PROPOSAL BY WHITE MINING LTD TO DEVELOP THE ASHTON COAL PROJECT AT CAMBERWELL

Report on the assessment of a Development Application (DA 309-11-2001-i)
Pursuant to Section 80 of the Environmental Planning and Assessment Act, 1979
S01/00200

Department of Planning

October 2002

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1. Introduction

White Mining Ltd (WML) proposes to develop the Ashton Coal Project near Camberwell in the Upper Hunter Valley.

The project site is located 14 km to the northwest of Singleton as shown in the locality plan in Figure 1. The proposed mine would be approximately 600m from Camberwell village at the closest point. Apart from Camberwell village, the surrounding area has a mix of agricultural and coal mining landuses as shown on the aerial photograph in Figure 1.

The proposal would involve a capital investment of approximately $42 million and provide up to 200 construction jobs and 140 full time operating jobs.

The mine would be developed using both open-cut and underground mining techniques. A coal preparation plant and associated surface infrastructure would be constructed and operated to process extracted coal for transport from the site. Production of coal would be up to 4.3 million tonnes per annum (Mtpa) over the proposed 20 year mine life.

Coal would transported from the site by rail, and a rail siding and loading facility would be constructed on the adjacent Main Northern Railway.

A development application for the proposal was lodged with the Department on 2 November 2001. This report presents the Department's assessment of the proposed development in accordance with the provisions of the *Environmental Planning and Assessment Act, 1979* (the Act). The Department's assessment is based on an independent analysis of the range of impacts associated with the development proposal and identification of associated residual risks to people and the environment. The assessment considered both the information contained in the Environmental Impact Statement (EIS) and particularly independent advice and verification of such information from relevant government/regulatory authorities. Their requirements have been incorporated throughout the process and its outcome. The Department's assessment also relied on issues raised in submissions received in response to the exhibited EIS.

This assessment report and its recommendations form an integral basis of the advice to the Minister for Planning in his role as consent authority for the proposed development.

2. Development Proposal

2.1. OVERVIEW

The proposed Ashton Coal Project includes the following, as shown in the site layout in Figure 2:

- site preparation and clearing of specified areas of vegetation in the DA area;
- open cut coal mining in two pits to the north of New England Highway;
- underground coal mining using longwall techniques to the south of New England Highway;
- construction of a Coal Preparation Plant;
- stockpiling and coal loading facilities and a new rail siding;
- administration, car parking, stores and bathhouse facilities;
- site access from Glennies Creek Road; and,
- mine operation for up to 21 years.

Figure 1 Site Location – Proposed Ashton Coal Project

2.2. AMENDMENT TO THE PROPOSAL

Following the Department's detailed assessment of the proposal, as set out in the Development Application and EIS, it was concluded that the section of the proposed underground mine involving coal extraction at shallow depth of cover below Bowmans Creek would result in unacceptable and irreversible environmental impacts. The Department advised the Applicant that a precautionary approach should be adopted, given the nature of the potential impacts, and the Applicant decided to amend the proposal to reduce such impacts to an acceptable level. The amendment removed the area of shallow mining and the proposed diversion of a section of Bowmans Creek. This issue is discussed further in section 5.1 of this report.

The amendment to the Development Application was received by the Department on 12 September 2002. It was determined, under section 79 (6) of the *Environmental Planning and Assessment Act 1979*, that the amended application differed only in minor respects from the original application. The amended development is substantially the same as the original proposal, however it would avoid potentially serious environmental impacts on Bowmans Creek and its associated alluvial groundwater system. Exhibition and notification of the amended application was not required due to the minor nature of the amendment. However, since the amendment had the potential to change issues of concern to Government agencies, particularly integrated approval bodies, the Department referred the documents to all relevant agencies and invited comments or revised General Terms of Approval resulting from the amendment.

The amended proposal is discussed and assessed in this report.

2.3. SITE DESCRIPTION AND LOCALITY

The subject land is located in the Singleton Local Government Area in the Upper Hunter Valley. An aerial photograph of the locality is shown in Figure 1.

The proposed site is generally bounded by Glennies Creek in the east, the Hunter River in the south, the Narama and Ravensworth mines in the west, and the Main Northern Railway in the north. Bowmans Creek traverses the site from the north to its junction with the Hunter River in the south. The New England Highway crosses the site and the village of Camberwell is immediately to the east of the site. The site is located between the towns of Singleton and Muswellbrook, approximately 14 km from Singleton.

The site itself is mainly grazing and agricultural land with some significant stands of remnant vegetation in the north, south, and along the creeklines. The site is mainly owned by mining companies and is not currently operated as a working property. The site also includes Crown Land in a Travelling Stock Reserve (TSR), Crown public roads, Crown reserves, and a section the Camberwell Common which is administered by a trust board.

Surrounding landuses are predominantly agricultural, grazing, and coal mining. The alluvial flats of the Hunter River and its tributaries provide prime agricultural land used for cropping. Camberwell Village comprises approximately 50 smaller lots which are mainly residential properties. The Village has a community hall and the St Clements Anglican Church is located between Camberwell and the proposed opencut mine.

There is extensive coal mining activity in the locality including the following existing and approved coal mines within a 10 km radius of the proposed site:

1. Narama (open cut)
2. Ravensworth South (open cut)
3. Nardell (underground)
4. Camberwell (open cut)
5. Rixs Creek (open cut)
6. Glennies Creek (underground)
7. Glendell (approved open cut)
8. Ravensworth East (open cut)
9. Lemington (open cut)
10. Hunter Valley North and South (open cut)

The broader region contains a mixture of landuses including mining, agricultural, industrial, power generation, and viticulture. Main population centres in the region are Singleton, Muswellbrook, Maitland, Cessnock, and Newcastle.

2.4. DESCRIPTION OF THE PROPOSED DEVELOPMENT

The proposed Ashton project would involve the mining of coal from the site which covers approximately 880 hectares. The proposed project layout is shown in Figure 2. The mine would be developed in two sections being open cut, to the north of the New England Highway, and underground to the south of the highway.

2.4.1. Open Cut Mine

The open cut section of the mine contains approximately 20% of the total recoverable coal resource on the Ashton site (62 Mt total) and would be completed within the initial seven years of the project development. The open cut would be developed in two pits located between the Main Northern Railway and Glennies Creek Road.

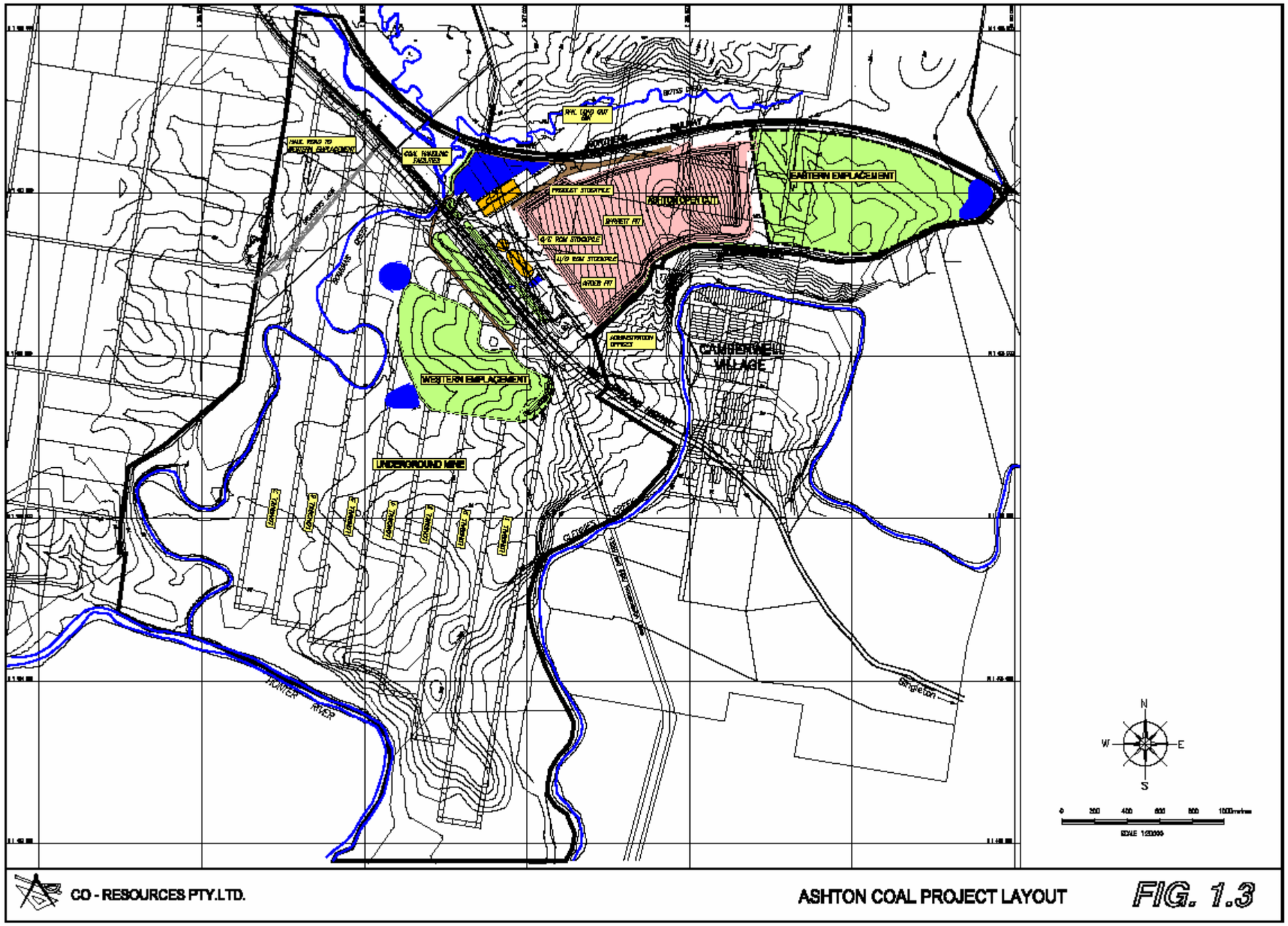
Open cut mining would be carried out using hydraulic excavators, blasting, dozers, front end loaders and trucks to transport product coal and overburden. Some highwall and auger mining of the thicker seams would be used to maximise economic extraction of coal.

The smaller Arties pit would be aligned parallel to the New England Highway and be used to develop an entry portal to the underground mine under the highway. This pit will also provide an area for ROM coal storage below ground level during the life of the mine. Overburden for the Arties Pit, approximately 1.5 million bulk cubic metres (Mbcm), would be used for environmental bunds and site infrastructure.

The Barrett Pit would provide the main open cut source of coal and would operate for seven years. Overburden from the pit would be emplaced in two out-of-pit areas with the remainder being emplaced in the pit. The overburden emplacement areas would be located to the east of the Barrett Pit (Eastern Emplacement), and to the south of the New England Highway (Western Emplacement). The Eastern Emplacement would receive approximately 12 Mbcm of overburden, with 5 Mbcm going to the Western Emplacement. Overburden will also be used to construct environmental bunds around the surface facilities, open cut mine, and overburden dumps. Overburden would be transported to the Western Emplacement during only the first two years of mining via a purpose built underpass to be constructed below the Bowmans Creek bridge on the New England Highway.

The opencut mine would require the clearing of approximately 100ha of native remnant vegetation and topsoil. This material would be segregated and used in rehabilitation of the site.

Figure 2 Project Layout – Proposed Ashton Coal Project



2.4.2. Underground Mine

The underground mine would be located south of the New England Highway as shown in Figure 2. The underground mine would produce approximately 80% of the coal to mined under the proposal. Mining would be carried out by longwall extraction techniques. The seven longwall panels proposed would be aligned approximately north south with main development headings situated directly below the New England Highway. Access to the mine would established via the highwall of the Arties Pit to the north of the Highway. The Applicant proposes to mine four coal seams, the Pikes Gully, Upper Liddell, Upper Lower Liddell, and Lower Barrett seams. Average seam thickness is approximately 2-2.5 m for all seams and longwall panels would be superimposed vertically. The southern extent of longwall panels is defined by a 200m setback from the Hunter River alluvium and the east by Glennies Creek. The lease boundary to the west defines the extent of possible extraction. Longwall panels would be 210m wide.
Coal would be transported from the working face on conveyors via an interseam drift to the permanent ROM stockpile in the Arties Pit. The underground mine would be operated over approximately 18 years. The underground extraction would commence in year 2 or 3 of mining.

Longwall extraction of coal would occur below Bowmans Creek and it associated alluvium. The Applicant proposes to only extract coal from seams with sufficient depth of cover to prevent any connective bedrock cracking between the alluvium and the underground mine. Given the Applicant's prediction that 150m would provide sufficient depth of cover, extraction of two of three seams only could proceed below the alluvium.

2.4.3. Coal Handling and Mine Infrastructure

Run of Mine (ROM) coal would be stockpiled at the northern end of the Arties Pit. ROM coal from the open cut mine would be transferred from haul trucks to a 25,000 tonne stockpile via a primary crushing station and conveyor. ROM coal from the underground mine would be transferred from the mine's drift conveyor to a separate 40,000 tonne stockpile adjacent to the open cut ROM stockpile.

ROM coal from either stockpile would be transported by a series of conveyors and a secondary crusher to a new Coal Handling and Preparation Plant (CHPP). The CHPP would be located to the north west of the Arties Pit as indicated in Figure 2. The CHPP would be a single module dense medium spiral plant with design capacity of approximately 700 tonnes/hour. The CHPP would be housed in a building.

Product coal from the CHPP would be transferred via an overhead conveyor to a 160,000 tonne stockpile located to the east of the CHPP. Product coal would be transferred to a high rate train loading bin via underground reclaim conveyors. 9,000 tonnes unit trains would be loaded with product coal for transport to the Port of Newcastle.

The project would include the construction of a new rail siding off the Main Northern Railway for loading trains as indicated in Figure 2. A new private underpass below the New England Highway would be constructed to allow haul trucks to access the southern section of the site for overburden emplacement. The underpass would be constructed through the spans of the existing New England Highway bridge over Bowmans Creek. The underpass would provide for two carriageways and require some minor excavation works involving the partial relocation of Bowmans Creek below the bridge. Safety barriers would be installed on the underpass to protect the bridge structure and prevent vehicle run-off.

Haul roads would be constructed from the surface facilities to the western emplacement area. The proposal in the EIS included a temporary haul road for ROM coal to the Macquarie Generation conveyor during the first 15 months of the mine development. This temporary haul road, indicated in Figure 2, has since been removed from the development application.

2.4.4. Mine Services

Mine services would include provision for underground mine ventilation, mine gas management, mine dewatering, water supply, electricity, rejects handling and emplacement, an administrative and car parking facilities.

Mine ventilation would not be required for the majority of the underground mine due to the compact nature of the workings. Two 600mm diameter bore holes would be installed over the ends of longwall panels 3 and 5 to provide ventilation under the influence of the mine fan.

Analysis of the gas content of the four coal seams to be mined in the underground mine indicates that gas generation would only be significant from the Lower Barrett Seam. A gas management plan would be developed to ensure safe and efficient handling of this gas before the Lower Barrett Seam is mined in year 15 of the mine life.

Mine dewatering would be achieved through a network of smaller compressed air or electric pumps located in low points in the underground mine. These pumps would deliver water to underground settling tanks and larger capacity pumps would be used to pump water from the tanks to the surface.

Water for use in the CHPP and for dust suppression would be that water extracted from the underground mine, the open cut void and surface run-off. Surface runoff and water from the fine rejects ponds would be stored in several settlement dams located to the north of the CHPP. Process water would be pumped from the settlement dams to a process water dam which would also receive water from the underground mine and any make-up water required during dry years. The CHPP would receive make-up water from the process water dam. Potable water for use on site would be obtained from roof run-off and water trucked in from off-site.

Drainage structures would be constructed around the disturbed areas such as the open cut mine, surface facilities, haul roads, and emplacement areas. Clean surface water from undisturbed catchments would continue to discharge into local creeks. Dirty or saline water from disturbed catchments would be directed via smaller catchment ponds to the settlement dams located adjacent to the CHPP. Sufficient freeboard would be maintained in these dams to contain run-off from a 1:100 year storm event. After closure of the open cut mine the remaining void may also be used to store water. The mine would not discharge any water from the site to local creeks or the Hunter River.

Electricity would be supplied from existing Energy Australia 66 kV lines via a new substation adjacent to the CHPP. Existing transmission lines would be relocated around the surface facilities. Estimated electricity consumption would be 117,296 MW hrs per annum at a load of 13.39 MW. Approximately 11 ML of diesel fuel would be used per annum and would be contracted locally.

Up to 10 billion cubic metres (Mbcm) of coarse rejects and tailings would be produced by the CHPP over the life of the project. Coarse rejects would be emplaced within the Eastern Emplacement and the overburden placed in the completed section of the Barrett Pit until the open cut operation is complete. Following this, coarse reject would be emplaced in the

remaining open cut void. Tailings would be placed initially in two storage ponds adjacent to the CHPP using coarse reject as a filter medium. After year 5 of operation, tailings would be directed to ponds created in the overburden within the Barrett Pit and the final Barrett Pit void once the open cut mine is complete.

An administrative building would be constructed at the south eastern end of the Arties Pit and contain offices, bathhouse, and a car parking area.

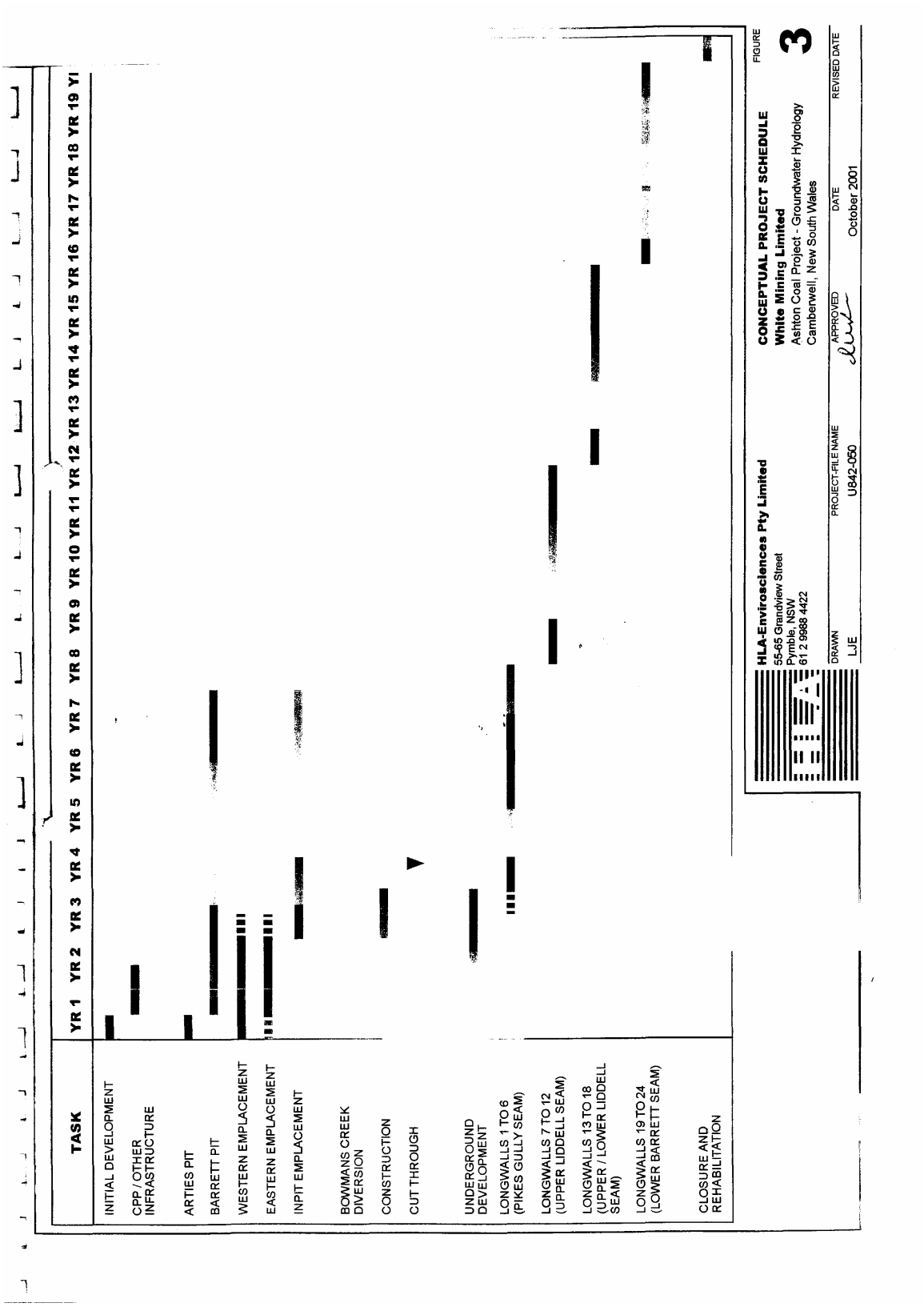
2.4.5. Mine Schedule and Operating Hours

The proposed schedule for the Ashton Coal Project development is shown in Figure 3. Construction of the mine facilities and infrastructure would occur along with development of the Arties Pit in the first 18 months of the mine life. The development of the Barrett Pit would continue until year 7 of the mine life, with emplacement of overburden at the out of pit dumps until around year 4. The underground mine would be constructed before year 4 with underground coal extraction continuing until year 19.

Hours of mine operation would be as follows:

Open Cut Mine: 7am – 10 pm, Monday-Saturday, and 8am-10pm, Sundays.
Blasting: 9am-5pm, Monday-Saturday.
CHPP: 24 hrs, 7 days.
Underground mine: 24 hrs, 7 days.
Maintenance and dust suppression: 24 hrs, 7 days.

Figure 3 Project Schedule – Ashton Coal Project



2.5. ENVIRONMENTAL MANAGEMENT AND MITIGATION OF IMPACTS

The EIS states that environmental management of the Ashton project would include measures to mitigate potential impacts due to subsidence, changes in air quality, noise and vibration, and surface water. Rehabilitation and design of the final landform of the site would be used to mitigate ecological impacts, and measures would be implemented to ensure traffic, visual, hazards, spontaneous combustion, and socio-economic impacts are ameliorated. The project would also include extensive environmental monitoring and verification of predicted impacts.

The Applicant indicates that surface cracking due to subsidence would be monitored over the lease by visual monitoring and cracks would be rehabilitated to prevent erosion. Any surface improvements such as water storage dams and power lines would be regularly inspected and repaired if required.

The EIS states that air quality impacts would be mitigated using best practice dust management techniques including planning controls, operational controls, and engineering controls. In addition, dust generating activities would cease to operate based on information fed from a network of real-time dust monitors, meteorological observations, and weather forecasts to ensure relevant EPA criteria are not exceeded at nearby residences in Camberwell Village.

The Applicant states that noise impacts would be mitigated by controlling overburden dumping operations in some weather conditions, selecting equipment with low sound emissions, not using reversing beepers in some conditions, and establishing environmental bunds. Nearby residents would be notified of blasting and noise and blasting would be rigorously monitored.

Surface water from disturbed areas would be contained and managed on site. Undisturbed catchments would continue to discharge into local creeks. Subsidence due to underground mining in the southern area of the lease is predicted to cause some ponding of run-off and this would be mitigated to some extent by the construction of grassed swales.

Rehabilitation of the site would be carried out generally in accordance with a conceptual final landform and vegetation plan presented in the EIS. This provides for revegetation of both disturbed areas and existing degraded areas that would not be disturbed. Revegetation would be carried out by effectively managing and classifying topsoil and cleared vegetation for reuse on the site. Weed invasion would be checked by regular monitoring and control on disturbed areas. Stock would be excluded form some areas to assist revegetation while other areas would be retained for agricultural land use including irrigated pastures and pasture improvement.

