NSW GOVERNMENT
Department of Planning

MAJOR PROJECT ASSESSMENT: Anvil Hill Coal Project

Director-General's
Environmental Assessment Report
Section 75I of the
Environmental Planning and Assessment Act 1979

June 2007

Cover photo: View from the project site to the southwest

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EXECUTIVE SUMMARY

Centennial Hunter Pty Limited (Centennial) proposes to establish a new open cut coal mine and associated infrastructure near Wybong in the Upper Hunter Valley (see Figure 1).

The proposal - known as the Anvil Hill Coal Project - involves the extracting, processing and transporting up to 150 million tonnes of coal over a period of 21 years for domestic and export markets.

The project has a capital investment value of $240 million, would contribute up to $324 million a year to the NSW economy, and employ around 240 people during operations.

The proposal constitutes a 'major project' under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act), and consequently the Minister is the approval authority for the project.

The Department exhibited the Environmental Assessment of the project for 6 weeks from 25 August 2006, and received 2,039 submissions on the proposal: 11 from government authorities and 2,028 submissions from special interest groups and the general public. Over 95% of these submissions objected to the project, raising concerns about a broad array of potential impacts including the greenhouse gas, flora and fauna, noise and blasting, dust, water, Aboriginal heritage and socio-economic impacts.

On 19 September 2006, the Minister appointed a Panel of Experts to assess key aspects of the project. This Panel comprised four independent experts chaired by Dr Andrew Refshauge, and reported to the Director-General in January and May 2007.

The Department has assessed the project application, EA, submissions on the project, Centennial's response to submissions, and the Panel's reports, in accordance with the objects of the EP&A Act and principles of ecologically sustainable development, and is satisfied that there is sufficient information available to determine the application.

This assessment has found that the project would have a number of adverse environmental impacts, most notably: the clearance of 1,304 hectares of native woodland vegetation of some conservation significance; the generation of significant greenhouse gas emissions; and the dislocation and disruption of the local community due to the large number of landowners (36, including 6 blocks of vacant land) that would be significantly affected due to the noise, blast and dust emissions of the project.

Nevertheless, the Department is satisfied that most of these impacts can be adequately mitigated, managed, offset and/or compensated for, and has recommended a range of comprehensive conditions to ensure this occurs.

In addition, the Department assessment recognises the significance and need for the project in terms of securing domestic and international energy needs, bolstering the regional and NSW economies, and generating jobs and employment opportunities in the State.

After careful consideration, the Department believes, on balance, that the project's benefits sufficiently outweigh its costs, and that it is therefore in the public interest.

Consequently, the Department recommends that the Anvil Hill Coal Project be approved, subject to strict conditions of approval.

1. PROPOSED PROJECT

1.1 Project Description

Centennial Hunter Pty Limited (Centennial) proposes to establish a new open cut coal mine in the Wybong area, 20 kilometres west of Muswellbrook and 10 kilometres north of Denman, in the Upper Hunter Valley (see Figures 1 and 2).

Figure 1: Regional Context

The proposal is known as the Anvil Hill Coal Project (the project). The major components of the project are summarised in Table 1, and depicted in Figures 3 and 4. The project is described in full in Centennial's Environmental Assessment (EA), which is attached as Appendix H.

Table 1: Major components of the project

Aspect	*Description*
Project Summary	**Open cut mine, extracting a total resource of 150 million tonnes of coal over 21 years, for processing and supply to both domestic electricity generation and export markets.** **Construction and operation of associated infrastructure and facilities, including a Coal Handling and Preparation Plant (CHPP), and rail and train loading infrastructure to facilitate transport of product coal to market.**
Mining and Reserves	Mining from 4 open cut pits at a rate of up to 10.5 million tonnes of run-of-mine (ROM) coal a year, using truck and shovel mining methods with cast blasting, to handle overburden and remove coal. The project is based on a coal reserve of approximately 150 Mt.
Mine Waste Rock Management	Waste rock would be deposited predominantly within mined-out voids, however some out-of-pit overburden emplacements would be developed prior to the establishment of pit voids.
Coal Washing	Construction and operation of a Coal Handling and Preparation Plant (CHPP) capable of processing up to 10.5 million tonnes a year of ROM coal.
Water Demand and Supply	Water demand would vary between 1 to 4 megalitres (ML) a day, mainly for coal processing and dust suppression. The water would be sourced from surface run-off within disturbance areas, groundwater inflows into mining areas, and from the Hunter River (via pipeline).
Water Supply Pipeline	A pipeline would be constructed to the site from the Hunter River, to supply up to 400ML/year (via acquisition of existing water licences). The water would be stored on-site in a dam upstream of the CHPP.
Coarse Rejects and Tailings Management	Coarse rejects would be placed predominantly within mined-out voids. Apart from initial tailings disposal in a surface tailings dam in the eastern area of the site, all tailings would be placed within in-pit tailings disposal areas.
Associated Facilities	Access roads and intersections, workshop and refuelling facilities, administration and employee facilities, and ancillary services.
Project Life	An expected project life of 21 years (from the date of grant of a mining lease).
Employment	Peak construction workforce of 200 employees and an operational workforce of 240 employees at peak production.
Capital Value	$240 million.
Construction	Construction of the rail loop, coal stockpiling, reclaim and train loading infrastructure, CHPP and mine facilities area would be undertaken over a period of approximately 1 year.
Hours of Operation	Mining operations would take place 24 hours a day, 7 days a week. Construction activities would be generally undertaken during daylight hours up to 7 days a week. Train loading facilities would be available 24 hours a day, 7 days a week (average of 4 trains per day).
Product Coal	Production of up to 8 million tonnes of saleable coal a year for domestic and export markets. Up to 2.5Mtpa is proposed to be supplied to Macquarie Generation's Bayswater and Liddell power stations.
Product Coal Transport	Product coal would be loaded onto trains and transported to market via the Project rail loop connected to the Muswellbrook-Ulan railway.
Mine Access and Roadworks	Access to site via mine access road to Wybong Road. Project involves upgrade of Wybong Road from the Bengalla Link Road to the mine access road.
Rehabilitation and Offsets	The project involves disturbance to 2,238 hectares of land, including 1,304 hectares of native trees. The project disturbance area would be progressively rehabilitated. The project includes an offset strategy comprising external (off-site) offsets of some 2,600 hectares of trees. Ultimately (through mine rehabilitation plus external offsets), the project would provide for the conservation of 4,100 hectares of trees.
Community Contributions	Project includes a voluntary planning agreement with Muswellbrook Council which would contribute $4.5 million toward community projects, community infrastructure, local environmental management and education and training.

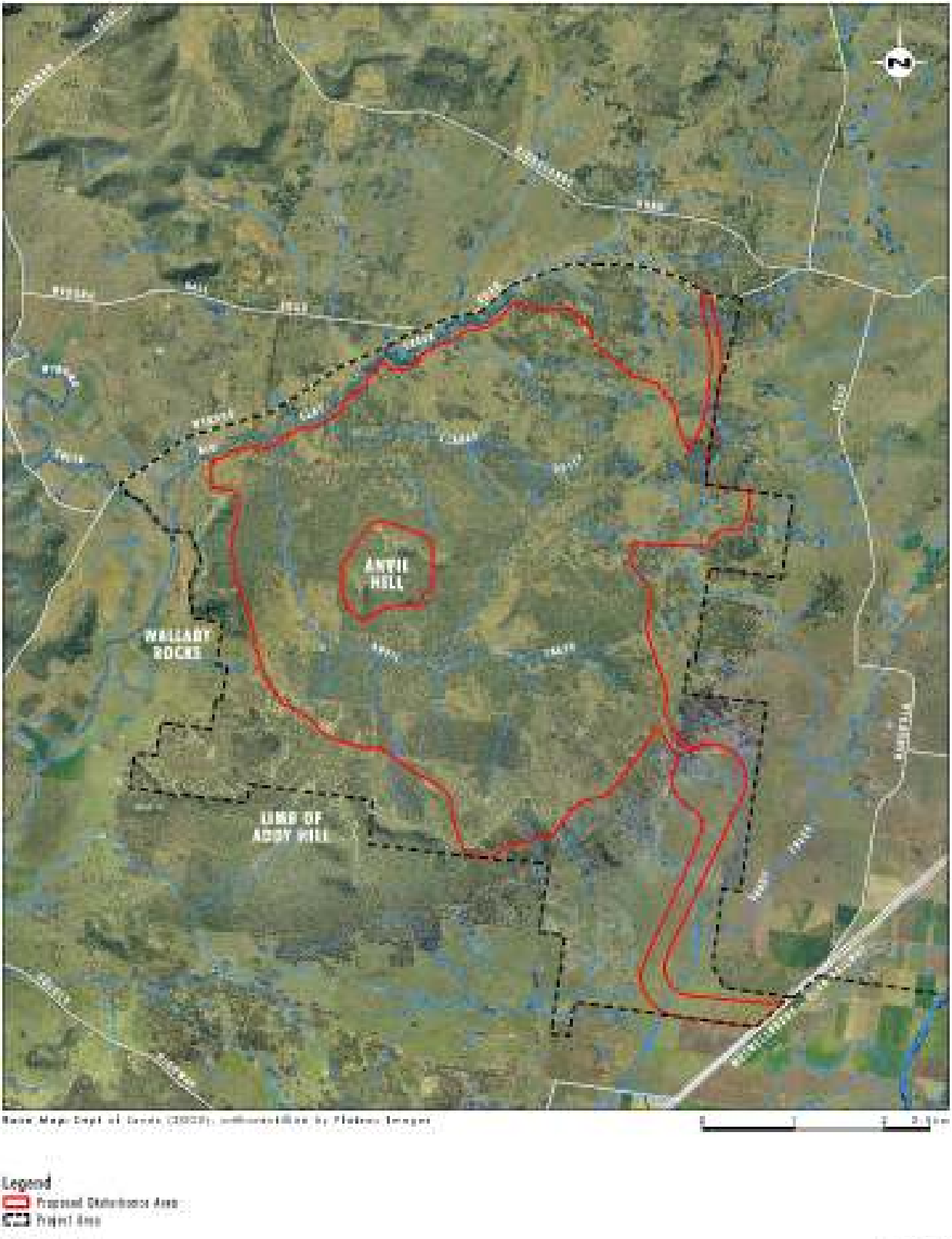

Figure 2: Site Plan

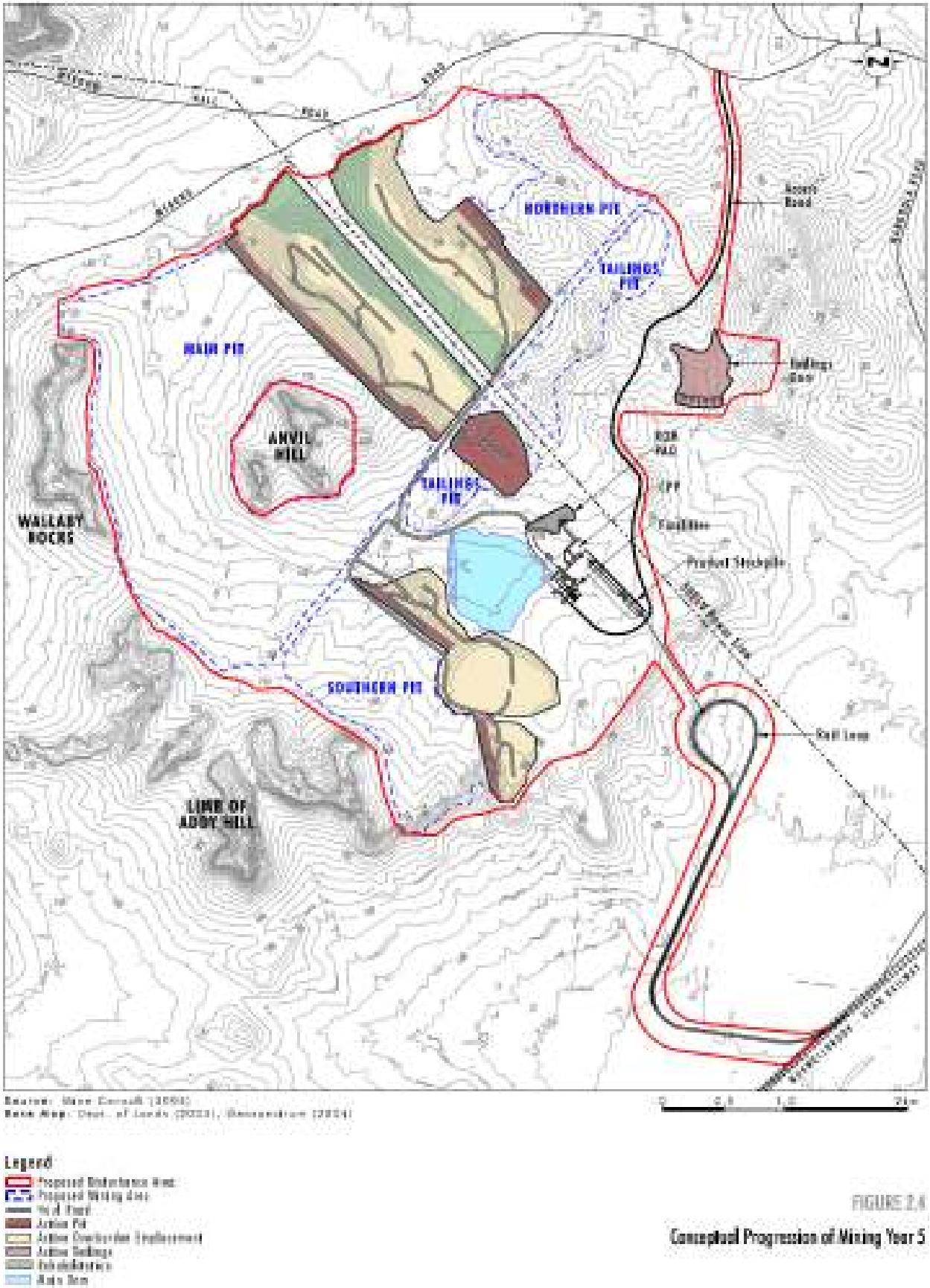

Figure 3: Project Layout – Year 5

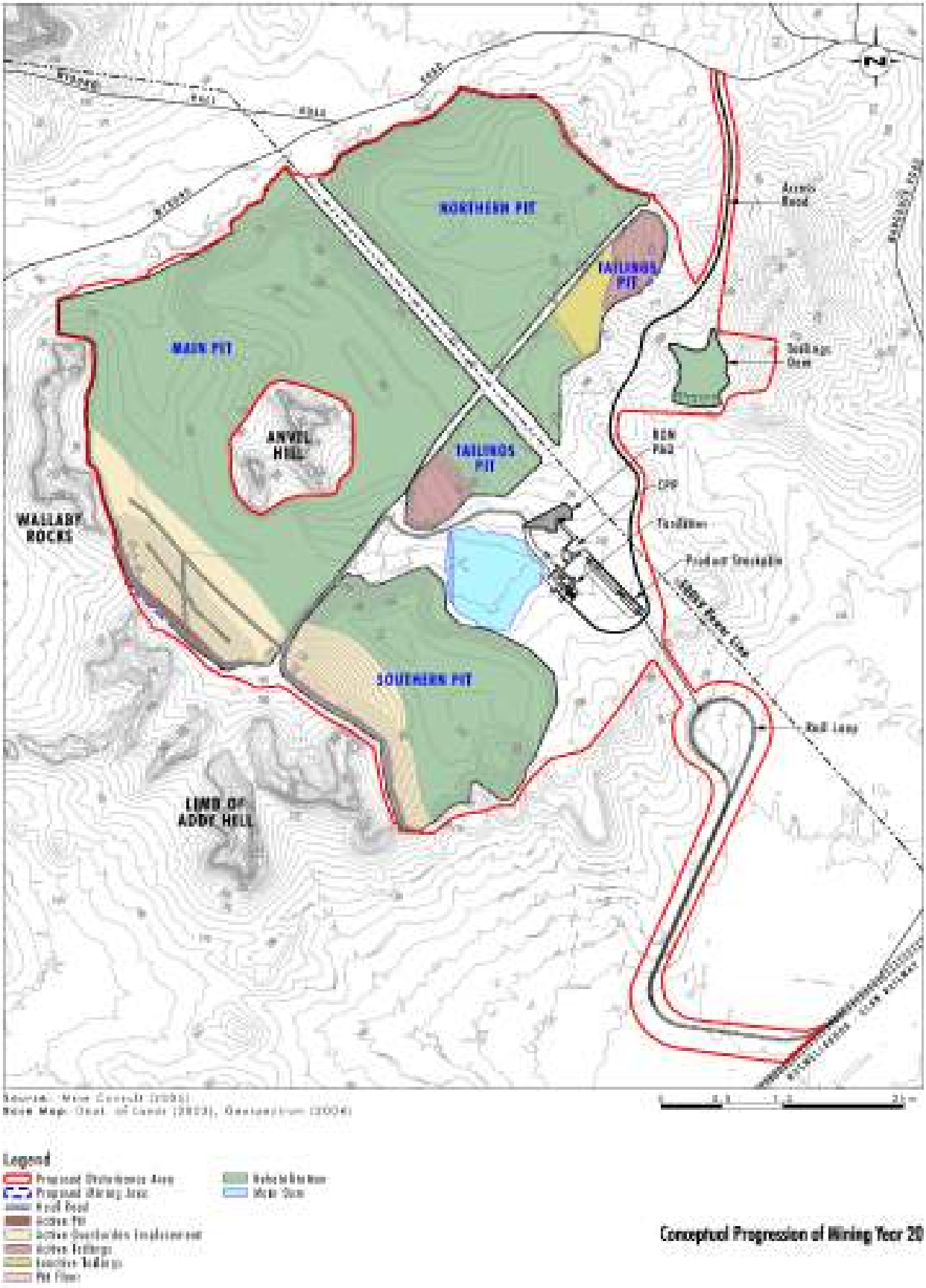

Figure 4: Project Layout – Year 20

1.2 Project Setting

The project is located 20 kilometres west of the town of Muswellbrook, 10 kilometres north of the town of Denman, 10 kilometres north-east of the village of Sandy Hollow, and lies within the locality of Wybong (see Figure 1).

The proposed mining area is characterised by rolling grazing land with remnant and regrowth woodland (see Figure 2). Two largely intermittent creeks, Anvil Creek and Clarks Gully, meander through the site.

The area around the site comprises a range of landscapes, including:

- Big Flat Creek and Wybong Creek to the north and west, and Sandy Creek and the Hunter River to the east and south-east;
- undulating grazing land on the valley floor; and
- hill country to the north, west and south, including Limb of Addy Hill immediately to the south and Wallaby Rocks immediately to the west. Anvil Hill, which is not proposed to be mined, is located in the middle of the proposed mining area.

Land use within the proposed mining area comprises low intensity agriculture (grazing) (see Figure 5).

Key land uses in the surrounding area (within the area predicted to be significantly affected by noise, dust and/or blasting associated with the project) include (in decreasing order of land area):

- Grazing;
- Intensive Agriculture – including pastoral grazing, irrigated agriculture (including lucerne) and dairying, particularly on the floodplain to the south-east, about 2.5 kilometres from the mining area at the closest point;
- Crown Land – to the north-west and west, about 2 kilometres from the mining area;
- Rural-residential – mainly to the north-west on Wybong Hall Road, about 1 kilometre from the mining area; and
- Vineyards – mainly to the south-east (about 2.5 kilometres from the mining area) and west (about 1.5 kilometres from the mining area).

Other key land uses in the surrounding area (outside the predicted significantly affected area) include:

- a Horse Stud – located 4 kilometres to the south-east;
- Tourist developments – three small scale (up to 5 cabins) tourist accommodation facilities located to the south, about 4 kilometres from the mining area at the closest point; and
- Community facilities – including 2 churches, 1 cemetery and Wybong Hall, about 1.5 kilometres from the mining area at the closest point.

Key infrastructure in the area includes:

- the regional road network including Wybong Road immediately to the north, the Golden Highway about 4 kilometres to the south-west, and Denman Road about 5 kilometres to the south-east;
- the Muswellbrook to Ulan railway line, 3 kilometres to the south-east; and
- a 500kV electricity transmission line which dissects the site from north-west to south-east (see Figure 3).

There are a number of coal mining tenements in the wider Muswellbrook area (see Figure 6). The closest operating mine is the Bengalla open cut coal mine, located approximately 12 kilometres east of the project site.

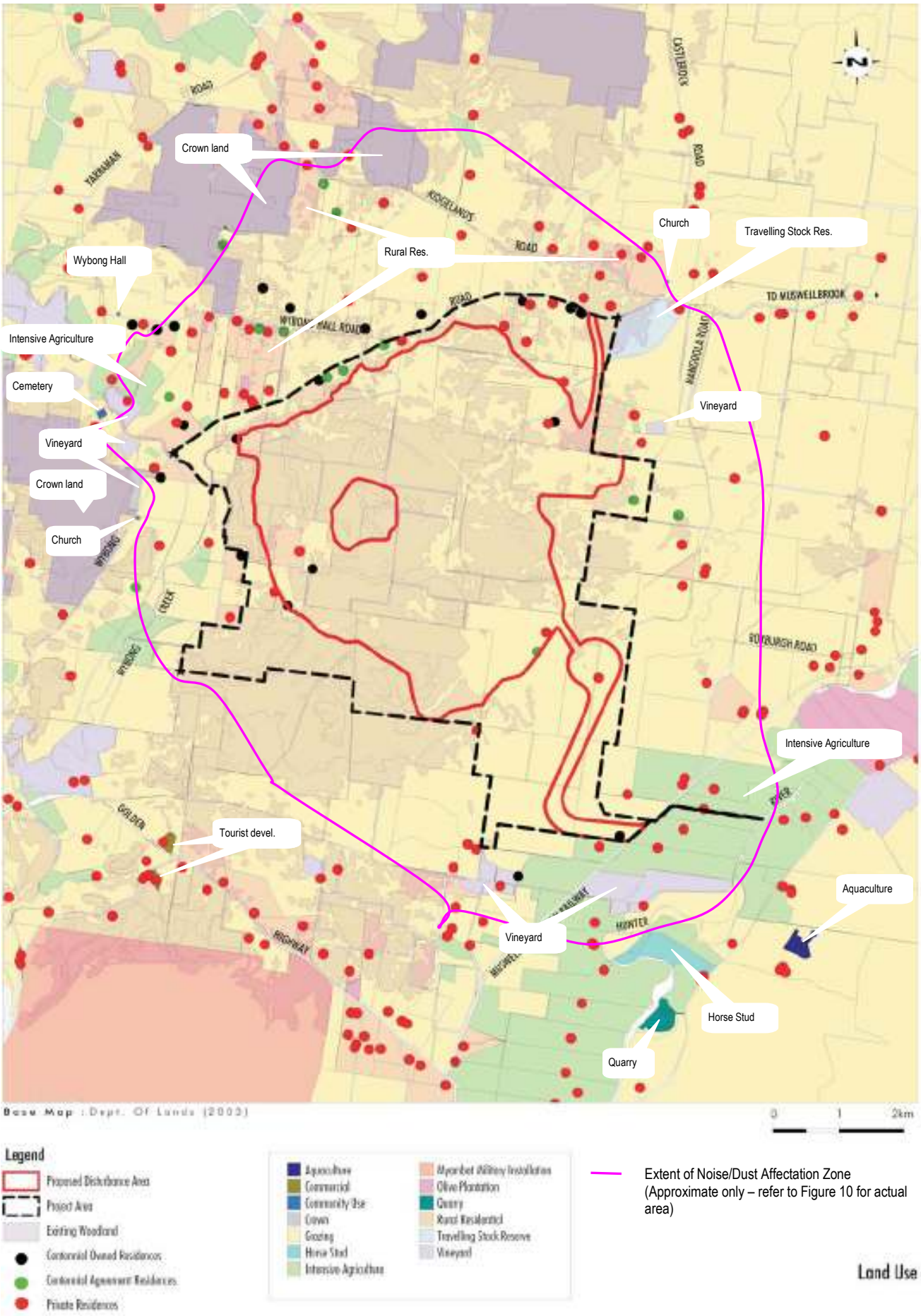

Figure 5: Landuse Plan (Note: Property ownership status as at EA date)

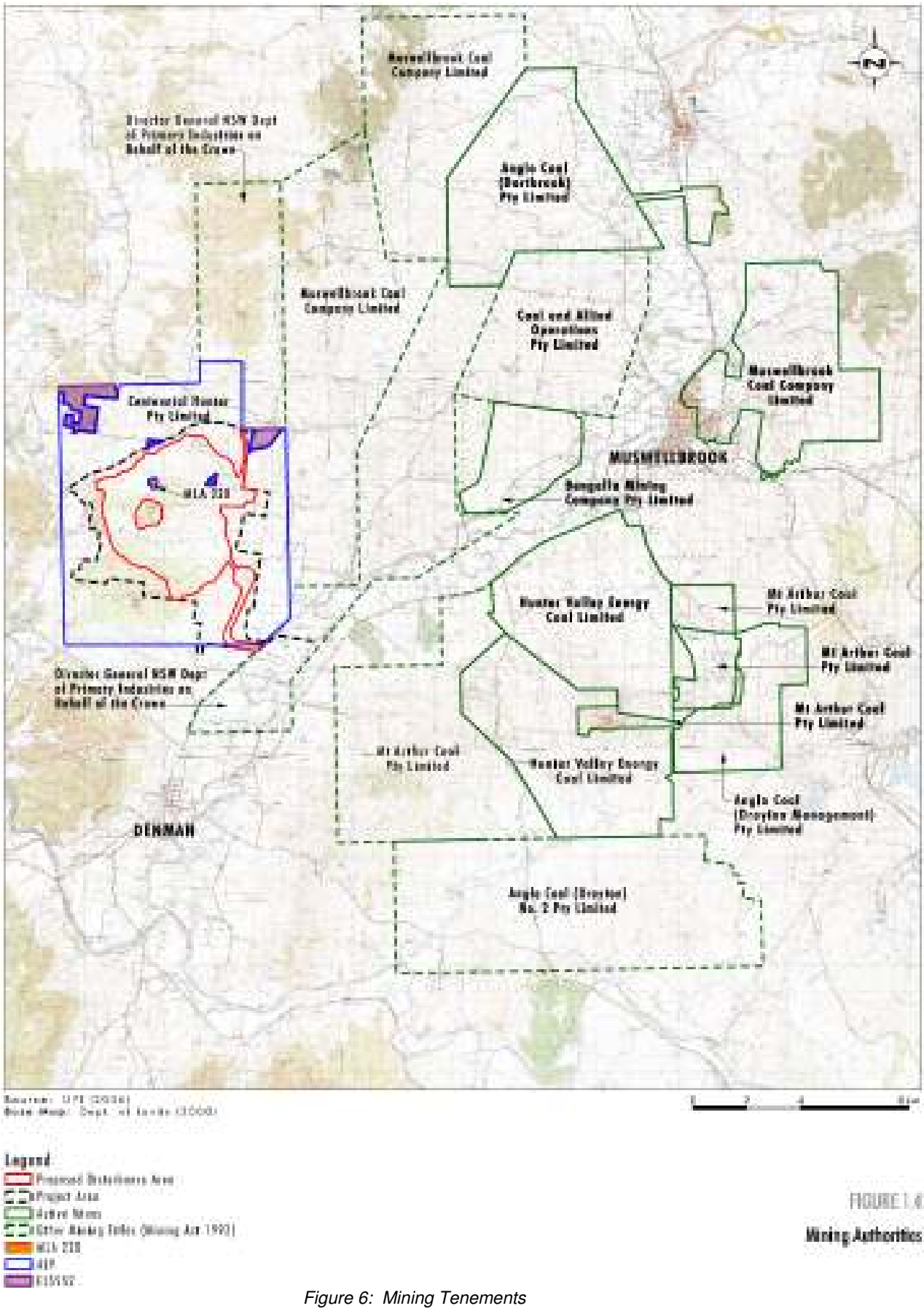

Figure 6: Mining Tenements

1.3 Project Need

One of the key issues raised in submissions to the project has been the project's contribution to global warming/climate change.

The Department recognises that the burning of coal for energy production produces large amounts of greenhouse gas (GHG) emissions, which contributes to global warming and climate change. The stationary energy sector represents some 47.6% of Australia's total GHG emissions.

However, the Department also recognises that society – both at a domestic and international level – is currently heavily reliant on coal to meet its basic energy needs. Coal provides around 90% of NSW's energy needs, 75% of Australia's energy needs, and 40% of global energy needs.

