce the liability for Broad-headed Snake offsets. The Department has recommended a condition requiring Castlereagh Coal to re-calculate the species impact credits to account for this recommendation and to provide funding to OEH based on $500 per credit.

Conclusion
While the Department acknowledges the conservation significance of the Ben Bullen State Forest and surrounds (as discussed in **Section 5.1**), it is satisfied that, with the combination of avoidance measures recommended by the Department and the biodiversity offset package, the proposed modification would not result in any significant impacts on threatened species, or the broader ecological values of the area.

The Department's recommendation to reduce the scale of the open cut would further reduce any biodiversity impacts and the species and ecosystem credit requirements, including offset requirements for Broad-headed Snake habitat. The Department is satisfied that the proposed biodiversity offset strategy would adequately compensate for any residual impacts associated with the proposed modification.

To ensure these benefits are realised, and the impacts on biodiversity minimised, the Department has recommended conditions requiring Castlereagh Coal to:

- undertake surveys for the presence of Bathurst Copper Butterfly and offset any impacts, if identified;
- review and update the ecosystem and species credit requirements to reflect the Department's recommendation to minimise the open cut;
- implement the proposed biodiversity offset strategy;
- secure the long-term protection of the offset areas;
- lodge a conservation bond to safeguard the implementation of the offset strategy; and
- prepare and implement a comprehensive Biodiversity Management Plan in consultation with OEH that incorporates:
  - detailed performance and completion criteria for the biodiversity offset strategy;
  - measures for managing remnant vegetation and fauna habitat; and
  - best practice pre-clearance protocols.

5.3 Water Resources

Introduction
The Invincible Colliery is located in the Cullen Creek catchment which has been subject to a long history of disturbance from forestry, coal mining, extensive agricultural enterprises and construction of infrastructure. There are extensive historical underground mine workings in the vicinity which have had (and continue to have) a major influence on the groundwater regime in the area (see **Figure 9**).

The Invincible underground workings have historically been used to store excess water as part of the water management system. Castlereagh Coal also currently discharges water into the Cullen Creek via a licenced discharge point (LD002) in accordance with its Environment Protection Licence (EPL).

The proposed water management strategy was revised in the RTS to address concerns raised by EPA and the former DPI Water. In this regard, Castlereagh Coal has eliminated the need to discharge large volumes of water that would be dewatered from the Ivanhoe No.2 underground workings. Castlereagh Coal also updated its Water Balance and estimates for the amount of water in the Ivanhoe No. 2 workings (see **Appendix E**).

Site Water Balance

A comprehensive water balance was undertaken for the proposal. Overall, the water balance shows that the mine would have a water surplus under all climatic conditions and Castlereagh Coal would continue to store water for further use (either in underground workings and/or within water management dams) and discharge excessive water via its licenced discharge point (LD002). It also shows that no-offsite water from groundwater or surface water sources would be required at the mine.

Castlereagh Coal would be required to dewater the old Ivanhoe No. 2 underground workings in order to mine the Southern Extension Area. Under the revised proposal, Castlereagh Coal would store this water in the Invincible underground workings and there would be no direct discharge of this water off-site.

EPA initially raised concerns about the assumptions used to estimate the volume of water and whether discharges to Cullen Creek would be required. EPA recommended discharge criteria commensurate with default trigger values in the *Australian and New Zealand Environment Conservation Council (ANZECC) Guidelines and Water Quality Objectives* to ensure that any water discharged from the site would not impact on the receiving environment.

The Department notes that there is some inherent uncertainty associated with the estimation of water volumes in historical underground workings. The Department has twice requested further analysis of the volume of water that may be present in the underground workings in order to reduce any uncertainty as far as practicable. Castlereagh Coal has now refined its estimates based on monitoring data from 2 bores and a detailed analysis of record tracings form the Resources Regulator.

Based on this additional work, Castlereagh Coal estimates that up to 701 ML of water would need to be dewatered form the Ivanhoe underground workings and that the storage capacity in the Invincible underground workings is currently approximately 2,048 ML (see **Appendix E**).

The Department is now satisfied that the assumptions are based on all available data, including monitored groundwater levels and a detailed analysis of record tracings, and that the assessment includes a reasonable estimate of the volume of water that would be dewatered and the capacity for storing this water.

The Department also notes that a number of contingencies are in place to manage any surplus water.

Firstly, there is a significant surplus of storage within the Invincible underground workings (i.e. approximately 1,300 ML). This means that Castlereagh Coal would be able to store a far greater amount of water than is predicted to be dewatered.

Secondly, Castlereagh Coal would develop a program for monitoring the amount of water and ceasing mining operations should volumes exceed predictions. Castlereagh Coal would initially transfer 200 ML of water from the Ivanhoe No.2 workings to the Invincible workings. Should monitoring indicate that volumes do not behave as expected, and that there is more water than anticipated, Castlereagh Coal would revise its mine plan to prevent any risk to the environment.