The EIS indicates that the landform of the final open cut void would be a dish like structure with batters of up to 18° and up to 110m high. This would create a low lying centre of the void which would have high salinity in both the water and soil due to the saline nature of the overburden used to fill the void. Specific topdressing material would be selected to partially address this issue and appropriate salt-tolerant plant species would be planted. In addition sediment and erosion controls works would be constructed to mitigate salinity impacts on vegetation.

Aquatic habitats would be improved by the exclusion of stock from some areas and Bowmans Creek would be extensively rehabilitated with riparian and aquatic vegetation.

Areas of ponding both along the creek and in subsidence troughs would be enhanced with riparian and aquatic vegetation to provide aquatic habitat for amphibian and bird species.

To mitigate any potential traffic impacts of the proposal the Applicant would construct a new intersection at the mine entrance off Glennies Creek Road and improve both the surface of Glennies Creek Road and the intersection of Glennies Creek Road with the New England Highway. Glennies Creek Road would also be slightly realigned north of the mine entrance. Impacts of oversized construction traffic, coal truck on private internal haul roads, and Glennies Road closures during blasting in the open cut mine would be mitigated by temporary traffic control measures where necessary.

The EIS states that visual impacts of the proposed mine would be mitigated by the construction of environmental bunds to screen views from Camberwell Village and the New England Highway. Bunds would be rehabilitated with native vegetation to improve visual absorption potential and provide habitat. Use of night lighting would be designed and controlled to minimise visual impacts.

Hazardous materials such as fuel and explosives would be stored and managed in accordance with Dangerous Goods legislation and relevant Australian Standards. Chemicals would be stored in bunded areas and spill response procedures would be developed and implemented. Site infrastructure would be designed in accordance with the Building Code of Australia considering any potential seismic activity.

Spontaneous combustion would be mitigated in the underground mine through appropriate design of the ventilation system and mine management. Coal in stockpiles would be maintained in continuous rotation to minimise the potential for spontaneous combustion.

The Applicant proposes to appoint a site Environmental Officer and establish a community consultative committee to ensure good communication with the local community and government agencies.

3. Statutory Planning Framework

3.1. PERMISSIBILITY

The subject land is zoned 1(a) – Rural Zone under the Singleton Local Environmental Plan 1996 (Singleton LEP 1996). The objectives of this zone include mining, and none of the activities or structures proposed on the site are prohibited within the zone. The proposal is therefore permissible with development consent in the zone under the Singleton LEP 1996.

3.2. MINISTERS ROLE

The proposal is State Significant development as described below. Under section 76A (9) of the *Environmental Planning and Assessment Act 1979* (the Act) the Minister is the consent authority for State Significant development. The Minister must therefore determine the Development Application by either granting or refusing consent under section 80 of the Act.

3.3. LEGISLATIVE CONTEXT

3.3.1. Environmental Planning and Assessment Act 1979

State Significant Development

The proposal is a new coal mine which would require a new mining lease under section 63 of the *Mining Act 1992.* The proposal is therefore State Significant development under a declaration made by the Minister on 29 June 2001 under section 76A (7) of the Act.

Integrated Development
The proposal is also 'integrated development' under section 91 of the Act since the proposal requires the following approvals or licences:

- an environment protection licence from the Environment Protection Authority (EPA) under the *Protection of the Environment Operations Act, 1997;*
- licences from the Department of Land and Water Conservation (DLWC) under the *Rivers and Foreshores Improvement Act 1948* and the *Water Act 1912;*
- a permit from NSW Fisheries under the *Fisheries Management Act 1994;*
- permits from National Parks and Wildlife Service (NPWS) under the *National Parks and Wildlife Act 1974;*
- approval from the Roads and Traffic Authority (RTA) and Singleton Shire Council under the *Roads Act 1993;*and
- approval from the Mine Subsidence Board (MSB) under the *Mine Subsidence Compensation Act 1961.*

All agencies have provided their general terms of approval, indicating that they would give approval to the proposed development.

Designated Development
The proposal is an underground and open cut coal mine that would disturb more than 4 ha of land and produce over 500 tonnes of coal per day. The proposal is therefore 'designated development' as it is listed under Schedule 3 of the *Environmental Planning and Assessment Regulation 2000*. An Environmental Impact Statement must be prepared for such a development and one was attached to the Development Application lodged with the Department on 2 November 2001.

3.4. COMMONWEALTH LEGISLATION

Environment Protection and Biodiversity Conservation Act 1999

Details of the proposal were submitted by the Applicant to Environment Australia as a referral under the *Environment Protection and Biodiversity Conservation Act 1999.* The reason for the referral was due to potential impacts on matters of National Environmental Significance. The Commonwealth determined that the proposal was not a controlled action on 4 January 2002.

3.5. RELEVANT ENVIRONMENTAL PLANNING INSTRUMENTS

The following environmental planning instruments are relevant to the proposed development:

- *State Environmental Planning Policy No. 11 – Traffic Generating Developments*
- *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development*
- *State Environmental Planning Policy No. 44 – Koala Habitat Protection*
- *Hunter Regional Environmental Plan (REP) 1989*
- *Singleton Local Environmental Plan (LEP) 1996*

The consistency of the proposal with these planning instruments is assessed below and in Appendix A.

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

The aim of SEPP 11 is to ensure that the traffic authority is made aware of, and is given an opportunity to make representations in respect of the development referred to in Schedule 1 or 2.

As mining is listed in Schedule 1, this policy applies to the proposed development. In accordance with this policy, a copy of the DA and EIS was forwarded to both Singleton Shire Council, and the RTA. Submissions from both Council and the RTA were considered in assessing the traffic impacts of the proposal, and both agencies provided their General Terms of Approval for integrated development. The requirements of SEPP 11 have therefore been met. Traffic impacts of the proposed development are assessed in section 5 of this report.

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development

SEPP 33 aims to identify proposed developments with the potential for significant off-site impacts, in terms of risk and/or offence (odour, noise etc). A development is defined as potentially hazardous and/or potentially offensive if, without mitigating measures in place, the development would have a significant risk and/or offensive impact on off-site receptors.

The proposed Ashton Coal Project would be a potentially hazardous industry under SEPP 33. A Preliminary Hazard Analysis was prepared in accordance with the Department's guidelines. The Department has considered potential hazards and risk impacts in detail in section 5 of this report, concluding that the proposed development is not a hazardous development.

The proposal is also considered "potentially offensive" as it requires an Environment Protection Licence (EPL) from the Environment Protection Authority (EPA). The EPA has issued General Terms of Approval for the proposed development, thereby indicating that it is

prepared to issue the EPL. As such, the proposal does not constitute "offensive" development.

The Department concludes that the provisions of SEPP 33 have been complied with and would not prevent the Minister from granting consent for the proposed development.

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP44)

SEPP 44 applies to the proposed development site since it is within Cessnock local government area, which is listed in Schedule 1 of the policy. The aims and objectives of the policy are:

> *"to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline"*

The provisions of SEPP 44 require the consent authority to consider whether there is "potential koala habitat" on the site. Potential koala habitat in defined in the policy as areas of native vegetation where the trees of the types listed in Schedule 2 of the policy constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.

The Applicant's flora survey of the site (HLA, 2001) indicates that, while species listed in SEPP 44 are found on the site, they are not common and do not constitute more than 15% of the total number of trees in any strata component. The Department therefore considers that the Ashton Coal Project site, the land to which the development application applies, does not constitute potential or core koala habitat.

The Department is satisfied that the land within the proposed development site is not potential koala habitat and the provisions of SEPP 44 would not prevent the Minister from granting consent to the development application.

Hunter Regional Environmental Plan (REP) 1989

The Hunter Regional Environmental Plan (REP) 1989 applies to the proposal. The REP provides a framework to guide and control growth and development in the region. The REP includes objectives relating to the management of coal and other mineral resources and extractive industries in the region. The Department has assessed the application of these provisions in Appendix A and considers that the proposal is consistent with the Hunter REP 1989.

Singleton Local Environmental Plan (LEP) 1996

The subject land is zoned 1(a) – Rural Zone under the Singleton LEP 1996 and the proposal is permissible with development consent and consistent with the aims of the zone, one being:

"to allow mining where environmental impacts do not exceed acceptable limits and the land is satisfactorily rehabilitated after mining"

Clause 20 of the LEP requires the consent authority to take into account whether and environmental buffer area has been provided around the site to ensure significant adverse environmental effects do not occur on surrounding land. The environmental impacts of the proposed development are considered in detail in section 5 of this report and the

Department is satisfied that there is adequate separation between the proposed development and surrounding landuses.

Clause 31 of the LEP requires the consent authority to consider the impacts of a development on flooding and vice versa. Flooding issues are considered in section 5 of this report. There are no heritage items on the subject land and it is not within a heritage conservation area as defined in the LEP.

The Department considers that the proposed development, as amended, is consistent with the objectives and provisions of Singleton LEP 1996.

3.6. DEVELOPMENT CONTROL PLANS

The following Development Control Plans apply to the proposed development:

- *Singleton Erosion and Sediment Control Development Control Plan*
- *Singleton Car Parking Development Control Plan*

The Department has assessed the proposed development against the relevant provisions of these development control plans (see Appendix A) and concludes that it is generally in accordance with the aims and provisions of these plans.

3.7. CONCLUSION

The Department has assessed the development application for the proposed Ashton Coal Project in accordance with the Act and Regulation. All statutory requirements under NSW legislation have been met. The Department has considered the proposed development in the context of all relevant environmental planning instruments and Council's Development Control Plans. The Department concludes that the proposal is generally consistent with the aims, objectives and provisions of all applicable instruments, plans, and policies.

4. Stakeholder Consultation and Summary of Issues Raised

The Department's consultation with stakeholders has been comprehensive and in keeping with the scale and implications of the proposed development. The views expressed by each government agency, special interest group, and individual have been carefully considered. The Department has conducted public participation in accordance with the Act and the Regulation. The Department's consultation included:

- advertisement of the exhibition period on 20 November and 21 December 2001 in the Singleton Argus newspaper;
- notification of nearby and potentially affected landholders and residents, and placement of signs at the site during the exhibition period;
- exhibition of the development application and EIS at Planning NSW in Newcastle and Sydney, Singleton Shire Council, and the Nature Conservation Council from 20 November 2001 to 6 February 2002; and
- consultation with Singleton Shire Council and other government agencies through correspondence and meetings.

The exhibition period was initially advertised until 9 January 2002, however it was later extended to maximise opportunity for public comment until 6 February 2002. Extension of the exhibition period was advertised in the Singleton Argus.

A summary of submissions received by the Department from key stakeholder groups is provided in Table 1. Of the submissions received, 3 were provided on a Pro-Forma letter and 8 requested a Commission of Inquiry.

Table 1 Summary of Submissions

Submission Type	Number of submissions received	Submissions requesting COI	Submissions objecting to proposal
Community Private Individual	23	7	22
Community Pro-Forma letter	3		
Government Agencies	23		
Businesses	2		2
Special Interest Groups	3	1	3
Total	**54**	**8**	**27**

Subsequent to the close of the exhibition period, the Department received retractions of three submissions. The key issues that were raised in public and government submissions are identified below.

4.1. GOVERNMENT AGENCIES

20 submissions were received from State Government agencies throughout the assessment of the proposal. Submissions were received from the Environment Protection Authority, Department of Land and Water Conservation, Mine Subsidence Board, Roads and Traffic Authority, NSW Fisheries, National Parks and Wildlife Service, NSW Agriculture, Department of Mineral Resources, NSW Heritage Office, and Energy Australia.

The key issue raised by Government agencies was concern over the original proposal to undermine and divert Bowmans Creek and the predicted water, groundwater, aquatic ecology and agricultural impacts. The concerns were substantially addressed by the Applicants decision to amend the Development Application and remove the proposed diversion.

EPA also raised concerns relating to air quality impacts, dust impacts on tenants of mine-owned properties, and water management. DLWC requested that a river management plan be developed for monitoring of impacts on Bowmans Creek, advised on the applications made by WML relating to Crown Lands, and requested remedial works on its stream gauging infrastructure. NSW Fisheries advised that with the amended DA no integrated approval would be required and recommended conditions relating to monitoring and remediation of Bowmans Creek. NPWS suggested conditions relating to monitoring of Aboriginal heritage sites, remediation works, and procedures to be followed if sites are uncovered during the development of the proposal. NPWS also raised concerns over the adequacy of the flora and fauna assessment, and provision of offsets for vegetation clearing. NPWS also provided detailed supporting information for its GTA requiring a Conservation Area for Aboriginal heritage and biodiversity. DMR did not raise any objection to the proposal and amendment to the DA. NSW Agriculture indicated that while the amended DA was not the ideal solution from an agricultural perspective, it is a workable compromise.

Detailed summaries of all Government agency submissions are provided in Appendix E.

4.2. SINGLETON SHIRE COUNCIL

The Department received three submissions from Council which are summarised below.

Submission dated 19 February 2002

- Council supports the development providing the following issues are addressed in conditions of consent:
    - A safety net for residents regarding air quality and noise impacts;
    - Structural assessment of heritage items (St Clements Church and Community Hall) and measures to ensure the buildings are not damaged from mining activities;
    - Suitable groundwater monitoring systems are implemented;
    - Contributions under Council's Section 94 Contributions Plan;
    - Landscaping Plan to mitigate visual impact;
    - Contribution to noise reduction measures along the rail corridor;
    - Road works under the Roads Act; and Building construction
- Areas of concern for further investigation are:
    - The cumulative impacts of multiple seam underground longwall mining and assessment of feasible alternatives; and
    - Assessment of the reduction in agricultural suitability and measures to minimise impacts.

Submission dated 5 April 2002

- Provided General Terms of Approval.

Submission dated 20 September 2002

- Council has no objection to proposed amendment.

4.3. INDIVIDUALS AND SPECIAL INTEREST GROUPS

Key issues raised in public submissions objecting to the proposal include:

- Concern over subsidence impacts on groundwater;
- Increase in dust by general operations, coal movements and blasting;
- Concern over the cumulative impacts of the proposal;
- Objection to diversion of Bowmans Creek;
- Frustration at the encirclement of the Camberwell community by mine sites;
- Problems between Camberwell coal mine and Camberwell community;
- Concern over blasting impacts on Anglican Church;
- Impacts to ecosystem;
- Negative impact on property values;
- Negative health and socio-economic impacts;
- Impacts from noise, dust, water quality, vibration and visual intrusion;
- Hunter River is already under great stress any more saline water and contaminants exacerbate the fragile condition of the river; and,
- Concern about the future amenity of the area post mining.

5. Consideration of Environmental Issues

5.1. IMPACTS ON BOWMANS CREEK AND ALLUVIUM

The key environmental issue associated with the Ashton Coal Project, as proposed in the EIS, was the potential for permanent, irreversible impacts on Bowmans Creek and its associated alluvium. This impact was mainly due to the proposal to mine coal seams below the creek at shallow depths of cover. Such underground mining would cause surface subsidence and bedrock cracking that would permanently connect the creek and alluvial groundwater to the underground mine workings and deep saline aquifers. The Applicant had proposed to divert approximately 1.5km of the creek to avoid surface water flowing into the underground mine via connective cracks, a proposal which would have had wide ranging impacts on water quality, aquatic ecology, and the alluvial groundwater system. More importantly, however, the damage to geological strata and groundwater systems would have serious permanent impacts on the creek due to discharges of saline water from the deeper aquifers to the creek and the Hunter River. The Applicant had proposed a series of tree plantings to mitigate, or offset, the resultant salinity on the site.

The Department and other relevant government agencies, including DLWC, EPA, NSW Fisheries, NSW Agriculture, and DMR engaged in a process of consultation and collaboration relating to this issue in the spirit of an all-of-government approach to the environmental impact assessment of the proposal. The result of this process was a detailed assessment of the issue prepared by the Department. This assessment is contained in Appendix C. The assessment notes that:

1. Predictions of subsidence induced bedrock cracking are subject to a high degree of uncertainty;
2. Predictions of post-mining groundwater impacts are subject to an increased degree of uncertainty due to limitations in modelling and cumulative uncertainty from subsidence cracking predictions;
3. The Applicant's proposed mitigation strategy is subject to uncertainty due to limited knowledge of groundwater recharge patterns, the applicability of dryland salinity methodology to the situation, the simplistic nature of the modelling of mitigative effects, and cumulative uncertainty from groundwater and subsidence predictions;
4. The predicted impacts of the proposal would be irreversible and permanent and the ability for the Department to ensure responsibility for the impacts remains with the Applicant in perpetuity is very limited.

The Department therefore concluded that the proposal to mine below Bowmans Creek and associated alluvium was likely to result in a significant environmental legacy for future generations and that it was not consistent with the principles of ecologically sustainable development.

The Department then notified the Applicant that a precautionary approach would be taken, given the significant uncertainty and likelihood of irreversible and unacceptable environmental impacts, and that the section of the proposed underground mine below the Bowmans Creek alluvium would be excluded from any development consent for the Ashton Project.

The Applicant considered alternative proposals which would eliminate the potential for connective bedrock cracking and the need to divert Bowmans Creek. The Applicant's response to the Department was an alteration of the underground mine plan, and amendment to the Development Application, which would generally achieve those

objectives, eliminate unacceptable environmental impacts, and maintain the economic viability of the project. The amended application removes underground mining at shallow depths of cover below the Bowmans Creek alluvium and the proposed diversion of Bowmans Creek. The amended application is assessed in this report.

5.2. SUBSIDENCE IMPACTS

Applicant's Position

The subsidence report in the EIS, prepared by GE Holt & Associates, states that the cumulative subsidence due to the longwall mining of the four coal seams will be between 5 and 6 metres. Maximum subsidence was taken as 65% of coal seam thickness, based on maximum values in monitoring data from Cumnock Colliery when working the same coal seams. The report considers that this data is more accurate and applicable to the Ashton Project, being in the Hunter Coalfield, than empirical predictions from the DMR's 1987 publication *Mining Subsidence in New South Wales – 2. Surface Subsidence Prediction in the Newcastle Coalfield*. The Applicant's amended application indicates that longwall mining below the Bowmans Creek alluvium would be generally two or three seams, not four as considered in the original report. This would give rise approximately 2.7m maximum cumulative surface subsidence for two seams or 3.8m for three seams in those areas.

The Applicant notes that subsidence would occur in up to four events as each seam is extracted, with maximum vertical subsidence of 1.7m in any one event.

Surface subsidence would create depressions aligned along the proposed longwall panels. Surface cracking is expected as a result of ground strains as the longwall extraction proceeds. The Applicant indicates that such cracking would extend to a maximum 20m below the surface and would not connect to the underground goaf at the depths of cover of seams to be mined below the Bowmans Creek alluvium. In other areas, where depth of cover is less, surface cracks are expected to connect to the underground goaf, however this would be unlikely to impact on groundwater systems.

The Applicant has indicated that minimum depth of cover to prevent connection between the surface and underground workings through cracking is approximately 150m. The Applicant's subsidence report also notes that any geological faults present would increase connectivity due to cracking but that no faults have been detected during geological investigations.

The Applicant considers that any surface cracks would seal with sediment over time, or could be sealed by manually rehabilitating cracks with soil to prevent water flow and erosion.

The Applicant assessed the impact of subsidence on native vegetation, groundwater systems, surface water flows, agricultural land, and archaeological sites. These impacts are assessed in the relevant sections of this report.

Improvements in the area include the New England Highway, three transmission lines, several mine-owned farm buildings and structures, private roads, and farm dams. The New England Highway would be subsided a maximum of 100mm over the 140m section of road likely to be affected. 132 kV transmission lines on the site would not be affected by subsidence, however two transmission lines, a 66 kV and a 415 kV line, cross the underground mining area and would be impacted. The Applicant proposes to protect, monitor and remediate any damage to these power lines as a result of subsidence. Impact of surface subsidence on other improvements would be likely, however since all such improvements are the property and responsibility of the Applicant any remediation costs would be borne by it. Subsidence would impact a small area of privately owned grazing land

in the south of the site. Impacts of such subsidence would be covered in a private agreement with that landholder.

Issues Raised in Submissions

EPA, DLWC, NSW Fisheries, NSW Agriculture, and NPWS all raised concerns over predicted levels of subsidence and impacts on natural systems or cultural heritage. These submissions and concerns are addressed in the relevant sections of this report.

RTA raised specific concerns over potential subsidence impacts on the New England Highway. RTA provided detailed General Terms of Approval requiring the Applicant to submit plans and subsidence monitoring results, and providing for protection of the New England Highway asset. Mine Subsidence Board provided General Terms of Approval for the proposal. The property owner of property 130, shown on Fig 3.13 of the EIS, objected to subsidence impacts on the access road to the property, pending the completion of a satisfactory agreement with the Applicant.

Subsidence impacts on environmental values such as groundwater and agricultural suitability were a source of concern in many objections to the proposal.

Department's Position

The Department assessed the subsidence predictions in the report with reference to other similar underground mining proposals in the Hunter, Newcastle, and Southern Coalfields. The Department considers that basing the prediction method for maximum vertical subsidence on actual data collected at the nearby Cumnock Colliery where two-seam mining is being undertaken, is adequate. The use of these values would give rise to subsidence predictions that are reasonable and conservative, compared to a detailed empirical analysis such as that outlined in DMR guidelines for the Newcastle and Southern Coalfields.

The Department notes, however, that prediction of ground strain and tilt, and surface or connective bed rock cracking due to subsidence are subject to high degrees of uncertainty. This is correctly identified in the Applicant's study. The lack of a specific DMR guideline for the Hunter Coalfield adds to the difficulty in these predictions. The Applicant has predicted that 150m depth of cover would be sufficient to prevent connective bed rock cracking, however the Department considers that further empirical evidence is required to justify this figure. The Department considers that this could be satisfactorily addressed through detailed monitoring of subsidence and revision of predictions for each group of longwall panels for which approval is sought from DMR under section 138 of the Coal Mines Regulation Act. In addition, the Department considers that provisions should be made for Independent Expert review of subsidence predictions to ensure protection of groundwater systems.

The Department has conducted several field inspections of existing underground mines in the Hunter and Newcastle coalfields to assess the impact and remediation of subsidence induced surface cracking. Mines visited had experienced subsidence in the range of that expected under each subsidence event at the Ashton project. The Department is confident that any potential surface cracking is unlikely to create significant environmental impacts and could be feasibly remediated with the techniques proposed by the Applicant.

The Department considers that impacts of subsidence on surface improvements would be manageable subject to development of appropriate mitigation and remediation techniques, and agreements with the affected private landholder and relevant electricity transmission authority. The Department notes that both the Mines Subsidence Board and RTA have provided GTAs for the proposal and considers that any impacts on surface improvements

would be manageable under the conditions provided by these agencies. The Department notes the concerns of the landholder of property 130 and considers that the Applicant should maintain access to the property and notify the landholder of mine operations affecting the property.

Recommendations

If the Minister determines to approve the Development Application the Applicant should be required to:

- *Prepare and implement a subsidence environmental management plan;*
- *Conduct detailed monitoring of subsidence impacts and site specific geology throughout the mining operations;*
- *Revise and update subsidence impact predictions based on monitoring data and submit for approval by the Director General before each group of longwall panels is approved by DMR under section 138 of the Coal Mines Regulation Act;*
- *Bear the costs of any independent expert review of subsidence documentation submitted to the Director-General*
- *Maintain access to Property 130 and advise the landholder of mining operations; and,*
- *Comply with the requirements of MSB and RTA.*

5.3. GROUNDWATER IMPACTS

Applicant's Position

The Applicant convened a Technical Working Group to consider groundwater issues with DMR and DLWC before the preparation of the EIS. HLA Envirosciences completed a study in the EIS on the groundwater impacts of the proposal. The study involved identification of the existing groundwater resources in the area and modelling of the predicted impacts of mining.