Current and predicted demand for coal as an energy source is outlined in government publications including the NSW Government's *Energy Directions Green Paper, 2004*, and the Commonwealth Government's White Paper, *Securing Australia's Energy Future, 2004*. The figure below, from the White Paper, illustrates Australia's current and projected energy mix over the next 15 years.

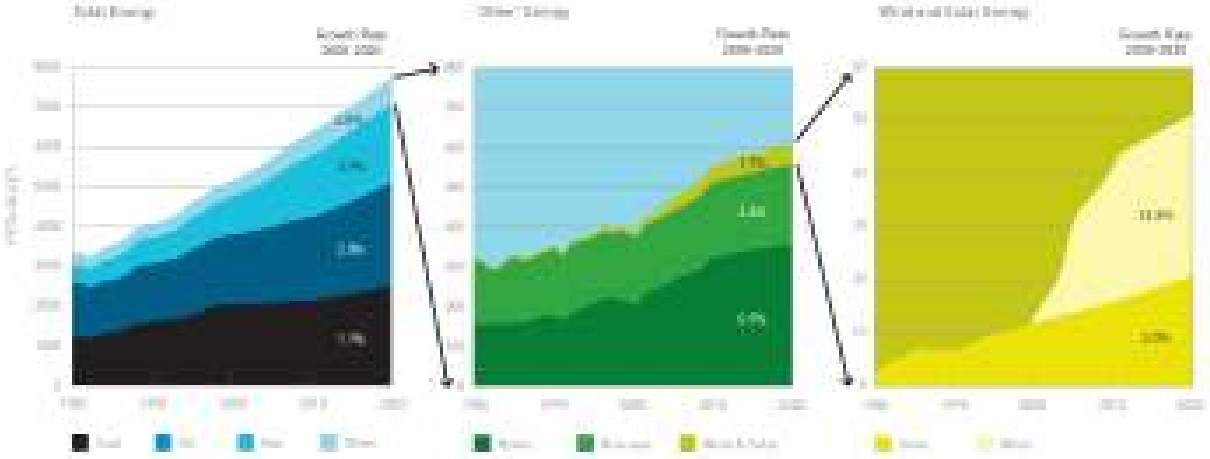

Figure 7: Composition of Australia's energy supply (Source: Securing Australia's Energy Future, 2004)

As shown, coal is predicted to be a significant contributor to Australia's energy demand for the foreseeable future, and at least over the lifetime of the proposed Anvil Hill mine. By 2025, coal as a proportion of total electricity production is predicted to reduce to 70% of Australia's energy needs, and 38% of global energy needs.

A comparison of global coal demand versus global coal supply is shown in the following table.

Table 2: Global Coal Supply and Demand

Year	***Coal Demand/ Consumption (million tonnes)***	***Coal Supply/Production (million tonnes)***
2005	4,973	4,980
2025-2030 (predicted)	7,029	7,557

As shown in the table and the above figure, there is a gap of some 2,049 million tonnes between current annual global coal supply and projected global coal demand in the year 2025. Accordingly, there is a need to develop new coal deposits to meet projected societal demand for energy, based on current NSW and Commonwealth Government forecasts. (The Anvil Hill coal project would supply 0.2% of 2005 global coal demand, and 0.1% of 2025 global coal demand).

These Government energy papers, and the projected energy demands shown in the above table, consider energy efficiency measures and alternative (or renewable) energy sources, including the ability of alternative energy sources to supply base-load energy requirements based on existing technologies.

The assessments indicate that, at current levels of technological development, alternative energy sources are not able to supply enough energy to offset the demand for continued use of fossil fuels including coal. Similarly, energy efficiency measures would not offset the need for continued coal consumption, based on current estimates.

With regard to alternative energy sources, the Commonwealth Government's Energy White Paper states:

> *'Impediments exist to the use of some of these sources. Gas reserves, while substantial, are mostly far from major domestic markets and cannot be delivered in large volumes without significant additions to pipeline or shipping capacity. Australia's large-scale hydro potential is largely exploited, with little scope for expansion. Wind and solar are intermittent, which will limit their penetration in the longer term unless affordable electricity storage becomes available. Use of uranium reserves raises cost, safety and waste disposal issues in power generation. While industrialised countries on average generate 24 per cent of electricity from nuclear power (IEA 2002 b), Australia is not contemplating the domestic use of nuclear power. Other potential low-emission electricity sources, like electricity produced using 'hot dry rocks' or fossil fuel generation with capture and storage of emissions, are yet to be commercially demonstrated.*
>
> *Many of these impediments can be overcome with sufficient expenditure. However, wide-scale uptake of low-emission base load electricity generation at current costs would lead to substantial increases in electricity prices, which would reduce Australia's competitiveness. This situation will remain for some time, even though the cost of many energy sources is falling.'*

The NSW Energy Green Paper identifies similar constraints, and notes that:

> *'Renewable and low emission technologies have an important contribution to make to meeting NSW electricity demand. In the long term, their potential could be enormous.*
>
> *The current focus for the Government is on ensuring that these technologies continue to be developed and applied, so that their current technical and cost barriers are overcome, and they can make a more substantial contribution to NSW energy supply in the longer term.'*

Given these energy demand assessments, the Department believes that, although alternative and low emission technologies offer considerable promise, there is and will continue to be an identified need for the development of new coal mines to meet basic domestic and international energy requirements, at least for the foreseeable future.

The Department is therefore satisfied that there is a demonstrable need for the Anvil Hill coal project in terms of meeting society's need for adequate, reliable and affordable energy.

It must be noted that if the Anvil Hill coal project was not allowed to proceed, the resultant gap in the coal supply would almost certainly be filled by another coal resource either in NSW, Australia or overseas. In other words, removing the GHG emissions from the Anvil Hill project would not likely result in any decrease in global CO_2 emissions.

2. STATUTORY CONTEXT

2.1 Major Project

The proposal is classified as a major project under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act), because it is development for the purpose of coal mining, and therefore triggers the criteria in Clause 5 of Schedule 1 of *State Environmental Planning Policy (Major Projects) 2005*.

Consequently, the Minister for Planning is the approval authority for the project.

This is consistent with past practice over the last 25 years (ie. since the introduction of the EP&A Act), where the Minister has always been the approval authority for major coal projects.

2.2 Permissibility

Under Section 75J of the EP&A Act, the Minister cannot approve the carrying out of a project that would be wholly prohibited under an environmental planning instrument.

The land subject to the application is primarily zoned 1(a) (Rural "A" Zone) under the *Muswellbrook Local Environmental Plan 1985*, with a smaller portion zoned 7(d) (Environment Protection (Scenic) Zone). In addition, part of the proposed rail loop is on land zoned 7(L1) Environment Protection General (Alluvial Areas) and 5(b) Special Uses "B" (Railways).

Mining is permissible with consent in zone 1(a), and development for railway purposes is permissible in zone 5(b). However, open cut mining is prohibited in the 7(d) zone, and mining/railway works are prohibited in zone 7(L1) (see Figure 8).

However, as the project is permissible with consent on the vast majority of the site, the Department is satisfied that the Minister may approve the project.

2.3 Exhibition and Notification

Under Section 75(3) of the EP&A Act, the Director-General is required to make the Environmental Assessment (EA) of a project publicly available for at least 30 days.

After accepting the EA for the project, the Department:

- made it publicly available for a period of 6 weeks from 25 August until 6 October 2006:
  - on the Department's website, and
  - at the Department's Information Centre, Muswellbrook Shire Council, Denman Library, and the Nature Conservation Council;
- notified landowners in the vicinity of the site about the exhibition period by letter;
- notified relevant State government authorities and Muswellbrook Council by letter; and
- advertised the exhibition in the Newcastle Herald, Muswellbrook Chronicle and Hunter Valley News.

This satisfies the requirements in Section 75H(3) of the EP&A Act.

During the assessment process the Department also made a number of documents available for download on the Department's website. These documents included the:

- project application;
- Director-General's environmental assessment requirements;
- EA;
- Centennial's responses to issues raised in submissions; and
- Independent Hearing and Assessment Panel's Terms of Reference and Report.

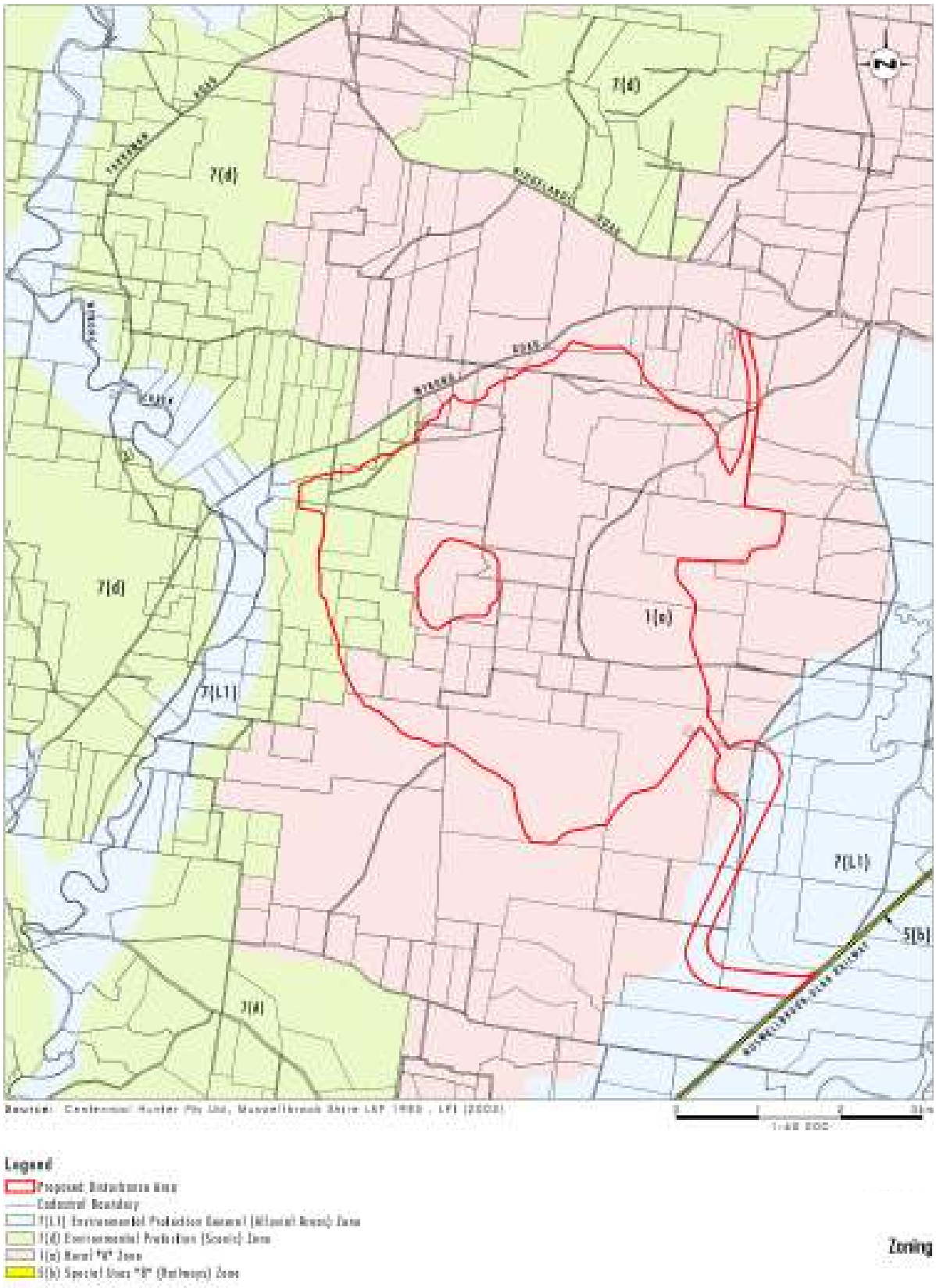

Figure 8: Zoning Plan

2.4 Legal Proceedings

On 19 September 2006, Mr Peter Gray lodged a Class 4 procedural appeal in the Land and Environment Court against the Minister, the Director-General and Centennial.

Mr Gray claimed that the EA for the project was inadequate because it did not include (and was not required to include) an assessment of the greenhouse gas emissions generated by the downstream use (or combustion) of the coal produced by the project.

Prior to the start of the formal proceedings, Centennial provided a detailed reassessment of the potential greenhouse gas-related impacts of the project, including consideration of downstream greenhouse gas emissions (as part of its response to submissions – see Appendix E).

Justice Nicola Pain heard the appeal in November 2006, and handed down her judgment on 27 November 2006 (see Appendix F). Justice Pain found that there is a 'sufficiently proximate link' between the mining of a large coal resource and the downstream emission of greenhouse gas emissions which contribute to global warming/climate change, such that these downstream emissions should be considered in the Minister's assessment of the project.

Justice Pain also confirmed and commented on the Minister's requirement to consider the principles of ecologically sustainable development (and other objects of the EP&A Act) in his assessment of the project.

However, the Court's ruling did not invalidate the assessment process for the project.

2.5 Independent Hearing and Assessment Panel

On 19 September 2006, the Minister for Planning directed that an Independent Hearing and Assessment Panel (Panel of Experts) be constituted in accordance with Section 75G of the EP&A Act to assess key aspects of the project in more detail.

The Panel was required to:

1. *consider and advise on the:*
   - *(a) following impacts of the project:*
     - *noise and blasting;*
     - *air quality, in particular dust impacts; and*
     - *flora and fauna, in particular vegetation offsets;*
   - *(b) relevant issues raised in submissions in regard to these impacts; and*
   - *(c) adequacy of the proponent's response to the issues raised in submissions; and*
2. *identify and comment on any other significant issues raised in submissions or during the panel hearings.*

The Panel comprised:

- Dr Andrew Refshauge (chair);
- Mr Najah Ishac (noise and blasting);
- Mr Robin Ormerod (air quality and dust); and
- Dr David Robertson (flora and fauna).

The Panel held hearings with community stakeholders, Government agencies and Centennial in Muswellbrook from 17 to 19 October 2006. A total of 28 parties made presentations to the Panel.

The Panel reported to the Director-General in mid January 2007, and provided a supplementary report on greenhouse gas emissions associated with the project in May 2007.

A copy of both of the Panel's reports is attached as Appendix C. Under Section 75J of the EP&A Act, the Minister is required to consider the Panel's reports in deciding whether or not to approve the project.

The Panel's reports contain 33 recommendations relating to the noise, blasting, air quality and flora and fauna impacts of the project.

The Department has considered the Panel's findings and recommendations in the relevant sections of this report, and adopted most of the Panel's recommendations in its recommended conditions of approval.

The only significant departure is the Panel's recommendation for a 2 to 1 offset for native grassland (in addition to a 2 to 1 offset for trees). This issue is discussed in Section 4.6 below. In summary, the Department and the DECC are satisfied that the proposed offsets (comprising 2,800 hectares), and the proposed mine rehabilitation (comprising 2,238 hectares), would provide adequate habitat for native grassland.

2.6 Environmental Planning Instruments

Under Section 75I of the EP&A Act, the Director-General's report is required to include a copy of or reference to the provisions of any *State Environmental Planning Policy* (SEPP) that substantially governs the carrying out of the project.

The Department has considered the project against the relevant provisions of several SEPPs (including SEPPs 11, 33, 44, and 55), and is satisfied that none of these SEPPs substantially govern the carrying out of this project. Nevertheless, it has considered the relevant provisions of these SEPPs in Appendix D.

2.7 Objects of the Environmental Planning and Assessment Act 1979

The Minister is required to consider the objects of the EP&A Act when he makes decisions under the Act. These objects are detailed in Section 5 of the Act, and include:

'The objects of this Act are:

(a) to encourage:

- *(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,*
- *(ii) the promotion and co-ordination of the orderly and economic use and development of land,*
- *(iii) the protection, provision and co-ordination of communication and utility services,*
- *(iv) the provision of land for public purposes,*
- *(v) the provision and co-ordination of community services and facilities, and*
- *(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and*
- *(vii) ecologically sustainable development, and*
- *(viii) the provision and maintenance of affordable housing, and*

(b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and

(c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.'

The objects of most relevance to the Minister's decision on whether or not to approve this project are those under Section 5(a)(i), (ii), (iii), (vi) and (vii).

With respect to ecologically sustainable development (ESD), the EP&A Act adopts the definition in the *Protection of the Environment Administration Act 1991*. Section 6(2) of that Act states that ESD *'requires the effective integration of economic and environmental considerations in decision-making processes'* and that ESD *'can be achieved through'* the implementation of the principles and programs including the precautionary principle, the principle of inter-generational equity, the principle of conservation of biological diversity and ecological integrity, and the principle of improved valuation, pricing and incentive mechanisms. In applying the precautionary principle, public decisions should be guided by careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment and an assessment of the risk-weighted consequences of various options.

The Department has fully considered the objects of the EP&A Act, including the encouragement of ESD, in its assessment of the project application.

This assessment integrates all significant economic and environmental considerations and seeks to avoid any potential serious or irreversible damage to the environment, based on an assessment of risk-weighted consequences.

Centennial has also considered a number of alternatives to the proposed project (including the alternative of not proceeding), undertaken an environmental risk analysis of the project, and considered the project in the light of the principles of ESD.

2.8 Statement of Compliance

Under Section 75I of the EP&A Act, the Director-General's report is required to include a statement relating to compliance with the environmental assessment requirements with respect to the project.

The Department is satisfied that the environmental assessment requirements have been complied with.

3. ISSUES RAISED IN SUBMISSIONS

During the exhibition period, the Department received a total of 2,039 submissions on the project:

- 11 from public authorities;
- 40 from special interest groups; and
- 1,988 submissions from the general public, including 1,305 form letters.

A summary of the issues raised in submission is provided below. A full copy of these submissions is attached in Appendix G.

3.1 Public Authorities

The ***Department of Primary Industries*** (DPI) does not object to the project, but recommended a number of conditions of approval covering:

- general environmental management and reporting;
- rehabilitation management and final void/landform design;
- maintaining and promoting viable and sustainable agricultural landuses;
- contingency planning for unforseen impacts on surface water and groundwater resources; and
- rehabilitation of streams affected by the project to ensure no net loss of stream length and the free passage of fish.

The ***Department of Environment and Climate Change*** (DECC) (formerly the Department of Environment and Conservation) initially stated that it could not support the project as currently presented [at the time of the EA], for the following reasons:

- *Noise and vibration* – in particular, that the project would 'represent an unacceptable impact on an entire community', because it would [at the time of the EA] have a significant noise impact on 82 privately owned residences, and a moderate noise impact on a further 73 residences properties;
- *Air quality* – The DECC considered that the air quality impacts predicted in the EA may have been underestimated and that about 31 privately-owned residences would likely experience air quality impacts above acceptable levels;
- *Flora and fauna* – The DECC considered that the project would have a significant impact on 2 threatened flora species, 13 threatened fauna species and 4 vegetation communities of moderate to high conservation significance, and that Centennial's proposed vegetation offset strategy was inadequate;
- *Aboriginal cultural heritage* – in particular, the impact of blasting on culturally significant rock shelters and landscape features; and
- *Water resources* – in particular, that saline water should be required to be retained on site and not discharged.

The DECC recommended that any project approval be subject to a requirement for Centennial to reach negotiated agreements with all significantly noise affected residents. Following the provision of additional information from Centennial, including revised information on the number of significantly affected properties, the DECC has subsequently indicated its recommendation is that negotiated agreements should be in place for significantly affected properties before mining commences, *'or the pursuit of such agreements must be given the highest priority'*. The issues raised by DECC are discussed in detail in Section 4 of this report.

The ***Department of Water and Energy*** (DWE) (formerly the Department of Natural Resources) also initially stated that it could not support the project, as it considered the project (particularly its access to water supplies) to be potentially inconsistent with the water sharing principles under statutes and policies including the *Water Management Act 2000* and the *Wybong Creek Water Sharing Plan*.

Following the provision of additional information from Centennial, including advice that water supply for the project would comply with the requirements of the Water Management Act, the DWE, whilst reiterating its concerns regarding water access for the project, acknowledged that access to adequate water supply for the project is a commercial risk for Centennial. This issue is addressed further in Section 4.5 of this report.

The DWE also raised concerns about the mine's impact on groundwater dependent ecosystems, including Swamp Oak Riparian Forest and Rough Barked Apple Woodland along Big Flat Creek, and Forest Red Gum Riparian Woodland along Anvil Creek and Clarks Gully.

The ***Hunter – Central Rivers Catchment Management Authority*** (CMA) does not object to the project, but raised concerns similar to those of the DWE regarding the need to ensure equitable water sharing between the environment and other users within the catchment, and the need to protect groundwater dependent ecosystems. The CMA also raised concerns regarding:

- *Water resources* – in particular:
  - stream salinity;
  - the need for comprehensive water management planning;
- *Flora and fauna* – including:
  - the significant (1,300 hectare) clearing of treed vegetation required;
  - the significance of native vegetation at Anvil Hill;
  - the project's impacts on threatened species and endangered ecological communities (Weeping Myall Woodland);
  - adequacy of the proposed vegetation offsets; and
  - adequacy of the proposed buffer to Big Flat Creek, and its potential impact on riparian vegetation.

The ***Department of Lands*** (DoL) does not object to the project but raised a number of concerns regarding:

- *Crown lands* – including the impact of the project on the Upper Hunter conservation corridor and the Manobalai Crown Reserves (which are subject to undetermined Aboriginal Land Claims), and the project's impact on the multiple use objectives for Crown land under the *Crown Lands Act 1989*;
- *Flora and fauna* – particularly the conservation significance of the Hunter Valley floor vegetation within the project area, and the project's impacts on threatened species;
- *Water resources* – including surface water and groundwater flow and quality impacts, particularly in Big Flat Creek, Wybong Creek and Sandy Creek; and
- *Aboriginal cultural heritage* – impacts on Aboriginal cultural heritage, particularly on Crown land.

The DoL recommends that, if approved, Centennial should be required to purchase the applicable Crown lands.

The ***Mine Subsidence Board*** (MSB) does not object to the project, but noted that the site is located within the Muswellbrook Mine Subsidence district and hence all surface improvements would require the approval of the MSB prior to development.

The ***NSW Heritage Office*** does not object to the project but noted that, although the heritage surveys indicate that no items of State or National heritage significance would be affected by the

project, the area contains several items of local significance. The Heritage Office raised some concerns about aspects of the heritage survey methodology and adequacy of the heritage impact assessment. Notwithstanding, the Heritage Office commented that it was clear that the identified heritage items do not warrant in-situ conservation, and the authority forwarded number of recommended conditions for the project, if approved.

The ***Roads and Traffic Authority*** / ***Hunter Regional Development Committee*** does not object to the project, subject to certain issues regarding mine access and traffic management being adequately addressed.

Muswellbrook Shire Council supports the project, subject to conditions, primarily because of its socio-economic benefits, including increased local employment opportunities and contribution to community infrastructure and facilities. Notwithstanding, Council raised a number of issues regarding:

- noise impacts;
- surface and groundwater impacts, and use of Hunter River water;
- consistency with the Muswellbrook LEP;
- traffic issues;
- threatened species impacts;
- visual impacts;
- health impacts from dust emissions;
- consistency of the project with the principles of ecologically sustainable development; and
- isolation of Anvil Hill.

Council recommended a number of conditions to manage these issues.

Singleton Shire Council does not object to the project itself, but resolved to support submissions put forward by community groups including the Hunter Thoroughbred Breeders Association and the Upper Hunter Winemakers Association, which object to the project. Council requested that the Department consider the issues raised by these community groups.

3.2 Community and Interest Groups

Of the 2,028 submissions from the community and special interest groups, 1,944 (96%) objected to the project, 30 (1%) did not object but raised concerns, and 54 (3%) supported the project.

Special interest groups and organisations that made submissions include:

- Anvil Hill Project Watch Association;
- Australasian Native Orchid Society;
- ALP - New Lambton South Branch;
- Clarence Environment Centre;
- Clarence Valley Conservation Coalition;
- Climate Action Network Australia;
- Climate Action Newcastle;
- Climate Change Australia;
- Coast & Wetlands Society Incorporated;
- Friends of the Earth International;
- Greenpeace Australia;
- Hunter Business Chamber;
- Hunter Community Environment Centre;
- Hunter Environment Lobby Inc.;
- Hunter Thoroughbred Breeders Assoc.;
- HunterNet Co-operative Ltd;
- Maitland Greens;
- Mineral Policy Institute;
- Minewatch;
- Mudgee District Environment Group Inc;
- Muswellbrook Chamber of Commerce.;
- Nature Conservation Council;
- North East Forest Alliance Hunter Region;
- NPA Southern Highlands;
- Rising Tide Newcastle;
- Sandy Hollows Progress Association;
- The Hunter Bird Observers Club;
- The National Trust of Australia (NSW);
- The University of New South Wales;
- Total Environment Centre Inc.;
- Upper Hunter Country Tourism;
- Upper Hunter Winemakers Assoc.;
- Waverley Greens;
- World Wide Fund for Nature Australia;
- Wybong Water Users' Association.

The main grounds for objection from both individuals and interest groups were (in decreasing order of mention):

- *Greenhouse gas emissions and global warming/climate change* – 91% of submissions, including all of the form letters, raised concerns regarding the project's contribution to global warming/climate change, primarily associated with the downstream burning of the coal extracted by the project;

- *Flora and fauna* – 83% of submissions, including almost all of the form letters, raised concerns regarding the large amount of native treed vegetation clearing required for the project (ie. 1,300 hectares), the project's impacts on threatened species and endangered ecological communities, the conservation significance of the vegetation and habitat on the site, and the inadequacy of the proposed vegetation offset strategy;
- *Water resources* – 70% of submissions, including most of the form letters, raised concerns about the project's direct and indirect impacts on local and regional creeks and rivers, impacts on surface water and groundwater availability and equitable water sharing within the catchment, salinity impacts, and other water quality impacts;
- *Aboriginal heritage* – 66% of submissions, including most of the form letters, raised concerns about the project's impacts on sites of Aboriginal heritage significance;
- *Socio-economic impacts* – 56% of submissions raised concerns about the project's impact on the social fabric of the Wybong and surrounding communities, primarily because of:
    - the large amount of land acquisition required for the project, and the resulting dislocation of residents;
    - the impacts of the project on other industries (including agriculture, wine growing, horse breeding, tourism, etc.); and
    - the general reduction to the area's amenity associated with the project's environmental impacts (particularly noise and dust);
- *Air quality* – 7% of submissions, including a large number from local residents, raised concerns about the amenity and health impacts associated with dust emissions from the project on people, livestock, other landusers and the environment; and
- *Noise and blasting* – 6% of submissions raised concerns about the noise and blasting impacts on residents, livestock, Aboriginal rock shelters and the environment.

Submissions also raised a number of other concerns, including visual amenity, traffic and non-indigenous heritage.

Submissions in support of the project generally cited employment and socio-economic benefits as reasons why the project should be approved.

3.3 Response to Submissions

Centennial has provided responses to the issues raised in submissions (see Appendix E), as well as a revised Statement of Commitments for the project. These have been made publicly available on the Department's website.

The Department has considered the issues raised in submissions, and Centennial's responses to these issues, in its assessment of the project.

4. ASSESSMENT

4.1 Greenhouse Gas Emissions

Issue

The project would generate direct and indirect greenhouse gas (GHG) emissions, that would contribute to global warming and climate change.

Consideration

Project GHG Assessment

The EA included a detailed Energy and Greenhouse Gas Assessment, undertaken by SEE Sustainability Consulting Pty Ltd. This assessment was undertaken in accordance with applicable GHG guidelines, including:

- the World Business Council for Sustainable Development and World Resource Institute's *Greenhouse Gas Protocol 2004* (GHG Protocol); and
- the Australian Greenhouse Office's *Factors and Methods Workbook, December 2005* (AGO Workbook).

The assessment calculated 'Scope 1' GHG emissions (ie. direct GHG emissions from sources controlled by Centennial) and 'Scope 2' emissions (ie. indirect emissions associated with the

import of electricity), but did not include consideration of 'Scope 3' emissions (ie. other indirect emissions, such as those associated with the downstream combustion of the coal).

At the time of the EA, this approach was consistent with contemporary environmental assessments for coal mining proposals in NSW.