Finally, Castlereagh Coal would maintain a barrier of coal in the south-eastern part of the site. This would prevent water that is stored below 898m AHD in the Ivanhoe No. 2 workings from infiltrating into the open cut.

The Department has recommended a range of conditions to mitigate any potential adverse impacts associated with dewatering and storing this water. This includes conditions that incorporate the EPA's recommendations and require the company to:

- ensure no direct discharge of any water dewatered form the old Ivanhoe No. 2 workings;
- ensure that any discharge complies with the highest standards of the ANZECC guidelines including trigger levels for all potential contaminants;
- ensure that any discharge does not breach Section 120 of the *Protection of the Environment Operations Act 1997*; and
- describe measures to manage this water and implement triggers, actions and responses for preventing any adverse impacts in an updated Water Management Plan.

With these measures in place the Department considers that the proposal is unlikely to have any significant impacts on water quality as a result of dewatering the old Ivanhoe No.2 workings.

Figure 9: *Underground Workings and Water Management Context*

Impacts on Surface Water

The existing operations and the Southern Extension Area are located within the Cullen Creek catchment. The proposed modification would not change the amount of surface water reporting to the dirty water management system as the Southern Extension area is located entirely within the catchment area of the existing water management system (see **Figure 10**).

The clean water diversions required by the existing water management plan at the Invincible Colliery do not operate in accordance with best practice. This results in some water from undisturbed areas reporting to the dirty water management system, rather than being diverted around the mine. Castlereagh Coal has not proposed to implement any additional diversion measures as part of the proposal due to topographical constraints associated with the construction of diversions and dams and the potential for additional biodiversity impacts.

Notwithstanding, the Department believes that measures should be taken to reduce the quantity of clean water intercepted by the mine, consistent with best practice management. To this end, the Department has recommended a condition that would require Castlereagh Coal to:

- develop a Clean Water Diversion Strategy including requirements to investigate all reasonable and feasible measures to divert clean water around the site;
- identify any of the measures to be implemented; and
- propose a timeframe for implementing these measures.

This recommendation is consistent with the former DPI Water's recommendation to install clean water diversions where possible and provides an opportunity to impose stricter requirements, and therefore provide an overall improvement, on the diversion of clean water at Invincible.

Impacts on Groundwater

There are unlikely to be any groundwater in-flows to the pit as the coal measures are located 'up dip' and have already been dewatered by historical mining activities. Nevertheless, it is estimated that 6-7 ML of water may from the spoil of the Ivanhoe North Mine located immediately west of the Southern Extension Area. The former DPI Water noted that the take of this water may need to be licensed as groundwater take. Castlereagh Coal holds a water access licence of 26 units from the Sydney Basin Murry Darling Basin Groundwater Source, which would account for the take of this water.

There is also a substantial volume of water in the Old Invincible Colliery underground workings and the connected Baal Bone underground workings to the north. There are currently large inflows of water to the Baal Bone Colliery, which required Glencore to pump out up to 1,300 ML of water per year. The proposed modification may increase the amount of seepage into the Baal Bone underground workings by approximately 5%, which is an increase of up to 15 ML per year.

Castlereagh Coal has sufficient water entitlements to licence any increase in seepage. Nevertheless, the Department has recommended that Castlereagh Coal be required to develop a protocol with the owners of the Baal Bone Colliery to manage this issue.

Conclusion

The Department is satisfied that the proposed modification would have minimal impact on water resources. There is sufficient storage in the Invincible underground workings to account for the dewatering requirements of the proposal and there are sufficient mechanisms in place to prevent any direct discharge of this water. Furthermore, there are existing water entitlements to account for any inflows to the open cut and the predicted seepage into the Baal Bone Underground workings.

Notwithstanding, the Department has recommended conditions requiring Castlereagh Coal to:

- ensure that it has sufficient water licenses for all stages of the project, and if necessary adjust the scale of operations to match the available supply;
- ensure that any discharge of water does not exceed ANZECC trigger values and is in accordance with Section 120 of the *Protection of the Environment Operations Act 1997*;
- comply with a range of best practice water performance management measures;
- prepare a Clean Water Diversion Strategy and implement all reasonable feasible measures to divert clean water around the site; and
- prepare and implement a revised Water Management Plan that includes appropriate controls and measures to monitor, mitigate and manage any water quality impacts and ensure compliance with the water performance measures.