The study considered the fractured rock aquifers in the coal seams to be mined and the aquifers in the alluviums of Bowmans Creek, Glennies Creek, and the Hunter River. A detailed study of the existing hydrogeological environment was undertaken with particular emphasis on the extent and quality of the Bowmans Creek alluvium and groundwater. The study identified one potentially affected registered groundwater bore located in Camberwell Village less than 1 km from the site.

Impacts on groundwater systems are expected from both the open cut and underground mining operations. Both these operations were considered simultaneously in the predictive modelling, including the cumulative impact of other nearby mining operations on the groundwater system.

Modelling of active mining was undertaken to predict mine inflows and resultant drawdown of aquifers. Maximum mine water inflows of 1.9 ML/day were predicted which would increase if connective bedrock cracking occurred below Bowmans Creek. The amendment to the underground mine plan has since eliminated this possibility The Applicant proposes to install sufficient pumping capacity, with built in contingency, to dewater the mine at the rate of inflow.

The mine is predicted to draw down groundwater in the Glennies Creek alluvium by up to 2.5 m, the Hunter River alluvium by up to 0.5 m, and the Bowmans Creek alluvium by up to 1.3 m. Predictions referring to complete drainage of the Bowmans Creek alluvium are no longer valid given the amendment to the mine plan.
The Applicant predicts that after mine closure, groundwater levels would re-establish within approximately 15-50 years. The resultant groundwater levels would be generally higher than

existing levels in the south of the site. The Applicant predicts that changes to recharge of the Glennies Creek and Hunter River alluviums would be small (less than 0.051 ML/day variation).

The Applicant conducted a detailed assessment of impacts on the Bowmans Creek alluvium. Due to the amendment of the mine plan, this predicted impact would be significantly reduced or eliminated. The Applicant predicts that resultant impacts on salinity in Bowmans Creek and the Hunter River would also be eliminated with the amendment.

Issues Raised in Submissions

DLWC, EPA, NSW Fisheries, and NSW Agriculture raised concerns relating to potential impacts on groundwater systems throughout the assessment of the proposal. DLWC requested the following information:

- Analysis of the long-term effects of dewatering and recharge of the Bowmans Creek alluvium;
- Justification of the boundary between the Hunter River and Bowmans Creek alluviums;
- An assessment of the remediation potential of groundwaters affected by the proposal, including possible timetable and an indication of the time period that WML will remain responsible for groundwater remediation; and.
- An assessment of the compliance of the proposal with DLWC's groundwater policies.

EPA also requested further information relating to groundwater impacts as follows:

- Description of groundwater impact mitigation measures including site selection, retention of native vegetation, artificial recharge, providing surface storage with impervious linings, and monitoring.

The Applicant responded to these requests. A series of meetings were held between DLWC, EPA, DMR, NSW Fisheries, NSW Agriculture, the Applicant and the Department to resolve the issues surrounding predicted impacts on the Bowmans Creek alluvium. The amendment to the proposal addressed the main concerns of Government agencies and EPA, DLWC, and NSW Fisheries subsequently provided GTAs indicating that they would be able to issue the relevant approvals to the project.

Several public submissions raised concern over potential impacts of the Ashton project on groundwater systems and water resources in general. Some submissions suggested that the proposal to drain the Bowmans Creek alluvium and divert the creek was not acceptable.

Department's Position

The Department raised initial concerns with the proposals likely impacts on groundwater systems and requested substantial additional information from the Applicant. The Department conducted a detailed assessment of the Applicant's groundwater study, which led to the amendment of the mine plan. This assessment is contained in Appendix C.

The Department considers that the amendment to the mine plan, which prevents drainage of the Bowmans Creek alluvium and permanent connective cracking between the aquifer and deep saline aquifers, addresses the bulk of its concerns relating to groundwater impacts. The Department is satisfied that the amended proposal is unlikely to have a significant impact in the Bowmans Creek alluvial groundwater system. The Department considers, however, that the groundwater impact prediction undertaken by the Applicant should be continually revised and updated based on monitoring of actual subsidence impacts from mining operations. The Department considers that this could be satisfactorily addressed through detailed monitoring of groundwater impacts and revision of predictions for each group of longwall panels for which approval is sought from DMR under section 138 of the

Coal Mines Regulation Act. This would be required in addition to standard groundwater monitoring and reporting requirements.

The Applicant also identified groundwater impacts to the Glennies Creek and Hunter River alluvial aquifers. The Department notes that the drawdown predicted in these aquifers would be temporary and is unlikely to affect groundwater dependant ecosystems or registered groundwater users including the bore in Camberwell Village. The Department considers, however, that due to the proximity of that bore the Applicant should be responsible for mitigation of any unintended impacts on its use, including modifications to the bore depth if necessary.

The Department is satisfied that the Applicant's estimates of minewater inflows are adequate, and likely to be conservative given the amendment to the mine plan, and that the Applicant's proposed mine dewatering strategy is reasonable.

Recommendations

If the Minister determines to approve the Development Application the Applicant should be required to:

- *Prepare and implement a groundwater management plan;*
- *Conduct detailed monitoring of impacts on groundwater systems throughout the mining operations;*
- *Revise and update groundwater impact predictions based on monitoring data and submit for approval by the Director General before each group of longwall panels is approved by DMR under section 138 of the Coal Mines Regulation Act;*
- *Conduct any mitigation works on the registered bore in Camberwell if impacts related to the project affect use of the bore; and,*
- *Comply with the requirements of DLWC and EPA.*

5.4. SURFACE WATER IMPACTS

Applicant's Position

The EIS contains a report on surface water and water management prepared by HLA Envirosciences and Paterson Britton and Partners. The study provides a detailed description and analysis of the existing hydrological environment on the site, defining local topography, catchments, meteorological conditions, steam hydrology, and groundwater hydrology. The Applicant's proposed water management plan is designed to ensure no dirty water discharges are required from the site, and takes into account the water management principles in Section 5 of the *Water Management Act 2000*.

The Applicant proposes that clean water from undisturbed catchments in the open-cut mine area, and all catchments south of the New England Highway would continue to discharge via natural watercourses during mining operations. Dirty water would be generated from the following areas of the mine:

- Underground and opencut mine groundwater inflows;
- Runoff from disturbed catchments in the open cut, surface infrastructure, and overburden emplacement areas;
- Wastewater from bathhouses and workshop areas.

The study also included possible major inflows to the underground mine through drainage of the Bowmans Creek alluvium, however this aspect of the project has since been eliminated

by the amendment. Wastewater would be managed separately and removed from the site by a licensed contractor.

The study proposes a surface water management system consisting of catchment ponds, settlement and storage dams, a process water dam, a raw water dam, fine rejects dams, the final open cut void, and pumping facilities. The development and operation of this system is analysed in three stages, corresponding to the following phases of mine development:

1. Open cut and CHPP operating, no underground
2. Open cut, CHPP, and underground operating
3. Underground and CHPP operating, no open cut, dumps rehabilitated.

Dirty water would be reused on site in the CHPP and for dust suppression. The Applicant has designed water storage structures to allow sufficient freeboard to contain a 100 year recurrence storm without overflow. In dry periods any required make-up water would be imported from surrounding mines or extracted from the Hunter River under licence.

The Applicant developed a water balance model for the project, incorporating allowances for rainfall, evaporation, and water use in on site facilities and mine activities. The balance was analysed for each stage of the project under wet, medium, dry, extreme wet, and extreme dry conditions concluding that:

- The mine would require water imports of up to 303 ML/yr during years 1-7, increasing to a maximum of 470 ML/yr in extreme dry conditions;
- A small surplus of water (<50ML/yr) is expected during a wet year in years 1-7, which could be accommodated within the system; and,
- After year 7, when the open cut void becomes available for water storage, the system would have the capacity to accommodate the expected peak surplus in extreme wet conditions, and an additional 365 ML/yr from drainage of the Bowman's Creek alluvium.

The Applicant later clarified that no discharge from the site would be required under the Hunter River Salinity Trading Scheme.

The Applicant assessed mine water quality, based on mass balance considering flow and quality of water inflows, as between 4,000 us/cm and 6,000 us/cm, depending on the rainfall conditions. Final void water quality is likely to be in the range 8,000 –9,000 us/cm.

The Applicant also assessed the risk of major inflows to the underground mine due to flooding over longwall panels under Bowmans Creek where connective bed rock cracking was predicted. With the amendment to the mine plan, the Applicant states that this risk has been eliminated.

The Applicant proposes to implement a detailed water monitoring and management program throughout the life of the mine.

The Applicant noted that the proposal would result in major modifications to some catchments in north, through open cut mining, and that subsidence would indirectly impact catchments in the southern area of the site. Some reduction in catchment yields is expected through surface cracking. This effect would be mitigated by monitoring and mitigation of cracks. The Applicant proposes to rehabilitate areas affected by open cut mining and overburden emplacement areas to reduce erosion and restore run-off and water quality characteristics of these areas.

The Applicant predicts that water logging of some subsidence induced depressions may occur. It proposes to mitigate these impacts through a combination of vegetation plantings and creation of wetland habitats if necessary.

The amendment to the mine plan, which removes the proposed diversion of Bowmans Creek, would significantly reduce predicted impacts on surface water resulting from the proposal. The creek would be subject to some vertical subsidence and surface cracking which would create significant ponding in the creek and may temporarily drain water into the upper rock strata. The Applicant notes that while large, deep pools would be created in the creek, the overall grade of the creek, and hence flow, would not be altered by subsidence. The Applicant has proposed a monitoring, mitigation, and rehabilitation strategy to ensure that impacts of cracking and ponding are minimised.

Issues Raised in Submissions

EPA and DLWC made submissions requesting further clarification of the surface water impacts of the proposed development including any proposed discharges, impacts of subsidence on surface water flow, and more details of the proposed water management system. The Applicant provided this information.

NSW Fisheries, NSW Agriculture, NPWS, EPA, and DLWC raised concern over the impacts on surface water, aquatic ecology, and dependant ecosystems of the proposal to divert Bowmans Creek.

The Department received 11 public submissions that objected to the potential impacts of the project on surface water. The majority of these submissions focussed on the proposal to divert Bowmans Creek, however some raised concern over impacts on water supply and any discharges to local creeks.

Department's Position

The Department considers that the following alterations and clarifications to the mine proposal since submission of the DA have substantially addressed surface water issues:

- Elimination of the proposed diversion of Bowmans Creek; and,
- Confirmation that the Ashton mine would be a nil discharge site.

Impacts of subsidence on Bowmans Creek channel include the creation of long deep ponds and potential surface cracking. The Department notes that subsidence of the creek channel could reach up to 3.8 m in areas where three seams are mined. While the Department agrees that ponding is unlikely to change the flow of the creek, since the overall grade would not change, it considers that the ponding would effectively create small weirs along the creek which would be prone to erosion. DLWC also noted this impact and has recommended the Applicant to prepare a River Management Plan to monitor and remediate subsidence impacts on Bowmans Creek. The Department concurs with this approach and considers that any impacts to Bowmans Creek would be manageable and can be satisfactorily remediated without significant impacts to water quality.

The Department concurs with the Applicant that the ponds created in the creek, combined with extensive rehabilitation, may improve fish habitat and provide refuge in low flows. The Department considers that NPWS request that habitat for the Green and Golden Bell Frog be created can also be accommodated in the creek rehabilitation.

The Applicant addressed possible ponding of surface water in subsidence depressions by developing a conceptual system of swales to divert surface water flows where required. The

Department considers that this is a satisfactory solution, however any swale construction should be rehabilitated and carried out in consultation with DLWC and the local Aboriginal community.

The Department considers that the water management system proposed by the Applicant would be adequate to manage the predicted flows and water usage on the site. The removal of potential inflows from Bowmans Creek alluvium and flooding is likely to allow for additional capacity in the system. The Department notes that any extraction of surface water for makeup water in the first 7 years of the development would require a licence from DLWC and that any impacts on other water users would be addressed in that process.

Recommendations

If the Minister determines to approve the Development Application the Applicant should be required to:

- *Prepare and implement a site water management plan and monitoring program;*
- *Implement the recommendations of the water management report in the EIS;*
- *Install backup pumping with float-operated switches on all storages to prevent overflows in the case of pump failure;*
- *Maintain sufficient freeboard to contain a 100 year 72 hour storm in all storages at all times;*
- *Consult with DLWC and the local Aboriginal community before and during construction of any surface water diversion structures.*

5.5. AIR QUALITY IMPACTS

Applicant's Position

Dust Impacts

The Air Quality Assessment for the Ashton EIS was prepared by Holmes Air Sciences (HAS). The study established existing air quality from measurements of Total Suspended Particulates (TSP), PM_{10}, and dust deposition in Camberwell Village and from monitoring at surrounding mines. The existing air quality was assessed as generally within acceptable levels.

The initial air quality assessment used air quality criteria for particulate matter below 10 microns (PM_{10}) established by the US EPA. EPA directed the Applicant to use the criteria in it's *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW (NSW EPA, 2001*) and the Applicant amended its assessment to reflect these criteria. The use of revised criteria only altered the assessment of the impacts of the development on 24-hour average PM_{10}. The relevant criteria are shown in Table 2.

Table 2 Ambient Air Quality Criteria for PM_{10}

Averaging Period	Standard/Goal	Agency
Annual	30 ug/m^3	NSW EPA
24 hrs	50 ug/m^3	NSW EPA
Annual	90μg/m^3	US EPA
24 hrs (average of 99th percentile of 24 hour averages over three years)	150μg/m^3	US EPA

Dust emissions from nearby existing and approved mines were estimated to assess the cumulative impact of dust emissions on sensitive receptors. The Applicant identified nearby residences in and around Camberwell Village as potential receptors for the impact assessment.

The air quality modelling and impact assessment is based on Year 4 of mining. Year 4 presents the "worst case" for dust emissions due to the proximity of the opencut mining operations and overburden dumping to sensitive receptors in Camberwell village and the intensity of those operations.

Initial modelling determined that there would be significant exceedences of annual average PM_{10}, TSP and dust deposition criteria unless the project operates with best-practice dust controls. Relevant EPA criteria for TSP and dust deposition are provided in Table 3 and Table 4. The dust controls required are categorised as planning, engineering, or operational controls. While the planning and engineering controls would be similar to those currently applied at open cut coal mines in the Hunter Valley, the Applicant proposes to implement additional real-time monitoring based operational controls. Under this system, operation of the mine would be managed using real-time monitoring of PM_{10} concentrations in Camberwell to ensure that relevant criteria are not exceeded. In addition, the Applicant would plan daily operations based on weather forecasts and real-time weather observations.

Table 3 EPA Ambient Air Quality Criteria for TSP

Pollutant	Standard/Goal	Agency
Total Suspended Particulate Matter (TSP)	90$\mu g/m^3$ (annual mean)	NH&MRC

Table 4 EPA Ambient Air Quality Criteria for Dust Deposition

Existing Dust Fallout Level (g/m^2/month)	Maximum Acceptable Increase Over Existing Fallout Levels (g/m^2/month)	
	Residential	Other
2	2	2
3	1	2
4	0	1

Modelling of such a control system using available air quality modelling software is difficult and the Applicant used several model runs and a semi-quantitative discussion to evaluate the effect of such controls.

Modelling with all practicable planning and engineering controls, but no real-time controls, indicates that the Ashton project in isolation and when combined with the nearby approved Glendell mine would comply with relevant EPA annual average criteria for TSP, PM_{10}, and dust deposition. The Applicant also predicts that the Ashton project alone, with no real-time controls and not considering background air quality, would comply with the EPA's 24hr-

average PM_{10} criteria (50 ug/m^3) approximately 85% of the time. The USEPA 24 hr-average criterion of 150 ug/m^3 would not be exceeded at any time under this scenario.

The Applicant states that the real-time controls would limit dust generating activities when monitoring indicates that ambient 24 hr average dust concentrations in Camberwell exceed 50 ug/m^3. All dust generating activity would be suspended if monitoring indicates that the USEPA criteria (150 ug/m^3) is exceeded and the Ashton project is found to be the cause.

The Applicant estimates that the effect of these real-time controls would be to ensure that the Ashton project does not cause 24 hour average PM_{10} concentrations to exceed 150 ug/m^3. The proposal may result in temporary exceedences of the relevant NSW EPA short term criteria of 50 ug/m^3, however if this occurs the project would employ best-practice controls to ensure impacts are minimised. In addition, the Applicant predicts that real-time controls would cause a slight reduction in annual average dust deposition, TSP, and PM_{10} and provide further ability to comply with the EPA criteria.

Other Air Emissions

The Applicant provided a qualitative assessment of air emissions such as NO_x, CO, and SO_2 from mobile equipment to be used at the mine. The Applicant indicates that, based on assessment's undertaken at much larger open cut mines such as Mt Arthur North, emissions would be likely to comply with relevant EPA criteria.

The Applicant estimates that annual Greenhouse gas emissions for the project would be approximately 69,000 tonnes. In addition, exposed coal seams would release methane to the atmosphere. Coal production from the mine itself, when consumed, would emit up to 4.3 million tonnes per annum.

Issues Raised in Submissions

EPA made a request for the following information relating to air impacts:

- application of relevant EPA PM_{10} criteria;
- revision of the impact assessment so that it follows an iterative process and a demonstration that predictions, with controls in place, meet air quality criteria;
- a definitive statement of background concentrations based on all available data;
- inclusion of Nardell, Ravensworth South, Narama, Glennies Creek, Ravensworth East, Liddell, and Lemington in the cumulative impact assessment;
- details of dust mitigation proposed and a comparison with best management practices;
- additional contour plots and tabulated values of TSP and PM_{10} showing incremental impacts, total impacts (increment + background) and cumulative impacts (increment + background + other mines); and,
- details of the assessment of 24-hour average PM_{10} concentrations.

The revised impact assessment was provided and EPA has issued its GTAs for the proposal indicating it would be able to issue an Environment Protection Licence for the project. EPA requested that a management framework be developed to ensure that residential tenants on mine-owned properties are advised of any potential exceedences of ambient air quality criteria. EPA also advised that the 24-hr average PM_{10} criteria of 50 ug/m^3 should not be applied directly as a limit condition to the development, but should be used as a goal for dust management at the mine.

The majority of the 31 public submissions raised concerns over potential dust impacts and cumulative impacts due to the proximity of a number of open cut coal mines. Concern was raised over potential health and drinking water quality impacts of dust in Camberwell Village.

Department's Position

Dust Impacts

The Department engaged an independent consultant, Pacific Air and Environment (PAE) to review the Applicant's dust impact assessment. The review report provided by PAE is contained in Appendix B. A summary of that review and the Department's comments are provided below.

The Applicant's revised report correctly refers to the annual average dust deposition, TSP and PM_{10} and 24 hour average PM_{10} impact assessment criteria for ambient air quality of 4 g/m^2/month, 90 ug/m^3, 30 ug/m^3 and 50 ug/m^3 respectively. EPA confirmed that the USEPA criteria quoted by the Applicant, and previously applied in NSW, is no longer applicable and the 50 ug/m^3 criteria has been adopted.

The Applicant presents background concentrations of annual average TSP, PM_{10} and 24 hour average PM_{10} of 45 ug/m^3, 18 ug/m^3 and 32 ug/m^3 respectively. This data provides a conservative basis for estimating the total (i.e. background plus increment) air quality impact of the proposal, since the Applicant has adopted the maximum recorded background levels. The impacts of 24-hour average PM_{10} are likely to be significantly lower than those reported since background levels would be below 32 ug/m^3 at certain times.

The cumulative air quality impact assessment carried out by the Applicant includes emissions from Nardell, Ravensworth South, Narama, Glennies Creek, Ravensworth No 2, Ravensworth East, Liddell and Lemington Mines. To account for emissions from these mines, background levels for annual average dust deposition, TSP and PM_{10} of 0.5 g/m^2/month, 10 ug/m^3 and 5 ug/m^3 respectively are reasonable and conservative. The Applicant's additional dispersion modelling of other mines emissions presents predictions that are lower than these values, which confirm their conservative nature.

The Department considers that background levels and additional allowances for cumulative impacts used in the assessment provide a conservative basis for analysing the impact of the proposal. The Applicant has provided a specific assessment to consider the additional impact of the nearby approved Glendell mine.

The Applicants modelling demonstrates that the planning and engineering controls identified in the report are necessary to ensure that the impact assessment criterion for annual average TSP of 90 ug/m^3 will be met at all residences. Modelling also indicates, however, that it would be difficult for the mine to meet the impact assessment criterion for annual average PM_{10} of 30 ug/m^3 at residences 41, 22 and 1 with planning and engineering controls alone. More significantly, the HAS report states that the incremental increase (i.e. Ashton alone) and total (i.e. incremental plus background) 24 hour average PM_{10} is likely to exceed the impact assessment criterion of 50 ug/m^3 for 15% and 32% of the time respectively with planning and engineering controls in place, and assuming the worst-case background level of 32 ug/m^3.

The Applicant has identified that real-time operational dust management controls are necessary to reduce predicted impacts on Camberwell village. The Department and PAE consider that the controls proposed by the Applicant, if fully utilised, represent the most effective dust mitigation methods achievable and are representative of best practice

procedures. The Department recognises that there is inherent difficulty in predicting the actual effectiveness of the real-time techniques proposed, however it is confident that the semi-quantitative assessment conducted by the Applicant represents a credible worst-case scenario.

The Applicant indicates that, even with proposed real-time controls in place, there may be some exceedences of the EPA 24-hr average PM_{10} ambient air quality criteria since it is proposed to use an exceedence of the 50 ug/m^3 criteria as the trigger for reduction of dust-generating activities. The Department considers that additional measures should therefore be implemented to further reduce the likelihood of exceedences, including the use of 12-hour average PM_{10} monitoring and 3 day – 3 hourly weather forecasts to control mine operations.

The Department concludes that the proposed planning, engineering, and operational controls, including the proposed real-time monitoring system, would employ current best-practice techniques and approach the limit of what can feasibly be applied in a mining situation. The Department is satisfied that the Applicant's assessment is realistically conservative and indicates that all relevant EPA criteria for annual average TSP, PM_{10}, and dust deposition would not be exceeded at any nearby residences through implementation of best-practice controls.

24-hr Average PM_{10} Assessment and Reporting

The Department notes that some exceedences of the EPA 24hr-average PM_{10} criteria are likely and considers that this issue warrants further attention.

The Department understands that, to meet relevant legislative requirements under the *Protection of the Environment Operations Act 1997,* the air quality impact assessment must either demonstrate that the relevant impact assessment criteria will be met, or that best management practices are being used to reduce emissions of dust.

The Department therefore understands that, in the case of 24-hr average PM_{10}, the Applicant must demonstrate that it can employ best practice management techniques to ensure that ambient air quality does not exceed 50 ug/m^3. The Applicant and PAE, however, have both argued that strict application of the EPA 24-hr average 50 ug/m^3 criteria is not necessarily justified. This position is based on an appraisal of the NEPM 24-hr average PM_{10} air quality goal, upon which the NSW EPA criteria is based, which is derived from studies of health impacts due to fine particulates from combustion processes in urban areas. Since dust from coal mines presents lower health risks, it is argued, than particulates from combustion, limited exceedences of the EPA criteria may not create a significant health impact. This position is in line with advice from EPA that the 50ug/m^3 criteria should be used as a management goal, not a limit condition for the development. The Department accepts this position and considers that some additional flexibility could be built into the setting of any strict criteria for the development, subject to the Applicant demonstrating the implementation of best practice management techniques.

In order to set a realistic maximum criteria for 24-hr average PM_{10}, the Department considers that the impact of the Ashton project should be considered in isolation. This is due to potential for the 50 ug/m^3 to be exceeded by events beyond the Applicant's control such as bushfires or agricultural and recreational activities. The Department therefore considers that the 50 ug/m^3 should not be exceeded considering the incremental impact of the Ashton project alone.