A large number of public submissions (91%) raised concerns about the GHG emissions associated with the project, particularly those emissions associated with the downstream burning of the coal in power stations. The key GHG-related issues raised included:

- that the EA should have included assessment of the downstream (or Scope 3) GHG emissions and impacts;
- that the EA failed to assess some Scope 1 and Scope 2 emissions adequately;
- that the project would significantly contribute to, or accelerate, global warming/climate change, due to the production of coal which, when burnt, would produce an estimated 27 million tonnes of GHG emissions annually, equating to:
  - 5% of Australia's national GHG emissions; and
  - doubling the number of cars on NSW roads;
- that coal is 'old technology' and the demand for continued use of coal will reduce in coming years;
- that the project is inconsistent with NSW Government policy on GHG emissions; and
- that the EA failed to consider the environmental impacts of global warming/climate change, the principles of Ecologically Sustainable Development (ESD), and the cumulative impacts of the project's GHG emissions.

In response to the issues raised in submissions, and the proceedings in the Land and Environment Court (see Section 2.4, and Appendix F), Centennial has prepared a revised Energy and Greenhouse Gas Assessment which includes consideration of Scope 3 emissions, and assessment of the project's contribution to climate change/global warming.

GHG Emissions Generated by the Project

The main GHG emissions associated with the project are shown in the following table.

Table 3: Project GHG Emissions

Scope	***GHG source(s)***	***Annual average GHG emissions (tonnes carbon dioxide equivalent, TCO_2e)***	***Total project GHG emissions (TCO_2e)***
Scope 1	Diesel, explosives, methane, spontaneous combustion, slow oxidation	123,207	2,464,139
Scope 2	Upstream electricity	61,006	1,220,117
Scope 3	Downstream electricity, diesel	34,881	697,620
	Downstream coal combustion	12,414,387	248,287,755
Total		**12,633,481**	**252,669,631**

The assessment indicates that 98% of the total GHG emissions generated as a consequence of the project are those associated with the downstream burning of the product coal at power stations – ie. Scope 3 indirect emissions.

As outlined above, many of the submissions claimed that the project would produce up to 27 million tonnes of CO_2 annually from the downstream burning of the coal, and that this equates to doubling the number of cars on NSW roads. Centennial's assessment indicates that the actual figure (ie. 12.7 million tonnes) is significantly lower than that claimed in submissions.

It is noted that some submittors claimed to have found discrepancies and/or omissions in Centennial's revised GHG inventory assessment, including a potential underestimation of Scope 3 emissions (by up to 13%) associated with the GHG emissions factor used. The Panel has reviewed this issue, and is satisfied that the Scope 3 emission factor used by Centennial is correct. The Panel also reviewed the GHG emission sources that were omitted from Centennial's assessment – including waste disposal, employee commuting, emissions from

purchased goods, and out sourced activities – and believes that the most significant omitted source is that associated with sea transport of product coal. The Panel estimates that the inclusion of sea transport related emissions would add about 600,000 tonnes of CO_2 per year, or 5% to the total project-related emissions. The Department is satisfied that the omission of these, and other ancillary GHG emissions, is relatively insignificant and does not affect the outcome of its assessment.

Comparison with National and Global GHG Emissions

A comparison between the total project-related GHG emissions and national/global emissions is presented in the following table.

Table 4: Project-Related GHG Emissions Comparison

Annual average project GHG emissions (TCO_2e)	***% of Australian GHG emissions in 2004***	***% of global GHG emissions in 2004***	***% of global GHG emissions in 2030***
12,633,481*	2.2%	0.031%	0.020%

* If emissions associated with sea transport are included, the contribution to Australian GHG emissions would increase to 2.3%, and the contribution to international emissions (in 2004) would increase to 0.033%.

GHG Impacts

The above comparison indicates that, when considered on a full life cycle basis (ie. direct and indirect GHG emissions associated with the project), the project's contribution to national and global GHG emissions is relatively very small. It is noted that the contribution to national GHG emissions (ie. 2.2%) is misleading (and overly conservative) as it assumes that all of the coal from the project would be burnt in Australia, whilst not including downstream GHG emissions from other Australian exporting coal mines. Accordingly, and because global warming/climate change is truly a global issue, the Department believes that comparison against the global GHG emissions provides a more meaningful indication of project-related GHG impact.

Notwithstanding the small contribution associated with the project, the Department recognises that global warming/climate change poses a significant threat to society and the environment. Briefly, the predicted impacts associated with global warming, based on estimates released by CSIRO and the International Panel on Climate Change (IPCC), include:

- *temperature rise / extreme weather* – the earth's average surface temperature is predicted to rise by between 1.4 to 5.8 degrees Celsius by the year 2100. Australia is likely to become warmer and drier (on average). Climate change is also likely to result in more extreme weather (including increasing extremely wet years where rainfall is predicted to increase, and more droughts where average rainfall is predicted to decrease), less snowfall, and greater bushfire risk;
- *sea level rise* – sea level is predicted to rise by 9 to 88 centimetres by 2100, or 0.8 to 8.0 centimetres per decade, with resultant impacts on coastal environments and communities;
- *biodiversity impacts* – studies have predicted that climate change could lead to extinction of between 18% to 35% of species by 2050; and
- *water supplies* – predicted changes to rainfall patterns would affect river flows and water supply to communities and the environment.

The Department understands that the project's contribution to these impacts is not able to be accurately determined based on the current level of scientific knowledge[1], however, the project's very small contribution to annual global GHG emissions suggests that its contribution to global warming/climate change would also be very small.

A basic indication of contribution to temperature rise is able to be made by comparing the project emissions against IPCC estimates. The IPCC has estimated that a doubling of the CO_2-equivalent concentration in the atmosphere would lead to a 2.5 degree Celcius increase in global average temperature. With a current global CO_2 load of 2,750 gigatonnes, and a total project contribution of 253 million tonnes, the project would lead to a negligible increase in global temperature of 0.0002 degrees Celcius.

Many submittors claim that, given the threat of serious and irreversible environmental damage associated with global warming/climate change, any increase in global GHG emissions is

[1] The scientific community has placed estimates on the social cost of CO_2. This issue is discussed in Section 4.11.

unacceptable, and therefore when considered on a cumulative basis the project should be refused.

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

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

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

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

It must be noted that if the Anvil Hill coal project was not allowed to proceed, the resultant gap in the coal supply would be almost certainly filled by another coal resource either in NSW, Australia or overseas. In other words, removing the GHG emissions from the Anvil Hill project would not likely result in any decrease in global CO_2 emissions. This point illustrates the reality that the key response to the issue of global warming/climate change needs to be made at a policy or strategic planning level, outside and above the NSW project assessment process.

The need for the project is discussed in Section 1.3. Following its consideration, the Department is satisfied that there is a clear need for the development of new coal deposits, for at least the foreseeable future, to meet society's basis energy needs. The Panel concurs, stating that it *'recognises that current demand for power supply is reliant on the coal industry and will do so for the foreseeable future, and definitely during the life of the project*'.

The benefits of the project are discussed in Section 4.11. Following its consideration, the Department is satisfied that the project would have a net social benefit, and that it would create significant employment and other socio-economic opportunities to the locality, the Hunter region and to NSW.

The objects of the EP&A Act are outlined in Section 2.7, and these objects have informed the Department's assessment of the project. With regard to the principles of ESD, the Department acknowledges that global warming/climate change presents a clear threat of serious or irreversible environmental damage, as well as a threat to intergenerational equity and a threat to the conservation of biological diversity. However, it must also be acknowledged that the downstream energy and other socio-economic benefits generated by the project would also benefit future generations, particularly through the shoring up of national and international energy needs.

The precautionary principle dictates that where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

The Department acknowledges that there is still considerable scientific uncertainty regarding the effects and impacts of global warming/climate change, and has not used this uncertainty as a reason for not considering measures to prevent environmental degradation associated with global warming/climate change. Consideration of such measures is provided below.

The ultimate project-related measure to avoid the threat posed by global warming/climate change would be to refuse the project. However, the Department does not believe this approach is reasonable or practicable, as:

- the project's contribution to global warming would be very small;

- there is a demonstrable need for the project to meet society's basic energy needs;
- refusing the project would not likely result in any reduction in global greenhouse gas emissions, as the need for coal would almost certainly be filled by another mine in Australia or overseas; and
- the project would have considerable socio-economic benefits (see Section 4.11).

Consideration of other GHG impact mitigation measures is given below. As the majority (98%) of GHG emissions associated with the project are only indirectly related to Centennial's activities, the Department has considered GHG impact mitigation at both the project level and the policy level, to fully inform the assessment of the project application.

GHG Impact Mitigation at the Project Level

Centennial has committed in its EA to a number of project related initiatives, including:

- the use of energy management systems;
- seeking continuous improvement in energy efficiency in the mining fleet, stationary equipment, mining processes and coal preparation;
- the use of some biodiesel in the mining fleet;
- use of electric boosted solar hot water; and
- small scale planting for carbon sequestration.

In its Response to Submissions, Centennial also committed to reviewing emission trading schemes available and assessing the suitability of these schemes for the project (eg. the NSW Greenhouse Gas Abatement Scheme).

Centennial also notes that it is undertaking a range of GHG initiatives at the corporate level, including subscription to:

- the Australian Government's Greenhouse Challenge Plus Programme;
- the Australian Coal Association Research Program (ACARP) Greenhouse Gas Mitigation Committee;
- the 'Greenfleet' program to offset GHG emissions from fleet vehicles; and
- the Australian Black Coal Industry's 'Coal 21 Fund', which is raising $300 million over 5 years towards development of clean coal technologies for reducing GHG emissions from coal-fired power stations.

With regard to the project related initiatives, the Department believes that the commitments provide a reasonable basis for mitigating the project's Scope 1 and Scope 2 emissions, and that the initiatives are comparable to contemporary mining developments.

However, the Department believes the initiatives lack certainty or clear targets for energy use efficiency. Accordingly, the Department believes that Centennial should be required to prepare and implement a comprehensive Energy Savings Action Plan for the project, in consultation with relevant stakeholders and to the satisfaction of the Department of Environment and Climate Change (DECC) and the Director-General. The Department also believes that Centennial should be required to continually improve its energy efficiency, and to publicly report its GHG reduction initiatives as part of an Annual Environmental Management Report.

With regard to Scope 3 emissions, the Department acknowledges Centennial's commitment to the corporate initiatives outlined above, including subscription to the Coal 21 Fund, which the coal industry has set up to fund and develop clean coal technologies.

The Department does not believe it is reasonable to apply other requirements on Centennial through the NSW planning system to significantly reduce Scope 3 GHG emissions associated with the downstream burning of the product coal. Any such impost – for example a CO_2 levy on product coal – would unfairly penalise Centennial and its ability to compete in the energy industry. The Department believes that such an ad hoc approach to the issue of global warming/climate change is not in the public interest.

The Department believes that a broadly applied scheme to internalise the cost of CO_2, administered outside and above the NSW planning system, is a more sensible and much fairer method to combat the major sources of global warming/climate change.

GHG Impact Mitigation at the Policy Level

The NSW Government's key policies and direction regarding GHG emissions and global warming/climate change is outlined in the *NSW Greenhouse Plan* (Greenhouse Plan).

The Greenhouse Plan articulates the NSW Government's key targets for GHG emissions reduction, namely:

- a 60% cut in GHG emissions by 2050; and
- cutting GHG emissions to year 2000 levels by 2025,

and sets out a plan to achieve those targets.

In addition to these targets, in November 2006, the Premier announced new mandatory renewable energy targets – namely 10% renewables by 2010 and 15% by 2020. The *NSW Renewable Energy Target Explanatory Paper, November 2006*, sets out a plan for implementing this renewable energy target.

The Greenhouse Plan highlights the NSW Government's support of Australia ratifying the Kyoto Protocol, stating that this would *'ensure Australia can participate in future international negotiations for the next stages of global action and provide Australian companies access to new and growing global markets in emission reduction technologies and emissions trading'*.

The Greenhouse Plan describes the actions that the NSW Government has already taken to reduce GHG emissions and combat global warming/climate change, as well as the key policy and initiatives proposed to be implemented under the Plan to meet the GHG targets.

Briefly, actions implemented to date include:

- introduction of the NSW Greenhouse Gas Abatement Scheme, the worlds first mandatory GHG emissions trading scheme, which places enforceable GHG emissions reduction targets on electricity producers;
- introduction of the worlds first carbon rights legislation, which recognises carbon sequestration by forests, and allows the ownership, sale and management of these rights;
- introduction of the Australian Building Greenhouse Rating Scheme, for benchmarking and reducing GHG emissions from commercial buildings;
- introduction of the *Native Vegetation Act 2003* to regulate and limit broadscale land clearing;
- introduction of the Building Sustainability Index (BASIX) for residential development; and
- establishment of the $200 million NSW Energy Savings Fund, to fund development of energy savings technologies.

Key policy and program initiatives outlined in the Greenhouse Plan include:

- **Energy Generation and Energy Efficiency:**
  - leading the development of a national emissions trading system;
  - extending the NSW Greenhouse Gas Abatement Scheme to at least 2020;
  - labelling of greenhouse performance on electricity bills to encourage energy retailers to reduce GHG emissions; and
  - requiring energy retailers to offer an optional 10% Green Power;
- **Buildings:**
  - further development and extension of minimum GHG emissions standards for buildings; and
  - introduction of a requirement for disclosure of home efficiency ratings;
- **Transport:**
  - introduction of a voluntary 'green vehicle registration' program;
  - introduction of an environmental rating scheme for trucks and buses; and
  - introduction of a requirement for disclosure of home efficiency ratings;
- **Waste, industrial processes and fugitive emissions:**
  - development of a Waste Infrastructure Planning Strategy;
  - new guidelines on the recovery of energy from waste; and
  - introduction of guidelines for consideration of GHG in environmental assessments;
- **Agriculture, natural resources and land management:**
  - development of a pilot system to bring together revegetation projects to seek to realise their carbon value;
  - strengthening the Climatology in Agriculture program, to help farmers adapt to climate change and its effect on their business; and

- further research on the potential for carbon sequestration through improved soil and vegetation management;

- **Government Leadership and Government Energy Management Policy:**
  - strengthening the current Government Energy Management Policy;
  - implementing a Government Sustainable Procurement Policy; and
  - streamlining Government energy and water use reporting, fleet and building performance and waste generation.

The Greenhouse Plan emphasises the importance of a national emissions trading scheme, focusing on the stationary energy sector, which could lead to a significant reduction in GHG emissions. The plan states that *'emissions trading can provide a flexible means by which greenhouse emissions targets can be met at least cost to the economy, while providing a market for the development and deployment of innovative technologies in this sector'.*

The Greenhouse Plan also acknowledges the challenges involved in reducing GHG emissions whilst ensuring that the society's energy needs are met, and includes the following policy objective:

> *'The NSW Government aims to curb growth in energy emissions and reduce energy intensity, while ensuring reliable, affordable and secure access to energy for all.'*

The Department acknowledges that the measures outlined in the Greenhouse Plan – particularly with regard to adoption of a national emissions trading scheme (or other scheme that internalises the cost of CO_2) – would assist in the mitigation of GHG emissions associated with the project.

An emissions trading scheme established at a national and international level would 'level the playing field' for energy producers and other GHG emitters. Such a scheme would provide a catalyst for coal-fired power stations and coal miners to reduce their net GHG emissions, whilst increasing the competitiveness of, and driving technological development in, renewable and low-GHG energy sources.

A rigorous but fair national and international emissions trading scheme would negate the requirement to restrict (or prohibit) one form of energy source over another. The market would inherently regulate the demand for different sources of energy, based on their full environmental and social cost in terms of global warming/climate change.

This approach is consistent with the principles of ESD, particularly the principle of improved valuation, pricing and incentive mechanisms.

Given the demonstrable need for new coal resources over the foreseeable future, the Department does not believe that the absence of a national emissions trading scheme is a justifiable reason for refusing the Anvil Hill project.

Conclusion

The Anvil Hill project would facilitate the generation of significant GHG emissions, both directly through extraction, processing and transport of the coal resource, and indirectly through electricity use and downstream burning of the extracted coal. The indirect downstream burning of the coal is by far the biggest contributor, generating some 98% of the GHG emissions associated with the project.

On a comparative basis, the total GHG emissions associated with the project represent a very small proportion of annual global GHG emissions (0.031%), and the project is not expected to make a significant contribution to global warming/climate change.

The Department has weighed the GHG impacts of the project against a range of matters, including its contribution to global GHG emissions, the need for the project and its benefits, its consistency with the objects of the EP&A Act, and the GHG impact mitigation measures available. On balance, the Department is satisfied that the project's potential GHG impacts should not preclude approval of the project.

Further, the Department believes that refusal of the project is unlikely to result in any reduction in global GHG emissions, as the gap in supply would almost certainly be filled by another mine in Australia or overseas.

However, the Department believes that Centennial should be required to mitigate, manage or offset direct and indirect GHG emissions by:

- developing and implementing a comprehensive Energy Savings Action Plan, which includes quantified energy efficiency targets and actions; and
- continually improving energy efficiency, and publicly reporting GHG reduction initiatives.

4.2 Noise

Issue

The project would generate construction, operational, traffic and rail related noise emissions. Given the quiet rural setting of the project site, operational noise emissions would affect a large number of private properties.

Consideration

Construction Noise

The project's construction period would extend for about 12 months, and Centennial proposes to limit construction works to daylight hours. As NSW construction noise criteria only provide noise allowances for construction periods of up to 26 weeks, Centennial has assessed construction activities as an operational phase of the project, and compared the noise impacts against operational noise criteria in accordance with the NSW *Industrial Noise Policy*. The Department and the DECC are satisfied with this approach.

The results of the assessment indicate that noise levels at private properties during the construction phase of the project would be generally much less than those levels predicted for operational noise. At the date of this report, 8 private properties are predicted to experience construction noise levels which would be considered to be significantly above (ie. more than 5dB(A)) the applicable noise criteria (ie. 35 dB(A) – see following section for explanation of the project noise criteria). All of these properties are also predicted to be significantly affected by operational noise associated with the project.

Given the temporary and intermittent nature of the construction work, the restriction of the works to the day time period, and the relatively small number of affected private properties, the Department is satisfied that the project's construction works would not generate a significant noise impact on the community.

However, the Department believes that Centennial should be required to restrict construction activities to the day period as defined in the NSW *Industrial Noise Policy* (rather than the day light period as proposed), namely 7:00 am to 6:00 pm Monday to Saturday, and 8:00 am to 6:00 pm on Sundays and public holidays. Certain activities would be allowed outside these hours, including works that are inaudible at residences, deliveries required outside normal hours for safety reasons, and emergency works.

In addition, the Department believes that Centennial should be required to:

- acquire significantly affected properties (at the request of the landowner); and
- offer additional noise mitigation measures (such as double glazing, insulation and/or air conditioning) to all landowners of privately owned residences which are predicted to be affected by noise associated with the project.

These measures are discussed further below.

Operational Noise

The EA includes an operational noise impact assessment undertaken in accordance with the NSW *Industrial Noise Policy (INP)* and prepared by specialist acoustics consultants Wilkinson Murray Pty Ltd. The assessment is based on a number of 'reasonable and feasible' noise mitigation measures that Centennial would implement, including:

- locating the CHPP, coal stockpiles and associated infrastructure in a valley which provides natural acoustic shielding;
- cladding/shielding the CHPP, rejects bin, crushers and conveyors;

- installing a 4 metre high noise barrier along parts of the rail loop; and
- at night, restricting trucks to operate below half the height of overburden emplacements.

The assessment determined that the background noise levels around the project site reflect the area's quiet rural setting, and are below 30 decibels (dB(A)) for day, evening and night time periods for all properties. As such, the applicable noise criterion for the project based on the procedures in the INP is 35 dB(A) for day, evening and night time periods.

The impact assessment indicates that, under worst case operational and meteorological conditions, the project would have a minor to significant impact on a relatively large number of private properties at some stage during the course of the project.

Typically, the Department considers an exceedance of the project noise criteria of up to 2 dB(A) to be minor, an exceedance of between 3dB(A) to 5 dB(A) to be marginal, and an exceedance of greater than 5 dB(A) to be significant.

At the date of the EA, the number of private properties that would experience noise levels above the project criterion totalled 179, with 106 properties significantly affected (ie. would experience noise more than 5dB(A) above the noise criterion, or more than 40dB(A)). The EA notes that 20 of these properties were, at the time, subject to an agreement with Centennial with regard to noise impact (see Table 5 below).

Given the broad noise impact, a large number of submissions (6%, including many from the local community) understandably objected to the project on noise grounds. Similarly, the DECC determined that it could not support the project, in large part because it considered that the noise (and vibration) impacts would cause an 'unacceptable impact on an entire community'.

Since exhibition of the EA, Centennial has continued its efforts to acquire and/or reach negotiated noise agreements with affected private properties. At the date of this report, the implementation of this program has reduced the number of significantly affected private properties to 33, including 28 residences.

A summary of the operational noise impacts is presented in Table 5 below. Figure 9 shows the relevant noise contours and affected properties, as at the date of the EA. Figure 10 presents a consolidated representation of the key noise, blasting and dust contours, and property status, as at the date of this report.

Table 5: Summary of Operational Noise Impacts

Noise Exceedance	***Management generally required at this level of exceedance***	***No. of private properties***		
		As at EA date	***As at EA date, exc. those with noise agreement***	***As at date of this report, exc. those with noise agreement***
Marginally Affected Residences (1-2dB exceedance)	Noise mitigation, if possible	37	36	35
Moderately Affected Residences (3-5dB exceedance)	Noise mitigation, inc. noise mitigation at residence	36	35	31
Significantly Affected Residences (>5dB exceedance)	Acquisition	82	71	28
Significantly Affected Vacant Land (>5dB exceedance)	Acquisition	24	17	5
Subtotal - Significantly Affected Properties	**-**	**106**	**88**	**33**
Total Properties Exceeding Noise Criteria	**-**	**179**	**159**	**99**

The Panel undertook a detailed technical appraisal of the operational noise predictions in the EA (see Appendix C). The Panel's analysis indicates that the predicted noise levels, during worst case wind and temperature inversion conditions, may be underestimated by up to 1.5

dB(A) for properties to the north west of the project site (due to the way that temperature inversions and winds were modelled in the EA). If this underestimation is correct, a further 10 (approximately) private properties would potentially fall into the category of being significantly affected by noise. However, the Panel cautions that the variation between its modelling and Centennial's modelling is within reasonable modelling accuracy, and that the noise modelling software itself has an accuracy of ±5dB. The Panel recommends either remodelling (using its derived values for worst case wind and temperature inversions), or alternatively relying on thorough noise monitoring to determine the extent of impacted properties.

The Department is satisfied that further noise modelling is not warranted, given the relatively small magnitude of the noise modelling prediction variations, that the variation is within the model accuracy of the noise modelling software, and given the recommended noise management conditions described below, which include requirements for a rigorous noise monitoring program (including real-time monitoring) and acquisition rights for any private property found to experience noise above 40dB(A), as a result of independent noise monitoring.

Nonetheless, the project is predicted to result in a significant noise impact on at least 33 private properties. This quantum of impact to private property is at the upper end of the scale when compared to contemporary coal mining developments in the Hunter Valley. As a comparison, the Mount Pleasant mine, approved in 1999 but not yet developed, was (at the time of its approval) predicted to have a significant impact (via noise and/or dust) on 47 private properties. The Bengalla open cut mine, approved in 1995, significantly affected 21 private properties. The Mount Owen open cut mine, approved in December 2004, was predicted to have a significant impact (via noise and/or dust) on 18 private properties.

The Department understands that the scale of the noise impact would not be reduced significantly further through additional noise mitigation measures, including a reduction in the scale or size of the mining operation. The Panel modelled a couple of possible scaled-down mining scenarios, and concluded that the reduction in noise impact would be marginal (around 2dB(A)), due largely to the location and topography of the project site, and the incumbent meteorological conditions of the area (including a significant prevalence of temperature inversions, which tend to increase noise impact). Accordingly, the Department does not believe that altering the mine plan, or undertaking other significant noise reduction measures at the mine site (such as noise abatement bunds), would result in any significant reduction of noise impact associated with the project.

The DECC has suggested that the Department consider restricting night time operations, when the greatest noise impacts are predicted to occur. The Department notes that Centennial's noise impact assessment does include such consideration, which found that night time noise impacts are dominated by noise from the operation of haul trucks around the site. The EA subsequently includes a commitment to restricting trucks and bulldozers to operating below the maximum elevation of the overburden emplacement areas during the night time period (this commitment was later clarified such that the plant would operate at approximately half the height of emplacements).

The EA also considered restricting or stopping operations at night under adverse meteorological conditions, but given the high frequency of temperature inversions (up to 85% of the time in winter), Centennial considers that not operating for this amount of time would be economically unviable.

However, Centennial has recently committed to night time restrictions (or other noise reduction strategies) as long as there are more than 20 private properties within the significantly affected area.

The Department acknowledges this commitment, but believes that Centennial should be required to actively pursue a reduction in the number of significantly affected properties prior to the commencement of mining operations. Accordingly, the Department has recommended a condition that would require Centennial to demonstrate to the satisfaction of the Director-General that it has used its best endeavours to acquire or reach negotiated agreements with all significantly affected private properties before the commencement of mining operations.