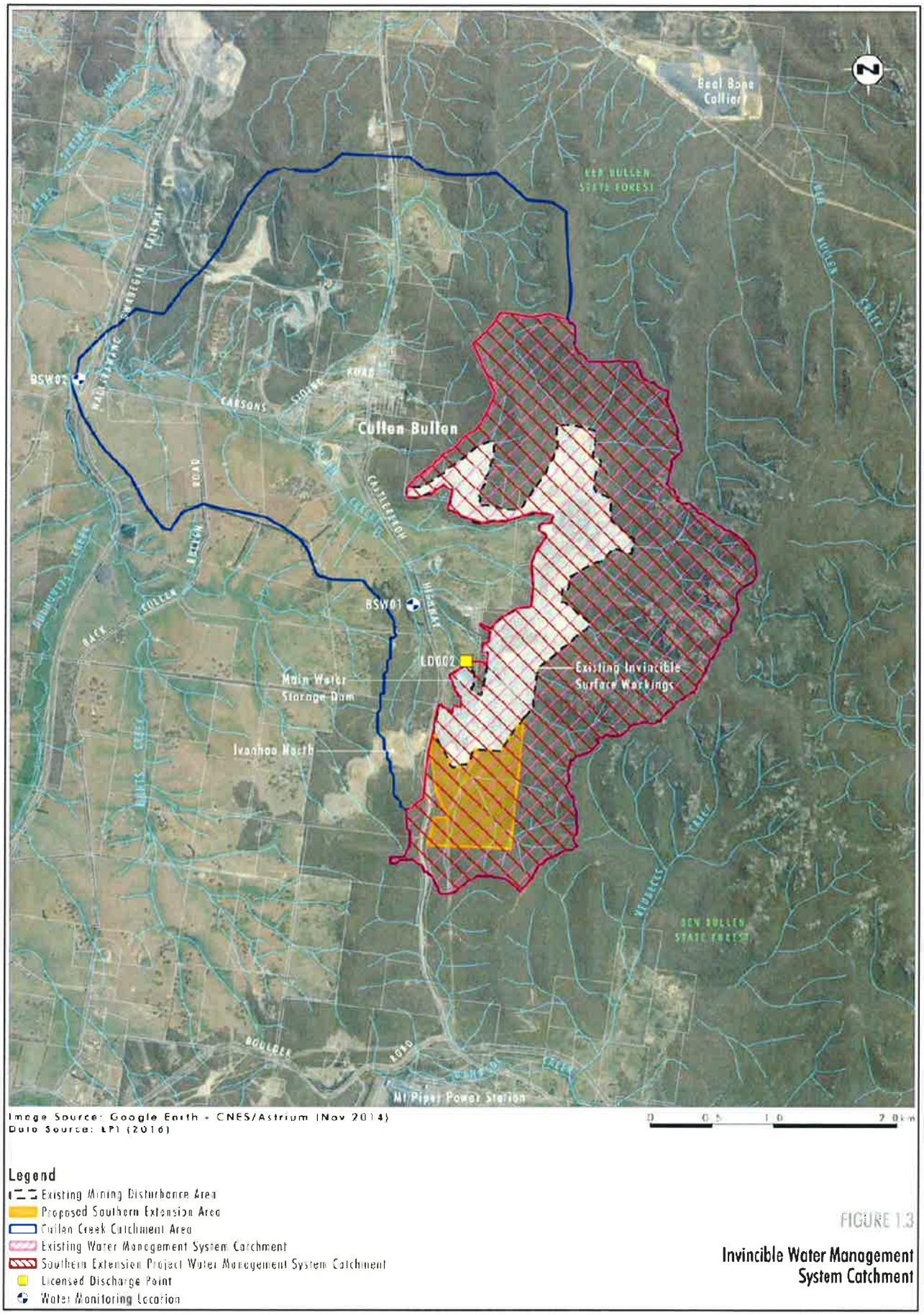

Figure 10: *Water Management System Catchment*

5.4 Noise and Blasting

Introduction
The EA includes a Noise Impact Assessment prepared by Umwelt in accordance with the draft *Industrial Noise Guideline* (dING). As the dING was not then Government policy, the Department requested additional assessment in accordance with the NSW *Industrial Noise Policy* (INP).

The Department also requested further consideration of measures to minimise and mitigate noise in accordance with the *Voluntary Land Acquisition and Mitigation Policy* (VLAMP). With the additional information provided (see **Appendix E**), both the Department and EPA are satisfied that the noise assessment is adequate.

Operational Noise
Mining operations would continue to be undertaken only during the daytime period (i.e. 7 am to 6 pm Monday to Saturday, and 8 am to 6 pm on Sundays and public holidays). The proposed modification also includes the implementation of various measures to mitigate and minimise noise impacts, including:

- shutting down equipment during adverse meteorological conditions, including restricting haulage of overburden to emplacement areas;
- undertaking mining operations in deeper areas during adverse meteorological conditions; and
- the use of alternative haul trucks with lower sound power levels than originally proposed.

While the proposal represents a continuation of the existing mine, the proposed mining would be undertaken further away from many privately-owned receivers than has occurred in the past, or as proposed in previous proposals, particularly those associated with the village of Cullen Bullen.

The worst-case noise levels are shown in **Table 5**. There would only be one exceedance of the Project Specific Noise Levels (PSNL) at one privately owned residence. Worst case noise levels at receivers 393 and 394 would coincide with the haulage of overburden to the eastern void. The noise contours associated with this scenario are shown in **Figure 11**.