In addition, to provide an overall maximum limit for cumulative 24-hr PM_{10} impacts the Department considers that the USEPA standard of 150 ug/m^3 is appropriate since it is applicable in all locations and can be used a limit criteria for ambient air quality.

The Department concludes the Applicants assessment is conservative and actual dust impacts are likely to be less that those predicted. In addition, the real-time control strategy and monitoring and limit conditions outlined above would satisfactorily limit exceedences and reduce any potential health impacts on local residences to acceptable levels.

Land Acquisition

Given the potential for dust impacts if the Applicant does not fully implement best-practice controls, the Department considers a land acquisition framework should be developed in order to protect the amenity, health, and equity of existing residents in the area. Under such a framework, the Applicant would be required to acquire any property, at the owner's request, if it can be demonstrated that the relevant EPA criteria, or 24-hr average PM_{10} criteria discussed above, cannot be met at that property. In addition, the Applicant should advise any tenants on mine owned properties affected by dust from the development of any potential risks to their health or amenity as requested by EPA.

Other Air Emissions

The Department notes that gas emissions from the project would be unlikely to have a significant impact on air quality. While greenhouse emissions of the mine operation are not expected to be significant, the Department notes with concern that major emissions would occur from the use of exported coal. The Department considers, however, that the impact of such emissions are beyond the scope of this assessment.

Recommendations

If the Minister determines to approve the Development Application the Applicant should be required to:

- *Ensure ambient air quality in the area does not exceed EPA criteria as a result of the proposal;*
- *Develop an air quality management plan for the project, including details of planning, engineering, operational, and reactive/predictive best management practices for the control of particulate matter impacts;*
- *Use accurate short-term meteorological predictions (eg 3 day forecasts) as an aid in managing mining and dust generating activities;*
- *Base reactive controls on monitoring of 12-hourly average PM_{10} concentrations rather than 24-hourly average PM_{10} concentrations;*
- *Develop a protocol, to be approved by the Director-General, for determining the mines impact on ambient air quality;*
- *Post air quality monitoring data on the Internet or some other means providing ready access to the public;*
- *Prepare quarterly reports on the performance of control measures and the monitoring system providing recommendations for improvements to the system and a record of complaints received, in addition to annual reporting of environmental performance;*
- *Acquire affected properties in the area at the owner's request if it can be demonstrated that relevant EPA criteria cannot be met at the property through independent monitoring;and,*
- *Advise any tenants on mine-owned properties affected by dust of the potential risks to health and amenity at those locations.*

5.6. NOISE AND BLASTING IMPACTS

Applicant's Position

The EIS included a noise impact assessment report by HLA-Envirosciences. The assessment was conducted in accordance with the EPA's *Industrial Noise Policy* (INP). Noise receptors were identified within Camberwell village and on properties to the south and east of the Ashton site. Several properties were not considered in the noise assessment since they are either mine owned or are under purchase contracts with the Applicant. This includes the nearest residence to the open cut mine, P and D Richards on Glennies Creek Rd. Existing noise levels were calculated using results of noise monitoring carried out at three locations in and around Camberwell village. Noise measurements were undertaken for a week at each location on two occasions in August and September 2001. A detailed evaluation of noise contributions from all existing and approved mines in the area was undertaken to take into account cumulative impacts in the calculation of background levels and intrusiveness criterion under the INP. Project Specific Noise Goals were calculated by comparing the amenity and intrusiveness criterion at 17 representative residences in and around Camberwell for day, evening, and night assessment periods.

Assessment criteria were also developed for sleep arousal, rail traffic noise and vibration, and construction noise in accordance with the EPA's *Environmental Noise Control Manual* (ENCM). Blasting criteria for overpressure and ground vibration were established from the ANZECC's *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration.*

The operational noise impact assessment was based on a worst-case scenario where all processing equipment, overburden dumping, and open-cut mining is occurring on the site simultaneously. Scenarios were developed with overburden dumping at two different levels on both the Eastern and Western overburden dumps. Fixed equipment such as the CHPP, ventilation fans, and conveyors was modelled with noise attenuation devices such as cladding, enclosures, and silencers fitted. Noise propagation was modelled under neutral, temperature inversion, and prevailing wind conditions in accordance with the INP.

Sleep arousal was modelled from train loading only since open cut mining and overburden dumping operations would not occur in the night period. Reversing beepers on overburden dumps were modelled to assess sleep disturbance on shift workers during day periods. Construction noise was assessed assuming site preparation earthworks and facilities construction occur simultaneously.

No exceedence of noise criteria was predicted under neutral conditions during either construction or operation. The noise assessment predicted the following exceedences of project specific noise goals:

- Exceedences of the day/evening goals in the range 1-7 dB during operation when dumping at the top of the east and west emplacements, only under adverse temperature inversion or wind conditions. One property would experience exceedences of above 5dB. This property is within the Glendell mine acquisition area. At least 12 properties would experience exceedences in the range 1-5 dB. Exceedences are in the range 1-2 dB when dumping is at lower levels, under adverse conditions.

- Exceedences of night project specific noise criteria by up to 2 dB under adverse wind conditions. This would affect approximately two properties. The open cut mine will not operate in the night period, so noise sources are limited to coal processing and train loading operations.

Construction operations were predicted to exceed EPA criteria at 6 residences studied in the range 1-5 dB only under adverse wind conditions.

The assessment of sleep arousal impacts concluded that relevant criteria would not be exceeded under any conditions. Minor exceedences are predicted for reversing beepers operating on overburden dumps in the day period.

Rail noise and vibration are not expected to increase significantly as a result of the project since no more than two trains would generated per 24 hour period. The noise assessment indicates that rail movements due to the Ashton project would not exceed relevant EPA criteria, including sleep disturbance criteria for residences closest to the train line near Camberwell.

The Applicant states that the predicted road traffic generation from the proposal, 200 movements a day including heavy vehicles, would have a negligible impact on road traffic noise from the New England Highway which carries approximately 12,000 vehicles per day.

The study predicts that air blast overpressure and ground vibration caused by blasting would not exceed the recommended criteria. Ground vibration predictions do not exceed 1.4 mm/s at receptors studied. The Applicant has designed the blasting program and charge weights on meeting a ground vibration criteria of 2 mm/s at the heritage listed St Clements Anglican Church in Camberwell. This criteria and the location of the Church relative to the mine and the village ensure that relevant criteria would not be exceeded at any residences.

The EIS outlines a number of mitigation techniques proposed to manage these potential noise impacts under adverse conditions including real time monitoring of meteorological conditions to guide operational procedures, and engineering solutions including selection of plant and acoustic treatment of equipment.

Issues Raised in Submissions

The EPA did not request additional information regarding noise and blasting impacts and has provided its General Terms of Approval.

The majority of the 31 public submissions objecting to the proposal raised concerns about potential noise and blasting impacts from the mining operations. Many submissions highlighted the potential for cumulative noise impacts due to the proximity of other mines to Camberwell village.

Department's Position

The Department's assessment confirms that the Applicant has carried out its analysis in accordance with the INP. The Applicant's monitoring of existing background noise levels at Camberwell is adequate and provides a reasonable approximation of existing noise levels experienced at potentially affected residences. The Applicant has used the best available information to assess the potential cumulative impact of nearby existing and approved mines and where information was not available has used conservative estimation assumptions. In developing the project specific noise levels for the assessment the Applicant conservatively used the "rural" amenity criteria for all potentially affected properties. The scenarios modelled by the Applicant present credible worst-case noise generating scenarios.

The Applicant's noise modelling shows that exceedences of project specific noise levels would be generally in the range 1-5 dB at up to 12 of the residences studied under adverse weather conditions. The Applicant's proposed best practice mitigation techniques can be reasonably expected to adequately reduce noise exceedences from those predicted and ensure amenity at local Camberwell residences is not adversely affected by the proposal.

In determining appropriate noise levels for consent and licence conditions, EPA questioned the Applicant's calculated project specific noise levels at some residences since:

1. Project specific noise levels for several residences in Camberwell were elevated due to the influence of traffic noise from the New England Highway on background level monitoring data. EPA considers that the monitoring data for that particular location (N2 in the report) is not representative of actual levels experienced at those residences since they are located further from the highway than N2.
2. EPA notes there is no explanation for the evening project specific noise levels being higher than those for the daytime period. EPA suggests that these elevated levels may be due to extraneous noise such as insect noise and that evening levels should be at least the same as daytime levels.

EPA therefore recommended setting project specific noise levels at 38 dB(A) LAeq (15 minute) for both the daytime and evening periods at all residences in Camberwell. While this may reduce noise limits for two residences, comparison of the Applicant's predicted noise levels with this criteria shows that these residences are not the limiting locations for noise impacts. In most scenarios noise levels do not exceed the reduce project specific noise levels at those residences. Applying the lower criteria to all residences would not result in increased exceedences that would not be manageable under the Applicant's proposed mitigation strategy. The Department concurs with EPA's assessment and considers that a single set of project specific noise levels may be applied to all residences without placing undue restrictions on operation of the proposed development.

The Department is satisfied that the Applicant's assessment of potential for sleep disturbance at affected residences is satisfactory and notes that no exceedences of relevant criteria are predicted in the night period. Minor exceedences are predicted due to reversing beepers under adverse weather conditions during the day assessment period, however the Department considers that these exceedences could be eliminated through the implementation of the best practice mitigation techniques recommended in the EIS.

The Department considers that the assessment of construction noise impacts was based on worst-case construction scenarios and compared with appropriate criteria. Construction of environmental bunds and initial earthworks may result in exceedences of up to 5 dB in adverse weather conditions (north west wind). The Department considers that such exceedences could be eliminated with the Applicant's proposed noise management strategy.

The Applicant's assessment of rail noise and vibration impacts due to the additional two trains per day expected as a result of the project. The Department is satisfied with this assessment and concurs that the project would not result in rail noise of vibration impacts that would exceed the relevant criteria at any residences.

The Department concurs with the Applicant's assessment that additional road traffic generated by the proposal would not create a significant increase in traffic noise on the New England Highway.

The Department notes that the Applicant's blasting plan has been designed to ensure strict ground vibration and overpressure criteria are not exceeded at the heritage listed St Clements Anglican Church. The Church is the nearest non-mined owned property to the proposed open-cut, therefore it is highly unlikely that the less restrictive amenity criteria applicable to residences in Camberwell would be exceeded by the proposed mine. This is reflected in the Applicant's assessment. The Department considers that potential blasting impacts of the mine would be manageable and have been adequately addressed by the Applicant.

Due to the potential for noise criteria exceedences if the Applicant does not operate the mine using the best-practice management techniques proposed, the Department considers that a land acquisition framework should be developed to protect the amenity of residents in the area.

Recommendations

If the Minister determines to approve the Development Application the Applicant should be required to:

- *Develop construction and operation noise management plans for the project;*
- *Implement the recommendations of the noise assessment report;*
- *Ensure that noise levels generated by the proposed development do not exceed the EPA's specified project specific noise levels;*
- *Acquire affected properties in the area at the owner's request if it can be demonstrated that relevant EPA criteria cannot be met at the property through independent monitoring;*
- *Develop a blast management plan to address monitoring, notification, and temporary road closure procedures for the open cut mine.*

5.7. CULTURAL HERITAGE IMPACTS

Applicant's Position

An Archaeology Survey Report prepared by HLA-Envirosciences and an Aboriginal Cultural Assessment prepared by Victor Perry of the Upper Hunter Wonnarua Council were included with the EIS for the proposal. NPWS determined that the survey and assessment had not been undertaken in accordance with its guidelines. The Applicant revised the Archaeology Survey Report and submitted it to the Department and NPWS in February 2002. NPWS subsequently advised that the additional information provided was not adequate and the Applicant engaged an alternative consultant, Mr Dan Witter, to conduct a new survey, consultation and report. This report, which incorporates an assessment of the work previously undertaken by HLA-Envirosciences was submitted in June 2002 with a Geomorphology Report by Groundtruth Consulting. Additional supporting information was submitted in July 2002 and this, along with the Witter, Perry (as modified by letter dated 27 June 2002), and Groundtruth Consulting reports form the basis of this assessment.

The Applicant based its archaeological survey of the site on a detailed literature review, a historical review of Aboriginal occupation in the area, consultation with the local Aboriginal community, a search of the NPWS Aboriginal Sites Register, and consideration of various predictive models proposed for the Hunter Valley. A detailed comparative analysis of previous studies undertaken at the nearby Narama, Camberwell, Ravensworth East, and Mt Owen mines was carried out to determine any trends in assemblages of artefacts found in the area. An analysis of the landscape context of the site was carried out, considering likely landscape units for human occupation, and the geographical location of the Ashton site in regional catchments. The Applicant's analysis highlighted the strategic location of the Ashton site for human occupation, being one of two "nodes" in the Hunter Valley where there are large tributary junctions. The Applicant suggests that the Ashton site would have been of exceptional resource potential for Aboriginal people and that future work may show that the site was a kind of "Wonnarua City" or a core area and population centre for the Wonnarua people in prehistory.

In this context, the Applicant carried out two detailed archaeological surveys by different qualified archaeologists assisted by members of three of the four Aboriginal community groups in the Hunter. The surveys involved foot searches of exposures and various landform units over the site. Detailed records of artefacts encountered in the surveys were

made and over 1300 artefacts were recorded. Nearly 200 exposures were surveyed and over half of these had artefacts.

Of the range of assemblages found in the surveys, the report identifies 17 archaeological sites located across the entire Ashton project area. A detailed analysis of artefacts found at these sites was carried out to determine their relative significance. The analysis concludes that the following three sites are most significant considering archaeological, educational, cultural and aesthetic perspectives:

- **Glennies Creek Site**: located on a large waterhole on the lower reaches of Glennies Creek and contains an abundance of artefacts and three sets of grinding grooves;
- **Waterhole Site**: located on a waterhole on the bend of Bowmans Creek close to the New England Highway bridge and contains three sets of grinding grooves on an outcrop by the creek and numerous artefact assemblages further up the hill;
- **Oxbow Site**: located on the outside of the oxbow on Bowmans Creek where the channel cuts across the valley slopes and may have been an encampment. Artefact concentrations were found along two small tributaries off Bowmans Creek.

The report also indicates that the Ashton Ridge which runs north-south between Glennies Creek and Bowmans Creek has significant cultural value being a high vantage point and containing important sites such as the Ridge Peak site. Other sites to the north of the New England Highway were assessed as having lower significance due to the low density of artefacts and levels of disturbance, and similar assemblages would be likely to occur in other areas.

In addition, the Applicant carried out subsurface testing using backhoe pits on the terraces beside Bowmans and Glennies Creeks and the Hunter River. This work was undertaken to determine the potential for buried Pleistocene surfaces or deposits which may indicate the presence of older Aboriginal sites from that period. The study found that the third fluvial terrace along the lower reaches of the creeks and the Hunter River may contain Pleistocene surfaces. Of the locations surveyed it was concluded that Area C, within the Glennies Creek Site, shows the most potential for further research, and it is recommended that this site be conserved.

All sites to the north of the New England Highway would be destroyed by the proposed development. Some sites to the south would be impacted by subsidence and construction of haul roads and the Western Emplacement area. Revegetation and subsidence cracking remediation works also have the potential to disturb sites in the southern area.

Based on the assessment of the significance of the sites, the Applicant considers that sites affected by open cut mining in the north could be collected and salvaged under section 90 permits. The Waterhole site would be partially impacted by the haul road to the Western Emplacement, however the grinding grooves and some artefacts would be conserved. No subsidence is predicted in this area.

The Glennies Creek site would not be impacted by any mining operations or subsidence and is proposed to be conserved under a Conservation Agreement between the Applicant and NPWS. The conservation area would also include the Ridge Peak and High Spur sites on the Ashton Ridge.

The Oxbow site was threatened by the location of the Western Emplacement, however the Applicant modified its footprint to conserve the site. This site, and other sites in the south of the New England Highway would be subject to varying degrees of vertical subsidence up to 6m and surface cracking. The Applicant provided a detailed assessment of potential

impacts of subsidence on Aboriginal sites, noting that impacts could be derived from cracking, nick point and rill erosion, and ponding. The Applicant estimates that cracking may impact on artefacts if the cracks cause shifting or ground disturbance, but that erosion could potentially damage large areas of artefact concentrations. Ponding may affect lower sites such as parts of the Oxbow Site, however this would mainly impact access to the site, not necessarily the integrity of the site itself. The Applicant has identified sites that would be affected by subsidence requiring section 90 permits from NPWS.

The Applicant proposes to mitigate the impacts of subsidence by detailed monitoring, remediation and erosion control to prevent additional impacts on Aboriginal cultural heritage. The Witter report also makes a series of recommendations for Aboriginal Cultural Heritage management during the development of the project.

The Aboriginal Cultural Heritage Assessment prepared by Victor Perry concurs with the findings of the Applicant's study, supports the development proposal, and includes recommendations for ongoing management of Aboriginal Heritage. The Applicant also provided correspondence from the Lower Hunter Wonnarua Tribal Council supporting the recommendations of the Witter Report and recommending conservation of the Glennies Creek Site.

The Applicant states that no items of non-indigenous heritage would be directly impacted by the proposal. The blasting ground vibration would not exceed 2mm/s at the heritage listed St Clements Anglican Church and Camberwell Community Hall.

Issues Raised in Submissions

As noted above, the Department received correspondence from NPWS requesting significant amounts of additional information before the final Witter report was submitted. NPWS and The Department held a meeting with the Applicant following the submission of the report and outstanding issues were discussed. The Applicant provided an additional report addressing these issues.

NPWS then provided its GTAs for the proposal. NPWS states that it does not agree with the size of the Applicant's proposed Conservation Area and has included a GTA requiring the Applicant to provide permanent conservation status, via a statutory mechanism such as a Voluntary Conservation Agreement, to an area indicated on a map attached to the GTAs. NPWS considers that this area is adequate for the purposes of long-term conservation of Aboriginal heritage values. The boundaries of the area were defined according to NPWS landscape and viability criteria, as well as maximising retention of existing vegetation. Other conditions relate to monitoring the impacts of subsidence, monitoring any remediation works, and procedures if any new sites are uncovered during the development. NPWS also provided detailed supporting information for the proposed Conservation Area.

The NSW Heritage Office submission did not object to the proposal and recommended a blast monitor be placed near the St Clements Anglican Church.

No public submissions raised concerns relating to Aboriginal heritage. Several submissions raised concerns over impacts on the heritage listed St Clements Anglican Church.

Department's Position

The Department considers that the Applicant has completed sufficient desktop and field survey work to provide an adequate assessment of Aboriginal heritage issues on the site, given the likely outstanding significance of the Ashton site in a regional context for Aboriginal people and the scale of the proposed impacts.

The Department notes that, of the sites surveyed, two sites of high significance would be destroyed by the proposed development, the Bridge Site, and the Tributary Site north of the New England Highway. The Applicant proposes to carry out salvage excavations on these sites, in consultation with the Aboriginal community and NPWS. The Department considers that this approach is satisfactory, provided the project presents an overall conservation outcome to balance the loss of these sites.

Other sites to the south of the New England Highway, such as the highly significant Oxbow Site, would be impacted indirectly by mining through surface subsidence. As noted in other sections of this report, the Department has conducted site inspections of other similar underground mines to assess subsidence impacts with reference to the Ashton project. The Applicant's analysis of the likely impacts of subsidence on Aboriginal heritage values is considered to be generally accurate, however the Department notes that actual impact on any one site is practically impossible to determine due to the nature of subsidence and surface cracking. The Department considers that the likely impacts predicted by the Applicant, cracking, erosion and ponding, can be viewed as a worst case scenario in the context of individual sites and that it is likely that impacts would be less on most sites in the area. The Department concurs with NPWS and the Applicant that a detailed monitoring program of subsidence impacts on Aboriginal cultural sites would be necessary during the life of the mine.

The Department notes that two of the most significant sites in the DA area, and indeed the Hunter Valley, would not be significantly impacted by the project. The Waterhole Site would be partially impacted by the construction of a haul road through the area and the aesthetic value of the site would be severely compromised. The Department notes, however, that the haul road would be used for the first two years of mining and then the area would be rehabilitated. The Glennies Creek Site would not be impacted and would be permanently protected in a conservation area. The Applicant indicates that access for the Aboriginal community to both the Waterhole and Glennies Creek sites would be arranged during the mining operations.

The Department negotiated with the Applicant and NPWS over the size and allowable activities on the Conservation Area contained in NPWS GTAs. The Applicant agreed with the size of the Conservation Area and requested that agriculture and grazing be allowed in the area where it would not compromise the conservation of Aboriginal heritage or biodiversity. The Department considers that these terms should be included in any consent for the proposal.

The Department notes that the Applicant has consulted extensively with all Aboriginal community groups and that no groups have objected to the recommendations of the Aboriginal cultural heritage assessment or the proposed conservation area. Letters to this effect were provided by the Upper Hunter Wonnarua Council and the Lower Wonnarua Tribal Council.

The Department believes that a satisfactory conservation outcome for Aboriginal cultural heritage has been achieved through its and NPWS assessment of the proposal. The extensive Conservation Area, approximately 140 ha, and the highly significant Aboriginal heritage sites contained in the area would provide an adequate offset for the predicted impacts on sites in the northern section of the site and any subsidence impacts.

The Department is satisfied that the project is unlikely to have a significant impact on any item of non-indigenous heritage.

Recommendations

If the Minister determines to approve the Development Application the Applicant should be required to:

- *Prepare and implement an Aboriginal heritage management plan;*
- *Establish a Conservation Agreement over the area in NPWS GTAs with a Plan of Management specifying allowable activities in the area;*
- *Conduct monitoring of Aboriginal heritage during mining operations and identify any areas where future Conservation Agreements could be established;*
- *Arrange access for the Aboriginal community to the Glennies Creek and Waterhole Sites;*
- *Comply with NPWS GTAs and consult regularly with the Aboriginal community;*
- *Ensure ground vibration at St Clements Anglican Church does not exceed 2 mm/s and monitor all blasts at the church.*

5.8. ECOLOGICAL IMPACTS

Applicant's Position

Terrestrial Ecology

The EIS includes a report on predicted flora and fauna impacts of the proposed development. The study included a detailed literature review and searches of the NPWS Wildlife Atlas, and extensive flora and fauna field surveys were conducted over the site of the proposed development.

Five broad vegetation communities were identified on the site, those being Grassland, Woodland, Bull Oak, Riparian, and Aquatic. The main vegetation remnants on the site were identified as being to the north of the New England Highway (the Northern Woodland), in the southern part of the site between the Hunter River and Glennies Creek (the Southern Woodland), and the riparian vegetation corridors on the site. The Northern Woodland and Southern Woodland are dominated by Woodland and Bull Oak vegetation communities. No threatened flora species were observed during field investigations. The Applicant notes that, while woodland remnants on the site have been disturbed by agriculture and grazing, they are significant due to the high rates of clearing in the Hunter Valley.

The Applicant's fauna surveys identified several species of raptors and wetland birds and a regionally significant woodland bird species, the Grey-crowned Babbler (*Pomatostomus temporalis)*. This species has recently been listed as Vulnerable under the *Threatened Species Conservation Act 1995* (TSC Act) and is therefore now significant state-wide. A breeding population of the Grey-crowned Babbler was located in the Southern Woodland. Twelve mammal species were observed, five of those being exotic, and none listed as threatened under the TSC Act. Several frog species were observed in dams on the site however no frog species were observed in either Bowmans or Glennies Creek. Nine lizard species were observed.

Additional threatened species surveys for woodland birds, the Green and Golden Bell Frog, and microchiropteran bats were conducted in summer 2001/2002 in response to requests for further information from the Department and NPWS. No additional species were positively identified during the surveys, however the Great Pipistrelle *(Falsistrellus tasmaniensis)*, a threatened species, was tentatively recorded in the Southern Woodland.