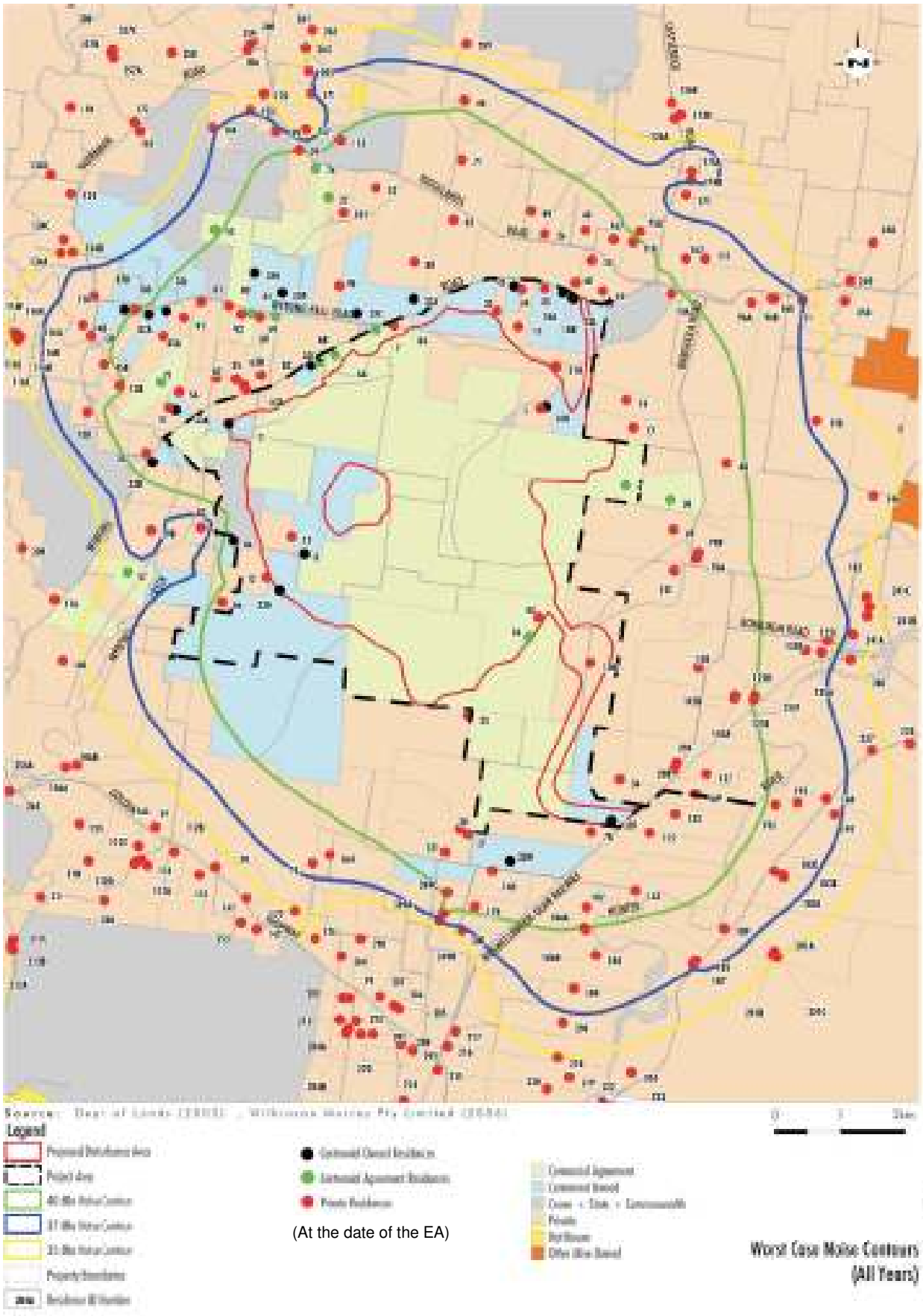

Figure 9: Noise Affected Area (Note: Property ownership status as at EA date)

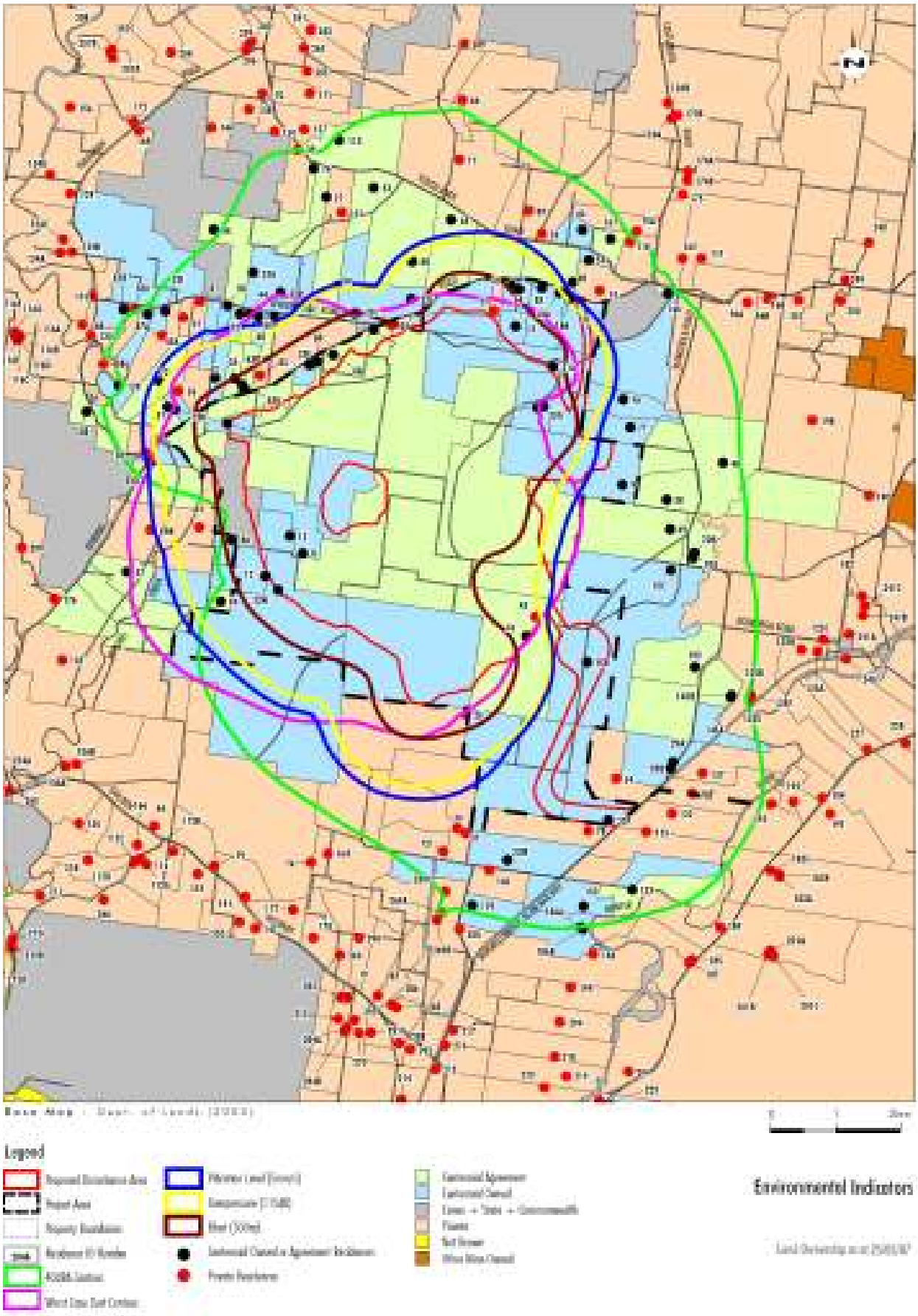

Figure 10: Noise, Dust and Blast Affected Area (Note: Property ownership status as at date of this report)

This condition is generally consistent with the recommendations of both the DECC and the Panel, which have recommended that any project approval be subject to a requirement for Centennial to acquire or reach negotiated agreements with all significantly affected residents prior to project commencement, or that the pursuit of such an agreement is given highest priority.

The Department is satisfied that this process need not occur prior to the commencement of any project works (ie. before construction), as the construction activities are temporary, intermittent, restricted to the day time period, and predicted to affect a relatively small number of private properties (see above).

Notwithstanding the above, the Department is cognisant that the existing background noise in the locality is very quiet, and below the 30dB(A) level set in the INP as a floor for consideration of background noise and setting of noise criteria. As such, the Department believes that special dispensation is warranted for all private properties affected by noise associated with the project (ie. significantly affected, moderately affected and marginally affected properties).

The Department's usual practice is to require proponents to offer architectural noise treatments (such as double glazing, insulation and/or air conditioning) to affected properties where the project noise criteria are exceeded by 3dB(A) or more (ie. 38dB(A) for the Anvil Hill project). In this case however, because of the very low background noise levels the Department believes that rights to such noise treatments should be provided to all private properties that experience noise levels from the project above the project noise criterion (ie. 35dB(A)). This recommendation is shared by the Panel.

In addition, Centennial should be required to establish a detailed noise monitoring program, in consultation with the DECC, which includes provision for comprehensive real-time noise monitoring. Any additional properties found to experience noise above 35dB(A) should be offered architectural treatments, and properties found to experience noise above 40dB(A) should be granted land acquisition rights. The Department also believes that Centennial should be required to continually seek to improve its noise performance, and to publicly report on these initiatives.

The Department believes that the recommended noise mitigation measures would adequately minimise, manage, or at least provide appropriate compensation for the noise impacts associated with the project. The measures however do not mitigate the social impacts associated with dislocation of a large number of Wybong residents, and what the DECC describes as an 'unacceptable impact on an entire community'. This issue is considered further in Section 4.11.

Road Noise

The EA indicates that the project would generate some noise impact to 4 private properties on Wybong Road, and 1 mine-owned property on the Bengalla Link Road. Noise levels are predicted to exceed the 55 dB(A) road traffic noise criterion by up to 1.5 dB(A) at these properties.

Noise levels during peak construction activities are also predicted to exceed the traffic noise criterion by up to 4.5 dB(A) during the daytime, however this impact would be of short duration only (2-3 months).

The Panel conducted its own analysis of road noise impact and considered that there is some possibility that the predictions in the EA are underestimated by up to 2.6dB(A) (due to differences between the two commonly used traffic noise models), which would increase the road traffic noise exceedences to up to 4dB(A) above the criterion. Nonetheless, the Panel believes that the level of impact is best determined through noise monitoring.

The Department and the Panel believe that the project would result in a marked increase in the currently low traffic noise levels on Wybong Road and Bengalla Link Road. This increase would be most pronounced during relatively short periods, associated with shift changeovers. Notwithstanding, the Department believes that Centennial should be required to undertake (with the landowners consent) noise mitigation works at the 4 affected private properties (ie. through installation of double glazing, insulation and/or air conditioning), and establish a noise

monitoring program that includes traffic noise monitoring and a protocol for mitigating any identified traffic noise impacts.

Rail Noise
The project would generate up to 3 daytime return trips and 2 night time return trips on the Muswellbrook to Ulan railway line. Existing train movements on the railway line average 18 return trips, with a peak of 22 return trips.

The rail noise impact assessment in the EA indicates that the additional movements associated with the project would result in an additional 2 residences experiencing rail noise above the applicable criteria (ie. 65 dB(A) daytime and 60 dB(A) night time).

The Department is satisfied that the project would not result in a significant rail traffic noise impact, but believes Centennial should be required to undertake (with the landowner's consent) noise mitigation works at the 2 affected properties.

Cumulative Noise
The EA includes consideration of cumulative noise associated with the project combined with other existing and proposed mines/industrial noise sources in the locality, which includes the Mount Arthur North, Bengalla and Mount Pleasant coal mines.

The assessment indicates that the cumulative operational noise levels would comply with the relevant amenity noise criterion (ie. 40 dB(A)). Similarly, cumulative traffic noise levels on Wybong Road are predicted to be similar to those predicted for the Anvil Hill mine in isolation. Cumulative traffic noise levels on the Bengalla Link Road would result in 1 additional mine-owned property marginally exceeding (by 0.5 dB(A)) the applicable noise criteria.

The Department is satisfied that the project is unlikely to result in significant cumulative noise impact, but believes that it is appropriate to include cumulative noise assessment and acquisition criteria for the project to protect the amenity of the wider community should further mining developments proceed in the area.

Conclusion
The Department and the Panel are generally satisfied that Centennial has assessed the potential noise impacts of the project in accordance with relevant DECC guidelines, and appropriately considered reasonable and feasible noise mitigation measures.

Notwithstanding these mitigation measures, the project would result in a significant residual noise impact to 33 private properties. Independent analysis undertaken by the Panel indicates that noise predictions in the EA may be marginally underestimated for properties to the north west, which would possibly result in an addition of around 10 properties being significantly affected by noise.

To manage these operational noise impacts, and given the very low background noise conditions of the locality, the Department recommends that stringent noise be placed on the project, including requirements on Centennial to:

- use its best endeavours to acquire or reach negotiated noise agreements with all significantly affected private property owners prior to the commencement of mining operations;
- undertake (with the landowner's consent) architectural noise treatments at all residences where operational noise levels meet or exceed the project noise criterion of 35dB(A);
- undertake (with the landowner's consent) architectural noise treatments at all residences where traffic and rail noise levels exceed the relevant road and rail noise criteria;
- purchase (with the landowner's consent) any private property that experiences operational noise levels above 40dB(A);
- establish and implement a comprehensive noise monitoring program, which includes real-time monitoring of noise impacts; and
- comply with stringent noise and amenity criteria, and strive to continually improve the noise performance of the project.

The Department also acknowledges Centennial's commitment to restricting night time operations (or to undertaking other noise reduction strategies in accordance with a noise management plan prepared in consultation with the DECC), as long as there are more than 20 private properties within the significantly affected area.

The Department is satisfied that these measures would adequately minimise, manage or at least provide appropriate compensation for the noise impacts of the project. The DECC has indicated that the recommended conditions, together with Centennial's commitments, would result in an outcome that would be reasonably consistent with some other approved mines in the Hunter Valley.

4.3 Blasting

Issue
The project has the potential to result in blasting impacts on nearby residences, infrastructure (including a 500kV electricity transmission line dissecting the site), rock shelters of Aboriginal cultural heritage significance, and items of non-indigenous heritage significance.

Consideration
Overburden and coal would generally require drilling and blasting prior to excavation. The frequency of blasting would vary throughout the project, ranging from 73 blasts in Year 2 up to a peak of 227 blasts in Year 5. The majority of these blasts would be of relatively small charge size associated with fracturing the coal resource (ie. maximum charge size of 67 kilograms). Larger blasts associated with overburden fracture (with blast sizes up to 3,698 kilograms) would be much less frequent, with a peak of 46 per year in Year 10.

The EA includes a specialist assessment of the impacts associated with these blasting operations, undertaken by Wilkinson Murray Pty Ltd.

Private Property and Residents
Blasting has the potential to affect residents and private property in three main ways, including:
- annoyance and discomfort, or 'amenity impact';
- structural damage to homes, buildings and property improvements; and
- direct risks to the safety of people and livestock.

(Dust emissions associated with blasting operations is considered separately in Section 4.4. Blast impacts on heritage and other vibration-sensitive structures are discussed separately below).

With regard to amenity and structural impacts, the relevant blast criteria are shown in the following table.

Table 6: Blast Criteria

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

* *ANZECC Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*
** *Australian Standard AS2187.2-2006 Explosives – Storage, Transport and Use* (houses and low-rise residential buildings).

Centennial has adopted the most stringent of these criteria in its impact assessment, namely the 115 dB overpressure and 5 mm/sec ground vibration criteria, as the 95% 5mm/sec annoyance contour line is similar to the 100% 10 mm/sec structural damage contour. The DECC and the Panel do not object to this approach.

Further, Centennial's blast impact assessment is based on the implementation of a number of mitigation measures, including:
- strict control of stemming for blast holes;
- management of blast timing sequences; and
- restriction of blasting during adverse weather conditions.

With the implementation of these measures, the assessment indicates that the worst case blasting associated with the project would exceed applicable airblast overpressure and/or ground vibration criteria at a total of 39 private properties. Centennial reports that, since exhibition of the EA, its acquisition program has reduced the number of affected private properties to 9 (see Table below).

Table 7: Summary of Blasting Amenity/Structural Damage Impacts

Blasting Exceedance - Overpressure (115dB) and/or vibration (5mm/s)	***No. of private properties exceeding criteria***		
	As at EA date	***As at EA date, exc. those with blast agreement***	***As at date of this report, exc. those with blast agreement***
Private Residences	28	23	8
Vacant Land	11	5	1
Total	**39**	**28**	**9**

All of the affected properties are within the area significantly affected by noise and dust. Accordingly, these residents would have access to acquisition rights under the recommended conditions of approval.

To mitigate the impact on these private properties, Centennial has committed to further managing blasting operations such that all blasts comply with the relevant blasting criteria (as shown in Table 7 above). This would be achieved through the adoption of a number of additional controls, including limiting blast charge sizes and consideration of weather conditions prior to blasting, as well as technical measures including electronic detonation techniques, use of adequate stemming, implementing a delay detonation system, and careful drilling and hole loading.

The Department is satisfied that, with the implementation of such measures, Centennial should be able to comply with the relevant blast criteria. However, the Department believes that Centennial should be required to comprehensively monitor all blasting operations in accordance with an approved blasting monitoring program. The monitoring program should include a protocol for demonstrating compliance with the criteria and evaluating blasting impacts on private properties.

The Panel recommends that all privately owned residences inside the 5 mm/sec vibration contour are inspected before and after blasting in areas closest to the homes. The Department concurs but believes this right to structural inspections be extended to all privately properties within 2 kilometres of the blasting area.

The Department also believes that Centennial should be required to give appropriate public notice of, and keep the public well informed about, all blasting operations.

In terms of hours of operation and frequency of blasting, the ANZECC *Guidelines to Minimise Annoyance due to Blasting* recommend that blasting be generally restricted to 9am to 5pm Monday to Saturday, with no blasting on Sundays and public holidays, and a maximum blast frequency of 1 per day. The Department notes that Centennial has committed to limiting blasting 'typically' to 9am to 3pm Monday to Saturday[2] (with no blasting on Sundays and public holidays), but has not nominated a maximum frequency of blasts per day.

The Department has recommended a blast frequency regime aimed at minimising annoyance, especially in relation to large blasts associated with overburden fracturing (as discussed in the introduction to this section). The recommended regime includes:

- a maximum of 1 large blast per week (averaged over 12 months), and a maximum of 1 large blast per day; and
- a maximum of 5 blasts (any size) per week (averaged over 12 months), and a maximum of 2 blasts per day.

With regard to safety, the Department notes that there are a number of private properties in proximity to the mine site (5 at the date of this report), as well as publicly accessible areas

[2] These hours are consistent with those recommended under the DECC's Environmental Noise Control Manual

including Wybong Road. The Department accepts that vibration and overpressure related safety risks to these properties would be managed through Centennial's commitment to meeting the relevant blast criteria at these properties, whilst they remain in private ownership.

However, there is also a risk to these private properties, commuters on Wybong Road, as well as residents/tenants of mine-owned properties, associated with flyrock (rock projectiles). Centennial proposes to manage this risk by temporarily closing Wybong Road during blast events within 500 metres of the road, and through making 'arrangements' with applicable residents to temporarily vacate their premises during blasting operations.

The Department accepts that the temporarily closure of Wybong Road during blasting is manageable, and that arrangements could be made with residents/tenants of mine-owned properties to minimise flyrock related safety risks to people and livestock (eg. through lease conditions). However, the Department is not satisfied that Centennial has any certainty of the ability to make suitable arrangements with residents of private property. Accordingly, the Department believes that Centennial should be restricted from blasting within 500 metres of any private property unless satisfactory arrangements have been made with the residents to minimise the risk of flyrock-related impact.

500kV Transmission Line

Blast predictions indicate that the project has the potential to exceed the applicable blast criterion for the 500kV transmission line that dissects the site. To address this issue, Centennial has committed to modifying the blast design (eg. through reducing charge size) such that all blasts comply with the applicable ground vibration criteria for the transmission line (ie. 50 mm/sec) at all times. Based on additional information provided by Centennial, the Department is satisfied that this criterion could be complied with. This information includes evidence from Centennial's mining contractor (Thiess Pty Limited) indicating that the 50mm/sec criterion has been met at the Liddell open cut coal mine with blasting within 30 metres of transmission pylons. Transgrid, the operator of the transmission line, does not object to the project subject to Centennial complying with this ground vibration criterion and managing blasting operations to avoid flyrock damaging the infrastructure.

Heritage Structures

There are 6 items of local built heritage significance that are likely to experience discernable ground vibration from project blasting. Two of these items, the 'Castle Hill' slab hut and the remains of charcoal retorts near Big Flat Creek (assessed as being of 'high local significance' and 'local historical significance' respectively), are predicted to experience ground vibration above their assessed vibration criteria (5mm/sec and 10 mm/sec respectively).

Centennial is proposing to conserve these local heritage items through modification of blast design, where possible. Archival recording and detailed historical investigation is proposed where monitoring indicates that blast design cannot be modified to protect the structures. In addition, Centennial is proposing to prepare a Conservation Management Strategy/Plan for 'Castle Hill' if blast monitoring indicates potential damage to the structure (see Section 4.8 below for further detail).

The Department believes that Centennial should be required to manage blasting operations to comply with relevant blast criteria at the locally significant 'Castle Hill', as far as is possible. The Department also believes Centennial should be required to prepare and implement a Conservation Management Strategy to manage blast-related impacts on all heritage items within the blast affectation area, including provision for dilapidation surveys and blast monitoring, and measures to protect heritage items (particularly Castle Hill) from the effects of blasting.

Rock Shelters and Formations

There are 16 Aboriginal rock shelters and 2 locally significant rock formations (ie. Anvil Rock and 'The Book') in the vicinity of the site that have the potential to be impacted by blasting operations. Centennial has undertaken a geotechnical assessment to establish ground vibration damage threshold criteria for each of the structures. The derived damage threshold

criteria are 90 mm/sec for Anvil Rock and 'The Book', and range from 90 to 280 mm/sec for the Aboriginal rock shelters[3].

Based on these damage thresholds, the blast impact assessment predicts that ground vibration during blast operations would exceed the criteria at 5 of the Aboriginal rock shelters, and at Anvil Rock and 'The Book' rock formations. To address this issue, Centennial has committed to refining the blast design such that all blasting would comply with the adopted damage thresholds, and/or undertaking ameliorative measures at the rock shelters/formations such as rock bolting, supports and other stabilisation measures.

The Panel questioned the derivation of the rock shelter/formation damage thresholds, and commissioned an independent geotechnical expert (Mr Phillip Pells) to review and advise on the damage thresholds. Mr Pells, who conducted a desktop assessment only, highlighted the general paucity of research or observational data regarding the stability of rock shelters and formations in relation to blast induced vibration, and considered that, due to their nature the stability of rock shelters is 'very difficult to assess'. Given the lack of published data on rock shelters, Mr Pells suggests a precautionary approach should be applied, and that the following vibration criteria would be appropriate:

- Highly vulnerable (fragile) shelters: < 5 mm/sec;
- Vulnerable shelters: 10 to 40 mm/sec; and
- Robust structures: ~ 100mm/sec.

Based on Mr Pells advice, the Panel recommends the adoption of a precautionary approach including vibration monitoring and inspection of rock shelter/formations during the early stages of mining to better understand vibration levels at the structures and to allow derivation of accurate site specific damage threshold criteria. The Panel also recommends an 'interim' damage threshold criteria of 40mm/sec, with detailed monitoring and inspections of all rock shelters predicted to exceed this ground vibration level.

The Department acknowledges that there is considerable uncertainty as to appropriate ground vibration damage thresholds for rock shelters and formations. Given the varying geology, geomorphology and nature of the rock shelters/formations themselves, it is unlikely that uniform criteria could be applied to such natural features. The Department therefore believes that a site specific approach to damage threshold criteria is appropriate. The Department acknowledges that Centennial has attempted such an approach, but notes that its methodologies have been questioned by a reputable independent geotechnical expert.

Given the uncertainty, the Department agrees that a precautionary approach must be adopted, particularly considering that a significant collapse of an Aboriginal rock shelter or rock formation (most of which have been assessed as being of high significance) would result in an irreversible impact.

The Department believes that the project's mine plan allows sufficient time to enable detailed site specific research and analysis of appropriate damage thresholds for the rock shelters/formations. Ground vibration levels at the rock shelters/formations are predicted to only reach a maximum of 6.8 mm/sec at Year 2 of the project and 28.1 mm/sec at Year 5, well below Mr Pell's 'vulnerable shelter' minimum criterion, the Panel's recommended interim criterion of 40 mm/sec, and Centennial's minimum damage threshold criterion of 90 mm/sec[4]. The most significant ground vibration impacts at the rock shelters/formations are not predicted to occur until Year 15 of the project.

Accordingly, the Department believes that Centennial should be required to undertake a detailed study in the early years of mining to establish site specific and reasonably conservative ground vibration damage threshold criteria for each of the rock shelters and formations, based

[3] There is a discrepancy between the damage thresholds published in the EA's geotechnical report and those identified in the EA's blast impact assessment report (which reports to adopt the thresholds established in the geotechnical report). Centennial has clarified that the thresholds in the geotechnical report are correct, and the Department's assessment is based on this clarification.

[4] Blast impact on rock shelters was also raised during the assessment of the Wilpinjong Coal Project in 2005. In that assessment, the Proponent used a criterion of 80 mm/sec, which it believed to be very conservative. The Proponent cited research from the United States which indicated that actual damage to geological structures would not occur until the vibration levels exceed 460 mm/sec.

on actual blast monitoring data and geotechnical data. The established criteria should be verified by a suitably qualified independent expert. The damage threshold criteria should then be used as the basis for a comprehensive management plan[5] for the rock shelters/formations. This management plan should focus on the avoidance of impact to the rock shelters/formations, with preventative mitigation measures to ameliorate any risk of residual unavoidable impacts.

Conclusion

The Department is satisfied that Centennial has appropriately considered the potential blasting-related impacts of the project. This assessment indicates that the project would exceed applicable blast criteria at 9 private properties, and has the potential to impact 2 items of local built heritage significance, Transgrid's 500kV transmission line, and up to 18 culturally significant rock shelters and formations. The project would also require the temporary closure of Wybong Road and vacation of a small number of residences during some blasting operations to avoid potential flyrock impacts.

To mitigate and manage these potential impacts, the Department believes that Centennial should be required to:

- manage blasting operations to comply with relevant blast criteria at all private properties, whilst they remain in private ownership;
- manage blasting operations as far as possible to comply with relevant blast criteria at 'Castle Hill' (a slab hut of high local heritage significance), and prepare a Conservation Management Strategy to protect and/or manage blast related impacts on heritage items;
- manage blasting operations to comply with relevant blast criteria at Transgrid's 500kV transmission line;
- undertake a detailed study to develop site specific damage threshold criteria for the 16 Aboriginal rock shelters and 2 culturally significant rock formations that may be affected by blasting operations;
- restrict blasting to daytime hours only, and restrict the blast frequency to minimise annoyance (including only 1 large blast per week on average);
- restrict blasting operations within 500 metres of any private property unless satisfactory arrangements have been made with the landowner/tenants to avoid flyrock-related risks;
- prepare a road closure management plan;
- keep residences notified and up to date regarding blasting operations, and facilitate feedback/complaint management;
- provide for structural property inspections and investigations; and
- develop a comprehensive blast monitoring program.

4.4 Air Quality

Issue

The project would generate dust from mining, processing and transportation activities. Operational dust emissions would affect a significant number of private properties.

Consideration

The EA includes a specialist air quality impact assessment undertaken by Holmes Air Sciences Pty Ltd. The assessment includes consideration of total suspended particulates (TSP), fine particulate matter (PM_{10}), and dust deposition, with reference to relevant 24-hour, monthly and annual air quality goals. The assessment is based on a number of mitigation measures that Centennial would implement, including:

- locating the CHPP, coal stockpiles and associated infrastructure in a valley which provides natural shielding;
- minimising the area of disturbance to that necessary for mining operations;
- achieving 90% dust suppression on haul roads;
- water sprays on stockpiles and coal transfer points; and
- employing best practice blast design for dust minimisation.

The modelling indicates that, under worst case operational and meteorological conditions, a number of properties surrounding the mine site would experience dust emissions in excess of

[5] As part of an overall Aboriginal Cultural Heritage Management Plan (for the rock shelters) or Conservation Management Strategy (for Anvil Rock and 'The Book').

established air quality goals. Figure 11 shows the contours for the applicable air quality goals (refer to Figure 10 for current property ownership status).

In total, the EA predicts that 33 private properties (including 23 residences and 10 vacant properties) would experience air quality impacts above established criteria at some stage of the project. At the time of the EA, 11 of these properties were subject to agreement with Centennial regarding air quality impacts.

Centennial's acquisition program has since reduced the number of affected private properties. At the date of this report, the number of affected private properties (excluding those subject to agreement with Centennial regarding air quality impacts) is 9 (including 7 residences and 2 vacant lands), with only 3 of these properties being outside the area predicted to be significantly affected by noise.

The air quality assessment also modelled cumulative impacts of the project with the approved but yet to be constructed Mount Pleasant mine, and concluded that because the mines are approximately 9 kilometres apart, the cumulative dust impacts would be small (less than 1ug/m^3 for PM_{10} and TSP, and 0.1 g/m^2/month for dust deposition), and would not result in any additional properties exceeding established air quality criteria.

The Panel questioned some of the assumptions made in Centennial's air modelling, including:
- the optimistic haul road dust control efficiency assumptions used by Centennial (which assumed 90% efficiency);
- possible underestimation of emissions from some activities; and
- overestimation of unstable dispersion conditions, which would tend to underestimate predicted dust impacts.

The Panel subsequently undertook its own dust impact modelling analysis, based on a haul road dust control efficiency of 75%, which it considered to be a reasonably conservative figure to compensate for the identified potential deficiencies in Centennial's assessment.

The Panel's assessment indicates that an additional 3 private properties (at the date of this report) would potentially experience dust levels in excess of established air quality goals. All of these properties are within the area significantly affected by noise and/or blasting.

The Panel acknowledges that all air quality modelling contains inherent uncertainties, and recommends that a comprehensive dust monitoring program be established if the project is approved, including provision for detailed real-time monitoring.

The DECC also considered that the air quality impacts as presented in the EA may have been underestimated, and recommended that approval for the project be subject to a commitment from Centennial to the acquisition of any additionally identified dust affected properties and the implementation of a real time dust monitoring/management program.

The Panel also raised some broader air quality assessment issues, including:
- the inability of current models and criteria to adequately deal with a) nuisance effects associated with short term (<24 hours) dust deposition events, and b) visual amenity effects associated with suspended particulate matter; and
- whether or not background levels should be included in assessment of short term (ie. 24-hour) PM_{10} impacts (traditionally they have not been included due largely to technical difficulties in establishing a suitable background for 24-hour PM_{10}).

The Department recognises these technical limitations, but acknowledges that Centennial's modelling has been undertaken in accordance with contemporary guidelines based on current technology for air quality assessment. Notwithstanding, the Department also recognises that short term dust impacts are a significant source of nuisance to surrounding landusers, and would potentially contribute to the degradation of visual amenity in the area surrounding the mine. Accordingly, the Department and the Panel believe that Centennial should be required to implement a comprehensive real-time dust monitoring program for the project, with appropriate mechanisms for managing dust emissions and complaints.