Table 5: *Summary of Noise Impacts (exceedances in bold)*

Receiver No	PSNL (dBA $L_{Aeq(15min)}$)	Worst Case (dBA $L_{Aeq(15min)}$)
393 (Billabong)	40	38
394 (Hillview)	41	**43 (+2)**
All others	35	35

Receiver 394, which is located approximately 500 m west of the mine, is predicted to experience impacts up to 2 dB(A) above the PSNL during the day. Under the VLAMP, an exceedance of 2 dB(A) is considered 'negligible' and represents an increase over the PSNL that would not be discernible by the average listener. The predicted noise levels at 394 are also substantially less than the original project, which was granted acquisition rights due to significant exceedances of the criteria (i.e. up to 46 dB(A)).

The Department has recommended that the predicted noise limits apply at affected receivers and has also recommended that noise acquisition rights for receivers 393 and 394 be removed. This is because the proposal is predicted to comply with the criteria at receiver 393 and only result in a negligible exceedance of the criteria at receiver 394.

A cumulative noise assessment was completed which assessed the impact of the proposed modification, together with the Mt Piper Power Station, Cullen Valley Mine and Baal Bone Colliery. The assessment focused on day-time, which is when noise is predicted to be the greatest. The Department is satisfied that the cumulative noise levels would comply with the acceptable amenity criteria ($L_{Aeq(period)}$ 50 dB(A)), with noise levels between 29 and 42 dB(A) $L_{Aeq(period)}$ predicted at privately-owned receivers.

Low Frequency Noise
The assessment (see **Appendix E**) includes a consideration of low frequency noise against the INP methodology. The proposal is unlikely to contain a dominant low frequency noise content and no modifying factor would need to be applied to account for low frequency noise. Nevertheless, the Department has recommended contemporary noise monitoring conditions, including octave band analysis, to determine if low frequency noise is being generated by the mine, and if it is, apply a penalty to measured noise levels. This is consistent with the approach recommended in the recently made *Noise Policy for Industry* (2017).