The proposal would involve the clearing of approximately 100ha of vegetation of the Northern Woodland through open cut mining and overburden emplacement. The Western

Emplacement area would be on open grassland and is not expected to impact on remnant vegetation.

Vegetation in the southern portion of the site would be subjected to up to four subsidence events with a maximum total subsidence of 6m. The Applicant argues that the southern vegetation and riparian vegetation would experience only subtle changes due to vertical subsidence and surface cracking. Depressions caused by subsidence in the open grasslands would increase moisture in those areas and allow exotic vegetation present as a result of agriculture to dominate. Erosion may increase where groundcover is poorly developed and slope changes with subsidence. Ground cracking may affect some vegetation and increase the risk of erosion.

The Applicant conducted eight-part tests of significance for all threatened species known or likely to occur on the site, under section 5A of the Act, and concluded that the proposal is unlikely to have a significant effect on any species or their habitat as a result of the proposal. Section 5A assessments were conducted for 26 individual species.

Despite this conclusion, the Applicant proposed a series of measures to mitigate the likely impacts of the proposal on threatened species and their habitats including:

- Revegetation of degraded remnants and riparian vegetation in areas that would not be directly disturbed by mining;
- Exclusion of grazing on existing vegetation and rehabilitation areas;
- Rehabilitation of areas disturbed by mining and overburden emplacement; and,
- Development of a Land Management Plan that identifies quality habitat to be protected and managed in the long-term, corridors for fauna movement, and areas where grazing and agriculture are allowed.

In addition, the Applicant has agreed to establish Conservation Agreement over land in the southern part of the Ashton site which contains the majority of the existing Southern Woodland and significant Aboriginal cultural heritage values.

Aquatic Ecology

An assessment of the aquatic ecology of Bowmans and Glennies Creek was completed by Marine Pollution Research Pty Ltd as part if the EIS. The assessment included both desktop and field studies and concluded that no species listed as threatened under the *Fisheries Management Act 1994* are likely to occur or were observed in the creeks on the project site. Therefore no eight-part test under section 5A of the Act was done as part of the study.

The assessment found that Bowmans and Glennies Creeks contain aquatic habitat which could support and allow the passage of native fish species. The streams are considered Class 1 under NSW Fisheries classification scheme. The field study found no obstructions to fish passage in Bowmans creek, despite the presence of the DLWC gauging station. The report notes that a large section of habitat would have been lost through diverting Bowmans Creek. With the amendment of the DA and the removal of the proposed diversion, this impact has been eliminated.

Bowmans Creek would be subjected to subsidence impacts which would result in significant ponding of the creek. This is not expected to affect fish passage since the overall grade and flow of the creek would not change. Surface cracking in the creek bed may result in temporary loss of water from the creek, however the Applicant predicts that any cracking would anneal naturally or could be easily rehabilitated. There would be no long-term drainage of the creek since potential for connective cracking has been eliminated with the amendment to the DA.

Impacts on aquatic ecology are expected to be low and short term. The creation of long deep pools is likely to improve fish habitat and provide refuge in extreme low flows in Bowmans Creek.

The Applicant has proposed the following measures to mitigate impacts on aquatic ecosystems:

- Rehabilitation of riparian vegetation, aquatic vegetation and habitat, and creek bank stabilisation works before, during, and after underground mining operations;
- Monitoring of any subsidence impacts on Bowmans Creek and creek stabilisation works where required; and,
- Integration of Bowmans Creek rehabilitation works with site Land Management Plan.

Issues Raised in Submissions

Terrestrial Ecology

NPWS raised concerns about the flora and fauna survey and requested additional surveys for woodland bird species, further assessment of subsidence impacts, and evaluation of the conservation significance of remnant vegetation on the site. This information was provided by the Applicant in February 2002. Following a site visit and discussions with the Applicant and the Department, NPWS provided a detailed submission on the proposal. NPWS highlighted the significance of remnant vegetation on the site and questioned the Applicant's assessment of subsidence impacts on the Southern Woodland. Other concerns raised were potential for impacts on the Camberwell Common and loss of aquatic habitat and riparian vegetation due to the (then) proposed diversion of Bowmans Creek. NPWS requested that rehabilitation plans be integrated with nearby mines and requested further Green and Golden Bell Frog surveys. Mitigation measures for impacts on amphibians were recommended, including habitat creation along Bowmans Creek and breeding and monitoring programs. In a further submission, NPWS requested that the following issues be taken into account in the Department's assessment:

- the assessment does not provide a thorough understanding of the Grey-crowned Babbler's use of the site;
- the section 5A assessment has not been adequately addressed in relation to significance of habitat removal;
- Other woodland bird species have been identified at Mt Owen mine, and are likely to occur on the site;
- Bat surveys should have been conducted along Bowmans Creek;
- Flora surveys conducted and vegetation community descriptions were inadequate. Further vegetation surveys are recommended;
- potential salinity impacts on vegetation;
- The proposed rehabilitation plan does not provide sufficient detail and requires further analysis of existing endemic vegetation and a quantified rehabilitation target;
- the Northern Woodland is of high regional conservation significance and is likely to be used by woodland birds and other fauna species on a seasonal basis; and,
- If alternative mine plans which retain the Northern Woodland cannot be identified, compensatory habitat of comparable quality would need to be secured to offset the vegetation loss.

NPWS provided further comments relating to flora and fauna issues when it issued GTAs for Aboriginal heritage. These were:

- the proposal does not adequately compensate for loss of vegetation since the Applicant's proposed conservation area does not provide compensation of 'like for like' vegetation at a ratio of at least 2:1;

- Proposed land to be swapped for the Camberwell Common does not adequately replace biodiversity values on the existing Common since it is cleared grazing land;
- The area proposed for a conservation area would be impacted by subsidence and would require an access road to be constructed through it and is therefore not 'like for like'; and,
- Proposed tree-planting offsets for salinity do not include any species endemic to the area.

Aquatic Ecology

NSW Fisheries objected to the original proposal to divert Bowmans Creek and stated that it is unlikely that it would issue a section 201 permit for the proposal. The objection was based on the significant loss of habitat and the findings of the Healthy Rivers Commission Draft Report which recommends Bowmans Creek be rehabilitated and developed as refuge habitat for fish. NSW Fisheries did, however, provide recommended conditions of consent should the project be approved. DLWC, NPWS, and EPA also expressed concern over the amount of aquatic habitat that would be lost due to the diversion proposal.

With the amendment to the mine plan, NSW Fisheries indicated that since no diversion of Bowmans Creek is planned, no integrated approval would be required. NSW Fisheries recommended conditions requiring monitoring of aquatic ecology before, during, and after underground mining, and rehabilitation of Bowmans Creek.

Department's Position

Terrestrial Ecology

The Department considers that the flora and fauna study conducted by the Applicant provides an adequate analysis of ecological considerations on the site and the likely impacts of the proposal. Additional surveys conducted during the summer period confirmed the limited number of threatened species observed and likely to be present on the site. This reflects, to some degree, the general quality of the habitat on the site and existing levels of disturbance from agriculture and grazing.

The project would result in the removal of a large section of existing vegetation, the Northern Woodland. While this vegetation could provide habitat for threatened woodland birds, such as the Grey-crowned Babbler which was found in the Southern Woodland, the Department notes that surveys indicate that the vegetation is not being used as breeding habitat. The Department considers that, although no threatened woodland bird species were observed in the Northern Remnant it is likely that the vegetation would be used as foraging habitat. In addition, the loss of the Northern Remnant may increase pressure on threatened species in nearby remnants from the relocation of competing species. The Department considers that potential impacts on the known Grey-crowned Babbler population or other woodland bird populations from these factors would not be significant since both foraging habitat and vegetation where competitors may relocate is not restricted to the Southern Woodland. Other existing remnants are located off-site to the north along Bettys Creek and Glennies Creek lease, south of the Hunter River, and to the southeast of Camberwell Village. In addition the Applicant proposes to improve existing vegetation, rehabilitate areas currently used for grazing, and revegetate all mine disturbed areas.

Due to the presence of the Grey-crowned Babbler and potentially the Great Pipistrelle in the Southern Woodland, any impacts on this vegetation must be analysed in detail.

Impacts on the Southern woodland would be limited to impacts from subsidence. The Department has considered the theoretical predictions and empirical evidence provided by

the Applicant and conducted site investigations of subsided vegetation at existing underground mines in the Hunter Valley and Newcastle Coalfield. The Applicant referred to the subsidence impacts experienced at the nearby Cumnock mine where similar subsidence events have impacted on woodland vegetation like that found on the Ashton site. The Department made a detailed site inspection of the Cumnock mine site where subsidence has occurred in two events after the longwall extraction of two seams. The first seam was approximately 3m thick and the second 2m thick. All seams proposed to be mined at the Ashton site are approximately 2m thick. Observed impacts at Cumnock mine were limited and difficult to detect during the inspection. Some minor cracking (up to 5cm wide) was observed on the margins of the longwall panel footprints, however cracks had generally annealed naturally in vegetated areas. Any cracks in open areas had been filled manually. No increased erosion or impacts to native vegetation was observed.

Similarly at Newstan mine in the Newcastle Coalfield, the Department inspected subsidence impacts on native vegetation due to the longwall extraction of a single 3-4m seam. Vertical subsidence at Newstan is over 2m in a single event, substantially more than that predicted in any one event at Ashton. In addition, the slope of the surface terrain at Newstan is generally greater than on the Ashton site. Again impacts on vegetation were limited and subsidence cracking was either naturally annealed or manually filled. Resulting erosion and impacts on vegetation stability observed on site were minimal and unlikely to have any impact on fauna using the vegetation as habitat.

The Department's analysis of subsidence impacts on native vegetation in similar situations to those expected at Ashton indicates that the level of impact on habitat value is relatively low and is likely to be less than current impacts on the Ashton site due to grazing and agriculture.

Detailed surveys for the Green and Golden Bell Frog and analysis of habitat on the site confirmed that there is no evidence of the species on the site, and that impacts of subsidence on Bowmans Creek and potential temporary drainage of stock dams would be unlikely to result in a significant impact on the species or its habitat. The Department agrees with this assessment, while noting the potential for Bowmans Creek to be used as a corridor for Green and Golden Bell Frog in the area which was highlighted by NPWS.

The Department therefore concurs with the Applicant's assessment under section 5A of the Act, concluding that the project would be unlikely to have a significant effect on threatened species, populations or ecological communities, or their habitats.

In its assessment of the likely impacts of the proposal, the Department must consider impacts of removal of remnant vegetation, even where impact on threatened species is unlikely to be significant. In this context, the Department considers that the Northern Remnant is of regional conservation significance given that it occurs in a cleared and highly fragmented landscape, provides a habitat corridor between Glennies Creek and Bettys Creek, and supports suitable habitat for threatened species. Information provided by NPWS regarding the regional conservation significance of remnants in the Central Hunter Valley (Branxton to Muswellbrook) supports this view. This information states that in the Central Hunter Valley:

- up to 99% of pre-European vegetation has either been cleared or altered;
- only 18.8% of the pre-1850 vegetation now remains as indicated in the initial results of the Hunter Remnant Vegetation Project; and
- only 3.4% is in formal reserves (largely in the lower Hunter) and a further 0.2% is in State Forests.

On this basis, the Department requested that the Applicant consider altering the design of the Eastern Emplacement to enable a section of the remnant to be retained. The Applicant assessed the implications on the project if a 200m wide strip of vegetation were retained. Apart from obvious economic impacts due to additional overburden haulage, the Applicant indicated that such a proposal would result in significant noise and dust impacts on Camberwell village due to an increase in the size of the Western Emplacement, or the addition of another emplacement area further south. NPWS did not support such a proposal since it considered that such a limited remnant would not provide satisfactory refuge to allow fauna to persist in the area. The Department therefore considers that the likely ecological benefits and additional environmental and amenity impacts of the proposal are not justified and that the mine plan should remain as presented in the EIS.

The Department concurs with NPWS that the loss of the Northern Woodland is significant in a regional context and should be offset in some way to maintain and improve biodiversity conservation on the site. The Department considers that any offset should be in accordance with current accepted Government policy and practice. The offset proposed by NPWS, namely compensation for vegetation loss with like vegetation at a 2:1 ratio conserved in perpetuity, is a policy that has been applied in the past where a significant impact on a threatened species would occur as a result of the proposal. In this scenario, the offset would be compensatory habitat, not solely vegetation, for the particular species affected. In the case of the Ashton Project, no significant impact on a threatened species was identified and this should be recognised when considering any offset proposal. Proposals for green offsets for vegetation clearing have been drafted by DLWC (2001) and EPA (2002). The general principles defined in these papers are:

Offsets must be:

- *enduring – they must offset the impact of the development for the period that the impact occurs*
- *quantifiable – the impacts and benefits must be reliably estimated*
- *targeted – they must offset the impacts on a 'like for like or better' basis*
- *located appropriately – they must offset the impact in the same area*
- *supplementary – beyond existing requirements and not already being funded under another scheme*
- *enforceable – through development consent conditions, licence conditions, covenants or a contract.*

The Department notes that, while these principles are defined in concept papers not currently implemented policy or legislation, they provide a general guideline for consideration of offsets. The Department considers that the minimum level of mitigation and management of the site would be the rehabilitation of all areas disturbed by mining to their existing state. Therefore, rehabilitation and protection of vegetation beyond this requirement may be considered an offset. The impact of the proposal is a combination of the clearing of 100 ha of Woodland and Bull Oak vegetation communities of the Northern Woodland and minor subsidence impacts on the Southern Woodland. As discussed above, the Department considers that impacts of subsidence on vegetation would be limited and can be acceptably mitigated with monitoring and rehabilitation of cracking. The resultant impact in the short, medium and long term is therefore the clearing of the Northern Woodland.

The Department considers that this impact could be offset by securing and enhancing sufficient existing vegetation for the duration of the short-term impacts, rehabilitating areas not to be disturbed in the medium term, and rehabilitation of mined areas in the long term. The Department has prepared the following table analysing the offsets proposed by the Applicant:

Table 5 Vegetation Offsets – Ashton Coal Project

Location	Area
Total Area of DA	**880ha**
IMPACT	
Northern Remnant (Woodland, Bull Oak)	100ha
MITIGATION	
Mine Rehabilitation (Northern Woodland)	100 ha
OFFSET	
Southern Woodland (Existing in Conservation Area)	56 ha
Southern Woodland (Existing outside CA)	20 ha
Total Existing vegetation preserved	**76 ha**
Southern Woodland inside CA (ND Reveg)	40 ha
Woodland on west of Bowmans Creek (ND Reveg)	15 ha
Northwest corner of DA area (ND Reveg)	80 ha
Central corridors south of NE Highway (ND Reveg)	28ha
Total Non-Disturbed Area revegetation	**159 ha**
Rehab of Northern Woodland (D Reveg)	156 ha
Rehab of Western Emplacement (D Reveg)	24 ha
Total Disturbed area revegetation	**181 ha**

ND Reveg – Revegetation of areas not significantly disturbed by mining
D Reveg – Revegetation of areas disturbed by mining

The analysis shows that short and mid-term impacts would be offset through a combination of retention and enhancement of existing vegetation and rehabilitation of areas not to be disturbed. Short term impacts would be offset through the protection of approximately 76 ha of existing woodland vegetation, 56 ha of this in a Conservation Area, and the exclusion of grazing from this area. This conservation strategy would offset on a 'like for like' basis all but 24 ha of the total area to be cleared.

The outstanding 24 ha would be offset in the medium term by rehabilitation of areas not to be significantly disturbed by mining in the southern and north western sections of the site (159 ha total, 40 ha of this in the Conservation Area). Rehabilitation of these areas would commence when project construction begins and be established before clearing of the Northern Woodland is complete. Taking into account the relative success rates of revegetation on grazing land, the Department considers that the offset ratio that would be achieved, with 159 ha revegetated for 24 ha cleared, or 6:1, is adequate.

Rehabilitation of mined areas would commence as follows:

- Western Emplacement – Year 2
- Eastern Emplacement – Year 3
- Open cut mine area – Year 7

After completion of mining, the site would have a combination of original intact vegetation, revegetated grazing lands, revegetated mined lands, and agricultural lands. The bulk of revegetation on the site would be completed within the first 7 years of the project, therefore all revegetated areas would have been established for at least 14 years. The overall offset ratio at this stage would be 340 ha of revegetated areas for the outstanding 24 ha of clearing. The Department considers that this provides a satisfactory ratio (14:1) given the relative success of revegetation compared to conserving existing vegetation.

Regarding long-term protection of the retained vegetation and revegetated areas, the Department notes that 96 ha would be placed into a permanent Conservation Area. No vegetation would be under threat of future mining once the mine closes, and the site would have significantly increased vegetation cover. Some of this vegetation may experience grazing pressure in the future, however that Department considers that the offset provided

by the extensive revegetation and management of these areas over 21 years would create improved conservation outcomes compared to a do-nothing scenario where the site continues to be used for agriculture.

The Department concludes that the proposed revegetation and land management strategy, conservation area, and retention of existing vegetation would provide adequate offset for the impacts of the proposal that cannot be directly mitigated, in accordance with the principles outlined above.

The Department has also negotiated with the Applicant and relevant stakeholders over revegetation works to be undertaken on the land proposed to be swapped for the Camberwell Common and Travelling Stock Reserve. The Applicant has agreed to include this land, located to the south of the New England Highway on the east of the site, in the final land management plan for the site. The Applicant has undertaken to develop this plan in consultation with the Common Trust, the Rural Lands Protection Board, Singleton Landcare, and the Hunter Catchment Management Trust. The aim of the rehabilitation works in this area would aim to balance grazing, agricultural, and biodiversity values in the long-term management of the site.

Aquatic Ecology

The Department considers that the existing aquatic environment and likely impacts have been adequately addressed in the Applicant's aquatic ecology study. The amendment of the DA to remove the proposed diversion of Bowmans Creek significantly reduced the potential impacts of the proposal on aquatic ecology. The Department is satisfied that the proposed monitoring and mitigation techniques would be sufficient to ensure impacts on aquatic ecology are minimised and aquatic habitat is enhanced as a result of the proposal.

Recommendations

If the Minister determines to approve the Development Application the Applicant should be required to:

- *develop a final land management plan incorporating biodiversity values in consultation with relevant Government agencies;*
- *establish a conservation agreement over the Southern Woodland;*
- *enhance corridor and habitat values for woodland birds, bats, and Green and Golden Bell Frog on the site through rehabilitation of areas not to be disturbed and areas to be mined;*
- *exclude stock from all rehabilitation areas;*
- *include the land proposed to be swapped for the Camberwell Common and the Travelling Stock Reserve in the final land management plan, in consultation with relevant stakeholders;*
- *develop a stream management plan to ensure aquatic habitat is monitored, rehabilitated and enhanced.*

5.9. LAND CAPABILITY AND AGRICULTURAL IMPACTS

Applicant's Position

The Applicant carried out a study of land capability and agricultural suitability of the site. The Applicant states that the majority of impacts from the project would be on lands of agricultural class 3 and 4, or lands of land capability Class IV and V. Approximately 91% of the Class 3 Agricultural land on the site and 69 % of the Class 4 land would be impacted by

the proposal. Approximately 63% of the agricultural land on the site would not be impacted by the development, being outside both the open cut and underground mining areas.

Class 1 Agricultural land occurs on the alluvial flats of Bowmans Creek. Within the DA area there is a total of 210 ha of class 1 land. The Applicant estimates that approximately 37% of this land would be impacted by subsidence. The Applicant notes that subsidence would result in a lowering of the ground surface, possible ponding and changes to run off characteristics, and alterations to the relative surface topography. The Applicant indicates that the areas of highest impact are in the northern section of Bowmans Creek where the diversion was planned and connective subsidence cracking of the alluvium was predicted. The Applicant claims that the subsided land would not be lost, however, and would be suitable for future agricultural purposes.

The Applicant states that proposed revegetation works would be largely confined to class 3 lands, except for riparian revegetation along Bowmans Creek. The Applicant engaged a specialist consultant to assess agricultural options for the site during mining and proposes to implement the following improvements to mitigate impacts on agricultural use of the property:

- Upgrade the property's irrigation system;
- Fence areas of subsidence to exclude cattle;
- Cultivate fodder crops on the Class 1 land on the river flats.

The Applicant concludes that the loss of prime agricultural land is not significant in a regional context and that agricultural practices on the property would be enhanced by the proposed improvements.

Issues Raised in Submissions

In its letter dated 5 April 2002, NSW Agriculture requested a Commission of Inquiry into the proposal stating that Class 1 agricultural land makes up only 1% of land in NSW and is an important natural and economic resource. In the Upper Hunter, Class 1 land comprises approximately 22,500 ha which is about 1.1% of the total area. NSW Agriculture considers the assessment of agricultural impacts and significance of those impacts by the Applicant to be inadequate and requested further information. This was supplied by the Applicant.

NSW Agriculture made a further submission raising concerns over impacts to the Bowmans Creek alluvial aquifer, the creek itself, and long term salinity impacts, in addition to degradation of agricultural lands over the site. NSW Agriculture was concerned with the precedent that may be set if such a proposal were approved, and recommends a moratorium on further mining proposals in alluvial areas of the Hunter until further research can be done into long-term impacts.

Upon review of the amended proposal and mine plan, NSW Agriculture indicated that the revision was a considerable improvement and, while not ideal, it is a workable compromise. NSW Agriculture recommended that the Applicant be required to undertake a detailed subsidence monitoring and rehabilitation program if the project is approved.

Several public submissions raised concern over the loss of agricultural potential from longwall mining below the alluvial flats of Bowmans Creek and impacts on groundwater resources for agriculture.

Department's Position

The Department raised initial concerns with the Applicants assessment of agricultural impacts, particularly impacts on prime agricultural land. These were addressed by the information provided by the Applicant.

The Department considers that the key impacts of the project on agricultural land, and key concerns of NSW Agriculture, such as diffuse saline discharges to the Bowmans Creek alluvium due to connective bedrock cracking, have been eliminated by the Applicant's amended mine plan. The Department also notes that the degree of vertical subsidence on this area would be substantially reduced since only two or three seams would be mined.

The Department notes, however, that sections of Class 1 agricultural land would be permanently impacted by subsidence and potential changes to surface water flow and groundwater characteristics. The Department considers that, contrary to the Applicants advice, the use of this land is likely to be compromised in the long term due to these changes. The Department also notes that the footprint of the amended mine plan would also further encroach on prime agricultural lands, however this is unlikely to significantly alter the overall balance of land impacted.

The Department considers that the measures proposed by the Applicant to improve agricultural productivity on the site are important, however they are unlikely to fully compensate for the loss of agricultural potential.

The Department notes NSW Agriculture's assessment of the regional significance of prime agricultural lands and, considering that approximately 60% or 140 ha of the Class 1 land on the site would be preserved, concludes that the proposal is unlikely to compromise local or regional agricultural productivity. The Department therefore considers that the loss of Class 1 lands is outweighed by the significant socio-economic benefits of the proposal.

Recommendations

If the Minister determines to approve the Development Application the Applicant should be required to:

- *Develop and implement a strategy for monitoring, remediation, and enhancement of agricultural values, taking into account biodiversity and other environmental values, on the site in a land management plan.*

5.10. TRANSPORT IMPACTS

Applicant's Position

Road Transport

The Applicant estimates that construction traffic generated by the proposal would average at around 100 movements per day for workers and additional movements for deliveries of equipment and materials over the 18 month construction period. Operational traffic would create approximately 50 vehicle movements at shift change over which would occur three times a day. The Applicant estimates that, including deliveries to site, the maximum vehicle movements per day during operation would be approximately 200. The main access to the site would be off Glennies Creek Rd while some oversize deliveries during construction would be made off the New England Highway via an old alignment of the Highway.