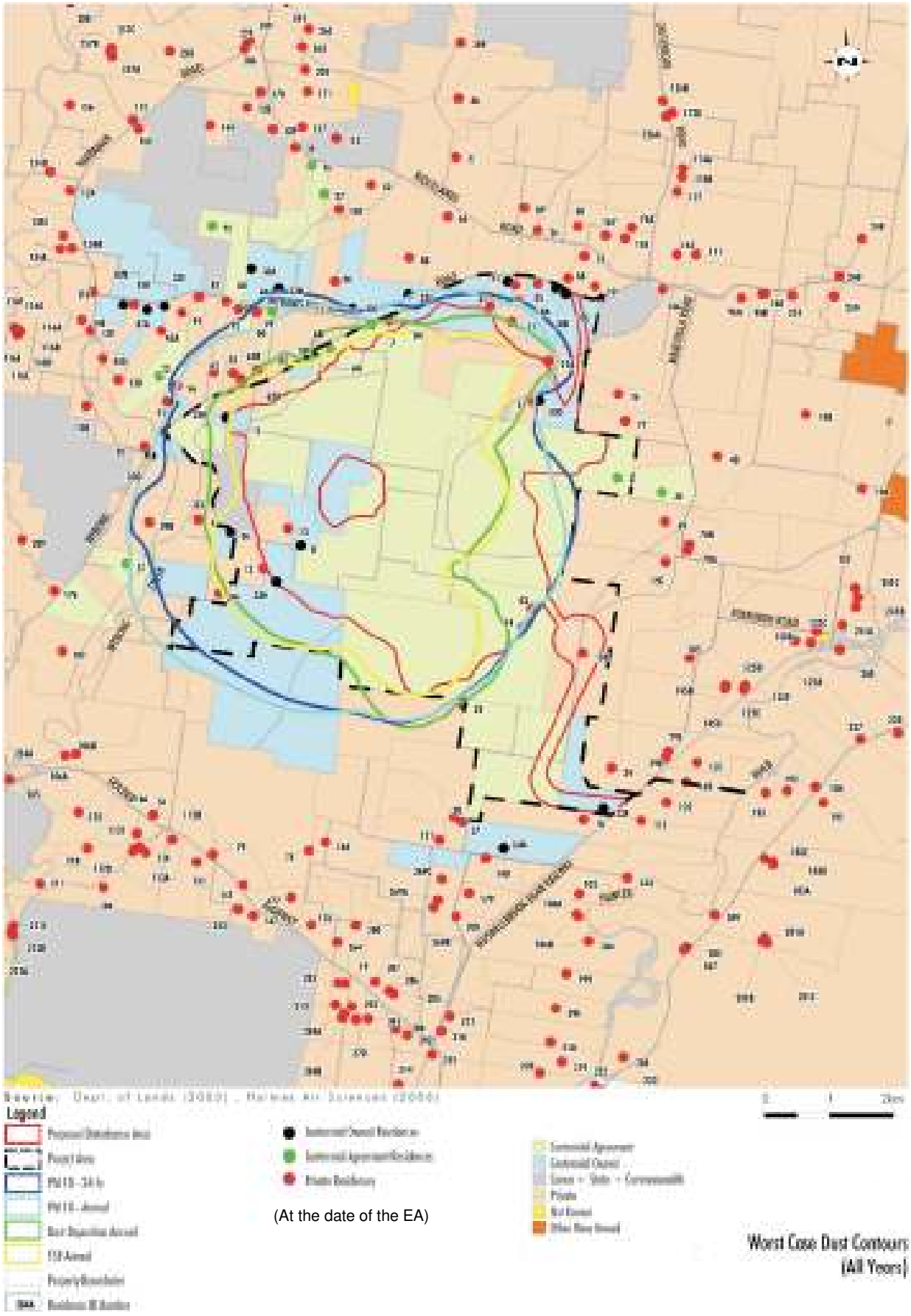

Figure 11: Dust Affected Area (Note: Property ownership status as at EA date)

With regard to health implications, the Panel acknowledges that, although real, the health impacts associated with mine dust are limited by virtue of the fact that the bulk of mine-generated dust is not small enough to lodge deep in the lungs. Accordingly, the Panel notes that the predicted exceedances of the PM_{10} criteria (ie. 50 $\mu g/m^3$) do not necessarily point to the potential for major health effects, and notes that some States have adopted a maximum 24-hour PM_{10} goal of 150 $\mu g/m^3$. No private properties (at the date of this report) are predicted to exceed this dust concentration.

Notwithstanding, the Department believes that Centennial should be required to periodically advise residents of the possible health impacts associated with exposure to dust, as recommended below.

The obvious way of reducing the dust impact on surrounding landusers would be to alter or modify the mine plan, such as by reducing the number of operating pits (from the 4 concurrently operated pits as proposed), or by reducing the mine area. Accordingly, the Department required Centennial to investigate the potential for altering the mine plan to reduce dust impacts. After considering the issue, Centennial concluded that it did not believe that changing the number of operating pits would result in a significant reduction in dust impacts, and was not operationally practicable, because:

- the significantly dust affected private properties are close to, or within, the project disturbance area, and therefore reducing the number of operating pits would not likely reduce the impacts on these properties to acceptable levels; and
- the mine plan requires the operation of 4 pits concurrently to compensate for the variations in coal quality on the site, and to generate acceptable economies of scale for the project.

Given the proximity of the affected residents to the project disturbance area, the Department is satisfied that reducing the number of operating pits would not achieve a significant reduction in the number of significantly affected residences, but would probably have a significant adverse effect on the operational efficiency of the mine. It would probably also increase the intensity of the operations in the remaining operating pits and/or the total life of the mine, and hence would not achieve significant net environmental benefit.

The Department also believes that a considerable reduction in the total mining area would be required to achieve meaningful reductions in dust impacts. Such a reduction would potentially sterilise a significant volume of coal resource. On balance, the Department does not believe that the air quality benefits that would be achieved outweigh the costs associated with sterilisation of the coal resource. However, the Department believes that the impacts on the residents should be appropriately minimised, managed or at least compensated for.

Conclusion

The Department is satisfied that the air quality assessment in the EA, together with the Panel's review and information provided in submissions, provides an adequate indication of the air quality impacts associated with the project.

This information indicates that the project, after the implementation of all feasible and reasonable mitigation measures, would have a significant dust impact on the amenity of 9 private properties, including 7 residences and 2 vacant lands.

Consistent with its recommendations for private properties affected by noise, the Department believes that Centennial should be required to use its best endeavours to acquire or reach negotiated agreements with each of these significantly affected private property owners, prior to the commencement of mining operations.

To minimise and manage the residual air quality impacts of the project, the Department believes Centennial should be required to:

- comply with strict air quality criteria;
- undertake all reasonable and feasible measures to minimise dust and odour emissions from the project;
- establish a comprehensive air quality monitoring program, including real-time monitoring;
- publicly report all monitoring data;

- acquire any private property where monitoring indicates that air quality criteria are being exceeded; and
- periodically advise residents of the possible health and amenity impacts associated with exposure to dust, based on consultation with NSW Health and review of human health studies.

4.5 Surface Water and Groundwater

Issues

The project has the potential to affect surface water and groundwater resources in a number of ways, including:

- directly removing local creeks, including Anvil Creek and Clarks Gully;
- affecting surface water flows in local and regional catchments, and water availability to downstream water users;
- affecting groundwater flows in subsurface aquifers, and water availability to local groundwater users;
- affecting water quality in downstream surface water and groundwater resources; and
- affecting flood behaviour.

Consideration

The project is predominately located within the Wybong Creek catchment, which ultimately drains to the Hunter River via the Goulburn River. A small part of the eastern area of the site lies within the Sandy Creek catchment, which flows directly to the Hunter River (see Figure 12).

Relevant sub-catchments within the Wybong Creek catchment include Big Flat Creek, Anvil Creek and Clarks Gully. The proportion of the relevant catchments that would be directly affected by the project are shown in the table below.

Table 8: Project Area Sub-catchments

Catchment	***Total Catchment Area (hectares)***	***Area of Catchment Affected by Project***
Wybong Creek	80,044	2.6%
- Clarks Gully sub-catchment	*365*	*100%*
- Anvil Creek sub-catchment	*1,404*	*100%*
- Big Flat Creek sub-catchment	*5,040*	*41%*
Sandy Creek	14,517	0.4%

The EA includes detailed surface water and groundwater impact assessments, undertaken by Umwelt Pty Ltd and Mackie Environmental Research Pty Ltd, respectively. The assessments include consideration of baseline water flow and quality conditions, water balancing and modelling to assess the impacts of the project on water quality and flows.

Water Balance

Water balance modelling indicates that the project would require between 1 and 4 megalitres of water a day to meet on site water needs, particularly for coal processing and dust suppression. This water is proposed to be collected from a number of sources, including:

- surface water runoff from disturbed areas of the site, as collected in the mine's dirty water management system;
- surface water runoff collected from the site in accordance with harvestable rights entitlements;
- groundwater inflows into the mine; and
- water imported (pumped) from water sources outside the Wybong catchment, particularly the Hunter River system.

Many submissions from local landowners and special interest groups (including regional agricultural landusers) raised concerns about the impact that this water demand would have on other water users within the Wybong Creek Water Source and the Hunter Regulated River Water Source, and on the environment.

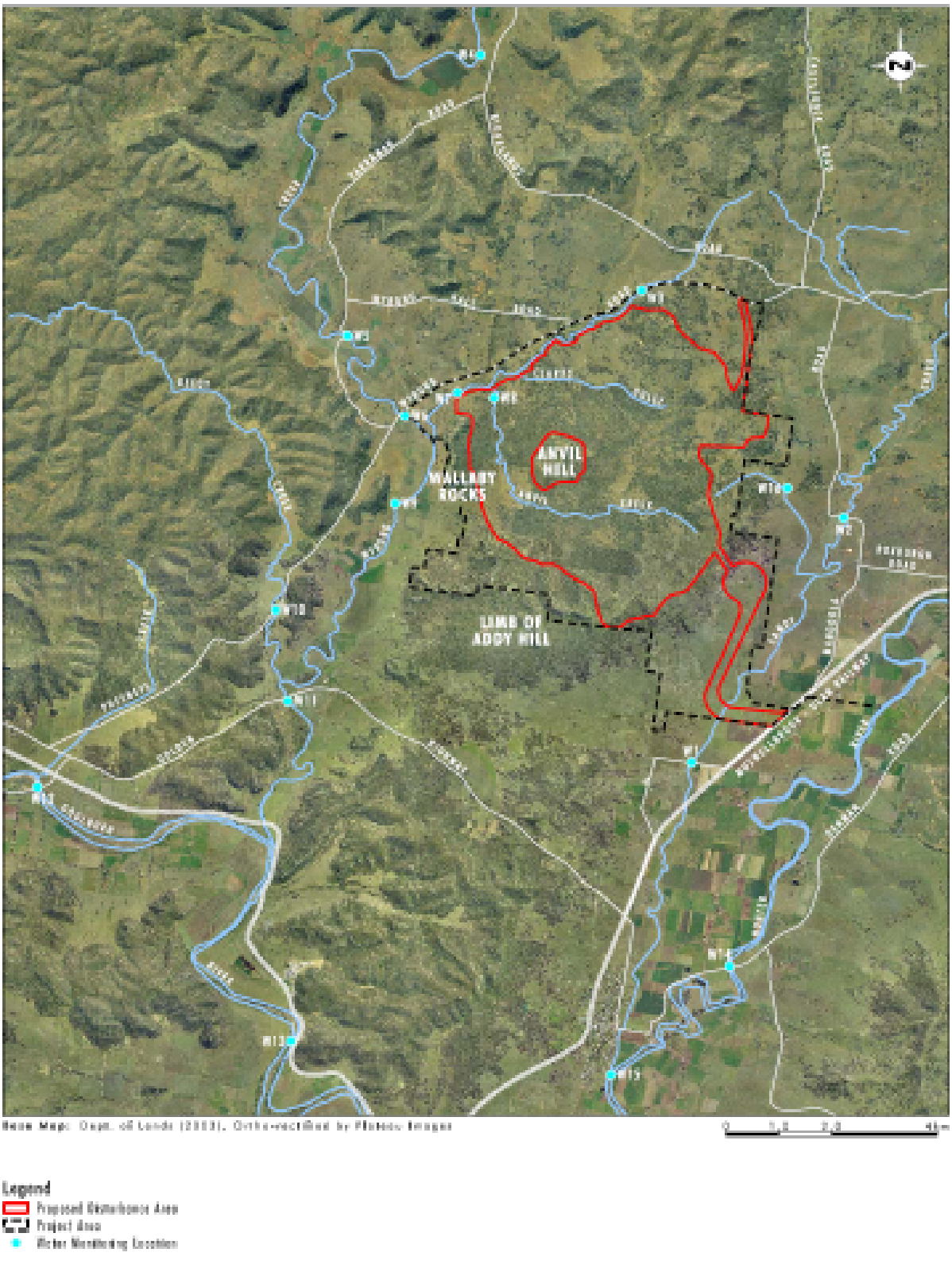

Figure 12: Surface Water Resources

The Department has considered the impacts associated with the first three of the above-listed water sources (ie. local surface water runoff and groundwater) under separate subheadings below.

With regard to the 'imported' water supply, the water balance indicates that, during the construction phase and during prolonged dry periods (ie. equal to the driest period on record), it would be necessary to import up to 400 megalitres of water a year to meet on-site water demand. (During prolonged wet periods, the water balance predicts that water would need to be discharged from the site).

In its response to submissions, Centennial confirmed that it would not source any of this imported water from the Wybong Creek Water Source, and that any water entitlements acquired through its property acquisition program would not be redirected from an agricultural use to the mine. That is, the water entitlements obtained from within the Wybong Creek Water Source would continue to be available for ongoing agricultural landuse within the catchment. The Department acknowledges this commitment and has recommended a condition which formalises the commitment.

Centennial proposes instead to acquire the 'imported' water component of its water demand from the larger Hunter Regulated River Water Source, via the open water trading market established under the *Water Management Act 2000*. Centennial's 400 megalitre worst case imported water demand would represent less than 3% of the available water allocation to general and high security licences on the Hunter Regulated River Water Source during a prolonged dry period. The Department accepts that this component of the total water access licence market is not significant, and is unlikely to significantly compromise other water users in the Hunter Regulated River Water Source.

Further, the Department acknowledges that this water demand is conservatively based on the worst case, and would only be required if a prolonged dry period (equal to the driest 7-year period on record, which incidentally occurred from 1935 to 1941) happened to coincide with the highest water demand period of mining operations (which occurs at Year 5). The likelihood of such periods coinciding would be low. The water balance indicates that, on average, the mine would be a net water producer for all mining periods.

Accordingly, the Department is satisfied that the project is unlikely to have a significant impact on water availability and water sharing in the Hunter Valley, and that the proposed project water supply is consistent with the open trading of water as established under the *Water Management Act 2000*.

The DWE, although initially critical of the lack of certainty of the proposed water supply, accepts that access to adequate water supply for the project is a commercial risk for Centennial.

The Department agrees that, like any other significant water user in the State, access to adequate water supplies is a commercial risk for Centennial. And like any other significant water user, if Centennial is not able to secure enough water to meet its demands, its operations may need to be curtailed, or it may need to investigate additional water efficiency measures. This is consistent with the water sharing principles introduced under the Water Management Act.

To demonstrate it has access to adequate water supply, and to ensure that it uses water efficiently, the Department believes that Centennial should be required to maintain a detailed water balance throughout the project, and to investigate and describe measures to minimise water use by the project.

Some submissions also raised concerns regarding the predicted increase in the scarcity of water supplies in the Hunter (and elsewhere) associated with global warming/climate change. The Department acknowledges that scientists are predicting a general tendency for decreasing annual average rainfall in NSW associated with global warming/climate change, but notes that current local (Denman) long term average rainfall is at around historically average levels. Given that the project's water demand is relatively small in comparison to the total Hunter water supply, and that the mine is predicted on average to be a net water producer for all mining

periods, the Department is satisfied that project is unlikely to place significant pressure on predicted declining water supplies associated with global warming/climate change.

Surface Water Runoff

Modelling indicates that the project would result in the following reductions in surface water flows to the Big Flat Creek and Wybong Creek catchments.

Table 9: Surface Water Runoff Reductions

Mine Year	***Reduction in average runoff***	
	Big Flat Creek	***Wybong Creek***
Year 2	13%	0.8%
Year 5	21%	1.3%
Year 10	11%	0.7%
Year 15	0	0
Year 20	0	0

The project is not expected to have any detectable impact on surface water flows in the Sandy Creek catchment.

As indicated in the above table, the project would have a small to negligible impact on average runoff volumes in the Wybong Creek catchment. The surface water assessment also modelled the potential runoff reduction during a range of different flow events (ie. 1 in 1, 1 in 20 and 1 in 100 year events), which indicate similar small to negligible impacts on surface water flows in the Wybong Creek catchment. Given the results of this modelling, the Department is satisfied that the project is unlikely to result in significant impacts to surface water flows in Wybong Creek.

At least one submission raised concerns regarding the exclusion of water gained through harvestable rights in the water runoff calculations. However, the Department is satisfied that the harvestable rights component (335 megalitres) was intentionally omitted to maintain consistency between pre-mining and during-mining calculations. If, for comparative sake, harvestable rights are excluded from pre-mining conditions but included for during-mining conditions (ie. we assume that the project area is not currently harvesting its entitled water, but that the mine will harvest its water entitlement), the predicted reduction in average runoff flow to Wybong Creek at Year 5 increases from 1.3% to around 2%, which the Department believes is negligible.

However, the Department believes the project would result in significant flow reductions in Big Flat Creek, a tributary of Wybong Creek. This creek system is already in a degraded state, with very high salinity concentrations. As a result, the waterbody is not utilised significantly for water extraction, with no licenced surface water extraction points or licenced water groundwater extraction bores within the catchment area. Accordingly, the predicted reduction in water flows in Big Flat Creek is unlikely to significantly impact any downstream surface water users, or any sensitive aquatic environments. (Impacts associated with salinity in Big Flat Creek are discussed in the water quality section below).

Surface Water Quality

Surface water quality essentially has the potential to be affected by the project in two ways; (1) directly through discharge of polluted water from the site, and (2) indirectly through changes to downstream surface water flows.

With regard to direct impacts, the main potential pollutants associated with water on the site are suspended solids (ie. dirt) and salt. The EA indicates that the water that would be in contact with soils and overburden is likely to have relatively low salinity levels, while water that has been in contact with coal (or water derived from groundwater inflow into the pits) is likely to have relatively high salinity levels. Electrical conductivity (a measure of salinity) in the coal measures ranges from 853 µS/cm to 12,508 µS/cm, and averages about 4,904 µS/cm.

Centennial proposes to implement a range of standard mitigation measures to manage water on the site, including diversion of clean run-on water around the disturbed areas of the site, and the collection, separation and treatment of dirty and saline water. The project would be managed on a nil discharge basis for dirty and saline water, thereby reducing the risk of downstream water pollution. However, the water balance indicates that some dirty water would need to be discharged from the site during prolonged wet periods. Centennial is proposing to discharge

this water to Big Flat Creek, following treatment to reduce total suspended solids to acceptable levels.

The EA predicts that all saline water (which would be separated from dirty water) would be able to be retained on site in the saline water management system, and would be preferentially used for dust suppression and coal washing. Discharge of saline water under the rules of the Hunter River Salinity Trading Scheme is mentioned in the EA as a contingency, but does not form part of the project application.

The DECC generally supports the proposed water management system, but believes that any project approval should be subject to conditions requiring the isolation of all saline water (as proposed) and prohibition of its discharge.

The Department is satisfied that Centennial's proposed water management system would effectively manage the risk to downstream surface water quality associated with the project. To ensure this risk is minimised, the Department has recommended conditions that would require Centennial to:

- seek a DECC licence prior to any discharge of dirty water from the site;
- not discharge any saline water from the site;
- develop a comprehensive Site Water Management Plan, including an Erosion and Sediment Control Plan, Surface Water Monitoring Plan, and Surface Water Response Plan.

With regard to indirect impacts caused by changes to surface water flows, as discussed in the preceding section Big Flat Creek is the only creek predicted to experience significant reductions in water flows as a result of the project. Big Flat Creek is subject to very high existing salinity levels. Electrical conductivity in the downstream areas of the creek ranges from 570 µS/cm to 48,500 µS/cm, and averages 14,269 µS/cm. These average and upper concentration levels are well above ANZECC guideline levels for domestic and agricultural uses, which for comparative purposes include:

- beef cattle and horses: 6,100 µS/cm;
- dairy cattle: 4,600 µS/cm;
- poultry: 3,000 µS/cm; and
- lucerne and grape irrigation: 1,500 to 2,000 µS/cm.

Water quality monitoring undertaken for the project indicates that Big Flat Creek, which represents only 6% of the Wybong Creek catchment, is contributing up to 30% of the total salt load in the Wybong Creek system[6]. The main source of this salt has been identified as salt scalds areas upstream of the project site.

Submissions raised concerns about the potential for the project to exacerbate the salinity problems in Big Flat Creek, with resultant increases in salinity downstream in Wybong Creek and beyond.

Given that the main source of salt to Big Flat Creek occurs upstream of the project site, and that the project includes a saline water management system (as discussed above), the Department is satisfied that the project is unlikely to significantly increase the total salt load in Big Flat Creek or Wybong Creek. However, the reduction in surface water flows in Big Flat Creek is likely to increase localised salinity concentrations in Big Flat Creek over the life of the project.

As such, it is necessary to consider the significance of such an increase.

In terms of impact to downstream water users on Big Flat Creek, the significance of an increase in salinity levels would be low, as the existing salinity levels in the creek generally preclude its use for stock, irrigation or domestic purposes. Accordingly, the waterbody is not utilised significantly for water extraction, with no licenced surface water extraction points or licenced water groundwater extraction bores within the catchment area.

[6] This level of contribution was questioned by the Hunter-Central Rivers CMA. Nevertheless, the difference in salinity levels in Wybong Creek immediately upstream and downstream of its confluence with Big Flat Creek suggests that Big Flat Creek is contributing significant levels of salt to the Wybong Creek system.

In terms of impact to the environment, the Department accepts that the creek is already stressed by high salinity levels, but notes that the riparian area does support some significant vegetation communities, including Swamp Oak Riparian Forest, Rough Barked Apple Woodland and Forest Red Gum Riparian Woodland (see Section 4.6). These communities are largely within the project's proposed offset areas.

Although increased salinity levels may have some impacts on these communities, the Department believes that any such impacts would be localised in nature, and would not significantly compromise the values of the communities. This is particularly so given that the project provides for the conservation and enhancement of the communities through the offset strategy, that Centennial would monitor and manage any impacts on the downstream vegetation, and that Centennial propose to combat the upstream source/s of the salt through what it calls the Wybong Uplands Land Management Strategy. Centennial has committed $500,000 towards this strategy, which would promote sustainable land management in the Wybong area.

Groundwater

There are no significant groundwater reserves in the vicinity of the site. Regional groundwater comprises a shallow aquifer associated with alluvial deposits and weathered bedrock along the main creek lines, and a deeper aquifer system associated with the coal seams. Hydraulic conductivity is generally very low, and groundwater quality is poor, with brackish to saline water occurring in the coal measures and the alluvium of Big Flat Creek and Anvil Creek. Electrical conductivity ranges from 117 to 23,955 µS/cm, with an average of 8,425 µS/cm.

Groundwater impact modeling indicates that the project would depressurise the coal measure aquifers to distances of up to 1.5 kilometres from the site, with a long term groundwater sink post-mining expected to extend up to 500 metres beyond the final mine voids.

The groundwater drawdown associated with this depressurisation has the potential to affect the yields of 2 known boreholes in the vicinity of the site. One of these bores is decommissioned and the other is unequipped and exhibits poor yields and water quality.

The alluvial aquifers of Big Flat Creek and Wybong Creek are not predicted to experience significant leakage associated with the project. The rate of leakage from the Big Flat Creek alluvium is predicted to be in the order of 50 to 100 kilolitres per day, whilst the rate of leakage from the Wybong Creek alluvium is expected to be low at around 15 to 30 kilolitres per day. These losses represent a negligible component of the total inflows to the systems from upstream runoff.

However, the mine would intercept the alluvium of Big Flat Creek when mining operations approach the confluence of Big Flat Creek, Clarks Gully and Anvil Creek. Hydraulic testing undertaken for the groundwater assessment indicates that this area has low hydraulic conductivities (consistent with observed clay and silt strata), however the assessment acknowledges that there may be isolated pockets of more permeable sand and gravel materials which would exhibit higher rates of seepage. As a contingency measure, Centennial has committed to the construction of a barrier cut-off wall across Anvil Creek if found to be necessary during mining operations. The Department is satisfied with this approach, given that Big Flat Creek groundwaters are generally saline with no significant beneficial use. The Department believes that such a contingency measure would adequately protect downstream ecological communities on Big Flat Creek, including Swamp Oak Riparian Forest, Rough Barked Apple Woodland and Forest Red Gum Riparian Woodland.

Some submissions raised concerns regarding the long term salinisation and water quality degradation of the water within the proposed final voids. The groundwater assessment acknowledges that the voids may exhibit a higher salinity than existing coal measures groundwater due to leaching of salts from the mined (and rehabilitated) material and evaporative losses. However, the salinity levels are predicted to be significantly lower than parts of the existing Big Flat Creek alluvium, and given that a groundwater sink would prevail as a result of evaporative lossess, the void waterbodies are expected to remain isolated from external waterbodies over the long term.

The Department is satisfied that the project is unlikely to result in a significant impact to regional groundwater resources, particularly given the low hydraulic conductitvity and poor quality of the resource, and the resultant lack of its beneficial use in the locality. Notwithstanding, the Department believes that Centennial should be required to:

- establish and implement a comprehensive groundwater monitoring program; and
- develop a detailed Groundwater Response Plan, including measures to mitigate and/or compensate potentially affected groundwater supplies, and measures to minimise, prevent or offset groundwater leakage from the Big Flat Creek alluvial aquifer.

Anvil Creek and Clarks Gully

The project would destroy the local waterbodies of Anvil Creek and Clarks Gully, and their catchments. Both creeks are tributaries of Big Flat Creek, with Anvil Creek extending for a length of approximately 6.5 kilometres and Clarks Gully extending for approximately 3.6 kilometres.

Centennial proposes to reinstate a drainage line along the approximate current alignment of Anvil Creek following mining, and the EA states that it would also be possible to re-establish in-channel habitat in the final landform such as pools and riffles, similar to that existing in the current Anvil Creek system. The rehabilitation concept plan does not propose to reinstate Clarks Gully, but rather construct new drainage lines to convey runoff from the Clarks Gully area to Big Flat Creek.

In its submission the DPI highlighted its policy of no net loss in relation to stream length, and consequently believes that the rehabilitated channel length of Anvil Creek and Clarks Gully should be equivalent to that removed by the project, with reinstatement of suitable aquatic habitats that allow the free passage of fish. The Department concurs and has recommended such requirements in its rehabilitation management conditions.

The Department also notes that Anvil Creek provides habitat for an extensive area (51 hectares) of the significant Forest Red Gum Riparian Woodland vegetation community, which would be destroyed by the project. The Department has considered this loss in Section 4.6 below.

Flooding

Centennial's modeling indicates that the project would not adversely impact flood levels or behaviour in the area. The Department is satisfied with Centennial's assessment.

Conclusion

The Department is satisfied that Centennial has adequately assessed the project's potential impacts to surface water and groundwater resources.

Following its assessment, the Department is satisfied that the project can be managed such that it would not have a significant impact on water resources. Apart from the obvious disturbance to the Anvil Creek and Clarks Gully catchments, the main impact associated with the project would be a reduction of surface water flows and potential increase of salinity concentrations in Big Flat Creek. However, the Department is satisfied that, given the high existing salinity levels in Big Flat Creek, these impacts would not significantly affect downstream water users or the environment. The Department believes that these and other water resource impacts can be minimised and/or managed effectively through Centennial's commitments and the Department's recommended conditions, which include requirements to:

- not use water from the Wybong Creek Water Source for mining purposes;
- only discharge dirty water in accordance with an Environment Protection Licence from the DECC;
- develop a comprehensive Site Water Management Plan, including:
    - a water balance;
    - an erosion and sediment control plan;
    - a surface water monitoring plan;
    - a groundwater monitoring plan; and
    - a surface and ground water response plan, to identify, investigate and mitigate any water related impacts;
- develop and monitor the project against water quality and stream health assessment criteria;
- publicly report water monitoring and management data; and

- effectively rehabilitate Anvil Creek (along its existing alignment) and Clarks Gully to ensure not net loss of stream length and aquatic habitat.