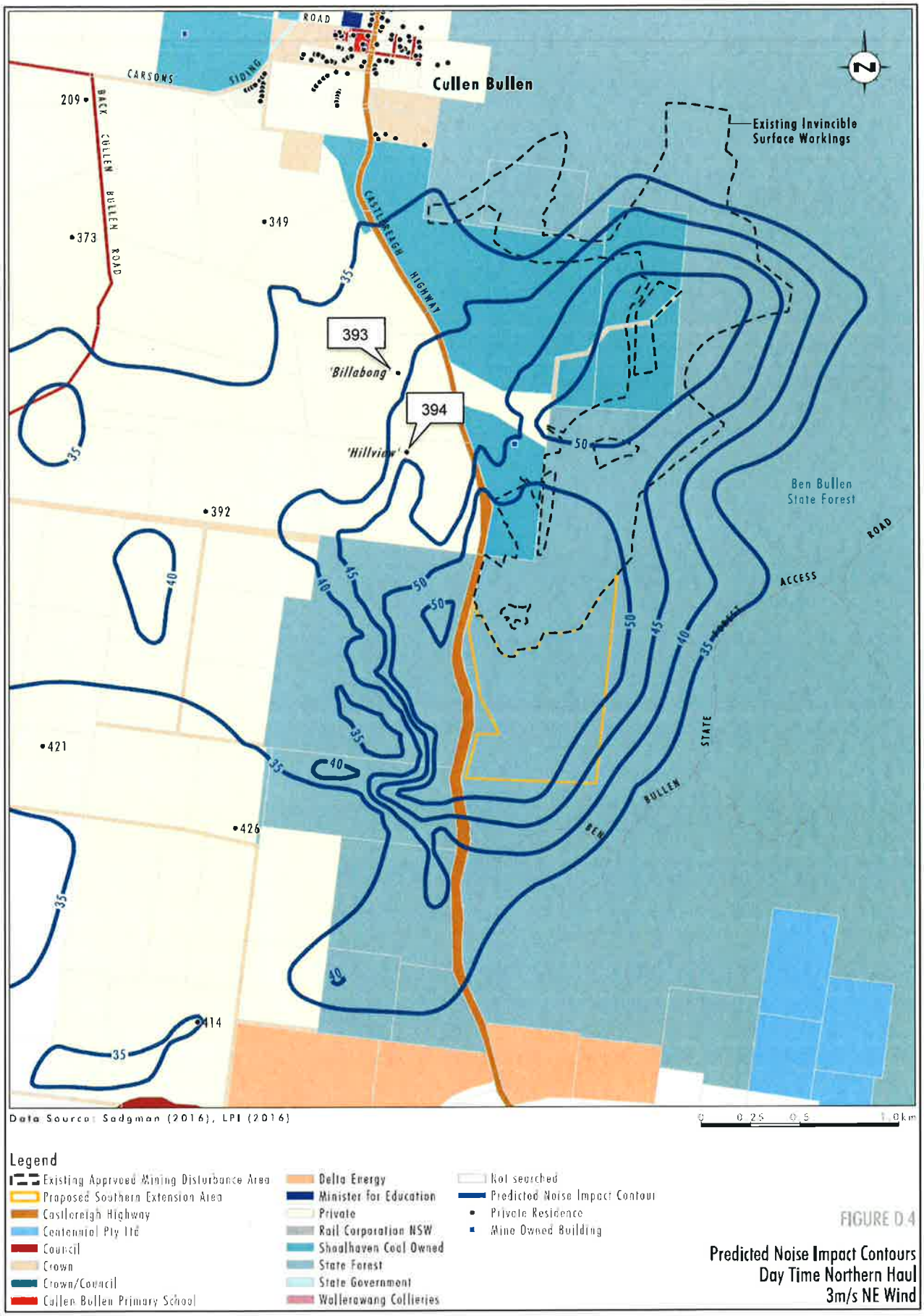

Figure 11: *Worst Case Noise Levels for Receivers 393 and 394*

Traffic Noise
The proposed modification would not increase the amount of product coal to be transported from the mine, or change the approved hours for transportation (i.e. during the day and evening). While the modification would result in a continuation of these impacts, the Department notes that any noise generated by mine related traffic would continue to comply with the applicable road noise criteria under the *NSW Road Noise Policy* and would not be significant.

The proposal would result in approximately 20 truck movements to and from the Shoalhaven Starches Plant per day. However, the Department is satisfied that this would be insignificant in the context of the high level existing traffic movements on the Castlereagh Highway.

Blasting and Vibration
The EA includes a specialist assessment of blasting and vibration impacts completed by Enviro Strata Consulting. It indicates that the proposed modification would comply with the applicable amenity criteria and structural damage criteria at all privately-owned residences and heritage sites. The predictions are based on a maximum instantaneous charge (MIC) of 466 kilograms (kg), with smaller MIC also modelled where blasting would be closer to privately owned receivers.

RMS initially raised concerns about the potential blasting impacts to the Castlereagh Highway, which would be located as close as 30 m from blasting in the Southern Extension Area. Castlereagh Coal has committed to meeting a ground vibration limit of 100 mm/s to minimise the potential for any impacts to the highway. Further, the Department has recommended conditions requiring that there are no greater than negligible impacts to all public infrastructure, including the Castlereagh Highway.

Castlereagh Coal has also committed to implementing a number of mitigation measures, including:
- limiting road closures to no more than 10 minutes;
- using dozers as an alternative to blasting when conditions permit; and
- undertaking several blasts in quick succession, as part of a single blast event and road closure.

To further reduce any potential impacts, the Department has also recommended conditions requiring:
- the frequency of blasting events be reduced from 2 to 1 per day to reduce the traffic impacts associated with the closure of the Castlereagh Highway;
- the preparation of a road closure management plan; and
- road closures be avoided during school bus times.

With these measures in place, both the Department and RMS are satisfied that blasting can be managed to avoid or minimise impacts to the Castlereagh Highway.

5.5 Air Quality

Dust Impacts
The EA includes an Air Quality Impact Assessment undertaken by Jacobs in accordance with the *Approved Methods for Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2005). It modelled the predicted contributions from the proposal together with background levels for total suspended particulates (TSP), fine particle matter ($PM_{2.5}$ and PM_{10}) and deposited dust. The predicted worst-case dust contours are shown in **Figure 12**.

The proposal would include a number of dust minimisation and management measures, including:
- watering haul roads, conveyors and coal stockpiles;
- enclosing coal processing infrastructure;
- minimising the areas of disturbance and progressively rehabilitating the site; and
- modifying or suspending activities during adverse meteorological conditions.

The Department notes that the Commission raised concerns about air quality in its review of the Coalpac Consolidation Project as there were numerous exceedance at residences. However, unlike the Coalpac Consolidation Project, the proposed modification would not result in any exceedances of NSW air quality criteria at any privately-owned or mine-owned residences.

EPA raised no concerns with the assessment of air quality impacts. Nevertheless, the Department has recommended a range of conditions to reflect contemporary standards for mining projects in NSW. This includes a requirement to prepare and implement a revised Air Quality Management Plan for the project.