The Applicant states that this number of vehicle movements is well within the design capacity of Glennies Creek Road and the intersection with the New England Highway. The additional maximum 200 movements would have minimal impact on the operation of the New England Highway which carries approximately 12,000 vehicles per day.

All other traffic, including all haulage of coal and overburden would be on private haul roads within the Ashton site or by rail. The Applicant has confirmed that temporary haulage of coal to the Macquarie Generation conveyor, as indicated in the EIS, is no longer required.

Blasting in the Arties and Barrett pits would require some short closures of the New England Highway on an irregular basis and regular closures of Glennies Creek Rd.

The Applicant proposes to further mitigate potential impacts by constructing a mine entrance to Glennies Creek Rd to AUSTROADS Standard, resurfacing Glennies Creek Rd from the entrance to the Highway, and upgrading the intersection of the Glennies Creek Rd and the Highway. A minor realignment of Glennies Creek Rd would be required to the north of the mine entrance to accommodate the open cut pit.

Rail Traffic

All coal transported from the Ashton site would be transported by rail. The proposal includes construction of a new rail siding adjacent to the proposed surface infrastructure. An average of two 9,000 tonne unit trains would be generated per day. This additional rail traffic would not exceed the 120 Mt per annum operating capacity of the Hunter Valley rail network. Blasting may have temporary impacts on trains on the Main Northern Railway, however the Applicant proposes to develop a protocol with rail Infrastructure Corporation to ensure safety and integrity of the rail line is maintained and that scheduled train services are not interrupted.

Issues Raised in Submissions

Singleton Shire Council requested additional concept plans and descriptions of all road works proposed for the Ashton project. The Applicant provided this information which includes drawings of the intersection and road realignment works proposed. The intersection of Glennies Creek Rd and the mine access road was designed as an AUSTROADS Type 'B' intersection. The Applicant also indicates that additional road signage would be provided.

Council subsequently considered the proposal at a meeting of the Corporate and Development Services committee on 11 February 2002, resolving to support to the Development Application. Council later provided its General Terms of Approval under the *Roads Act 1993,* indicating that it would be able to issue the relevant approval for works within the road reserve. RTA provided GTAs for the proposal indicating it too would be able to issue an approval under the *Roads Act 1993* for works in the New England Highway road reserve.

Some public submissions raised potential impacts from increased rail traffic and road safety issues at the level crossing of Glennies Creek Rd and the Main Northern Railway. One submission raised concern over increased road traffic.

Department's Position

The Department concurs with the Applicant's assessment of potential traffic impacts. The assessment shows that increases in traffic on the New England Highway would be minimal (approximately 1.6% of existing AADT) and that road capacity or intersection operation is unlikely to be compromised.

The Department notes that relevant Government agencies are satisfied with the proposed roadworks and considers that the roadworks would improve road quality and intersection operation in the locality.

The Department notes concern over rail traffic in public submissions, however considers that the average two trains per day predicted is unlikely to alter existing rail associated impacts or contribute to reduced safety at the Glennies Creek Rd level crossing.

The Department notes that road users may be affected by temporary road closures due to blasting. Due to the low number of blasts per day (1-2) the Department considers that, even in the worst case that all blasts require temporary closures, overall impacts on Glennies Creek Rd would be minimal. All blasting would be carried out under strict notification and management procedures which would mitigate any residual impacts on road users.

Recommendations

If the Minister determines to approve the Development Application the Applicant should be required to:

- *Develop traffic management plans for construction and operation of the project;*
- *Carry out construction in the road reserve according Council and RTA GTAs and requirements;*
- *Develop a blast management plan with procedures for notification and temporary road closures.*

5.11. LANDSCAPE AND VISUAL AMENITY IMPACTS

Applicant's Position

The Applicant provided a description of the existing visual environment stating it is compromised by the presence of existing coal mines, power stations, and industrial development in the region and locality. The Applicant identified two main landscape components on the site, being river floodplains and undulating foothills. Land to the south of the New England Highway is mainly cleared while on the northern side more vegetation remains. Areas closer to the Highway have been cleared. Relief for the site ranges from 60m to 110m AHD. Overall visual amenity is assessed as moderate since the topography is not rugged and relief is low. Main viewpoints to the proposed development are from Camberwell Village, the New England Highway, and some rural dwellings north and south of Camberwell.

Key impacts on the visual environment would be from the open cut mine, surface infrastructure, and overburden dumps. The Western Emplacement, to the South of the Highway, would be visible to motorists on the New England Highway. Travel time along the relevant section of the highway is about 80 seconds. The top pf the emplacement area would be visible from elevated locations in and around Camberwell Village, however this would be partially mitigated with vegetated visual bunds. The Emplacement would be complete by year 2 of mining.

The open cut mine and surface infrastructure would not be viewed from Camberwell Village. Motorists on the Highway would view this part of the development from as far as 3.2 km away to the north. The major impact would be over a 1.5km section of road passing the surface infrastructure, with a travelling time of 50 seconds.

Partial views of the Eastern Emplacement and visual bund would be obtained from Camberwell Village. Properties to the north, all but two of which are mine owned, would have direct views of the emplacement area. The Eastern Emplacement would be completed in Year 3 of mining.

Night lighting is predicted to have an impact on visual amenity since opencut mining would operate until 10pm. Lighting would be required for 5 hours in winter and 2 hours in summer. Truck haulage to the Western Emplacement would also occur at night and headlights may impact on motorists, however the Applicant proposed to construct haul roads and the underpass so that lights would not shine directly on vehicles travelling along the highway.

Issues Raised in Submissions

Several public submissions raised concerns over potential visual impacts of the proposal and the impacts of night lighting in particular.

Department's Position

The Department notes that the key visual impacts on residents in the area would be from the Eastern Emplacement, and to a lesser extent the Western Emplacement. These activities are likely to have impacts on local residents, particularly the residents on rural properties to the north of Camberwell. The Department notes, however, that the activities would be complete within three years of mining and that intervening visual elements such as the Main Northern Railway and Mt Owen Rail Spur, and the relative distance to the site partially mitigate the temporary loss of visual amenity.

The impacts of the open cut mine and infrastructure on visual amenity of local residents would be low due to their location on the other side of the Ashton Ridge.

The impact on motorists of these aspects of the development is not likely to seriously reduce amenity, given the large number of existing mines and industrial developments along the New England Highway. The Department also notes that passengers on trains on the Main Northern Railway would experience views of the site, with impacts likely to be similar to those on motorists.

Night lighting would have some impact on residents, particularly during open cut mining and use of the overburden dumps. It is unlikely that direct views of lighting would be obtained however there is potential for a glow effect to be observed. This could be mitigated through design of lighting systems and areas where mobile equipment would travel with headlights.

Views of the development would be partially mitigated by the use of vegetated visual bunds and design of surface infrastructure could be improved by using certain colour schemes to reduce visual contrast.

The Department concludes that the proposal would have some inevitable impacts on visual amenity of local residents, passengers on trains, and motorists. Many of these impacts would be temporary and could be partially mitigated by the Applicant.

Recommendations

If the Minister determines to approve the Development Application the Applicant should be required to:

- *Design all lighting systems and areas where mobile equipment travel to minimise off site visual impacts;*

- *Construct and rehabilitate visual bunds around proposed works to reduce off site visual impacts; and,*
- *Design all surface infrastructure with a colour scheme that blends into existing visual elements.*

5.12. HAZARDS IMPACTS

Applicant's Position

The Applicant applied *State Environmental Planning Policy No. 33 - Hazardous and Offensive Development* (SEPP 33) to the proposed development and prepared a Preliminary Hazard Analysis (PHA).

The major incident identified by the Applicant in the PHA is a magazine explosion, generating an affectation distance of 119 metres (to explosion overpressure of 7kPa). Based on this consequence, the Applicant suggests that portable explosives magazines should not be located any closer than 150 metres to the site boundary.

All other incidents identified in the PHA have affectation distances of less than 45 metres, and would therefore not cause a significant off-site impact.

Issues Raised in Submissions

No submissions raised issues relating to hazards impacts.

Department's Position

The Department considers that, on the face of the proposal, it could be qualitatively established that a PHA was unnecessary.

The Applicant's conclusion that portable explosives should not be located within 150m of the site boundary overlooks is the full interpretation of the Department's land use safety planning criterion that "explosion overpressure at residential land uses should not exceed 7 kPa at a frequency of more than 50 x 10^{-6} per annum". The PHA has taken the overly conservative assumption that such an event would occur, rather than estimate the frequency at which it could occur. The Department considers that, given the conservative approach taken, the resultant risk contribution from the incident (and the proposed development) would be well within acceptable limits.

The PHA, although highly conservative in its assumptions, adequately demonstrates that the proposed development would not pose a significant off-site risk impact. The Department considers, therefore, that no specific hazards-related conditions would be necessary and notes that DMR requires an Emergency Plan and Safety Management System for mining operations to address on-site safety issues.

5.13. WASTE MANAGEMENT IMPACTS

The Applicant indicates that wastes would be generated during construction and operation of the mine including timber, metals, oils and fuels, batteries, and domestic rubbish. Waste would be recycled or disposed of according to a site Waste Management Plan. Vegetation and topsoil from stripping would be reused in rehabilitation. Effluent from bathhouses may be used for irrigation on site or disposed of with liquid wastes from the workshop areas through a licensed liquid waste contractor. Tailings from the CHPP would be contained on

the site in settling dams and the final void where water would eventually be evaporated before those areas are rehabilitated.

The Department is satisfied that there is unlikely to be any significant environmental impacts associated with management of waste on the site.

Recommendations

If the Minister determines to approve the Development Application the Applicant should be required to:

- *Develop and implement a waste management plan for construction and operation of the mine.*

5.14. SOCIO-ECONOMIC IMPACTS

Applicant's Position

The Applicant provided a socio-economic impact assessment in the EIS for the proposal. This assessment includes a detailed description of the current socio-economic profile of the region.

The Ashton Coal Project would create approximately 140 full time jobs and up to 200 construction jobs. Construction would occur over an 18 month period. And mine operation over 21 years. The Applicant estimates that the majority of the proposed workforce would be sourced from the local area as it would preferentially source local employees for the mine. The Applicant states that employment in the mining industry in the Hunter Valley dropped from 6,358 to 4,770 between 1997 and 2000. The Applicant indicates that the proposal would create employment for locally based experienced workers and that a major influx of new residents to the Singleton area is not expected. Up to 50% of coal miners who work in the Singleton Shire commute from areas outside the Shire. The Applicant suggests that this indicates willingness to travel to work which is expected to reduce the number of new residents from non-local workers who may be employed at the mine. Based on this assessment, the Applicant concludes that there would be limited pressure on local housing stocks. An estimated 40 construction workers would require temporary accommodation which could be provided through the local rental market.

The proposal is expected to have significant positive impacts on local and regional employment and the economy. Jobs created as a result of the Ashton proposal would slow the growing number of job losses in the mining sector and provide significant flow-on indirect employment opportunities. The Applicant used an accepted input-output multiplier for coal mining in the Hunter to estimate that up to 210 additional indirect jobs may be created by the proposal.

Investment in the project would include $42 million capital expenditure, $11.2 million p.a in wages, $22 million p.a. on materials and services, $17 million on transport and port expenditure, and $5 million p.a. in government royalties. The Applicant applied an input-output multiplier to estimate the likely flow-on effects of wages expenditure on the local economy at approximately $9.3 million p.a., and up to $30 million during the construction phase. Annual yearly output is expected to generate indirect flow on of up to $17.2 million to the Hunter Valley Region.

Issues Raised in Submissions

Three submissions in support of the development raised the positive impacts of the proposal on employment in the area and the local economy.

Department's Position

The Department concurs with the Applicant's analysis and agrees that there is unlikely to be a major influx of new residents to the local area as a result of the project. A such there is not expected to be significant additional stress local service provision. As indicated by the Applicant, a contribution would be payable to Singleton Shire Council under its Section 94 Contributions Plan to cover any additional service requirements arising from the proposal.

The Applicant's standing offer to acquire any property in Camberwell Village at market price raised some initial concern due to potential social impacts on the fabric of the local community. Upon further analysis, however, the Department notes that the Applicant has entered into purchase agreements with only 12 of the over 80 private properties in Camberwell and surrounds. The Applicant has indicated that of those properties to be acquired, several owners have indicated that they wish to stay on as tenants after the acquisition. In addition, the employment generated by the mine is likely to require some workers from outside the local area who would utilise the mine-owned residences as rental properties. It is therefore unlikely that there would be major alterations to the composition of the local community or the creation of a large number of vacant dwellings in Camberwell.

The Department concludes that there is unlikely to be significant negative social impacts on the local or regional community. In addition the Department notes that the job creation and economic activity generated by the Ashton proposal would have significant benefits to the local economy and community.

Recommendations

If the Minister determines to approve the Development Application the Applicant should be required to:

- *Establish a Community Consultative Committee to ensure open communication with the local community;*
- *Establish a community liaison/environmental officer and complaints management procedures.*

5.15. CUMULATIVE IMPACTS

Applicant's Position

The Applicant has considered the cumulative impacts of the proposal and other developments in the area on air quality, noise, water quality, and visual amenity. The detailed assessment of these issues is largely contained in the relevant sections of the EIS and this report. The Applicant's air quality assessment shows that EPA criteria can be met by the Ashton site alone, and when considering other nearby mines. The noise impact assessment also included contributions from other mines in the area and concluded that, with appropriate mitigation techniques, relevant criteria can be met at all non-mine owned residences. The Applicant has not predicted any cumulative impacts on surface waters since the mine would be nil discharge. The Applicant's groundwater assessment included allowances for the groundwater extraction occurring at nearby mines. Cumulative visual impacts, it is stated, are largely on motorists travelling on the New England Highway, while impacts on residents would be short term. The Applicant considers that, due to the prominence of mining in the region, the additional impact of the Ashton would be minimal.

Issues Raised in Submissions

The majority of public, interest group, and business submissions raised concern over potential cumulative impacts of the proposal mainly due to noise, dust, and blasting activities.

Department's Position

The Department notes that, in addition to the cumulative impacts identified by the Applicant, a detailed assessment of cumulative impacts on ecology and cultural heritage has been undertaken.

The Department considers that cumulative noise and dust impacts are very important issues that must be continually monitored and addressed throughout the life of a mine. The Ashton assessment shows that noise criteria would be met under a worst-case cumulative scenario, however, contrary to the Applicant's assertion, cumulative 24-hr average PM_{10} impacts may exceed the relevant EPA goal unless the proposed monitoring and management regime is fully implemented. Therefore, as additional protection to local landholders, the Department considers that the Applicant should be responsible for acquisition of a property if it is established that acquisition criteria for dust and noise developed by the Department cannot be met at that residence.

In addition, the Department considers that the Applicant should be required to negotiate and consult with nearby mines to reduce noise an dust impacts if cumulative exceedences occur. In the event that the relevant noise and dust criteria cannot be met, the Applicant should be required to enact joint acquisition of a property with other contributing mines according to a Joint Acquisition Management Plan developed by the Applicant.

Recommendations

If the Minister determines to approve the Development Application the Applicant should be required to:

- *Acquire affected properties in the area at the owner's request if it can be demonstrated that relevant dust and noise criteria cannot be met at the property;*
- *Develop a Joint Acquisition Management Plan with nearby mines; and,*
- *Acquire any property in accordance with the Plan if cumulative exceedences are identified through independent monitoring.*

5.16. ECOLOGICALLY SUSTAINABLE DEVELOPMENT

Applicant's Position

The Applicant considered the principles if Ecologically Sustainable Development (ESD) in the EIS. The Applicant claims, considering the precautionary principle, that there is reasonable certainty in the scientific and engineering analysis undertaken on the proposal. The Applicant considers that issues of intergenerational equity are addressed by minimising impacts on the environment for future generations by rehabilitation of the site. The Applicant claims that, although non-renewable resources would be lost to future generations, the economic benefits of the mine would be distributed between existing and future generations. The operation of the mine would ensure that current environmental amenity in the area would be maintained for future generations. The Applicant claims that the flora and fauna study addresses any potential issues for conservation of biodiversity. The Applicant claims

that, by taking responsibility for rehabilitation of the site, it has adequately valued the natural resources to be impacted by the proposal.

Issues Raised in Submissions

One submission objected to the proposal on the grounds that ESD had not been properly considered, specifically stating concern over conservation of biodiversity.

Department's Position

Ecologically sustainable development (ESD) is one of the objects of the Act set out in section 5. The regulation requires, under Schedule 2, that and EIS contain a justification for a development proposal considering the following principles of ESD:

a) the precautionary principle;
b) inter-generational equity;
c) conservation of biological diversity and ecological integrity; and,
d) improved valuation, pricing and incentive mechanisms.

The Department considers that it has considered and implemented the precautionary principle in its assessment of the proposal and its negotiations with the Applicant. This process led to the elimination of aspects of the proposal which contained unacceptable levels of uncertainty and posed the risk of permanent irreversible environmental impacts.

The Department recognises that coal mining activities deplete non-renewable resources and potentially restrict use of these resources by future generations. The proposal would result in the removal of 62 Mt of coal resource, however the economic benefit and activity generated by this resource would assist current and future generations to develop alternative technologies which reduce reliance on non-renewable resources. In addition, the resource to be extracted represents a small fraction of available coal reserves and its consumption is unlikely to significantly limit future generations.

The Department has assessed biodiversity conservation issues in detail in section 5.8 of this report. This assessment concludes that the proposal is unlikely to have a significant effect on any threatened species or ecological communities. The Department also notes that, while an area of remnant vegetation would be cleared, the Applicant proposes to establish an extensive Conservation Area for biodiversity and Aboriginal heritage that would be conserved in perpetuity. In addition, the site would be rehabilitated and revegetated to provide an improved conservation outcome.

The Department considers that the Applicant has adequately considered the environmental and social costs of the proposal and has altered several aspects of the project due to these factors.

The Department is satisfied that the proposal is generally consistent with the principles of ESD.

6. Recommended Instrument of Consent

The Department has prepared a set of recommended conditions of consent for the proposal. These conditions include all integrated agencies General Terms of Approval.

The conditions are required to:

a) minimise any adverse environmental impacts associated with the development;
b) provide for environmental monitoring, reporting, and independent review; and
c) set requirements for mine infrastructure provision.

The Applicant has been consulted and has agreed with the conditions in the recommended instrument of consent.

7. Section 79 (C) Consideration

Section 79C of the Act sets out the matters that a consent authority must take into consideration when it determines a DA.

The Department has assessed the DA against these matters (see Appendix D), and is satisfied that:

1. the proposal is generally consistent with the provisions of the relevant planning instruments;
2. the potential impacts of the proposal could either be mitigated or managed; and
3. the proposal is generally in the public interest.

8. Conclusions

The Department is of the opinion that the proposed development is consistent with State and regional planning objectives relating to environmental management, sustainable economic development and employment generation. It is further considered that the potential environmental impacts of the proposal can be suitably managed such that they do not preclude the granting of development consent. The proposal would also provide substantial socio-economic benefits to the region and the State. It is therefore concluded that the proposal should be approved, subject to the conditions of consent designed to control and mitigate potential environmental impacts.

9. Recommendations

It is RECOMMENDED that the Minister:

(i) Consider the findings and recommendations of this report;
(ii) Approve the DA subject to conditions under Section 80 of the Act; and
(iii) Sign the attached Instrument of Consent.

Gordon Kirkby
Manager - Manufacturing and Rural
Major Development Assessment Branch

ENDORSED:

Sam Haddad
Executive Director
Sustainable Development

Report Prepared by Matt Andrews

10. References

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DLWC, 2001, “Offsets, Salinity, and Native Vegetation - Discussion Paper”, DLWC, Sydney.

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APPENDIX A – ENVIRONMENTAL PLANNING INSTRUMENTS AND DEVELOPMENT CONTROL PLANS

Hunter Regional Environmental Plan 1989 (Hunter REP)

The following is an assessment of the consistency of the proposed development against the aims and objectives of the Hunter REP. The aims of the Hunter REP are:

(a) to promote the balanced development of the region, the improvement of its urban and rural environments and the orderly and economic development and optimum use of its land and other resources, consistent with conservation of natural and man made features and so as to meet the needs and aspirations of the community,

(b) to co-ordinate activities related to development in the region so there is optimum social and economic benefit to the community, and

(c) to continue a regional planning process that will serve as a framework for identifying priorities for further investigations to be carried out by the Department and other agencies.

The Department considers that the proposed Ashton Coal Project is generally consistent with these aims and objectives.

The objectives of the Hunter REP in relation to planning strategies concerning mineral resources and extractive materials are to:

(a) manage the coal and other mineral resources and extractive materials of the region in a co-ordinated manner so as to ensure that adverse impacts on the environment and the population likely to be affected are minimised,

(b) ensure that development proposals for land containing coal and other mineral resources and extractive materials are assessed in relation to the potential problems of rendering those resources unavailable, and

(c) ensure that the transportation of coal and other mineral resources and extractive materials has minimal adverse impact on the community.

The Department considers that the Ashton proposal presents a coordinated approach to use of natural resources. All coal from the development would be transported by rail and would therefore have minimal impact on the community.

Hunter REP requires that consent authorities, in considering proposals for mining or extraction (including dredging):

(a) should consider the conservation value of the land concerned and apply conditions which are relevant to the appropriate post-mining or extraction land use,

The conservation value of the land has been considered in section 5 and the recommended instrument of consent provides for an extensive Conservation Area which would be protected in perpetuity under an agreement with NPWS.

(b) should, in respect of extraction from river banks or channels, ensure that instability and erosion are avoided,

The original proposal to divert a large section of Bowmans Creek has been eliminated by an amendment and the recommended instrument of consent provides for a detailed stream monitoring and management plan.

(c) should consult with officers of the Department of Mineral Resources, and of the Department of Agriculture, to determine appropriate post-mining or extraction land uses,

NSW Agriculture and DMR have been consulted throughout the assessment process and provision for ongoing consultation has been made in the recommended instrument of consent.

(d) should ensure the progressive rehabilitation of mined or extracted areas,

The Applicant proposes to progressively rehabilitate the site and management plans are required by the recommended instrument of consent to formalise this commitment.

(e) should minimise the likelihood and extent of a final void and the impact of any final void, or facilitate other appropriate options for the use of any final void,

The recommended instrument of consent requires the Applicant to prepare a Final Void Management Plan to address this issue.

(f) should minimise any adverse effect of the proposed development on groundwater and surface water quality and flow characteristics,

Water quality and flow impacts have been assessed in section 5 of this report.

(g) should consider any likely impacts on air quality and the acoustical environment,

Air quality and noise impacts have been assessed in section 5 of this report.

(h) should be satisfied that an environmentally acceptable mode of transport is available, and

Transport impacts have been assessed in section 5 of this report.

(i) should have regard to any relevant Total Catchment Management strategies.

The Department has considered the Final Report of the Healthy Rivers Commission Inquiry into the Hunter River and the draft Hunter Catchment Management Plan (the Hunter Catchment Blueprint) in its assessment.

The objective of the Hunter REP in relation to planning strategies concerning pollution control is to control development so as to minimise air, noise and water pollution. The Plan requires that a consent authority should not grant consent to the carrying out of designated development unless it is satisfied that:

(a) topographic and meteorological conditions are such that air pollutants would have no significant adverse effect,

(b) an appropriate buffer zone can be provided to ensure that noise, dust and vibration are maintained at acceptable levels,

(c) the best practicable technology for air, water and noise pollution control will be incorporated in the design and operation of the equipment and facilities to be used for the purposes of the industry,

(d) there will be no significant deterioration of air or water quality as a result of emissions from that equipment or those facilities, and

(e) the site will not become contaminated within the meaning of Part 5 of the Environmentally Hazardous Chemicals Act 1985.