4.6 Flora and Fauna

Issues
The project would disturb a total of 2,238 hectares of land, including 1,304 hectares of native treed vegetation on the margin of the Hunter Valley floor, with the balance comprising grassland. This clearing would disturb a variety of habitats of conservation significance, and has the potential to impact threatened species, populations and ecological communities.

Consideration
The EA includes a detailed flora and fauna assessment undertaken by Umwelt Pty Ltd, and is based on over 3 years of flora and fauna surveying covering all seasons. The DECC and the Panel's flora and fauna expert, Mr David Roberston, are generally satisfied with the survey effort.

The Department's consideration of flora and fauna impacts is based on this flora and fauna assessment, along with supplementary information provided by Centennial and submitters to the project.

Vegetation Communities
The surveys identified 17 vegetation communities within the study area (which included the project disturbance area and the proposed offset areas), including:
- 8 woodland vegetation communities;
- 5 riparian and floodplain vegetation communities;
- 3 shrubland vegetation communities; and
- 1 grassland community.

Vegetation communities within the project disturbance area are listed in the table below, and shown in Figure 13. The EA identifies 1 endangered ecological community (EEC) listed under the *Threatened Species Conservation (TSC) Act 1995* as occurring in the study area – Weeping Myall Woodland. This EEC was found mainly within the proposed offset areas, with an isolated occurance in the centre of the proposed rail loop. This area is proposed to be protected and conserved.

The EA generally downplays or omits (main text) discussion of the conservation significance of the remaining communities. Some public submissions, and the Panel, criticised the EA in this regard and raised concerns regarding the relative conservation significance of these other communities, arguing that many of the communities are significant and/or distinctive enough to fit criteria for listing as nationally endangered plant communities under the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*[7]. The significance of these communities, by the Panel's reckoning, is highlighted in the table below.

Table 10: Impacts on Vegetation Communities

Community	***Area to be Cleared (hectares)***	***Conservation significance***
Ironbark Woodland Complex	886	P
Slaty Box Woodland	245	P
Bulloak Woodland	100	P
Forest Red Gum Riparian Woodland	51	P; E*
Paperbark Woodland	19	P
Drooping Sheoak Woodland	1	
Swamp Oak Riparian Forest	1	P
Coast Myall Exposed Woodland	0.2	
Weeping Myall Woodland	0.1	E
Sub-total Treed Vegetation	**1303.3**	
Grassland	934	
Total	**3540.6**	

P – potential EEC under EPBC Act; E – listed EEC under the TSC Act; E* - considered by Panel to essentially meet listing criteria under TSC Act

[7] The Department notes that the Commonwealth has determined that the project is not a controlled action under the EPBC Act (although it understands that this decision is being challenged).

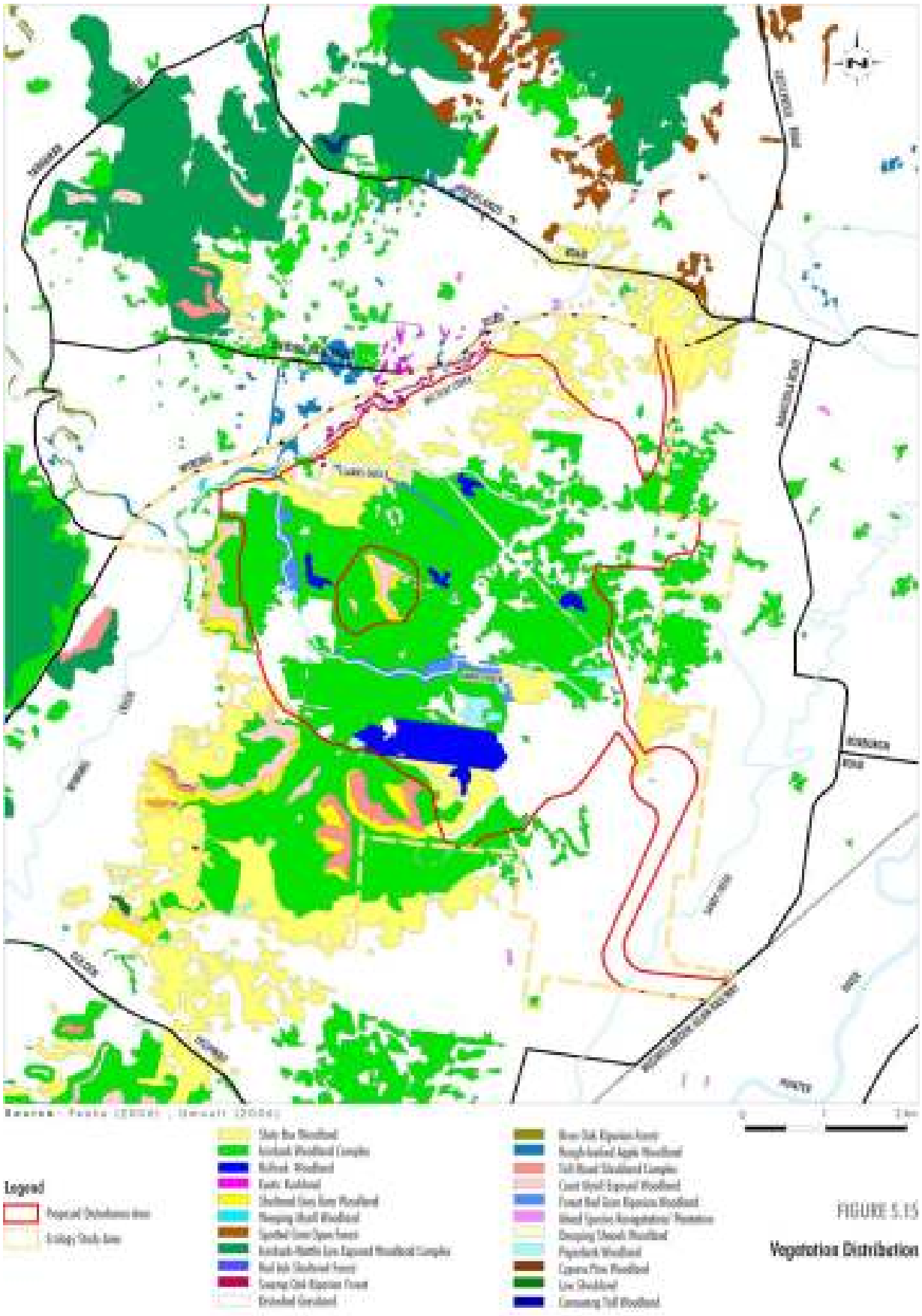

Figure 13: Vegetation Communities

The Panel, as well as some submittors, also argued that the grassland has some conservation significance, given that much of it appears to be dominated by native species, and that it provides habitat for threatened flora species (see below).

Much of the treed vegetative significance arises from the fact that the vegetation within the study area is located on the margin of the Hunter Valley floor, where agriculture and other landuses have largely cleared native treed vegetation for 'productive' pursuits. Accordingly, those areas of the Hunter Valley floor containing remnant vegetation have become more significant over time. 65% of the remaining treed vegetation of the Hunter Valley floor occurs within a few large remnants, with the largest being in the Myambat Military Area, covering 2,250 hectares. The study area forms part of the second largest remnant, known as the Wybong Uplands, which covers 2,067 hectares. The project would remove over half of this remnant.

From this information, the Department believes it is clear that the vegetation within the project disturbance area is of significance (notwithstanding Centennial's argument that much of it is regrowth). The Department believes that, for the project to be able to represent no net loss to flora and fauna values over the medium to long term (as required by the Director-General in his requirements for the project), it would require significant vegetation offsets of suitable size and quality. This issue is discussed under a separate sub-heading below.

Flora Species

The study area contains a high biodiversity, with flora surveys identifying a total of 597 plant species. Approximately 83% of the recorded species are native to the study area. The assessment identified a total of 9 threatened flora species in the study area, including:

- 6 flora species (*Commersonia rosea,* painted diuris (*Diuris tricolor*), narrow goodenia (*Goodenia macbarronii*), *Lasiopetalum longistamineum, Pomaderris queenslandica* and *Pomaderris reperta*);
- 2 endangered populations (weeping myall (*Acacia pendula*) and tiger orchid (*Cymbidium canaliculatum*) populations); and
- 1 endangered ecological community (EEC) (Weeping Myall Woodland), as discussed above.

Since publication of the EA, painted diuris (*Diuris tricolor*) (also known as donkey orchid) as been further listed as an endangered population in the Muswellbrook local government area, under the TSC Act. Centennial has provided an additional impact assessment in response to this listing (see Appendix E).

Of the threatened species, only 1 of the flora species (narrow goodenia (*Goodenia macbarronii*)) was found to occur extensively within the project disturbance area.

Of the threatened populations, some specimens of the endangered tiger orchid population were identified in the project disturbance area, but most identified specimens of this population were identified in the proposed offset areas. The endangered weeping myall population, which occurs within the Weeping Myall Woodland EEC, was found mainly within the proposed offset areas, with an isolated occurrence in the centre of the proposed rail loop. This area is proposed to be protected and conserved. Specimens of the (recently-listed) endangered painted diuris population were found in the proposed offset areas.

Centennial has undertaken detailed tests of ecological significance for each of these threatened flora species, as well as a number of additional threatened flora species that, although not identified in the surveys, have the potential to occur within the project disturbance area.

The tests of significance conclude that the project – without any impact mitigation/offset strategy – would or may have a significant impact on 2 threatened flora species, narrow goodenia and painted diuris, both small herbs.

Centennial proposes to mitigate the impact on these threatened species predominately through the establishment and implementation of the proposed offset areas, as discussed further below. With the implementation of the offset strategy, Centennial claims that the project would effectively compensate for the impact on these species.

Some submissions claimed that the flora survey had underestimated the impact on some threatened flora species, including:

- painted diuris, which submittors had identified in significant numbers within the project disturbance area on occasions; and
- 2 other terrestrial orchids (*Prasophyllum sp. aff. petilum* and *Oligochaetochilus sp. aff. praetermissus*).

With regard to painted diuris, the Department acknowledges the identification of the species by submittors, but accepts that Centennial had envisaged and acknowledged in the EA that the species was likely to occur more extensively within the project disturbance area than its own surveys suggested, and based its assessment on this potential occurrence accordingly. Indeed, the flora and fauna assessment concluded that without mitigation, the project may have a significant impact on the species.

The additional ecological assessment provided by Centennial in response to the endangered population listing of painted diuris estimates that the sub-population occurring in the project disturbance area/proposed offset areas could comprise 2-3% of the Muswellbrook LGA population. The assessment concludes that the project is unlikely to have a significant impact on the population.

With regard to the other two terrestrial orchids (which have been found within the offset areas but not within the project disturbance area), the Panel's flora and fauna expert considers that, although the species may not be listed as threatened within the TSC Act or EPBC Act, the species are nevertheless rare and therefore significant, and that the potential presence of these species adds to the significance of the grassland vegetation community within the project disturbance area.

From the above, the Department accepts that, without any mitigation, the project would significantly impact 2 threatened flora species (narrow goodenia and painted diuris), as well as another 2 other terrestrial orchids, all of which predominately occur in the grassland community. The Department believes that, for the project to be able to represent no net loss to flora and fauna values over the medium to long term (as required by the Director-General in his requirements for the project), it would require vegetation offsets of suitable composition and quality to offset these impacts. This issue is discussed under a separate sub-heading below.

Fauna

The fauna surveys identified a total of 188 fauna species in the study area, with 166 recorded in the project disturbance area, and 179 within the proposed offset areas. 122 bird species, 13 reptiles, 9 amphibians and 44 mammals were recorded.

A total of 19 threatened fauna species were identified in the study area, along with an additional 4 migratory bird species listed under the EPBC Act. The threatened species included 9 birds, 7 micro-bats and 3 other mammals (brush-tailed rock wallaby, koala and squirrel glider).

Tests of ecological significance were undertaken for each of these threatened fauna species, as well as a number of additional threatened fauna species that have the potential to occur within the study area.

The tests of significance conclude that the project – without any impact mitigation– would or may have a significant impact on 13 threatened species, including:

- 5 birds (brown treecreeper, speckled warbler, hooded robin, grey-crowned babbler, diamond firetail);
- 7 micro-bats (eastern firetail-bat, eastern bentwing-bat, eastern false pipistrelle, large-eared pied bat, large-footed myotis, greater broad-nosed bat and eastern cave bat); and
- 1 other mammal (squirrel glider).

To minimise the impacts on fauna, Centennial proposes to implement a range of standard management strategies including progressive clearing, pre-clearance surveys, ecological monitoring and habitat augmentation, which would complement the key mitigation measure – implementation of the biodiversity offset strategy (as discussed below).

Aquatic Ecosystems

The project would destroy the aquatic environments of Anvil Creek and Clarks Gully (as well as a number of farm dams), and has the potential to affect downstream aquatic ecosystems associated with Big Flat Creek, Sandy Creek and Wybong Creek through changes to water flows and quality.

Anvil Creek is bordered by Forest Red Gum Riparian Woodland for most of its length, and the downstream reaches of the creek contain pool/riffle sequences, refuge pools, debris habitat and shaded areas.

Clarks Gully does not support well defined riparian vegetation, indicating its ephemeral nature. However, the creek does support a thin band of Forest Red Gum Riparian Woodland, and does contain some pools and pool/riffle sequences.

A total of 24 aquatic fauna species were recorded within the study area, comprising 3 vertebrate and 21 invertebrate species. Only limited aquatic flora was identified. No threatened aquatic species were recorded.

In general, the flora and fauna assessment considers that the aquatic environments within the project disturbance area are of low floristic significance, and contain poor quality habitat for native fish and macroinvertebrate species. Identitified aquatic environments are similar to other communities and habitats in the Upper Hunter Valley, and are not considered to be regionally significant.

The Panel considered that the Forest Red Gum Riparian Woodland is a significant vegetation community, which could essentially be considered to fall within the categorisation of a listed endangered ecological community, 'Floodplain Eucalypt Forest on Coastal Floodplains'. The project would destroy 51 hectares of this community. The Department has considered this loss within the context of Centennial's proposed offset strategy (see below).

With regard to aquatic habitat, the Department is satisfied that the proposed destruction of Anvil Creek and Clarks Gully is unlikely to result in significant loss of regional aquatic habitat value, but, as discussed above in Section 4.5, believes that Centennial should be required to effectively rehabilitate Anvil Creek (along its existing alignment) and Clarks Gully to ensure not net loss of stream length and aquatic habitat.

Biodiversity Offset and Rehabilitation Strategy

The EA includes a rehabilitation strategy and a biodiversity offset strategy which outline the strategies to progressively rehabilitate the site and to compensate for the 1,304 hectares of native treed vegetation which would be cleared as a result of the project.

The offset strategy has been designed to assist in the protection of a diverse range of habitat, threatened flora and fauna, and significant Aboriginal archaeological sites, and, through progressive revegetation provide habitat corridors between existing woodland remnant areas surrounding the site (see Figure 14). These habitat corridors are detailed in a conceptual corridor strategy, which aims to ensure that the offset areas are integrated into the surrounding landscape and facilitate long term regional flora and fauna movement.

The offset areas as presented in the EA include the project disturbance area, which would be progressively rehabilitated during the life of the project. For the purposes of its assessment, the Department has excluded the rehabilitation area from its assessment of the adequacy of the offset strategy, given:

- the long timeframe associated with the rehabilitation works;
- the inherent risks associated with re-establishment of high-quality, diverse ecosystems on the rehabilitated landscapes; and
- the significance of the vegetation that would be removed by the project.

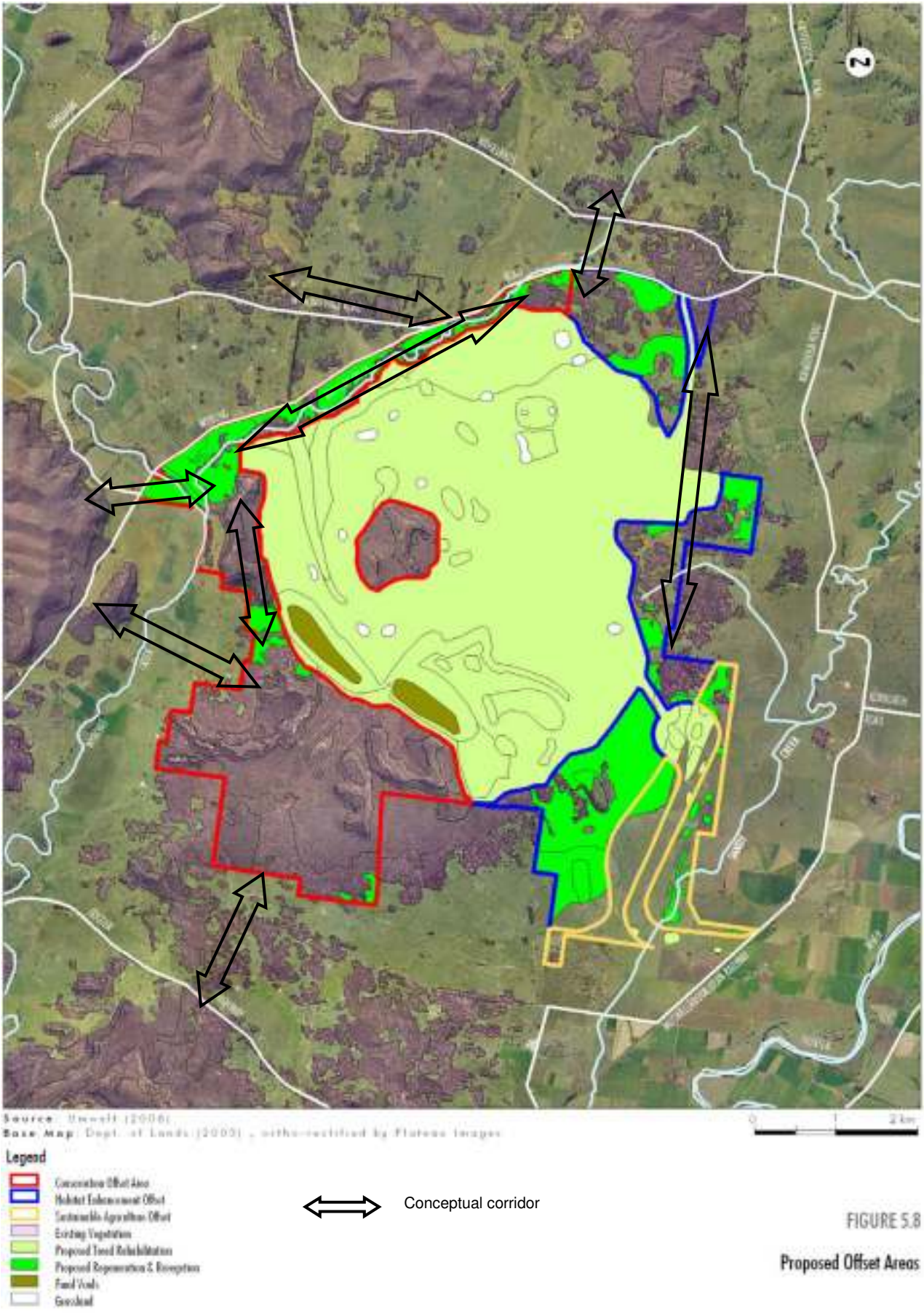

Figure 14: Original Offset Strategy and Conceptual Corridors

Notwithstanding, rehabilitation of the project disturbance area would ultimately become an important component of the total long term vegetation offset strategy for the project. The proposed long term vegetation provided by the rehabilitation works are shown in the table below.

Table 11: Project Rehabilitation

	Area Cleared (hectares)	***Area Rehabilitated (hectares)***	***Change (hectares)***
Trees	1,304	2,074	+770
Grassland	934	164	-770
Total	**2,238**	**2,238**	**0**

The Department is generally satisfied with the proposed rehabilitation strategy. However, the Department believes that Centennial should increase the rehabilitated grassland area to a total of 700 hectares, given the significance of the grassland community, the higher likely success of reinstating grassland on the rehabilitated landscape relative to treed vegetation, and the recommended treed vegetation offsets discussed below.

With regard to the offset areas (outside the project disturbance area), the DECC, the Panel, and many submissions believed that the offset strategy as proposed in the EA was inadequate to offset the flora and fauna impacts of the project.

The DECC suggested that the offset areas be increased by a minimum of 600 hectares, to which Centennial subsequently agreed. The (revised) offset areas are illustrated in the table below.

Table 12: Revised Offset Strategy (additional 600 hectares)

Offset Type	***Offset Area (hectares)***	***Offset Ratio***
Existing trees	1,334*	1.6:1
Trees to be established	771*	
Sub-total Trees	**2,105**	
Grassland	202	0.2:1
Total	**2,307**	**1.0:1**

* Approximate

Although it accepts that this strategy would ultimately result in the establishment and/or protection of some 2,105 hectares of treed vegetation (or around 3,600 hectares if the rehabilitation areas are included), the Department and the Panel believe that the revised offset strategy does not achieve the Director-General's requirement of 'no net loss of flora and fauna values in the area over the medium to long term'. The Department's reasons include:

- the significance of the vegetation communities and presence of threatened flora and fauna within the project disturbance area; and
- that a significant proportion of the proposed conservation areas are in rugged terrain (including areas around Anvil Hill, Wallaby Rocks and Limb of Addy Hill) where the existing vegetation is at very low risk of being cleared at any time in the future, with or without the project.

The Department believes that, in terms of offsets size, an offset ratio of at least 2:1 for trees would be required to adequately offset the flora and fauna impacts of the project. The composition of such an offset strategy is illustrated in the table below.

Table 13: Recommended Offset Strategy (2 to 1 treed offset ratio)

Offset Type	***Offset Area (hectares)***	***Offset Ratio***
Existing trees	1,560*	2.0:1
Trees to be established	1,040*	
Sub-total Trees	**2,600**	
Grassland	200	0.2:1
Total	**2,800**	**1.3:1**

* Approximate

The Department is satisfied that this offset strategy would, in terms of size, adequately offset the flora and fauna impacts of the project. The Department notes that Centennial has recently

extended its offsets commitment to be consistent with this total recommended offset size. The Department is satisfied that Centennial is able to obtain this additional offset area. In this regard, Centennial has identified Crown land to the west of the site that it would be prepared to manage, improve and conserve as part of its offset strategy. Alternatively, Centennial could include more of the land acquired through its acquisition program within its offset strategy, or acquire additional land.

In terms of quality, the Department notes that Centennial's original offset strategy provided good quality offsets for some of the vegetation communities removed by the project, but did not adequately compensate for the loss of other communities. In particular, the Panel's analysis indicates that the offset strategy would result in a net loss of:

- 379 hectares of Ironbark Woodland Complex;
- 100 hectares of Bulloak Woodland; and
- 51 hectares of Forest Red Gum Riparian Woodland.

Although not specifically listed in the TSC Act or EPBC Act as endangered, the Panel believes each of these communities has the potential to fit the criteria for listing under the EPBC Act, and the TSC Act in relation to the Forest Red Gum Riparian Woodland.

These losses would be partly offset by net increases in the protection of other vegetation communities of conservation significance. Notwithstanding, the Department believes that Centennial should be required to undertake all reasonable and feasible efforts to identify and/or establish offsets for all of the communities impacted by the project, within the additional offset areas recommended by the Department.

The Department is satisfied that the offset areas would provide adequate habitat for threatened flora and fauna, notwithstanding the net decrease in the grassland community, which provides habitat for threatened flora. In this regard, and consistent with the Panel's recommendations, the Department believes that the project rehabilitation plan should include provision to salvage and transplant/propagate the native grasslands and threatened species, based on additional survey and research. With this measure – together with the recommended increase in grassland within the rehabilitation area, the provision of at least 200 hectares of grassland within the offset areas, and the fact that native grassland will be present within the woodland areas of the offset areas (as understorey or mosaic) – the Department is satisfied that the project is unlikely to have a significant impact on native grassland and associated threatened species. The DECC is also satisfied that the project is unlikely to significantly impact grassland and its associated threatened species.

The Department is also satisfied that, through the continued implementation of its land acquisition program, Centennial now has control of much of the land required to facilitate the generation of important regional habitat corridors as identified in its conceptual corridor strategy, particularly those linking the site and offset areas to important remnant vegetation to the north and west of the site. The establishment and conservation of these corridors would benefit regional ecological function in the medium to long term.

Some submitters argued that Centennial's revised offset strategy (ie. the original strategy plus 600 hectares) did not provide any certainty of offset quality as the additional areas were not identified by Centennial. However, the Department is satisfied that precise identification of the additional areas is not required at this stage, and is confident that Centennial could identify and/or establish the additional areas. Indeed, the Department believes that some flexibility is beneficial in achieving the best possible offset strategy outcome, based on sound and thorough investigation. Notwithstanding, the Department believes that the additional offset areas should be identified prior to commencement of mining operations, in consultation with DECC and to the satisfaction of the Director-General. The potential offset areas would be considered against a range of factors, including habitat quality and corridor establishment.

Conclusion

The Department is satisfied that there is sufficient information available to determine the flora and fauna impacts of the project.

This assessment indicates that the project would:

- clear 1,304 hectares of good quality native treed vegetation, including vegetation communities of conservation significance;
- clear 934 hectares of grassland that provides habitat for threatened flora species; and
- significantly impact 2 listed threatened flora species and 13 threatened fauna species, in the absence of any offset strategy.

The Department and the DECC are satisfied that these impacts are able to be mitigated and/or offset to an extent such that the project could be considered able to represent no net loss of flora and fauna values in the area over the medium to long term. To achieve this goal, the Department believes that Centennial should be required to:

- revise its offset strategy and conceptual corridor strategy to provide a minimum offset area of 2,800 hectares (outside the project disturbance area), which includes an offset ratio for trees of at least 2 hectares offset to 1 hectare removed;
- ensure that the offset strategy contains adequate provisions to offset the project's net impact on significant vegetation communities and threatened species;
- develop a comprehensive Landscape Management Plan, including a Rehabilitation and Offset Management Plan, Final Void Management Plan and Mine Closure Plan;
- lodge a substantial Conservation and Biodiversity Bond to ensure that the offset areas are established to the satisfaction of the Director-General.

The Department notes that the implementation the recommended offset strategy and the recommended rehabilitation of the project disturbance area would ultimately provide for the establishment and long term conservation of over 4,100 hectares of trees to compensate for the 1,304 hectares removed by the project.

4.7 Aboriginal Cultural Heritage

Issue

The project would have direct impacts on a number of identified Aboriginal sites, and could also affect other sites of Aboriginal cultural heritage significance.

Consideration

The EA includes a specialist Aboriginal cultural heritage survey and assessment, undertaken by Umwelt Pty Ltd in consultation with local Aboriginal groups.

The survey identified a total of 173 Aboriginal sites, including 69 sites in the proposed disturbance area and 98 sites in the proposed offset areas, and a further 6 sites outside these areas. The sites include:

- 88 artefact scatters;
- 69 isolated finds; and
- 16 rockshelters with archaeological deposits (all located within proposed offset areas).

The project has the potential to affect the rockshelters through vibration associated with blasting operations. This issue is addressed in Section 4.3.

The areas containing the Aboriginal sites are generally considered by the Aboriginal stakeholder groups to be of high cultural significance. The archaeologists have rated the majority of the sites to be of low to moderate scientific archaeological significance, however 15 sites are rated as being of moderate to high or high scientific significance. All but one of these sites occur within the proposed offset areas, and are not proposed to be disturbed by the project.

The project would destroy all 69 sites within the project disturbance area, including one site rated as being of high scientific significance (Site AC13, an artefact scatter near Anvil Creek containing more than 100 artefacts). One additional artefact scatter site (SC10) of moderate scientific significance was initially within the proposed rail corridor, however the alignment of the rail corridor has been amended to enable the site – which contains in excess of 300 artefacts – to be conserved.

Site AC13 is located within the footprint of the proposed main water storage dam. The Department is satisfied that the conservation of this site would not be reasonably achievable.

To mitigate the project's impact to Aboriginal sites, Centennial has committed to:

- salvaging all sites within the proposed disturbance area, including undertaking sub-surface investigations in areas of high archaeological potential;
- undertaking a detailed geomorphic investigation and surface and sub-surface investigations of Site AC13, due to its high significance;
- conserving Site SC10 and managing the site for use by the Aboriginal community for teaching and educational purposes; and
- conserving all 98 sites located within the proposed offset areas – including the 16 Aboriginal rock shelters that have the potential to be impacted by blasting activities (see Section 4.3) – in accordance with an Aboriginal Heritage Management Plan prepared in consultation with Aboriginal stakeholder groups.