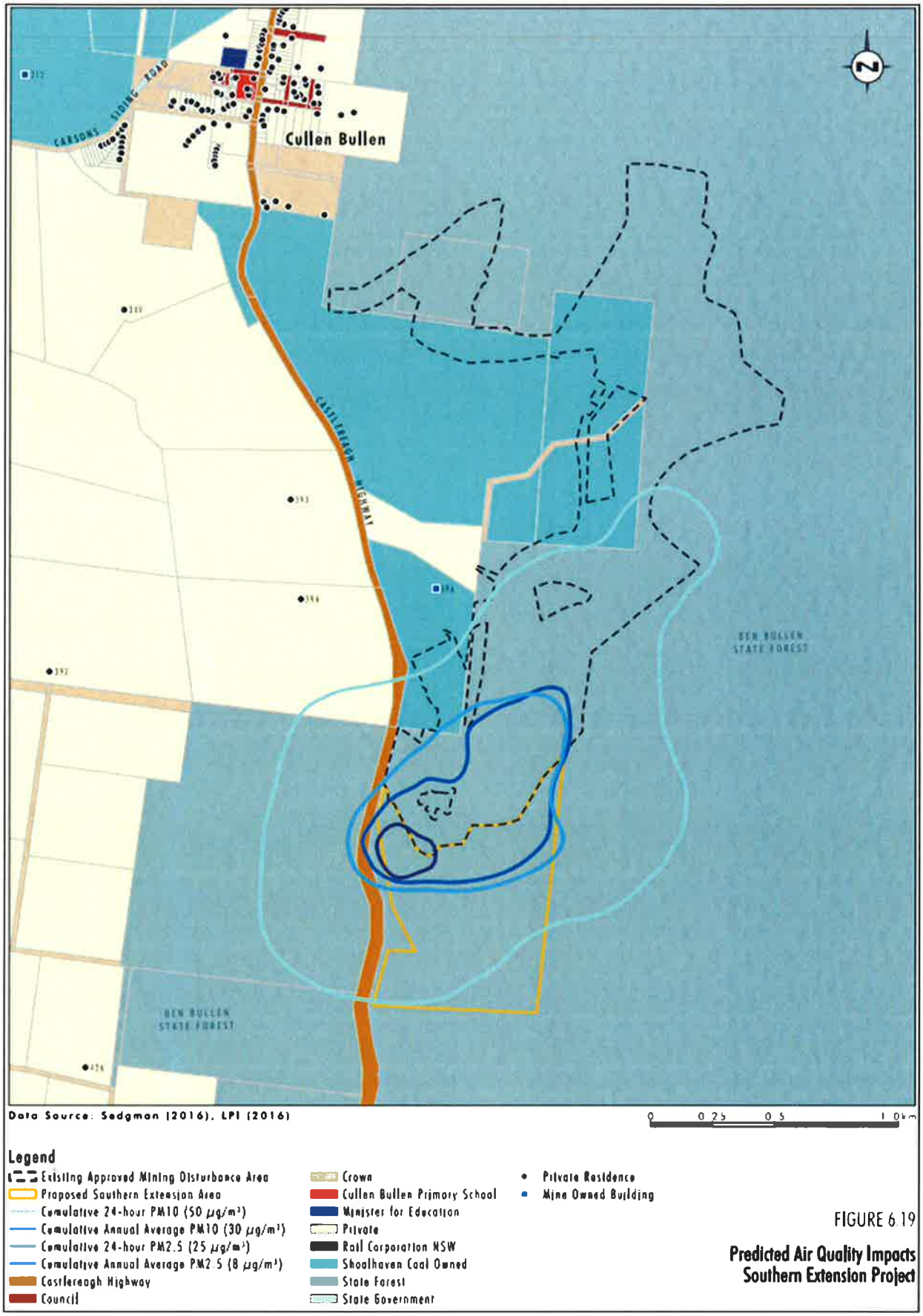

Figure 12: *Predicted Worst Case Air Quality Contours*

Greenhouse Gas Emissions

The Greenhouse Gas Assessment identified that direct and indirect (i.e. Scope 1 and Scope 2) greenhouse gas (GHG) emissions from the proposed modification would contribute some 183,300 tonnes of CO_2 equivalent (CO_{2e}) or approximately 46,750 tonnes of CO_{2e} a year, based on a maximum production scenario over four years. This represents approximately 0.0072% of Australia's annual average emissions under the Kyoto Protocol.

The assessment also indicates that the total indirect emissions (i.e. Scope 3) from the proposed modification would be around 6.5 million tonnes of CO_{2e} over the life of the proposal. This would be accounted for by other projects/developments including the Mount Piper Power Station and the Shoalhaven Starches Plant.

In assessing the potential GHG impacts of this proposal, the Department has considered the *NSW Climate Change Policy Framework*, which was released in November 2016 and sets an aspirational objective for NSW to achieve zero emissions by 2050. The Department notes that the proposed modification would result in a very small amount of GHG emissions in both the local and regional context. The proposed modification would only allow the extraction of a small coal resource (with a specific ash content for use in the Shoalhaven Starches Plant) over a relatively short period of 8 years.

Nevertheless, the Department has recommended a condition requiring Castlereagh Coal to implement all reasonable and feasible measures to minimise GHG emissions from the site, and describe these in the revised Air Quality Management Plan.

5.6 Aboriginal Cultural Heritage

The EIS includes an Aboriginal Cultural Heritage and Archaeological Assessment undertaken by Umwelt. The assessment considers the findings of surveys of the proposed extension area as well as results of a previous archaeological assessment within the project area completed by AECOM.

Both the Department and OEH are satisfied that the Aboriginal heritage assessment and consultation for the project has been undertaken in accordance with applicable guidelines, including the OEH's *Aboriginal Cultural Heritage Consultation Requirements for Proponents (2010).*

Six registered Aboriginal parties were involved in the Aboriginal heritage assessment and consultation process, which reviewed potential impacts to Aboriginal heritage items and sites, both inside and outside of the proposed extension area.