The Department has assessed these issues in detail in section 5 of this report and is satisfied that the proposed development is generally consistent with the pollution control provisions of the Hunter REP.

The Department considers that the proposed development is generally consistent with the objectives and provisions of the Hunter REP.

Singleton Erosion and Sediment Control Development Control Plan

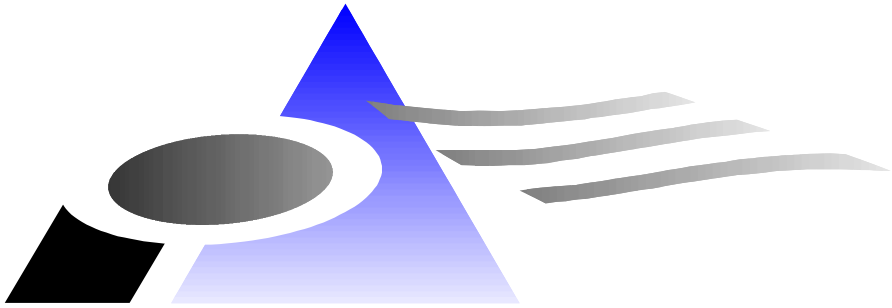
The Singleton Erosion and Sediment Control Development Control Plan aims to prevent land degradation by soil erosion, protect streams and waterways, and protect biodiversity. The DCP requires all developments with potential to cause soil erosion to prepare an Erosion and Sediment Control Plan (ESCP) to DLWC standards before commencement of site works. The recommended instrument of consent requires the Applicant to develop an ESCP in accordance with the requirements of DLWC and Council. The Department is therefore satisfied that the proposal is consistent with the aims of the DCP.

Singleton Car Parking Development Control Plan

The Singleton Car Parking Development Control Plan aims to ensure adequate car parking facilities are provided at new developments. The plan does not have specific provisions relating to new coal mine developments and states that requirements for any other building or use of land not covered by the Plan are to be determined by Council in individual cases.

The Applicant has included a car parking area in the design of the proposed development with provision for 76 car spaces. Given that the maximum number of employees on site would be 140 in three shifts, the Department is satisfied that the allowance made by the Applicant is adequate and consistent with the aims of the DCP.

APPENDIX B – INDEPENDENT DUST CONSULTANT REPORT



Pacific Air & Environment

DUST ASSESSMENT REVIEW

PROPOSED ASHTON COAL MINE, CAMBERWELL
Final Report

Prepared for:

PlanningNSW

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October 2002

Job No: 1496

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REFERENCES

INTRODUCTION

PlanningNSW has engaged Pacific Air & Environment to review air quality aspects of the proposed Ashton Coal Project to be operated by White Mining limited. The proposed mine will be situated near Camberwell Village in the Upper Hunter Valley. This report contains the review findings.

The review is centred primarily on the EIS for the project prepared by HLA-Envirosciences dated November 2001. Pacific Air & Environment has reviewed the detailed technical report on air quality by Holmes Air Sciences (HAS), appearing as Appendix F of the original EIS report. The response document prepared by HAS (dated February 2002) on air quality issues raised by the EPA is also reviewed.

This review incorporates reference to submissions on the EIS by government agencies, residents and other parties; reports and EIS documents relating to studies on coal mines and air quality in the Hunter region; and other documents relevant to assessing the impacts of the proposal.

This review process also involved a site visit to Camberwell and an on site meeting with representatives of White Mining on April 18 2002.

REVIEW

OVERALL APPROACH OF THE HAS REPORT

The air quality assessment carried out by Holmes Air Sciences (HAS) has a primary emphasis on dust, which is widely regarded as the primary air quality issue associated with the Ashton Coal Project proposal. Reference is also made to the impacts of emissions from mine machinery and vehicles and from spontaneous combustion of coal. Emissions of greenhouse gases are also discussed.

Dust is the primary area of concern and accordingly it is the main focus of the HAS report and therefore of this review. The HAS report's approach in quantifying dust impacts is based on the quantification of impacts through dispersion modelling, and the comparison of the predicted impacts with relevant guidelines. A brief assessment has also been performed to predict the impacts of exhaust emissions from mine machinery and equipment, and a brief assessment of the potential greenhouse gas emissions from the project has also been made. This broad approach is typical of EIS assessments for proposed coal mines and indeed other projects. It reflects the requirements of determining authorities and general scientific practices.

The dust modelling and assessment procedure is based on several key components, which are examined in this review:

- the dispersion model, which essentially is a set of mathematical equations that predicts ground level concentrations or deposition rates based on various input data;
- the estimates of emissions from relevant sources used as an input to the dispersion model;
- the hourly meteorological conditions (for the course of a year) that provides the mathematical model with essential information for plume dispersion processes;
- the model output in the form of predicted ground level concentrations and deposition rates for selected averaging periods at selected receptor locations; and
- comparison of predicted dust concentration and deposition levels against relevant criteria or guidelines.

Scientific uncertainty is inherent throughout the assessment process, which needs to be addressed for a full appreciation of the quality of the assessment. Uncertainty is associated with all of the various elements of the assessment procedure: estimates of emissions, characterisation of meteorological influences on plume dispersion, mathematical treatment of the dispersion and deposition processes in the dispersion model, and relation between impact indicators and actual impacts. Therefore, the results of the air quality assessment cannot be considered as precise, and are better regarded as indicative.

REVIEW OF THE DISPERSION MODEL METHODOLOGY

The EIS predictions of air quality rely on the ISC3ST model, which is a USEPA regulatory model. ISC3ST is a Gaussian plume model, which deals with the complex processes affecting ground level impacts in a very simplified manner. However, it is a widely used and generally acceptable model for many applications. ISC3ST is able to deal with particle deposition and time-varying emissions, and is widely used for modelling of dust emissions from open cut coal mines in Australia. AUSPLUME is another widely used steady-state Gaussian plume model.

According to the US EPA, ISC3ST is appropriate for the following applications:

- Industrial source complexes;
- Rural or urban areas;
- Flat or rolling terrain;
- Transport distances less than 50 kilometers;
- 1-hour to annual averaging times; and
- Continuous toxic air emissions.

The ISCST3 model is a US-EPA recommended dispersion model (Appendix A of the *Guideline on Air Quality Models*, US EPA, 2001a).

Gaussian plume models are based on a variety of assumptions and simplifications, one of the most important of which is the assumption of steady-state meteorology. The steady-state assumption states that the meteorological factors that determine plume dispersion act in a constant manner during each hour for which data is provided. Thus, once emitted, the plume is assumed to travel in a straight line at the same speed to the edge of the modelled domain until meteorological conditions change in the next hour. Changes in hourly average meteorological data are enacted instantaneously on the plume, allowing no interval of time for the plume to incrementally change speed, direction or distribution.

Assumptions inherent in steady state Gaussian plume dispersion models such as ISC3ST and AUSPLUME are not always valid, especially near a coastline or in complex hilly terrain, where plume dispersion influences are often more complex. Key assumptions of steady-state models may be summarized as follows:

- Meteorological parameters remain constant for the period of one hour.
- Meteorological parameters remain fixed over the entire modelling domain, which often includes all regions within 10-20 km of the source. This is particularly questionable near coastlines and complex terrain, where wind directions may vary significantly.
- Most meteorological parameters either remain fixed with height above the ground (including wind direction and hence wind sheer is ignored) or are assumed to vary according to generic formulae, which are seldom, if ever, validated for the site.

- The height of the mixing layer remains constant for the entire region. This is questionable in the vicinity of a coastline where the mixing height often varies considerably as a function of distance from the coast, or in complex, hilly terrain.

In reality a plume segment will move in varying directions and at varying speeds and will be dispersed at different rates as it moves away from the source. This behaviour is due to spatial variations in wind speed and direction, as well as other meteorological parameters, in response to factors such as heat fluxes, the underlying terrain and changing pressure gradients. Thus, significant deviations from the steady state assumption can result in uncertainties in the ground level concentrations of plume material.

In situations where non-steady state meteorological conditions are important (e.g. significant impacts occurring when the wind field varies over the area of interest), steady- state models are not adequate and more realistic three-dimensional models such as CALPUFF ought to be used. CALPUFF is a multi-layer, multi-species non-steady state puff dispersion model that can simulate the effects of time and space-varying meteorological conditions on pollutant transport, transformation and removal. A non-steady-state model is one in which the temporally and spatially variable atmospheric conditions are incorporated into the model. This gives a more realistic simulation of reality than the older, steady-state models such as ISC3ST and AUSPLUME.

The CALPUFF model contains algorithms for near-source effects such as building downwash, partial plume penetration, sub-grid scale interactions as well as longer-range effects such as pollutant removal, chemical transformation, vertical wind shear and coastal interaction effects. The model employs dispersion equations based on a Gaussian distribution of pollutants across the puff and takes into account the complex arrangement of emissions from point, area, volume and line sources.

As with any mathematical environmental model, CALPUFF represents a simplification of the many complex processes involved in determining the outcome, in this case ground level concentrations of pollutants. However, this model represents a major advance in modelling from the simple, steady state models such as ISC3ST.

The complex hilly nature of the terrain around the Ashton mine, and the location of Camberwell Village in a valley in relation to the proposed Ashton mine is such that ISC3ST might not be the best choice of model for assessing dust impacts. A more complex, three dimensional non-steady state model such as CALPUFF might result in different dust modelling results and therefore a different assessment of dust impacts.

Gaussian steady-state type models such as ISC3ST are likely to under-predict maximum impacts at receptors close to the emitting source (generally within 1000 m or so of the source), but generally tend to over-predict impacts at receptors further than 1000 m from the source. This is an inherent feature of the steady-state assumption employed in ISC3ST. It is difficult to assess the extent to which the relatively complex terrain surrounding the Ashton mine will bias dust predictions with ISC3ST.

While the ISC3ST model might not be the most sophisticated of the available models, the choice of model does not represent the largest source of uncertainty in the dust modelling. Far more uncertainty arises from the estimates of dust emission rates, from the quality of site-specific meteorological data, and the quality of terrain information. The largest individual source of uncertainty is likely to be the estimate of dust emission rates from sources.

Cumulative impact prediction has been included in the EIS and involves the inclusion of other mine emissions in the Hunter Valley region. Estimated emissions from Camberwell, Narama,

Rix's Creek and the proposed Glendell mines are included in the cumulative impact modelling. These mines are separated by distances of up to 20 km and the steady-state assumption may not be adequate as a basis for modelling, at least to capture all significant impacts. The time and distance scales involved may lead to some situations where the locations or magnitudes of predicted impacts would be different from those obtained with a more sophisticated three-dimensional model. However, it is not considered to be necessary to use other models in the circumstances, as maximum impacts at any specific location are generally dominated by a nearby source, and the more distant sources have a relatively small influence.

AIR QUALITY GUIDELINES

The EIS refers to health-based and amenity-based criteria for air quality and dust fallout (deposition), with criteria for TSP, PM_{10} and dust deposition rate. An attempt is made in the EIS to predict the short-term (24 hour) effects PM_{10} emissions from the mine. The EIS makes it clear that short term predictions of this nature are by their nature uncertain, and therefore the EIS uses meteorological data for two extremely windy days – "unfavourable conditions", as stated in the EIS. The EIS was not completely clear in its interpretation and understanding of the appropriate NSW EPA criteria discussed in *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW (NSW EPA 2001)*. This was addressed in the response document by HAS (February 2002) to the EPA request for further information.

The use of PM_{10} (particles less than 10 microns in aerodynamic diameter) as an indicator of air quality has become important because of the health implications of exposure to fine particle pollution. This is especially the case in urban areas, where the predominance of vehicle emissions results in a high proportion of total particle emissions in the PM_{10} range. The finer part of the PM_{10} range, e.g. $PM_{2.5}$, is increasingly becoming the focus of health-related assessments, as it becomes clearer that these smaller particles are the dominant concern with respect to health. These fine particles can be inhaled and lodge in the lungs.

Around coal mines, the importance of potential health effects resulting from exposure to fine particles cannot be ignored, and it is appropriate to refer to PM_{10} levels as an indicator of impact. However, owing to the nature of the dust sources in coal mining, the proportion of PM_{10} to total dust emissions is not normally large and the predictions will tend to show relatively low impacts of PM_{10}. The EIS correctly highlights the recent increasing legislative attention paid to $PM_{2.5}$, but validly makes the point that coal mining operations tend to emit coarser rather than finer particles. Therefore $PM_{2.5}$ is expected to be a minor but not insignificant contributor to the total suspended particle (TSP) size distribution.

The more obvious and annoying aspect of dust from mining is its impact on amenity. The better indicators of amenity are TSP and dust deposition rate. However, annual average values of these indicators – as used in the EIS in line with EPA criteria - are not necessarily an accurate guide to the potential for annoyance and associated long-term stress in a community, as in many cases the exposure to elevated dust levels is highly episodic.

The EPA recommends maximum acceptable increases in annual average dust deposition based on existing levels and on the premise that a level of 4 g/m^2/month is an acceptable upper limit for residential amenity.

It is, however, insufficient to rely solely on this general annual guideline as an indicator of the likelihood of acceptable or unacceptable levels of impact. The issue of episodic impacts has been raised in response to impact assessments of coal mines, and it is considered to be a relevant and important aspect of understanding the true impact of mining operations. Research in the Hunter Valley some years ago (Jakeman & Simpson, 1987) showed that even where measured dust deposition levels were below the EPA's acceptable level of 4 g/m^2/month, at least 40-60% of residents reported high levels of annoyance and frequently noticed dust.

In a recent review of dust deposition and nuisance in the UK, Vallack & Shillito (1998) noted that the distinction between monthly and annual mean values of dust deposition is important, because fugitive dust emissions (such as occur from coal mines) are often episodic in nature. For a given site, peaks in the monthly mean are usually much higher than the annual mean. In Australia, Williamson *et al.* (1978) proposed a monthly limit of 130 mg/m^2/day (approximately 4 g/m^2/month) to be used as an acceptable upper limit for satisfactory residential conditions in cities. This implies a significantly lower acceptable limit for the annual mean deposition rate if there is significant month-to-month variation.

Vallack & Shillito (1998) report that complaints of dust nuisance can arise in individual months having average dustfall rates less than 100 mg/m^2/day (approximately 3 g/m^2/month) and that black coal dust is likely to cause complaint in months when the deposition rate is 80 mg/m^2/day (approximately 2.4 g/m^2/month).

One of the factors influencing the perception of dust impacts is the normal background level of dust deposition. The potential for annoyance will increase if there is perceived health risk from breathing in the dust. Because the perception of dust nuisance involves such a large subjective element, there is likely to be a wide range of opinion between residents of an area as to when dustfall becomes heavy enough to be unacceptable (Vallack & Shillito, 1998)

Nuisance and complaints can arise from daily or even shorter-term peaks in dust deposition, which may or may not be reflected in the monthly mean. The standard measurement methods for dust deposition, involving monthly exposure periods, make it impossible to assess the extent to which this occurs. Recent work in Europe has involved the development of short-term criteria for dust deposition and of methods for measuring or estimating short-term impacts (Vrin, *pers. comm.*, 2000). These developments involve the setting of nuisance limits based on daily deposition rates that equate to the formation of visible dust deposits on that time scale.

In the absence of such short-term measurements, Vallack & Shillito (1998) suggest that in UK residential areas and the outskirts of towns complaints are 'possible' when the monthly dust deposition rate exceeds 110 mg/m^2/day (approximately 3.3 g/m^2/month) and 'likely' when it exceeds 150 mg/m^2/day (4.5 g/m^2/month).

Hence, use of the annual average dust deposition rate (and the annual average TSP concentration) will tend to mask the underlying nature of the exposure to dust: in many cases, problems may arise from high short-term levels interspersed by longer periods of minimal exposure. Therefore, assessment based on annual average dust deposition rates, using a criterion of 4 g/m^2/month for example, is likely to only crudely indicate the potential areas affected by annoyance and complaints.

In summary, there is currently a generic difficulty in providing realistic and credible predictions of dust impact. There appears to be an element of cynicism in some communities such as that near the Bengalla and Mount Arthur North mine sites in

relation to EIS predictions, and this is at least partly due to the fact that the current indicators of impact do not fully characterise the aspects that directly affect annoyance.

METEOROLOGICAL DATA

Holmes Air Sciences used meteorological data collected in 1987 from weather stations at Ravensworth/Glendell. A comparison is made to more recent meteorological data (2000) collected from the Camberwell mine, and both data sets were found to show very similar wind patterns which are typical for the Hunter Valley. The 1987 data was used in preference to the more recent data set because of it was more complete (100% of a full year's data) that the Camberwell 2000 data. Further, the 1987 Ravensworth/Glendell data provides a more severe wind episode which was used as a "worst-case" scenario in modelling emissions under severe wind conditions.

It is accepted that the data are reasonably representative of the wind regime of the region, and are consistent with data from other nearby monitoring sites. The wind regime displays a dominance of WNW-NW and SE flows, which are aligned along the main axis of the Hunter River valley in the region. This wind regime results in relatively frequent direct impacts on Camberwell Village. This does not mean of course that winds from other directions do not occur, and indeed the impacts during these times are of key importance to the nearby sensitive areas. The meteorological data used is of high quality and represents well typical conditions in the upper Hunter Valley. However, a more realistic representation of meteorological variations in the area might be achieved through a combination of on-site meteorological monitoring and gridded meteorology, land use and topography data from TAPM (The Air Pollution Model, CSIRO Atmospheric Research, Australia).

DUST EMISSIONS MODELLING

General comments on estimating dust emissions

The dust emission rates from the Ashton Coal Project have been generated using emission factors, which use input data on various aspects of the mining activities and mine characteristics. Emission factors from the USEPA and from research conducted in the Hunter Valley have been applied. Factors exist for specific dust-generating aspects of the mines, e.g., overburden and coal handling and stockpiling, blasting, vehicle movements, wind erosion from exposed surfaces.

Owing to the variety of individual sources present in a large coal mine, and to the variable nature of emissions from many of those sources (e.g. varying according to wind speed, activity level, vehicle speed, material moisture content, etc), HAS has based their estimates on predicted Year 4 operating data – taken to be the year in which the impact on Camberwell Village will be the greatest. There appear to be no significant anomalies in the emissions data, and hence the application of the relevant emission factors is accepted as being reasonable.

The main issue in relation to the emissions estimates arises from the limited extent of measurements on which emission factors are based. Emission factors are approximations, which trade site specificity against ease of calculation and estimation. Therefore, emission factors applied to specific sites may be quite crude approximations of reality. There is inherent uncertainty in the equations and emission factors used and also uncertainty in parameters that need to be estimated and applied in the equations, for example material moisture content and wind speed. Further uncertainty arises from the changing nature of the particle size distributions. $PM_{10,}$ or the fraction of the dust

with an aerodynamic diameter less than 10 μm, is dependent on the type of material and will vary over a site and over time even for the same material type.

Therefore, dust emissions cannot be estimated accurately. Many of the emission factors used in the Ashton Coal Project EIS are derived from measurements at Hunter Valley coal mines and research by the US EPA, but this does not guarantee accuracy at any specific site. Their reliability is reduced further when generalised emission factors are used to estimate short term emissions variations.

Uncertainty in dust emissions must be regarded as particularly high when wind speeds are elevated. This arises from the non-linear relationship between wind erosion and wind speed. As wind speed increases, emission rates tend to increase at a faster rate, the result of which is that at higher wind speeds the calculated emission rates can vary significantly with only modest changes in wind speed. The estimates of dust emissions at high wind speeds are not based on a highly accurate predictive model. The emission rates relating to wind erosion have been estimated as follows: the emission factors have been used to estimate annual average emission rates. Hourly emission rates have been estimated using the assumed relationship between emissions and wind speed, and then the sum of the hourly rates has been scaled to ensure that the total annual emissions equal the assumed annual total. Given that high wind speed events are important in relation to short-term dust impacts, it is considered that the short-term emissions and ambient dust levels associated with high wind events are only very approximate.

The processes leading to wind erosion from exposed areas are complex. USEPA guidance on emissions from stockpiles, for example, indicates that depletion of available particles is an important factor, as is the degree of recent disturbance to the eroding surface. Furthermore, wind gusts or short-term wind speeds are critically important, and the hourly average wind speed is less important. The net result of these factors is that wind erosion effects may be far more 'peaky' than estimated in the modelling approach that has been adopted. This could have a significant effect on 24-hour average predictions.

The use of real time dust monitoring as proposed by White Mining will only aid in maintaining the average PM10 concentration to within guideline levels. No amount of monitoring on its own will mitigate dust emissions, as the monitoring cannot affect processes or dust emission factors.

It is likely that dust criteria at Camberwell will be exceeded in strong north-westerly wind conditions. Monitoring dust deposition is useful for obtaining an average dust deposition rate, but it cannot be used to stop, or mitigate, episodic high-dust events. A far better method of managing episodic dust events is to use short term predictive weather modelling as a guide for operational procedures. For example, the Alcoa Pinjarra mine in Western Australia uses 3-day short term weather forecasts in planning operations in order to minimise dust impacts, described in section 0 below.

The background dust level

The assessment of background dust levels reported by Holmes Air Science in the EIS is unclear, difficult to understand, and lacks a concise best-estimate summary of the existing background dust levels. The original EIS work relied on data taken from a total suspended particulates (TSP) monitor mounted on the Camberwell Church, a site known to be exposed to nearby recreational dust-generating activities. PM_{10} concentrations were inferred from the church-mounted TSP monitor, despite the fact that the monitor was exposed to nearby dust-generating activities. Data collected by a new PM_{10} monitor, mounted in a separate part of Camberwell Village was not effectively

used in the assessment of background dust levels. These concerns were correctly identified by the EPA in its request for further information from HAS.

The response document by HAS (February 2002) is a substantial improvement in the methodology used to assess background dust levels in Camberwell Village. TSP data believed to be affected by bushfires between December 2001 and January 2002 were discarded, as were several anomalous TSP values. There is still considerable doubt about the validity of the remaining TSP data, given the proximity of the monitor to recreational dust-generating activities. PM_{10} data from a newly installed monitor does not seem to be contaminated by local episodic events, and therefore can be expected to be of high quality. Removal of PM_{10} data affected by the December 2001-January 2002 bushfires, and the conservative assumption of a PM_{10}/TSP ratio of 0.4, allows a reasonable estimation of the background TSP concentration.

It is the strong opinion of the reviewer that the Church mounted TSP monitor should be decommissioned and a TSP monitor installed at the same location as the PM_{10} monitor. This would remove the need for simplifying assumptions regarding the PM_{10}/TSP ratio, and would give more accurate information about the background air quality in Camberwell.

There are some broader concerns about the use of a single set of PM_{10} and TSP values to describe the background air quality, as this approach assumes that there is little temporal variation in the PM_{10} and TSP concentrations. Dust emissions from coal mines can be highly variable, and therefore the background concentrations of PM_{10} and TSP measured at a particular site can also be extremely variable. However, this approach is the one of the few ways of estimating the incremental impact of a particular coal mine project.

The existing amount of dust deposition in Camberwell Village has been determined by HAS by using data collected from a network of dust monitors operated by Camberwell Coal and Ashton Coal. This is the best available data, but as described in section 0, the use of annual average dust deposition rates (and the annual average TSP concentration) will tend to mask the underlying nature of the exposure to dust - high short-term levels interspersed by longer periods of minimal exposure. Therefore, assessment based on annual average dust deposition rates, using a criterion of 4 g/m^2/month for example, is likely to only crudely indicate the potential areas affected by annoyance and complaints.

Incremental dust impact due to Ashton Coal Project

The original assessment of the incremental dust impact due to the Ashton Coal Project reported by Holmes Air Science is unclear and difficult to understand. Their response document (February 2000) addresses some of the issues identified by the EPA, but still does not provide the required information in a concise and easily accessible manner. However, PAE agrees with the methodology used by HAS in its estimation of the incremental dust impact.