The Department supports Centennial's proposed mitigation measures.

Conclusion

The Department acknowledges that the project would destroy a significant number of Aborginal sites of cultural heritage significance, including one site (an artefact scatter) of high archaeological significance. However, the Department accepts that due to the location and depth of the coal resource there are no viable alternatives to the extraction of the coal via open cut mining methods, and that conservation of the highly significant site is not reasonably viable.

The Department also acknowledges that the project would ensure the long term protection of at least 98 Aboriginal sites within the proposed offset areas. With the recommended significant increase in the offset areas (see Section 4.6), the actual number of Aboriginal sites conserved in the offset areas would be well above this figure.

To manage the project's impacts on Aboriginal cultural heritage, the Department believes Centennial should be required to prepare a comprehensive Aboriginal Heritage Management Plan in consultation with Aboriginal stakeholder groups, which includes provisions for:

- salvaging Aboriginal sites within the project disturbance area;
- protecting and monitoring Aboriginal sites outside the project disturbance area;
- contingency measures in the event that additional Aboriginal objects are discovered during the project; and
- ongoing consultation with Aboriginal communities throughout the project.

4.8 Non-indigenous Heritage

Issue

The project has the potential to have direct and indirect (through blasting) impacts on items of heritage significance, and also has the potential to result in the loss of local history through displacement of landowners.

Consideration

The EA includes a heritage impact assessment undertaken by Umwelt Pty Ltd. The assessment includes a literature review and site inspection to identify items of heritage significance.

The assessment found that there are no items listed on the national or State heritage registers, or listed in the Muswellbrook Local Environmental Plan (LEP), that would be affected by the project. However, there are a number of sites of local heritage significance in the area that are currently being considered by Muswellbrook Council for inclusion in the LEP.

In total, the assessment found 19 sites of local heritage significance within the project disturbance area and the wider area that could be affected by blasting associated with the project. These sites are listed in the table below.

Table 14: Heritage sites affected by the project

Site	Heritage item	Assessed significance	Location
1	Hogan property house (and associated structures) ruins	Low-Moderate	Inside project disturbance area (PDA)
2	Rock spillway	Moderate	Inside PDA
3	Coal mining exploratory test shaft	Moderate	Inside PDA
4	Ham house 1 ruins	High	Inside PDA
5	Ham house 2 ruins	High	Inside PDA
6	'Yarrawongah' cottage	Moderate	Inside PDA
7	'Bundabulla' cottage and associated structures	Moderate	Inside PDA
8	Remains of post and rail fence on Anvil Creek	Low	Inside PDA
9	Rays quarry	Low	Inside PDA
10	Walkers quarry	Low	Inside PDA
11	Windmill and dam	Low	Inside PDA
12	'Amaroo' cottage	Local	Outside PDA
13	Charcoal retorts	Local	Outside PDA
14	'Springvale' cottage	Local	Outside PDA
15	'Angle Vale' cottage	Local	Outside PDA
16	'Old Angle Vale' homestead group	Local	Outside PDA
17	'Castle Hill' slab hut	High Local	Outside PDA
18	Anvil Rock	Local	Outside PDA
19	'The Book' rock formation	Local	Outside PDA

All of the items within the project disturbance area would be destroyed at some stage during the project. Centennial is proposing to undertake archival recording of these items prior to destruction, in accordance with NSW Heritage Office guidelines. Recording would include surface collection and salvage of the Ham House 1 and Ham House 2 ruins, which are considered to be of high local heritage significance as evidence of early dairy farming in the area.

Heritage items outside the project disturbance area (with the potential to be impacted by blasting) are proposed to be conserved where possible through modification of blast design. Archival recording and detailed historical investigation is proposed where monitoring indicates that blast design cannot be modified to protect the structures. In addition, Centennial is proposing to prepare a Conservation Management Plan for 'Castle Hill' if blast monitoring indicates potential damage to the structure. The items of natural heritage significance (ie. Anvil Rock and 'The Book') would be conserved (see Section 4.3 for detail).

Although somewhat critical of parts of the heritage impact assessment, the NSW Heritage Office agreed that the identified heritage items do not warrant in-situ conservation. The authority recommended a number of conditions of approval regarding heritage management; including dilapidation surveys, blast impact monitoring and preparation of a Conservation Management Strategy for items potentially affected by blasting, and archival recording for all heritage items prior to removal.

Apart from impacting items of local heritage significance, the project would also potentially result in a loss of local history, through displacement of families that have lived in the Wybong area for generations. To mitigate against this loss, Centennial proposes to compile a community based oral history to document the local history of the area.

Conclusion

The Department is generally satisfied with the level of heritage assessment presented in the EA and Response to Submissions.

The Department acknowledges that the project would result in the destruction of 11 items of local heritage significance, and would have additional indirect impacts on a further 8 locally significant heritage items. Notwithstanding, the Department is satisfied that the project would not result in a significant impact to the heritage values of the greater Muswellbrook area.

However, of perhaps greater significance is the potential loss of local history associated with the displacement of the local Wybong community, which includes families that have lived in the Wybong area for generations. To mitigate against this loss of local knowledge and history, the

Department supports Centennial's proposal to prepare a community based oral history that comprehensively documents the local history of Wybong. The Department believes that this oral history should include consultation with at least all landowners within the area significantly affected by noise and dust.

The Department also believes that Centennial should be required to:

- undertake archival recording for all heritage items within the project disturbance area and blast affectation area;
- prepare a Conservation Management Strategy to manage heritage items within the blast affectation area, including provision for dilapidation surveys, blast impact monitoring and measures to protect sensitive heritage items (particularly 'Castle Hill'); and
- protect and monitor blasting impacts on significant rock formations (Anvil Rock and 'The Book').

4.9 Traffic and Transport

Issue

The project would significantly increase traffic levels on local roads around the site, and would generate additional movements on the Muswellbrook to Ulan railway line.

Consideration

Road Traffic

The road network in the vicinity of the site is shown in Figure 15. The majority of road traffic accessing the project would originate from Muswellbrook, with contributions from the Denman, Scone and Singelton areas. The primary traffic route for the project (from/to Muswellbrook) would be via New England Highway/Denman Road/Bengalla Link Road/Wybong Road/mine.

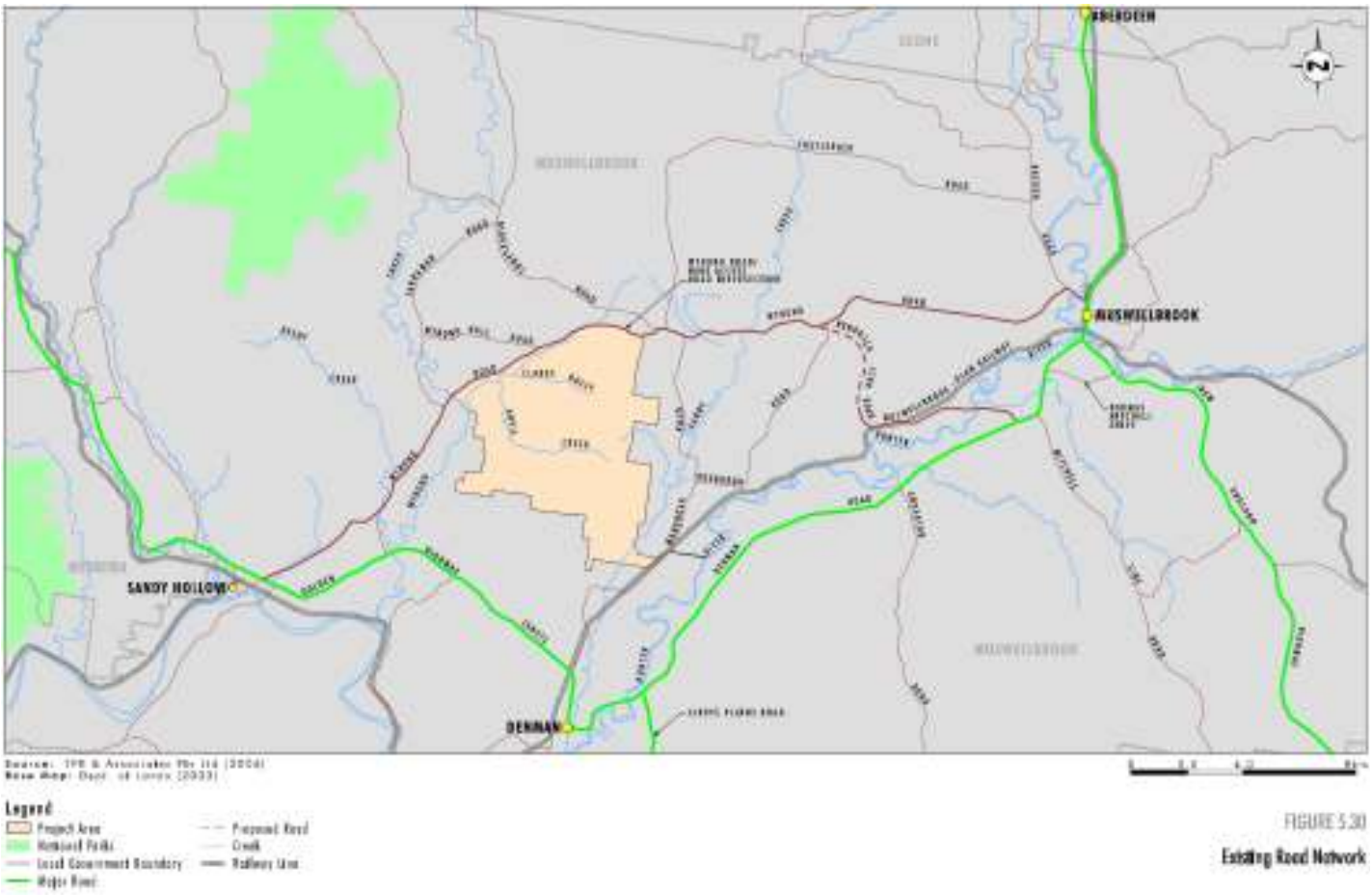

Figure 15: Road Network

Part of the Bengalla Link Road has been constructed to date to provide access to the Bengalla coal mine. The Bengalla mine development consent requires the extension of the link road to Wybong Road, and the EA assumes that the extension would be completed prior to commencement of the project. (The eastern part of Wybong Road is planned to be closed once the alternate route via Bengalla Link Road is established).

All project related traffic is proposed to access the site via an intersection on Wybong Road. Existing traffic levels on Wybong Road average 500 vehicles per day, with a peak hourly flow of 50 vehicles per hour.

Centennial's traffic impact assessment, undertaken by TPK and Associates Pty Ltd, calculates that the project would generate:

- up to 191 vehicle movements per hour during the peak of construction, which would occur for a period of 2-3 months; and
- up to 125 vehicle movements per hour during the operations (at shift change over); and
- an average of 300 to 340 vehicle movements per day during operations.

This traffic volume represents a significant increase in total peak hour (250% increase) and daily (70% increase) traffic movements on Wybong Road. However, in absolute terms, the project is not expected to significantly affect the level of service of the existing road infrastructure.

The EA acknowledges the increase in road traffic, and Centennial has committed to upgrading Wybong Road from the intersection with Bengalla Link Road to the proposed mine access road.

The RTA/Hunter Regional Development Committee are satisfied with Centennial's assessment and the traffic associated with the project, subject to Centennial:

- constructing the remainder of the Bengalla Link Road in conjunction with Bengalla mine, with subsequent dedication as a public road;
- upgrading a number of intersections (including lighting and signposting), to RTA/Council requirements, including:
    - Bengalla Link Road/Denman Road;
    - Bengalla Link Road/Wybong Road;
    - Wybong Road/mine access road;
- upgrading Wybong Road to the satisfaction of Council;
- sealing the mine access road, with adequate sediment controls and on-site parking; and
- preparing a construction traffic management plan.

Council further recommends that Centennial be required to:

- discourage the use of Mangoola Road as an access route;
- upgrade additional intersections, including:
    - Reedy Creek Road/Golden Highway;
    - Reedy Creek Road/Wybong Road;
    - Golden Highway/Wybong Road;
- provide a southern access to the site from Mangoola Road;
- upgrade affected bus stops; and
- only accept deliveries during daylight hours.

The Department believes that most of these recommendations are reasonable, given the traffic volumes associated with the project, and the safety hazards raised by this traffic.

With regard to the Bengalla Link Road, the Department is satisfied that the construction of the road is adequately provided for through the development consents for the Bengalla mine and the Mt Pleasant mine, and does not believe that Centennial should be required to further contribute to the construction of the road itself. However, the Department believes that it is reasonable that Centennial be required to contribute to the road by upgrading the Bengalla Link Road intersections with Wybong Road and Denman Road.

The Department notes that there is some risk that the Bengalla Link Road will not be completed by the time the project construction works are due to start. As the project relies on this road, the Department proposes to write to the Bengalla mine shortly requiring the road to be completed promptly.

With regard to Wybong Road, the Department believes it is unreasonable to suggest – as Centennial does – that all or most traffic originating from Denman or Sandy Hollow would access the site via the Bengalla Link Road when a much shorter route is present from the western end of Wybong Road. Although these traffic volumes would be a relatively small proportion of total traffic, the Department agrees with Council that the intersection of Wybong with the Golden Highway should be upgraded, and that Wybong Road be upgraded to the satisfaction of Council.

With regard to the southern site access via Mangoola Road as suggested by Council, the Department believes that such an access would potentially affect the amenity of residences along this road, and notes that the suitability of this roadway to handle significant volumes of project related traffic has not been assessed. Given that the Wybong Road access route has been demonstrated to be adequate in servicing the development, the Department does not believe that such a requirement is warranted.

Mangoola Road, Roxburgh Road and Reedy Creek Road, all minor local roads, do present some potential for 'short cutting' between the project site and Denman. To protect the amenity and safety of residents and commuters, the Department believes that Centennial should be restricted from using these roads to access the site. In accordance with this restriction, the Department does not believe that Council's request for upgrading of the Reedy Creek Road intersections is warranted.

With regard to restricting deliveries to daylight hours only, the Department does not believe that such a restriction is warranted, as the vast majority of deliveries would occur during daylight hours. The Department has considered traffic noise issues in Section 4.2 above.

Rail Traffic

Train loading is proposed to occur up to 24 hours a day, 7 days a week, and the project would generate an average of 4 trains per day (ie. 8 total movements), and a peak of 5 trains per day (ie. 10 total movements), on the Muswellbrook to Ulan railway line. This represents an increase of approximately 20% of the existing and approved movements on the railway line.

The EA considers that the existing railway line, with planned upgrade works, would accommodate the rail traffic generated by the project. The ARTC has not objected to the project. (Rail traffic noise is considered above in Section 4.2).

Conclusion

The Department, RTA and Council are satisfied that the road and rail network is capable of accommodating the traffic associated with the project, subject to certain upgrade works and traffic management controls. The Department has recommended conditions requiring Centennial to:

- transport all coal via rail, and keep accurate records of coal and rail movements;
- upgrade the Bengalla Link Road intersections with Denman Road and Wybong Road prior to commencing works on site;
- upgrade Wybong Road and its intersections with the mine access road and the Golden Highway prior to commencing works on site;
- restrict traffic from using Mangoola Road, Roxburgh Road and Reedy Creek Road; and
- prepare a construction traffic management plan.

4.10 Visual Amenity

Issue

The project would result in visual impacts on residents and other land uses in the areas surrounding the site.

Consideration

The EA includes a visual impact assessment undertaken by O'Hanlon Design Pty Ltd. This assessment considered the visual impacts of the project at 12 representative view locations around the site (including the visual impacts associated with night lighting) prior to the implementation of the proposed visual mitigation measures (see Table 15 and Figure 16).

Visual impact ratings (Severe, High, Moderate, Low and Nil) were assigned to each representative view location based on the perceived severity of impacts, the number of viewers expected to experience visual changes, and the capacity of the landscape to absorb the proposed changes. Transects were also prepared for some of the view locations to illustrate the predicted direct sight lines into the project area.

In summary, the assessment found that other than VP 7 (which is located directly to the west of active mining areas) the greatest visual impacts are expected to occur to the east (VP 2 and VP 3) and northwest of the site (VP 8 – VP 11). The impact in these areas has been assessed as 'Moderate' and 'Moderate to High' respectively, and is expected to vary over the life of the project, with the eastern areas expected to experience the greatest visual impacts from Years 10 to 15 and the areas to the northwest during Years 5 to 10.

With regard to night lighting, the assessment shows that the areas of greatest impact are similar to the locations where the visual impact is expected to be highest, although the impacts to the southeast of the mine (i.e. VP 4 and VP 5) are also expected to be high due to their proximity to the surface infrastructure such as the CHPP and rail loading infrastructure.

The assessment also indicates that the visual impacts on residents in the Wybong Road and Wybong Hall Road area (i.e. to the north and west of VP 8) are expected to experience more significant impacts than those predicted at VP 8 because of their elevated position.

Table 15: Visual Impact Assessment

View Location	***Visual Impact Rating***	***Night Lighting***
VP1 – Roxburgh Road	Low-Moderate	Low
VP2 – Mangoola Road	Moderate-High	Moderate-High
VP3 – Cnr Mangoola & Roxburgh Road	Moderate	Moderate-High
VP4 – Adjacent to Bells Lane	Low-Moderate	Moderate-High
VP5 – Denman Road	Low-Moderate	Moderate
VP6 – Wybong Road	Low	Low-Moderate
VP7 – Adjacent to Bellevue	High	Moderate
VP8 – Wybong Road	Moderate-High	Moderate
VP9 – Wybong Road 1.1 km south of Wybong Hall Rd	Moderate-High	Moderate-High
VP10 – Wybong Hall Road	Moderate	High
VP11 – Ridgelands Road	Moderate	Moderate-High
VP12 – Golden Highway	Nil-Low	Nil-Low

To minimise the visual impacts of the project, Centennial proposes to implement a range of mitigation measures that can be broadly characterised as follows:

- vegetative screenings – along the lower sections of Mangoola Road and the ridge extending west from the Limb of Addy to reduce the visibility of the surface infrastructure, and along sections of Big Flat Creek to reduce the visibility of active mining areas from the north;
- rehabilitation and final landforms – progressive rehabilitation and revegetation of disturbed areas and shaping of overburden emplacements to minimise straight edges and provide greater topographical relief in the final landform;
- infrastructure and mine layout – locating mining areas and surface infrastructure in areas that take advantage of existing topographical features to minimise visibility of the mine from surrounding areas, including the realignment of the northern pit boundary to provide a greater set back from Wybong Road; and
- lighting – a range of standard measures to minimise light spill from surface infrastructure and active mining areas.

With the implementation of these measures the visual assessment indicates that the overall visual impacts of the project would be reduced. However, the Department notes that the

assessment does not provide any details about how effective these mitigation measures would be at reducing visual impacts from representative view locations or from residences in the areas surrounding the site.

In addition to these measures, Muswellbrook Council has requested that Centennial be required to construct a vegetated bund wall adjacent to the main and northern pits to reduce visibility from Wybong Road. This request is consistent with Council's policy of minimising the visibility of active open cut mining areas from public roads within its LGA.

However, in its response to submissions, Centennial argues that the construction of a bund in this area would create additional environmental impacts, interfere with its biodiversity offset strategy and not be effective in reducing visual impacts on residences to the north of the site. In particular, Centennial makes the following points:

- the mine plan has previously been altered to increase the distance from Wybong Road to the active mining areas to between 350 and 450 metres;
- the existing vegetation together with the proposed planting of native vegetation in this area as part of the biodiversity offset strategy would effectively screen views from Wybong Road without the need for an additional bund;
- the construction of the proposed bund would create unnecessary additional disturbance in the Big Flat Creek corridor area that is proposed to be managed for conservation of ecological and cultural heritage values;
- due to the elevated location of residences to the northwest of the site, a vegetated bund wall would not provide an effective screen of active mining areas; and
- the outer face of overburden emplacements would be rehabilitated with native vegetation as soon as practicable to reduce visual impacts on the surrounding area.

The Department acknowledges that the construction of a bund in this area would provide an effective visual screen from Wybong Road. However, the Department believes that the additional visual screening effect achieved by the construction of a bund wall over and above that offered by several hundred metres of vegetation (both existing and proposed) would be marginal. The Department also notes that to provide effective screening of the active mining areas along Wybong Road, the proposed bund would need to be at least 4 kilometres long. The additional disturbance and noise generated by the construction of a bund of this size would be significant, and the Department questions whether the marginal visual impact benefits offered by the bund outweigh its impacts. In addition, it is noted that the bund would only be effective in screening views from Wybong Road which is a local road that does not usually have significant volumes of traffic compared with other major roads in the area, and would have little or no benefit for residents on elevated land to the northwest of the site. Given these considerations, and the potential for the construction of the bund to interfere with the proposed revegetation and rehabilitation of Big Flat Creek, the Department does not believe the construction of a bund wall along Wybong Road is warranted.

Some submissions raised concerns about the visual impacts of the project on the scenic protection zone that covers part of the project site, and land to the north and northwest of the site (see Figure 8). In particular, residents believe that the project should not be allowed to proceed because of the apparent inconsistency of the project with the 7(d) Environment Protection (Scenic) Zone which aims to preserve the scenic quality of the area and limit development that is visually destructive or intrusive. The Department notes that open cut mining is prohibited in this zone, but that the Minister is able to determine the application because the project is not wholly prohibited (see Section 2.2). Notwithstanding, the Department believes that the project is likely to result in significant visual impacts on at least some of the land covered by the scenic protection zone, and acknowledges that the project is therefore inconsistent with the aims and objectives of the zone and would adversely affect some of the scenic values for which the area has been protected.

Figure 16: Visual Assessment Locations

Overall, the Department is generally satisfied with Centennial's proposed on-site mitigation measures, and given the topography of the site and surrounds, believes there is limited opportunity to incorporate additional measures on the site to reduce the visual impacts of the project further. However, even with the implementation of these measures, the Department believes that the project would have a significant visual impact on a large number of properties, particularly to the northwest of the site where the elevated terrain would result in several residences having direct views into the open cut pits.

The Panel commented on the potential visual impacts of the project as a prominent issue raised in submissions. The Panel noted the significant visual impacts of the project on the community, but noted that it would not be possible to develop a mine of this size without some visual impacts on surrounding areas, and that the majority of these properties would have acquisition rights due to the predicted noise impacts of the project. Notwithstanding, the Panel recommended that the Department consider the possibility of requiring Centennial to provide tree screening on properties that would have a direct line of sight of mining operations, and investigate ways of minimising the night lighting impacts of the project on residents.

The Department agrees with the comments and recommendations of the Panel, and has incorporated conditions of approval that require Centennial to identify the residences that are expected to experience significant visual impacts as a result of the project, and implement appropriate landscaping treatments (such as planting vegetative screens on the properties or in other suitable locations) in consultation with the landowner to reduce the visibility of the mine from these residences (see below).

Conclusion

The Department is generally satisfied with Centennial's visual impact assessment, and the on-site mitigation measures proposed in the EA. However, even with the implementation of the proposed mitigation measures the Department believes that the project is likely to result in significant visual impacts (both during the day and at night) on several residences, particularly to the east, southeast and northwest of the mine (most of which are already in the noise acquisition zone).

Consequently, in addition to the measures proposed by Centennial, the Department believes Centennial should be required to:

- identify the residences that are expected to experience significant visual impacts as a result of the project;
- develop a suite of reasonable and feasible landscaping treatments (such as vegetative screens) that could be implemented to reduce the visual impacts of the project on these residences;
- notify these residents that they are entitled to additional landscaping treatments to reduce the visibility of the mine from their properties; and
- on request from the landowner, implement reasonable and feasible landscaping treatments either at their property or in other areas that would assist in reducing visual impacts.

The Department has also recommended a number of other conditions that require Centennial to:

- prepare a detailed Landscape Management Plan for the site that (amongst other matters) describes the measures that would be implemented within the project area to reduce the visual impacts of the project (see Section 4.6 above);
- implement the measures proposed in the EA to reduce night lighting impacts, and any other practicable measures that would minimise off-site lighting impacts further; and
- ensure that all external lighting associated with the project complies with relevant Australian Standards for controlling impacts of outdoor lighting.

4.11 Socio-economic Impacts

Issue

The project would generate a large number of jobs and inject considerable capital investment into Muswellbrook and the broader Hunter region, but would also affect a significant number of residents and landusers in the area.

Consideration
The project, like any large mining project, would have social and economic benefits, and social and economic costs.

The EA includes a socio-economic assessment and an economic assessment, undertaken by Coakes Consulting Pty Ltd and Gillespie Economics Pty Ltd respectively, which attempt to identify, assess and analyse the project's socio-economic costs and benefits.

Cost Benefit Analysis
The assessments include a cost benefit analysis which seeks to calculate a net benefit/cost associated with the project based on its full range of environmental, social and economic impacts and benefits[8]. These are illustrated in the table below.

Table 16: Costs and Benefits of the Project

	Potential Costs	***Potential Benefits***
Production	• Opportunity cost of land (inc. loss of agricultural production) • Mining and infrastructure capital costs • Mine operating and rehabilitation costs	• Residual land value and capital at project end • Value of export and domestic product coal
Potential External Impacts	• Air quality affecting neighbouring properties • Noise and blasting affecting neighbouring properties • Disturbance of surface and groundwater flows • Modification of the visual landscape • Disturbance of flora and fauna • Disturbance of Aboriginal heritage sites • Generation of greenhouse gas emissions (inc. Scope 3 emissions) • Increased road and rail movements	• Value derived from energy produced
Conservation	• Cost of offsets	• Environmental and heritage benefits of offsets

The assessment included in the EA concludes that the project would have a net benefit to society of $480 million. However, the Department notes that this assessment:
- did not include consideration of the costs and benefits associated with the downstream burning of the coal resource; and
- used a cost for Scope 1 and Scope 2 carbon emissions of A$10/tonne CO_2e, whereas the much publicised Stern Review (which was released after the publication of the EA), adopts a social cost of carbon at US$85/tonne CO_2e.

The Department subsequently required Centennial to expand its assessment to include consideration of the costs and benefits associated with the downstream burning of the coal resource, and consideration of different estimates for the social cost of carbon emissions.

With regard to the social cost of carbon, Centennial has undertaken a sensitivity analysis which reassesses the cost benefit analysis using a range a carbon cost estimates based on various estimates made by the scientific community. The analysis indicates that the project would (excluding downstream costs and benefits) continue to have a net socio-economic benefit for the range of carbon cost estimates used, including the Stern estimate (see table below).

Table 17: Net present Value of the Project Under Varying Carbon Cost Assumptions

Assumption	***Net Present Value***
Original Estimate	A$483M
Adjusted for additional direct GHG estimates (219,095t CO2e) – using A$10/tonne	A$478M
Adjusted for additional direct GHG estimates (219,095t CO2e)– using US$25/tonne	A$427M*
Adjusted for additional direct GHG estimates (219,095t CO2e) – using US$30/tonne	A$413M*
Adjusted for additional direct GHG estimates (219,095t CO2e) – using US$85/tonne	A$254M*

**Assuming an exchange rate of 0.75*

[8] As amended (from that in the EA) based on additional information from Centennial regarding costs and benefits associated with the downstream coal combustion.

With regard to the inclusion of downstream costs and benefits, Centennial's economic consultant argues that consideration of secondary costs and benefits such as those associated with the downstream burning of coal is inconsistent with the economic theory behind cost benefit analysis, and that it is not possible to calculate a reliable net present value for the project which includes these costs and benefits.

Notwithstanding, Centennial's analysis includes a basic qualitative analysis of the downstream costs and benefits.

On the cost side, the above estimates of carbon cost can be used to estimate the economic costs associated with downstream coal burning. At a carbon cost of A$10/tonne, the project's downstream GHG emissions would cost $124 million per year (based on downstream emissions of 12,414,387 tonnes of CO_2e per annum). At a carbon cost of US$85/tonne, the project's downstream GHG emissions would equate to an economic cost of A$1,407 million per year.

On the benefit side, Centennial highlights that electricity production has both direct benefits in the form of producer surplus and consumer surplus, as well as public good and external benefits associated with electric street lighting, education, health, entertainment and communication, comfort and protection, convenience and productivity. Centennial notes that the benefits of electricity in developing countries, particularly rural electrification, is seen by the World Bank as significant for the alleviation of poverty.

The Department is satisfied with Centennial's (revised) cost benefit analysis, and that the project, if consideration of downstream costs and benefits is excluded, would have a considerable net benefit to society.