The assessment has identified 11 Aboriginal heritage sites in the vicinity of the proposal. Of these, 4 sites would be subject to disturbance as part of the approved rehabilitation of the mine. These sites have been identified subsequent to the original surveys carried out for the project and have consequently been included in the assessment for the proposal. These sites include isolated finds, an artefact scatter and a scarred tree, all of which are assessed as having low archaeological significance.

One of the sites (45-1-2712) is a rock shelter located outside the proposed disturbance footprint that has been assessed as having high archaeological significance. This site is unlikely to be impacted by the proposal due to its distance from the proposed modification (i.e. approximately 1 km). This is because Castlereagh Coal would manage blasting impacts on other rock features, including pagodas and a nearby cliff line, that are located much closer to the proposal (i.e. up to 210 m).

The remaining six sites identified are located within the Southern Extension Area and would be disturbed by the proposed modification. These include isolated finds, artefact scatters and a scarred tree, all of which are assessed as being of low archaeological significance.

Castlereagh Coal proposes to implement a number of measures to mitigate the potential impacts of the project on Aboriginal heritage. These include measures to:

- carry out periodic monitoring of the high significant rock shelter;
- collect surface artefacts and salvage scarred trees that would be impacted by the proposal; and
- arrange for suitable storage of salvaged artefacts in consultation with the registered Aboriginal parties.

Subject to Castlereagh Coal's mitigation measures, the Department and OEH are satisfied that impacts on Aboriginal cultural heritage would not be significant and could be appropriately managed. Nevertheless, to ensure that impacts on Aboriginal Heritage are appropriately managed, the Department has recommended Castlereagh Coal prepare and implement a revised Aboriginal Heritage Management Plan for the project, in consultation with OEH and the registered Aboriginal parties.

5.7 Economic

A large percentage of submitters raised concerns about the economic justification for the proposal, including concerns that the benefits would not outweigh the impacts, and that Shoalhaven Starches could source coal from other operating mines.

The EA includes an economic assessment prepared by Cadence Economics, which includes a cost benefit analysis (CBA) that has been prepared in accordance with the applicable NSW Government guidelines.

The assessment considers a range of matters including environmental impacts, the principles of ecologically sustainable development and the cost of rehabilitating the site.

In summary, the cost benefit analysis calculates that the project would have a net benefit of around $79.9 million (net present value). There are a number of important factors to consider in evaluating the economic impacts of the proposal.

Firstly, the Department recognises that coal is crucial to the operation of Shoalhaven Starches and accounts for approximately 30% of its energy needs. Although coal is currently the least used energy source, a transition away from coal to gas or electricity would increase the production costs for Shoalhaven Starches, therefore limiting the competitiveness of the plant's operations.

Secondly, Shoalhaven Starches requires a coal with a very low ash content that is generally sized differently to other coal produced in NSW. The result is that Castlereagh Coal is paying a significantly higher price for coal from existing mines than it would pay to produce it at the Invincible Colliery.

Thirdly, the proposal would supply approximately 2.4 million tonnes of coal to the Mt Piper Power Station over 8 years. Energy Australia supports the proposal on the basis that coal supply is currently a significant challenge for the Mt Piper Power Station which currently relies on a single source of coal, being the Springvale mine. The option of sourcing some coal from the Invincible Colliery would be useful in maintaining a sufficient coal supply to the power station in the future, particularly in emergency situations.

Finally, the proposal would result in a number of tangible economic benefits including:

- employment of up to 35 full time employees;
- net benefit to NSW of $74.4 million (in net present value terms) consisting of $55 million of direct benefits to the State and $26.8 indirect benefits; and
- contributions to Lithgow City Council consisting of approximately $135,000.

The Department's recommendation to minimise the extent of the open cut would reduce revenue and the economic benefits of the project. It is estimated that the economic benefits of the proposal would be in the order of approximately $68M accounting for this recommendation.

The Department is satisfied that its recommendation would not significantly impact the economic benefits of the proposal, and considers that the proposal would continue to generate important benefits, including income to the NSW Government and increased energy security for Shoalhaven Starches and Mt Piper Power Station.

5.8 Traffic and Transport

The proposed modification would not change the approved rate of coal production, and transportation arrangements to the Mount Piper Power Station would remain unchanged. Nevertheless, there are potential impacts associated with the transportation of coal to the Shoalhaven Starches Plant in Bomaderry, as well the ongoing impacts of extending the mine life by 8 years.

The EA indicates that the approved transport route between Invincible and the Mount Piper Power Station has sufficient capacity to account for the proposal and all intersections would operate at a good level of service.

Approximately 20 truck movements would be generated to and from the Shoalhaven Starches Plant per day, based on maximum production levels. The Department is satisfied that this would be insignificant in the context of other traffic movements, noting that the predicted traffic movements would represent an increase of approximately 0.2% of the total traffic using the Great Western Highway.