With regard to downstream costs and benefits, the Department acknowledges that the inclusion of these secondary effects is inconsistent with cost benefit analysis, but is nevertheless satisfied that the electricity ultimately produced by the coal derived from the project would generate significant socio-economic benefits. Indeed, electricity underpins much of the economic prosperity of NSW and Australia. As detailed in Section 1.3, the Department is satisfied that there is a demonstrable need for the development of new coal resources to meet society's basic energy needs.

Local and Regional Impacts

The Department acknowledges that cost benefit analyses can seem rather callous, particularly to residents in the vicinity of the mine whose lives and livelihoods would be affected by the project. Nevertheless, the cost benefit analysis indicates that the project, when considered against a broad range of environmental, social and economic factors, would have a net benefit to society.

At the local level, it is clear that the project would directly affect a large number of residents and families. The number of private properties significantly affected by operational noise, blasting, and dust is summarised in the following table.

Table 18: Private Properties Significantly Affected by Noise, Dust and/or Blasting

Property Type	***No. of Private Properties***		
	As at EA date	***As at EA date, exc. those with agreement***	***As at date of this report, exc. those with agreement***
Residence	84	73	30
Vacant Land	25	18	6
Total*	**109**	**91**	**36**

* As discussed in Sections 4.2 and 4.4, the Panel believes that the noise and dust impacts of the project may be underestimated, which would potentially increase the numbers shown in the above table. Nevertheless, the numbers presented provide a broad indication of total affected properties.

The above table illustrates that the project would significantly affect the amenity of a total of about 109 private properties, including 84 residences. That is, 109 private properties would experience noise, dust and/or blasting emissions at levels to which the Department's general policy dictates would entitle the landowners to acquisition rights. Assuming an average family size of 2.7 for the residences, the project would potentially displace around 227 people from the Wybong area.

At the date of this report, about two-thirds of these private landowners had chosen to either sell their property to Centennial, or sign a compensatory agreement with Centennial in relation to the predicted impact. Accordingly, it could be said that the project would have, at the date of this report, a significant impact on around 36 private properties owned by people who may not wish to sell up or sign some form of compensatory agreement with Centennial.

As discussed in Section 4.2, this quantum of affected private properties is at the upper end of the scale in comparison to large contemporary mines in the Hunter Valley, being comparable to the Mt Pleasant Mine and Bengalla Mine.

However, it must be acknowledged that the locality contains a significant coal resource, which cannot be moved. The shallowness of the resource dictates that it cannot be extracted via underground mining methods. The Department and the Panel have investigated the potential to alter the mine plan to reduce the noise and dust impacts to residences (see Sections 4.2 and 4.4), but this analysis indicates that reasonable modifications to the mine plan (whilst maintaining the mine's viability) are unlikely to yield significant improvements in the quantum of affected residences.

Accordingly, the Department is satisfied that Centennial has adequately considered reasonable and feasible measures to mitigate the project's impact on the significantly affected portion of the Wybong community.

To minimise, manage or at least compensate for these residual impacts on significantly affected properties, the Department believes that Centennial should be required to:

- acquire affected properties upon request, including payment of reasonable compensation and relocation costs, in accordance with the Department's land acquisition procedures;
- use its best endeavours to acquire these properties before the start of mining operations;
- upon request, undertake architectural treatments on affected residences whilst they remain in private ownership;
- notify and inform affected residents about their acquisition rights, and the potential health and amenity impacts associated with the project; and
- provide for independent assessments of environmental impacts, and provide for a transparent dispute resolution process.

In addition to these significantly affected properties, the project would also have minor to moderate impacts on the amenity of a number of other private properties in the Wybong and wider area, by way of changes to noise, dust, traffic, visual and other environmental impacts, and changes to demand on community services.

These project impacts, when considered in combination, would adversely affect the amenity of the area surrounding the mine, and would affect the lifestyle and 'sense of place' of the area's residents. The Department has recommended a range of conditions to mitigate these environmental impacts, as discussed in the preceding sections.

In addition, the Department acknowledges that Centennial and Council have negotiated a comprehensive voluntary planning agreement for the project, which provides for a direct contribution of $4.5 million from the project to fund community projects. The relevant elements of the planning agreement are shown in the table below.

Table 19: Project Community Contributions

Funding Area	***Project***	***Minimum Centennial Contribution***
Local Environmental Management	Wybong Uplands Land Management Strategy	$500,000
Local Employment	Educations and Training Strategy	$600,000
Community Projects	Recreation Assets Renewal Fund	$1,200,000
Community Infrastructure	Denman recreation area enhancements	$2,200,000
Total		$4,500,000.00

The Department also notes that the project would provide a number of economic benefits to the region and the State. These economic benefits include the generation of up to:

- *At the Mine:*
  - 200 direct jobs during construction;
  - 240 direct jobs during operations;
  - $240 million in initial capital investment;
- *For the Regional Economy (during operations);*
  - $224 million in annual direct and indirect regional output;
  - $121 million in annual direct and indirect value-added (gross regional product);
  - $28 million in annual household income;
  - 449 direct and indirect jobs;
- *For the NSW Economy (during operations);*
  - $324 million in annual direct and indirect regional output;
  - $158 million in annual direct and indirect value-added (gross regional product);
  - $43 million in annual household income; and
  - 809 direct and indirect jobs.

Effects on Winegrowing and Horse Breeding Industries

The Department notes that winegrowers and horse breeders of the Upper Hunter Valley have expressed strong opposition to the project, and more broadly to the further expansion of coal mining in the Upper Hunter. The main issues raised by these industries relate to impacts associated with:

- water quality and competition for water resources;
- noise and dust, and associated general amenity impacts; and
- direct loss of productive land, and the need to maintain a 'critical mass' for the industries.

As identified in Section 1.2, there are no vineyards or horse studs within the proposed disturbance area, however there are about 5 vineyards within the area predicted to be affected by noise, blasting and/or dust by the project, and there is one horse stud just outside the affectation area. The horse stud and larger vineyards are generally located to the south-east of the project site, where the main impact would be rail noise associated with the proposed rail loop (see Figure 5).

Based on past experience in the Hunter Valley, particularly in the area around Bulga where open cut mines have successfully co-existed with vineyards for many years, the Department is satisfied that the project is unlikely to have a significant impact on the productive capability of the vineyards both in the affectation zone and beyond. This means there should be no impediment, apart from the normal economic vagaries, to the continued operation of the vineyards.

In terms of the studs, the Department is satisfied that they are located sufficiently far away from the project to experience any significant impacts, and notes that the project would comply with all the relevant air quality and noise criteria at these properties.

The principal impact of the project on the agricultural capability of the broader area would be the disturbance of the project site. However, the agricultural capability of this is considered to be low (Class VI), and its disturbance is consequently unlikely to affect the 'critical mass' of any agricultural industries in the Hunter Valley.

The project's affects on water resources is discussed in Section 4.5. Following its detailed consideration, the Department is satisfied that the project would not significantly affect water quality and water resources in the Hunter Valley, and hence would not significantly affect water supplies to the winegrowing and horse breeding industries.

Conclusion

The Department is satisfied that Centennial has adequately assessed the project's social and economic impacts.

These assessments, together with the environmental assessments undertaken, indicate that the project would have a significant impact on the Wybong community. The project would have a significant impact on at least 36 private properties whose owners may not wish to sell or enter

into a negotiated noise agreement with Centennial. The project would also affect the amenity and 'sense of place' of a larger number of residents surrounding the mine.

On a broader level, Centennial's cost benefit analysis for the project, which estimates the total cost of the project in consideration of a range of environmental, social and economic factors, indicates that the project would have a considerable net social benefit.

To minimise, manage or at least compensate for the socio-economic impacts of the project, the Department believes that Centennial should be required to:

- acquire significantly affected properties (upon request);
- use its best endeavours to acquire significantly affected properties prior to the start of mining operations;
- minimise, mitigate, offset and/or compensate the range of environmental impacts associated with the project;
- enter into a planning agreement with Council, providing a minimum community contribution of $4.5 million toward local projects;
- establish and maintain a community consultation committee for the project; and
- make environmental monitoring and reporting data publicly available.

5. RECOMMENDED CONDITIONS

The Department has prepared recommended conditions of approval for the project (see Appendix B), and summarised these conditions in Appendix A. These conditions are required to:

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

The Department has provided the draft conditions of approval for the project to relevant government authorities for comment, and has incorporated these comments into the conditions of approval where appropriate.

Centennial has reviewed and accepts the recommended conditions.

6. CONCLUSION

The Department has assessed the project application, EA, submissions on the project, Centennial's response to these submissions, and the Panel's reports in accordance with the requirements in Clause 8B of the EP&A Regulation and the objects of the EP&A Act, including the object to encourage ecologically sustainable development.

The pursuit of ecologically sustainable development requires the effective integration of economic, social and environmental considerations in the decision-making process.

The Department's assessment of the project has included detailed consideration of the economic, social and environmental impacts of the project, the findings of which are summarised in the following table. It has also sought to effectively integrate the consideration of these impacts in a holistic way.

Table 20: Key Project Impacts and Mitigating Factors

Issue	***Key Impacts***	***Key Mitigating Factors***
Greenhouse Gas (GHG) Emissions	• The project would facilitate the generation of 12.6 million tonnes of GHG a year, 98% of which would be from the downstream burning of the coal. • The project's GHG emissions (inc. indirect downstream emissions) represent 0.031% of global annual GHG emissions.	• At present, and for the foreseeable future, there is a demonstrable need to develop coal resources to meet society's basic energy demands. • Much work has been done, and much more work needs to be done, to address GHG abatement at a societal level. Centennial would be required to contribute to this abatement.
Flora and Fauna	• The project requires clearing of 1,304 hectares of remnant native treed vegetation of conservation significance.	• Recommended offset conditions would secure and conserve 2,600 hectares of treed vegetation. • Ultimately (through mine rehabilitation + offsets), the project would provide for the long term conservation of 4,100 hectares of trees.
	• The project, without any impact offsetting, would significantly affect 2 threatened flora species, and 13 threatened fauna species.	• Offsets have been proposed to provide habitat – and long term conservation – for these species. • The Department is satisfied that recommended offsets would ensure no net loss of flora and fauna values over medium to long term.
Noise	• The project's operational noise emissions, following reasonable mitigation, would significantly impact 33 private properties, including 28 residences and 5 vacant lands. • The project would have minor-moderate impact on a further 66 private properties.	• Centennial has committed to restricting night time activities (or other noise noise reduction strategies) as long as there are more than 20 significantly affected private properties. • Recommended conditions require Centennial to use its best endeavours to acquire or reach agreements with all significantly affected properties before mining commences. • Significantly impacted properties to be granted acquisition rights. • All affected properties to be granted access to architectural noise abatement on their residences (eg. insulation, double glazing, air conditioning).
	• The project's road and rail noise emissions would impact 6 private properties.	• Affected properties to be granted access to architectural noise abatement on their residences.
Blasting	• The project's blasting operations could impact 9 private properties	• Centennial has committed to meeting blast criteria at all private properties while they remain in private ownership • Recommended conditions require Centennial to manage blast design to protect Aboriginal rock shelters, rock formations and heritage items • Affected properties to be granted acquisition rights, and all properties within 2 kilometres to be granted access to structural investigations.
Air Quality	• The project's dust emissions would significantly impact 9 private properties, including 7 residences and 2 vacant lands.	• Recommended conditions require Centennial to use its best endeavours to acquire or reach agreements with significantly affected properties before mining commences. • Affected properties to be granted acquisition rights.
Water resources	• The project would reduce flows into Big Flat Creek by up to 21%, although only 1.3% in Wybong Creek. • The project's worst case water demand would be 400 megalitres per year, which would represent less than 3% of the available water allocation to general and high security users on the Hunter Regulated Water Source during dry periods. On average, the project is expected to be a net water producer.	• Big Flat Creek is already salinity affected, and is consequently not significantly utilised by water users. The project includes a strategy to tackle the upstream source of this salt. • Centennial would be required to source its water via the open market established under the Water Management Act. • Centennial has committed to sourcing its imported water demand from the Hunter Regulated Water Source, not from the local Wybong Water Source. Water licences in the Wybong Water Source acquired through Centennial's land acquisition program would continue to be used for agricultural purposes.

Issue	*Key Impacts*	*Key Mitigating Factors*
Aboriginal heritage	• The project would destroy 69 Aboriginal objects or sites, including one site of high significance (an artefact scatter containing more than 100 artefacts). • Project blasting has the potential to damage 5 Aboriginal rock shelters outside the mining area, through ground vibration.	• The offset areas would provide long term protection for more than 98 objects and sites. • Sites to be destroyed would be salvaged, in consultation with Aboriginal groups. • Recommended conditions require Centennial to manage blast design to protect all Aboriginal rock shelters (eg. by reducing blast size), and to prepare a comprehensive Aboriginal Heritage Management Plan.
Non-indigenous heritage	• The project would destroy 11 items of some local heritage significance, and would have additional indirect impacts on a further 8 heritage items. • Displacement of families around the mine site would result in some loss of local history.	• The Department and the NSW Heritage Office are satisfied that conservation of the affected items is not warranted. • Recommended conditions require Centennial to undertake archival recording for all impacted heritage items, to document the oral history of the Wybong locality in consultation with the community, to prepare a Conservation Management Strategy, and to protect culturally significant rock formations.
Traffic and transport	• The project would significantly increase traffic levels on local roads. • The project would generate an additional 4 trains per day (ie. 8 total movements) on the Muswellbrook to Ulan railway line.	• The RTA, Council and the Department are satisfied that the road and rail network is capable of accommodating the traffic associated with the project, subject to certain recommended road upgrade works.
Visual Amenity	• The project would affect the visual amenity of a number of residents, and commuters on Wybong Road.	• Affected properties to be granted access to visual screening on their properties. • Mining areas to be set back from Wybong Road at least 350 metres, with appropriate vegetative screening.
Socio-economics	• The project's noise, dust and blasting impacts would potentially displace owners of 36 private properties, who may not wish to move. • In total (ie. including residents who have already agreed to sell), the project could displace over 230 people.	• The project would generate 240 direct jobs at the mine during operations, and generate over 800 jobs in the NSW economy. • The project would contribute up to $324 million a year to the NSW economy. • The project includes contribution of $4.5 million toward local community infrastructure, facilities and environmental projects. • Cost benefit analysis, including consideration of environmental and socio-economic factors, indicates that the project would have a net social benefit.

In summary, the project is likely to cause a range of local, regional, national and global impacts.

Many of these impacts can be adequately mitigated and/or managed to ensure and acceptable level of environmental performance. However, even with the implementation of all reasonable and feasible mitigation measures, the project is likely to generate several significant residual environmental impacts.

Firstly, it would clear up to 1,304 hectares of remnant vegetation of conservation significance in the Hunter Valley, where significant vegetation clearing has occurred over the last 100 years due to a range of farming, mining, and urban development; and it would clear important habitat for 2 threatened plant species and 13 threatened fauna species.

While this clearing poses a threat to the biological diversity and ecological integrity of this part of the Hunter Valley, both the Department and the DECC are satisfied that the impacts of this clearing would be adequately offset by the broad array of measures incorporated in Centennial's proposed biodiversity offset strategy.

This strategy includes the conservation and creation of up to 2,600 hectares of treed vegetation, the progressive rehabilitation of the mine to woodland, and the creation of several vegetation corridors to integrate the mine and its immediate surrounds into the broader landscape.

With the successful implementation of this strategy, the Department is satisfied that the project is unlikely to result in a significant impact on any threatened flora or fauna species, populations or endangered ecological communities; and should, if anything, result in a net conservation benefit to the area in the medium to long term with the conservation of up to 4,100 hectares woodland vegetation on the valley floor.

Consequently, the Department is satisfied that these impacts of the project are unlikely to compromise the biological diversity or ecological integrity of the local area or broader region, and would therefore not offend object 5(a)(vi) of the EP&A Act or the relevant principles of ESD.

Secondly, the project would generate - or facilitate the generation of - a range of greenhouse gas emissions over a 20 year period, primarily through the downstream burning of the coal extracted by the project.

Several submissions argued that these impacts offend the precautionary principle, because they represent a threat of serious or irreversible damage to the global environment. However, following detailed consideration, the Department does not accept this argument for several reasons.

In the first instance, the project does not involve or seek approval for the combustion of coal; it only seeks approval for the extraction, processing, and transport of coal; and the greenhouse gas emissions of these activities are predicted to be extremely small on both the national and global level.

While there is no doubt that one of the consequences of the project would be the combustion of coal to provide energy for a vast array of people and companies across the world, and that the combustion of this coal would generate up to 250 million tonnes of greenhouse gas emissions over 20 years, or an average of about 12.6 million tonnes of greenhouse gas emissions a year, it is important to recognise that these emissions would represent an extremely small proportion of global greenhouse gas emissions.

In fact, these emissions would constitute between 0.02 and 0.03% of annual global greenhouse emissions from any source, and would lead to a negligible increase in global temperature of up to 0.0002 degrees Celsius.

Consequently, while the project would contribute towards climate change, and there is no doubt that climate change poses a significant threat of serious or irreversible damage to the global environment, the Department is sceptical of the claims that the project on its own– or even the project and its consequential impacts – would cause serious or irreversible damage to the global environment.

Nevertheless, even if for argument's sake it was assumed that the project and its consequential impacts would pose a serious threat to the global environment, and that these impacts should be avoided, this assumption does not automatically lead to a decision to refuse the project.

Rather, these impacts would need to be balanced in consideration with several other factors, such as:

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

In many respects, the crucial question is: would refusing the project lead to a reduction in global greenhouse gas emissions? And the answer to this is quite simply – no.

Even with the aggressive pursuit of energy efficiency and renewable energy, at least 70% of Australia's energy and 38% of global energy needs are predicted in the lifetime of the project to come from coal. In other words, the world economy is, and for the lifetime of the project will remain, structurally dependent on coal-fired energy. In addition, coal is not a particularly scarce

resource at present, and so it is safe to assume that if the Anvil Hill project is refused then the resultant gap in the global coal market would be quickly filled by coal from another source.

Consequently, the greenhouse gas emissions that would be generated by the project and its consequential impacts would be generated regardless of whether the project is approved or not.

This highlights two significant points. Firstly, that the primary driver of greenhouse gas emissions is people's demand for energy, not coal mining, and that for the foreseeable future this demand is likely to be structurally dependent on coal-fired energy. And secondly, refusing coal mines is likely to be a highly ineffective, perhaps futile, means of addressing the potential threats of climate change.

In other words, it highlights the fact that the threat of climate change requires a global response, and that this response is only likely to be effective if it is successful in internalising the external costs associated with energy production in general, and bringing about structural changes in people's demand for energy and the way this energy is produced. Or, by the implementation of policy measures that improve the valuation, pricing and incentive mechanisms of assets and services in the broader economy, such as the introduction of a broad-based greenhouse gas emissions trading scheme.

Consequently, the Department is satisfied that the approval of this project would not offend the precautionary principle, or the ability of future generations to enjoy a healthy, diverse and productive environment.

Finally, even with the implementation of all reasonable and feasible mitigation measures, the project is expected to cause significant noise, air quality, blasting and/or visual impacts on up to 36 properties, including 6 blocks of vacant land. This is at the upper end of the scale for open cut mining proposals in NSW, and is only exceeded by the approval of the Mount Pleasant mine which was predicted to significantly affect up to 47 properties.

Traditionally, the owners of significantly affected properties have been granted voluntary acquisition rights in the conditions of approval for mines. This is to ensure that these owners are able to sell their land and move away from the significant impacts, and that they receive suitable compensation for their land and the disturbance caused by such a move.

However, these rights have only been granted in situations where the overarching benefits of a project are considered to outweigh its costs.

In this particular instance, the Department is satisfied that the project would generate substantial economic and social benefits, as it would extract up to 150 million tonnes of ROM coal and help satisfy domestic and international energy needs; it would bolster the regional and NSW economies to the tune of up to $320 million a year; it would generate up to 240 direct and 560 indirect jobs and consequently generate significant household income; and it would result in additional community benefits through the implementation of a community enhancement program worth $4.5 million.

It is also satisfied that the residual environmental and socio-economic impacts of the project can be adequately mitigated, managed, offset and/or compensated for; and has recommended a comprehensive range of environmental conditions to ensure this occurs.

After considering all the impacts of the project in detail, in accordance with the objects of the EP&A Act and the principles of ecologically sustainable development, the Department is satisfied, on balance, that the project's benefits would sufficiently outweigh its residual costs, and that it is therefore in the public interest.

Consequently, the Department recommends that the Anvil Hill Coal Project be approved, subject to strict conditions of approval.

7. RECOMMENDATION

It is RECOMMENDED that the Minister:

- consider the findings and recommendations of this report;
- approve the project application, subject to conditions, under section 75J of the *Environmental Planning and Assessment Act 1979*; and
- sign the attached project approval (see Appendix B).

David Kitto
Director
Major Development Assessment

Chris Wilson
Executive Director
Major Project Assessment

Sam Haddad
Director-General

APPENDIX A - SUMMARY OF CONDITIONS OF APPROVAL

Aspect	*Condition*	*Requirement*
Schedule 2: Administrative Conditions		
Terms of Approval	5	Approval for mining restricted to 21 years
	6	Restriction on production to 10.5 million tonnes of coal a year
	7	All coal to be transported by rail
Schedule 3: Specific Environmental Conditions		
Land Acquisition	1	Acquisition rights for significantly affected privately owned land
	2	Requirement to use best endeavours to acquire or reach negotiated agreements with affected properties prior to start of mining
Noise	3-7	Noise impact assessment and acquisition criteria
	8	Additional noise mitigation measures for noise affected properties
	9	Restriction on construction activities to the day period only
	10	Requirement to seek continual improvement of noise performance
	11	Noise Monitoring Program
Blasting	12-14	Blast impact assessment criteria
	15-16	Restriction on blasting hours and frequency of blasting
	17-20	Blast related operating conditions, including restriction on blasting within 500m of privately owned land, requirement for Road Closure Management Plan, and requirement for public notification of blasting operations
	21-22	Rights for structural property inspections for properties potentially affected by blasting
	23	Blast Monitoring Program
Air Quality	24-25	Air quality impact assessment criteria and acquisition criteria
	26	Requirement to minimise air quality impacts
	27-28	Air Quality Monitoring Program, and meteorological monitoring
Surface and Ground Water	29	Restriction on using licensable water from the local Wybong Creek Water Source
	30	Restriction on discharging dirty water and saline water from the site
	31-36	Site Water Management Plan
Rehabilitation and Landscape Management	37	Requirement to progressively rehabilitate the site
	38-40	Requirement to revise and implement the Offset Strategy, and to arrange for long term security of the offset areas
	41-44	Landscape Management Plan
	45	Requirement for Conservation and Biodiversity Bond
Heritage	46	Aboriginal Cultural Heritage Management Plan
	47-48	Wybong oral history study, and Conservation Management Strategy
Traffic and Transport	49-52	Requirements to upgrade roads, to restrict access via certain roads, and to keep records of coal transport
Visual Impact	53-57	Requirement to undertake visual screening on affected properties, and to minimise project's visual and lighting impacts
Greenhouse Gas	58-59	Energy Saving Action Plan
Waste Minimisation	58-59	Requirement to monitor and minimise waste
Schedule 4: Additional Procedures		
Notification of Landowners	1-3	Requirement to notify landowners of acquisition rights, exceedances of relevant criteria during monitoring, and the potential health and amenity impacts associated with exposure to fine particulates
Independent Review	4-9	Procedures for independent review if landowners believe the project to be exceeding relevant impact assessment criteria
Land Acquisition	10-12	Procedures for land acquisition
Schedule 5: Environmental Management, Monitoring Auditing and Reporting		
Environmental Management Strategy/ Program	1-2	Environmental Management Strategy/ Environmental Management Program
Incident Reporting	3	Requirement to report incidents
Annual Reporting	4	Annual Environmental Management Report
Auditing	5-7	Requirement to undertake regular independent environmental audits
CCC	8-9	Requirement for Community Consultative Committee
Access to Information	10-11	Requirement to publicly report environmental management plans/programs/strategies, and monitoring results

APPENDIX B – CONDITIONS OF APPROVAL

APPENDIX C – INDEPENDENT HEARING & ASSESSMENT PANEL'S REPORTS

APPENDIX D – CONSIDERATION OF ENVIRONMENTAL PLANNING INSTRUMENTS

1 State Environmental Planning Policy (SEPP) No.11 – Traffic Generating Development

The project is affected by the provisions of SEPP 11, as an 'extractive industry or mining' (Schedule 1(m)). As such, in accordance with clause 7 of the SEPP the application was referred to the RTA, who subsequently confirmed that it does not object to the project, subject to certain conditions (see Section 3 of assessment report).

2 SEPP No.33 – Hazardous and Offensive Development

The Department considers that the project represents a 'potentially offensive industry' as defined under clause 3 of SEPP 33, but does not represent a 'potentially hazardous industry'.

Clause 4 of the SEPP provides a definition of 'offensive industry', namely:

> *'**offensive industry** means a development for the purposes of an industry which, when the development is in operation and when all measures proposed to reduce or minimise its impact on the locality have been employed (including, for example, measures to isolate the development from existing or likely future development on other land in the locality), would emit a polluting discharge (including, for example, noise) in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land in the locality.'*

Clause 8 requires that consideration be given to the Department's guidelines (ie. *Applying SEPP 33*, 1994) in determining whether a development is an 'offensive industry'.

The guidelines state that compliance with DECC requirements should be sufficient to demonstrate that a proposal is not an offensive industry. The guidelines state that if the DECC considers that its EPL licence requirements can be met, then the proposal is not likely to be 'offensive industry'.

In consideration of the above definition for offensive industry, and the DECC's opinion that the project would have significant impacts (see Section 3), the Department believes that the project is an 'offensive industry'.

As detailed in Section 2.2 of the assessment report, the majority of the land to which the project application applies is zoned 1(a) (Rural "A" Zone) under the *Muswellbrook Local Environmental Plan 1985*. Under the development control table to the LEP, offensive industries are permissible with consent in the 1(a) zone where, in the opinion of the consent authority, they are incapable of being rendered sufficiently safe for location in an industrial zone and are adequately separated from adjoining development. The Department is satisfied that the project meets these requirements and is therefore permissible in the 1(a) zone.

Clause 13 of the SEPP requires the Minister, in determining an application to carry out a potentially offensive (or hazardous) industry, to consider:

(a) current circulars or guidelines published by the Department of Planning relating to hazardous or offensive development, and

(b) whether any public authority should be consulted concerning any environmental and land use safety requirements with which the development should comply, and

(c) in the case of development for the purpose of a potentially hazardous industry—a preliminary hazard analysis prepared by or on behalf of the applicant, and

(d) any feasible alternatives to the carrying out of the development and the reasons for choosing the development the subject of the application (including any feasible alternatives for the location of the development and the reasons for choosing the location the subject of the application), and

(e) any likely future use of the land surrounding the development.

The Department has considered these matters, and is satisfied that:

- the project is not inconsistent with the relevant guidelines (ie. *Applying SEPP 33*, 1994);
- the relevant authorities have been consulted;
- the EA, and the Department's assessment, has considered feasible alternatives to carrying out the development;
- the EA, and the Department's assessment, encompasses likely future use of the land surrounding the development (which is likely to comprise rural and rural residential landuses); and
- the EA, and the Department's assessment, has adequately considered all reasonable and feasible measures to mitigate the offence produced by the project.

3 SEPP No.44 – Koala Habitat Protection

The EA states that, despite a significant level of survey effort, no koalas or koala scats were identified within the project disturbance area, and the area does not provide core Koala habitat. (Some evidence (scats) of koala presence were identified in the proposed offset areas). The Department agrees with Centennial that the project is unlikely to significantly affect koala habitat, and as such is satisfied that the proposal is generally consistent with the aims, objectives, and requirements of SEPP 44. Notwithstanding, the Department believes that Centennial should be required to adequately offset the project's impact on Forest Red Gum Riparian Woodland, which provides some habitat potential for koalas (see Section 4.6 of assessment report).

4 SEPP No.55 – Remediation of Land

The Department is satisfied that the land subject to the project application does not have a significant risk of contamination given its historical landuse, and that the proposal is generally consistent with the aims, objectives, and requirements of SEPP 55.

APPENDIX E – CENTENNIAL'S RESPONSES TO SUBMISSIONS AND ADDITIONAL INFORMATION

APPENDIX F – LEC JUDGMENT

APPENDIX G – SUBMISSIONS

APPENDIX H – ENVIRONMENTAL ASSESSMENT