To ensure that traffic and transport are appropriately managed, the Department has recommended the preparation and implementation of a Traffic Management Plan for the proposal. This plan includes a requirement for a driver's code of conduct, as recommended by RMS. The Department has also recommended a range of operating conditions, including limits on coal truck movements and requirements to minimise haulage during school bus times.

Subject to these recommended conditions, the Department is satisfied that the modification would have a minimal and acceptable impact on the road network.

6 RECOMMENDED CONDITIONS

The Department has prepared a draft Notice of Modification (see **Appendix F**) for the proposal. This includes conditions that are required to:

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

The conditions incorporate the recommendations of relevant government authorities where applicable, and the Department considers that they reflect best practice and provide a sound basis for managing the potential impacts of the proposal.

7 CONCLUSION

The Department has assessed the merits of the proposed modification in accordance with the requirements of the *Environmental Planning and Assessment Act 1979* and has considered the modification application, EA, submissions, response to submissions and additional information provided by Castlereagh Coal.

While the proposed modification must be assessed on its individual merits, the Department has also considered relevant aspects associated with the assessment of the Coalpac Consolidation Project and the findings of the Commission in its determination of Invincible Colliery – Modification 4.

The Department's assessment has found that the proposed modification is significantly different to prior proposals at Invincible and would have significantly less environmental impacts. In particular, the proposal would be unlikely to have any significant impacts on water resources, noise, air quality, aboriginal heritage, and traffic and transport.

The Department notes that the proposal has generally been designed to avoid impacts to the landscape including the significant values of the pagoda landform complex and EECs. In this regard, the proposal does not include any highwall mining that has previously been proposed on the site and also includes far less open cut mining within close proximity to pagodas and geodiversity features (i.e. 6 ha within 300m of pagodas compared with 57 ha for Modification 4).

Notwithstanding, the Department has found that the aspects of the proposal that involve mining through steep wooded slopes associated with the pagoda landform complex would result in increased short-term visual impacts associated with exposed mining areas and would induce risks associated with rehabilitation of steep areas, including the potential for slope instability and long-term visual impacts.

The Department considers that mining in steep areas would be incompatible with the conservation significance of the broader landscape and further mining in these areas should be restricted.

Consequently, the Department recommends that mining operations be prohibited from occurring within the steep areas of the site that are located closer to pagoda formations and geodiversity features.

This would mitigate the potential risks to the landscape and would ensure that:

- mining would be located at least 300m from pagodas and other geo-diverse features (in accordance with the minimum setback recommended in the Commission's review of the Coalpac Consolidation Project);
- any potential for blasting impacts on pagodas would be extremely low given the low blasting thresholds proposed and the increased flexibility that would be afforded to blast design by having a greater setback from these features;
- mining would not be undertaken in areas that have been identified as contributing to the significance of the pagoda landforms (i.e. the wooded slopes of the landscape);
- visual impacts would be reduced significantly such that any residual impacts would be insignificant in the context of the existing mining operation; and
- any risks associated with the rehabilitation of steep areas, including risk of long-term instability and visual impacts, would be effectively eliminated.

The proposed modification would involve the disturbance of up to 50 ha of native vegetation, including potential threatened habitat for the Squirrel Glider and Broad-headed Snake, and some threatened species including Capertee Stringybark.

The Departments recommendation to restrict mining from occurring on the steep wooded slopes would minimise any potential impacts on habitat for Broad-headed Snake and would also reduce impacts on threatened species including the Capertee Stringybark. Any residual biodiversity impacts, including those to the Broad-headed Snake would be offset through a comprehensive biodiversity offset package incorporating almost 368 ha of land based offsets and monetary payments to offset any residual impacts on Broad-headed Snake habitat.

With these measures in place the Department is satisfied that the proposal would have an insignificant impact on pagoda landforms, would be unlikely to impact on the conservation significance of the landscape as a whole, and would adequately compensate for any minor residual biodiversity impacts.

Furthermore, the Department believes that a reduction in the proposed mining footprint would strike an appropriate balance between ensuring the ongoing operation of the mine, the recovery of coal for use in Shoalhaven Starches, and the protection of landscape and conservation values associated with the surrounding pagoda landscape and the Ben Bullen State Forest.

In this regard, the Department notes that Shoalhaven Starches relies on a very specific specification of coal for approximately 30% of its power generation and that a reliable supply of coal is crucial for its ongoing operation. The proposed modification would ensure energy security for the Manildra Group for the next 8 years and provide some coal to the Mount Piper Power Station.

The proposal would have the added benefit of generating up to $12 million of revenue for the State in royalties and would inject approximately $9 million into the local economy.

Based on its assessment of the proposed modification, the Department considers that the proposed modification is approvable, subject to restricting mining from being undertaken on the steep sloped areas of the site and the imposition of strict conditions (outlined in **Appendix F**).

Recommended by:

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