Modelling shows that control measures as typically applied on Hunter Valley mines are not sufficient if the mine's incremental emissions are to comply with the NSW EPA guidelines. However, with best practice engineering controls in place (including 80% control on haul roads and restricted operating hours), the mine by itself will comply with the US EPA 150 $\mu g/m^3$ 24-hour PM_{10} standard 100% of the time. These controls are still not sufficient to ensure compliance with NSW EPA 50 $\mu g/m^3$ 24-hour PM_{10} standards 100% of the time. For this, it was shown that both best practice controls and real time dust mitigation measures are essential, and the HAS report correctly identifies this.

It is clear that the incremental impact due to Ashton will only meet NSW EPA air quality guidelines if stringent "best practice" dust mitigation methods are employed, which include the cessation of mining activities if 24-hour average PM_{10} concentrations trigger-points are reached, as measured in Camberwell Village. The effectiveness of the mitigation methods is discussed in section 0.

The cumulative dust impact

Cumulative dust impacts (proposal plus background plus other mines) were discussed in the original HAS report and in the HAS response document (February 2000). The response document explains omissions in the original HAS report and highlights the data sources used in the modelling of cumulative dust emission.

The dust background levels include neighbouring mine emissions (data from June 2001 to January 2002). Additional modelling in the response document indicates that estimates of the dust contribution from distant mines and biogenic sources are justified and appear reasonable. Further, the treatment of potential dust emissions from the proposed Glendell mine appears reasonable.

The total dust contribution includes the combined effects of the background dust concentration, the contribution from other mines (near and distant) and the Ashton coal proposal. Modelling in the HAS response document implies that the Ashton mine will cause the NSW EPA 50 $\mu g/m^3$ 24-hour standard to be exceeded approximately 15% of the time at the closest residence, if real time dust mitigation practices are not employed. However, staged mitigation techniques are proposed, commencing from when the 24 hour PM10 concentration in Camberwell reaches 50 $\mu g/m^3$. It is difficult to assess the effectiveness of the staged dust mitigation techniques, and therefore a statement of the portion of Camberwell likely to experience exceedences of the EPA criteria is not possible.

The US EPA 150 $\mu g/m^3$ 24-hour standard, according to the modelling provided, should not be exceeded. The US EPA 150 $\mu g/m^3$ 24-hour standard was the basis for consent for the Mt Arthur North project. White Mining has undertaken to stop all mining activities when the 24 hour running average PM_{10} concentration measured in Camberwell Village exceeds 150 $\mu g/m^3$.

The portion of Camberwell village likely to experience changes in amenity due to dust deposition episodic events in impossible to predict, given the high degree of uncertainty involved in the prediction of short term episodic events.

These modelling analyses highlight the importance of real time dust mitigation control measures, and their effectiveness is discussed in section 0 below.

Dust effects on nearby residences

The Ashton coal mine will have an effect on nearby residences, despite the use of real time operational best practice controls. Three categories of affected residences in or near Camberwell Village have been identified. The closest residences, along the ridgeline adjacent to Glennies Creek Road (Category 1 residences) are either owned by Glendell Mine or subject to compulsory purchase orders. Residences close to the Ashton mine (Category 2) have either agreed to "no objection" to the mine or will be purchased by White Mining. Category 3 residences are the remaining houses in Camberwell Village. These residents have been given the option of purchase at market value of their properties. The boundaries of each category of residence have not been clearly identified ("close to Ashton" v "all other houses within the Village") and it is suggested that the numbered residences in the HAS report be assigned to each category for

further clarification. Camberwell village consists of 51 properties, four of which are land only and one of which is the community hall.

Although these analyses seem reasonable in terms of set EPA goals, a previous discussion highlighted the importance of perceived impacts of dust emissions by residents affected. In this case, it is possible Residence 41 and other residences nearby could experience some annoyance especially in times of peak emissions, despite control measures.

The post-event response nature of the proposed real time control measures implies that peak dust emissions could exceed nominated 24-hour average guidelines, thus causing annoyance to residences in Camberwell Village. It is far more likely that residences will experience annoyance from peak short-term dust emissions rather than 24 hourly or monthly average concentration and deposition rates. Although quantification or prediction of episodic events is not included in the EIS report, the impact on residences from short term (or episodic) events can be significant. It is suggested that more work be conducted on estimating episodic events in order to quantify frequency and their impact on nearby residents.

White Mining has evidently taken particular measures of compensation in relation to neighbouring residences by either purchasing those properties or establishing legal agreements with landowners. These measures seem reasonable given the potential impacts on the Village.

DUST MITIGATION METHODS

Dust control methods have been grouped into three classes. Planning controls relate to large-scale, long-term methods aimed at minimising dust emissions. These methods include restricting the mine surface area and operating hours, construction of earth shields and tree plantations, rapid rehabilitation of overburden emplacements, and locating coal handling facilities as far as practicable from Camberwell Village. Coal stockpiles will be below ground level, protecting them from wind erosion.

Engineering controls relate to small-scale, short term methods to minimise dust. Typical engineering controls include watering haul roads, watering stockpiles, partially enclosing conveyers and fitting drills with dust control devices.

The most advanced dust control methods suggested by White Mining (operational controls) involve a network of real-time dust monitoring stations within Camberwell Village and around the mine. A staged series of mitigation techniques is implemented depending on the wind direction and the running 24 hour average PM_{10} concentration. Mitigation techniques range from suspending blasting operations to complete suspension of all dust generating conditions.

Pacific Air & Environment's assessment is that these techniques, if fully utilised, represent the most effective dust mitigation methods achievable, and are representative of best practice procedures. However, it is extremely difficult to accurately assess and predict the efficacy of these techniques, and any estimate of their efficiency is likely to be inaccurate.

The efficiency of staged dust-mitigation techniques is difficult to model quantitatively, as HAS has correctly identified in its response document. HAS therefore presents a semi-quantitative assessment, summarised by the following methodology.

The maximum observed 24-hour PM_{10} concentration in Camberwell has been 32 $\mu g/m^3$. This is assumed to be the constant background PM_{10} concentration – effectively the worst case scenario. Real time dust mitigation techniques will commence when the 24-hour PM_{10} concentration in Camberwell is 50 $\mu g/m^3$. According to HAS modelling, Ashton will cause the 50 $\mu g/m^3$ PM_{10}

concentration to be exceeded on 117 days per year, if the background PM_{10} concentration is assumed to be a constant, worst-case 32 $\mu g/m^3$. Using the HAS methodology, complete cessation of mining should occur on five days per year.

This assessment by HAS concludes that Ashton mine should be able to maintain dust concentrations in Camberwell Village to the US EPA 150 $\mu g/m^3$ 24 hour standard by progressive modification of mining procedures, including the suspension of mining if the US EPA standard is breached. PAE agrees with this assessment. If real time monitoring and staged mitigation techniques are both applied in the correct manner, the US EPA standard should not be breached. It is our opinion that this assessment is both realistic and feasible.

Ashton will exceed the NSW EPA 24-hour guideline of 50 $\mu g/m^3$ PM_{10} approximately 15% of the time (in the worst-case scenario) without the use of staged real-time mitigation measures. Ashton has undertaken to modify its operating procedures when the 24-hour average PM_{10} in Camberwell exceeds 50 $\mu g/m^3$ in order to meet the NSW EPA guideline. However, there is some difficulty with this approach. Since the NSW EPA 24-hour PM_{10} standard is chosen as the "trigger" for staged mitigation measures, Ashton mine will in effect at some point in time, exceed the NSW EPA standard.

There are some important points to make about the NSW EPA 24-hour PM_{10} standard. There may be occasions where the standard will be impossible to meet due to reasons that have nothing to do with the Ashton mine project, regardless of what dust mitigation methods are in place. Bushfires, the contribution of other mines and adverse weather conditions can all cause the NSW EPA 24-hour PM_{10} standard to be exceeded. In fact, the National Environmental Protection Measure for Ambient Air Quality allows its 24-hour 50 $\mu g/m^3$ PM_{10} standard to be exceeded on up to five occasions per year.

Guidelines for PM_{10} exposure are generally determined from large scale epidemiological studies of urban populations. The major source of PM_{10} in an urban population is from fossil fuel combustion. The finer part of the PM_{10} range, e.g. $PM_{2.5}$, is the dominant concern with respect to health as these fine particles can be inhaled and lodge in the lungs. Further, PM_{10} from combustion contains a chemical component which compounds potential health effects. The dust regime surrounding coal mines is very different to what occurs in urban areas. The major source of dust surrounding coal mines is dirt and coal – not combustion. Coal mining operations tend to emit coarser rather than finer particles and are not affected by the chemical component of combustion sources, therefore the health risks are lower than those in urban areas.

The use of a network of real time, PM_{10} concentration measurements removes the need for accurate estimates for the efficiency of dust reduction techniques (like watering), since mine procedures will be conducted as to constrain 24-hour PM_{10} concentrations measured in Camberwell to appropriate guidelines. Ashton will be completely dependent on this monitoring network in order to meet its undertakings regarding 24-hour PM_{10} concentrations. The installation of a PM_{10} monitoring network should be a requirement for the mine approval, given its proximity to Camberwell Village.

In order to meet the US EPA 24 hour PM_{10} concentrations, the following must take place:

- The network of PM_{10} monitors should be designed to accurately capture the dust contribution of the Ashton mine, and the contribution of the nearby mines to the dust concentration in Camberwell. From discussions Pacific Air & Environment had with White Mining staff, the PM_{10} network will be designed to effectively surround the Ashton mine site. If this is carried out correctly, the PM_{10} monitoring network will be able to identify the contribution of Ashton on the dust concentration in Camberwell Village.

- The staged mining operations are properly implemented and their effectiveness monitored by reviewing the effect of mining operation changes on the PM_{10} concentration in Camberwell Village.

The quantitative effectiveness of staged mining operations on the level of dust control is difficult to assess accurately, as to our knowledge this kind of dust mitigation has not been attempted elsewhere in Australia or overseas.

Regarding compliance with the NSW EPA standard, Ashton mine proposes using 24 hourly average PM_{10} concentrations and real-time wind data as the criteria which trigger additional "real-time" dust mitigation measures, including cessation of mining. The difficulty with this method is that the mine will always be responding after the NSW PM_{10} threshold has been exceeded. Since dust emissions are highly dependent on wind speed, a better solution would be to invest some thought into a short term (3 day to 3 hourly) predictive weather forecast. Therefore, the likelihood of wind conditions likely to generate high dust emissions can be estimated, and appropriate management steps can be taken before the event. Further, it is recommended that a 12-hourly average PM_{10} concentrations measured in Camberwell be used as the "trigger" for staged mitigation techniques. This suggested dust mitigation model contains both a historical and a predictive component, and is more preventative than what is proposed by the Ashton mine project. Preventative steps are likely to be more efficient than reactive management to high dust conditions. The design of this type of dust management model is a project in its own right and beyond the scope of this review. An Australian Alumina refinery operation in Australia already use a similar method for dust management, and these are described in section 2.6.1 below.

Case Study 1 – use of short term meteorological forecast – Alcoa of Australia Pinjarra (WA) refinery[1]

Alcoa of Australia operates an alumina refinery at Pinjarra, 70 km south of Perth, Western Australia. It covers an area of 900 hectares, of which two thirds is used for residue storage. The refinery is located at the foot of the Darling Escarpment 1.5 km east of Pinjarra. The region is subjected to intense easterly winds during summer and spring. These easterly winds known as katabatic winds are generated by the local topography and typically average velocities of 40 to 50 km/hr with gusts to 80 km/hr. It is not unusual for these conditions to last for 8 hours or more a day. With these conditions the potential dust impact to the town of Pinjarra is significant.

Alcoa receives 3-day forward meteorological forecasts from consultants at 1pm each day. This forecast allows Alcoa to plan its dust mitigation control strategy a few days in advance. Alcoa uses the 3-day forecast to plan the use of various dust control methods, including:

- A bitumen emulsion, applied from a truck using a boom. It is usually applied on completed dykes, sand stockpiles and temporary construction works.
- Over 500 sprinklers are used, in a network designed for optimal coverage across mud drying beds. The sprinkler system is fully automated and integrated with the on-line weather system, and is pre-programmed each day.
- A waste oil/water emulsion is also used to control dust. Waste oil is analysed to determine low levels of contaminants prior to use. The oil is mixed with water and an emulsifier, and applied to roads and dozer crossover points. This suppressant, approved by the Department of Environmental Protection (WA),

[1] Dust Control, Best Practice Environmental Management in Mining series, *Environment Australia*, 1998 ISBN 0 642 54570 7

has reduced expenditure on water carts by 90% and is applied to all internal roads of the Residue Storage Area.

This alumina refinery illustrates how a short-term meteorological predictive dust control strategy might work. It is a realistic and effective method of dust control, which provides the ability to preventatively plan dust mitigation techniques.

Case Study 2 – Real time dust concentration measurement, Bayswater Colliery, Hunter Valley, NSW[2]

Bayswater colliery currently operates a network of dust deposition and high volume air samplers around the mine. Real time dust concentration data are obtained by a GRIMM™ laser dust monitor, located between the residential areas and the mine.

The real-time monitor operates in conjunction with a weather station. Dust and weather data are continually relayed via a radio link to the mine site. A general dust 'risk factor' is calculated by assessing weather conditions such as wind speed and direction, temperature, solar radiation and rainfall and existing dust levels. When the dust risk factor is high, alarms alert the Environmental Officer and the Mine Supervisor, allowing mine operations to be adjusted to reduce dust. The same monitoring system is used to provide environmental clearance prior to blasting.

OTHER ATMOSPHERIC EMISSIONS

Greenhouse gases

The HAS report predicts the emission of greenhouse gases from the Ashton Coal project. The report correctly identifies CO_2 as the major greenhouse gas, resulting from the use of coal-fired electricity, diesel fuel and explosives. The latest emission factors from the Australian Greenhouse Office are used to estimate the amount of CO_2 emitted. This methodology is used correctly by HAS, giving a reasonable estimate of potential CO_2 emissions. HAS has applied the best available techniques in its assessment of CO_2 emissions.

The main issue in relation to the CO_2 emission estimates arises from the use of emission factors. Emission factors are approximations, which trade site-specificity and accuracy against ease of calculation and estimation. Therefore, emission factors applied to specific sites may be quite crude approximations of reality. There is inherent uncertainty in the equations and emission factors used and also uncertainty in parameters that need to be estimated and applied in the equations. However, HAS has used the best appropriate method for its assessment of CO_2 emissions.

There are concerns about the quality and level of information provided by HAS regarding other gases, and we find several errors in their interpretation of the scientific facts.

Carbon monoxide (CO), nitrogen oxides (NO_x) and non-methane volatile organic compounds are not greenhouse gases. Instead, they act in complicated and indirect methods to affect the overall radiative balance of the earth's atmosphere, and are more correctly called indirect greenhouse gases. For example:

[2] Dust Control, Best Practice Environmental Management in Mining series, *Environment Australia*, 1998 ISBN 0 642 54570 7

- Carbon monoxide does not absorb infrared radiation but is involved in the destruction mechanism for methane, which is a greenhouse gas.
- Nitrogen oxides do not absorb infrared radiation but are involved in complicated reactions which affect the concentration of carbon monoxide, methane and the hydrofluorocarbons (HFCs). Methane and HFCs are greenhouse gases.
- Volatile organic carbons have short atmospheric lifetimes (days to months) and have little greenhouse impact in their own right, but are involved in the production of atmospheric aerosols, which affect the overall global radiative balance.

The HAS report has made errors of understanding in its discussion of methane. Firstly, quoting a greenhouse warming potential (GWP) of 21 for methane is not correct. Greenhouse warming potentials take into account the atmospheric lifetime of the species in question, and therefore need to be quoted together with the time horizon of interest. In the case of methane, its GWP (compared to CO_2 on a per-molecule basis) is 48-90 over a 20 yr horizon, 20-43 over a 100 yr horizon, and 8-15 over a 500 year horizon. Secondly, the phrase "…*effective carbon emitted by methane"* is incorrect. The correct phrase should be *"…effective carbon dioxide-equivalent emitted by methane"*. The worldwide accepted accounting standard is to quote greenhouse gas emissions relative to carbon dioxide equivalent (CO_2-e) tonnes[3], not simply carbon. In balance, the HAS report correctly assumes that while the coal mine will emit methane from gas seams, the level of methane is likely to be small compared to the overall CO_2 emission. We agree with this conclusion.

The main greenhouse gas emitted by the Ashton Coal project is carbon dioxide and we agree with the HAS estimates of potential CO_2 emissions. As mentioned above, there are always concerns in the accuracy or suitability of emission factors. In most cases the use of these emission factors results in conservative estimates of greenhouse gas emissions, and this is likely to be the case for the Ashton Coal project estimates. The HAS discussion on carbon monoxide (CO), nitrogen oxides (NO_x) and non-methane volatile organic compounds is not required for this level of assessment.

Toxics

Plant equipment operating on diesel fuel will emit some gaseous toxics, in particular carbon monoxide (CO), sulphur dioxide (SO_2) and nitrogen oxides (NO_x). However, these emissions are very likely to be small and not impact on regional air quality guidelines, as the HAS report correctly identifies. Attempts to model these emissions from plant equipment are notoriously unreliable due to the very high temporal and spatial variability of the emitting sources – typically trucks, generators and earthmoving equipment. An attempt to model these emissions was made in the Mt Arthur North EIS. Using very conservative estimates, the predicted concentrations of CO, SO_2 and NO_x were a minimum of a factor of 2, and up to a factor of 1000 smaller than current air quality criteria. Therefore, the much smaller Ashton Coal Project should be well within air quality criteria. This has been correctly identified in the HAS report and we agree with its methodology.

Blasting and Spontaneous Combustion

The risk and extent of impact from blasting and spontaneous combustion is predicted to be low. The assessment of the Ashton Coal Project correctly indicates that if appropriate simple management practices are used, the risk of spontaneous combustion and blasting effects will be low.

[3] The Greenhouse Gas Protocol – a Corporate Accounting and Reporting Standard, World Business Council for Sustainable Development and World Resources Institute, 2002

SUBMISSIONS AND CONSULTATION

EPA

Pacific Air & Environment consulted with the EPA as represented by Peter Hughes (Acting Head Regional Operations Unit – Hunter) and Nick Agapides, (Air Quality Assessment Branch – Sydney).

The position of the EPA regarding the air quality component of the EIS is relatively straightforward. The initial report did not provide air quality information in a way that was easily usable for decision-making processes and therefore the EPA requested further information. The response document by HAS (February 2002) satisfied the majority of the requirements of the EPA. EPA chose not to see further information from Holmes Air Sciences. The EPA recognises that there will be some dust impacts on Camberwell Village, and stresses the importance of effective dust mitigation techniques. The EPA views the dust mitigation techniques proposed by Ashton mining as being adequate.

WHITE MINING LIMITED

A meeting and site inspection of the Ashton Mine project was carried out on Wednesday 17 April 2002. Present were Director and Project Manager Ian Callow and Technical Manager Peter Barton. As described in the EIS, White Mining has undertaken to install a network of real time PM_{10} monitors, and has called for quotations for developing this network. The final number and location of PM_{10} monitors has not yet been decided, but White Mining expects to have a series of monitors around the mine perimeter, some in Camberwell Village, and some near neighbouring mines. White Mining is considering making dust measurement information and blasting schedules publicly available on a web page for easy access.

White Mining recognises that there might be dust impacts on Camberwell Village, and has accordingly made offers of purchase to the most affected residences. The majority of the most affected residents, in the northern part of the Village, have agreed to sell now or in the future. Offers of employment have been made to several residents. White Mining has also discussed with some residents the installation of air conditioning, and use of methods which isolate the "first flush" of rainwater collected from roofs from the main rain water tank, to limit dust contamination of tank water. The project managers have frequent face-to-face contact with Camberwell residents. It is PAE's overall impression that White Mining has taken very seriously its accountability to the Camberwell community.

SINGLETON SHIRE COUNCIL

Pacific Air & Environment consulted with Singleton Shire Council as represented by Ken Horner, Senior Planner. Singleton council voted in favour of the Ashton mine development on 11 February, but has some concerns about the potential impact of the project.

The council's concerns centre on the effectiveness of the real time dust monitors and the cumulative dust impact due to the surrounding mines. Concerns exist that the monitors will not do justice to the residents, as *"…you can't monitor each house in Camberwell*."[4] Therefore, the council is concerned that the monitors will not adequately describe the experience of Camberwell residents.

The council is also concerned about dust emissions from the overburden dumps. One dump is proposed for the Western side of the New England Highway and Camberwell Village. Since the

[4] Quote from Ken Horner, Singleton Shire Council, during telephone conversation with Fred Turatti (PAE), 12 April 2002

prevailing winds around Camberwell are westerlies, the council is concerned about the dust impact from this dump on cars on the highway and Camberwell Village itself. However, White Mining has undertaken to continuously water exposed overburden dumps. Out-of-pit dumps will be used for approximately two years.

A further concern relates to accountability of dust emissions. The council is concerned that it will be relatively easy for White Mining to claim that it is not responsible for excessive dust measured by the PM_{10} monitors, thereby evading its commitments to implement real-time operational controls described in the EIS. The Council is concerned that there is no definitive way of determining the source contributions to dust during a high-dust episode.

It is the opinion of Pacific Air & Environment that Holmes Air Sciences has modelled the contributions of the overburden dumps adequately and conservatively. The worst-case scenario has been modelled by assuming constant worst-case meteorology and the greatest exposed surface area for overburden dumps. It is unlikely that increasing the size of the Western Emplacement and decreasing the size of the Eastern Emplacement will significantly affect dust impacts from the overburden dumps.

COMMUNITY

There seems to be a reasonable degree of acceptance of the Ashton mine project within the local Camberwell community despite some concern about potential dust impacts from Ashton and the cumulative effect of the surrounding mines. This is due in part to the high level of community consultation undertaken by White Mining, and the offer of employment and/or purchase of property at market value. White Mining has also discussed with some residents the installation of air conditioning, and use of methods which isolate the "first flush" of rainwater collected from roofs from the main rain water tank, to limit dust contamination of tank water. No verbal or written submissions were received by the Council from residents during the exhibition period. PlanningNSW received 26 submissions, the majority of which mentioned dust impacts as a source of concern.

Conclusion

From the assessment that has been performed, some key conclusions are:

- Predictions of the annual average TSP, PM_{10} and dust deposition are considered reasonable given the limitations of the emission estimates, and the simplifying assumptions of the ISC3ST dispersion model. The prediction of short-term (episodic) effects on dust deposition are much harder to accurately quantify and assess.

- Uncertainty in the prediction of dust impacts on Camberwell Village is primarily due to the quality of the dust emission estimates. Holmes Air Science uses accepted methodology for estimating dust emissions. Dust emissions are calculated using emission factors which are designed to capture all inter-site variations and conditions. This is the primary cause of uncertainty in the dust estimate, but it is the accepted methodology for assessing impacts from a planned mine. Other sources of uncertainty include the quality of meteorological data, terrain information, and the choice of mathematical model.

- The choice of model is a small contributor to the uncertainty of dust predictions in this situation, where there is so much uncertainty in the dust emission estimates. If dust emissions are measured, as will be the case with the PM_{10} monitoring network, then CALPUFF will be a more accurate mathematical model than ISC3ST, due to the

complex terrain surrounding Camberwell, which can lead to potential violations of the steady-state meteorological assumption inherent in the ISC3ST model. Pacific Air & Environment believes there is little additional value in remodelling dust emission scenarios with CALPUFF at this stage, given the level of uncertainty of the initial dust emission rates. It is the opinion of PAE that the modelling has been carried out adequately, conservatively, and conducted as to capture the worst-case scenarios.

- Recent research suggests the annual average dust deposition rate of 4 g/m^2/month as used in the EIS and recommended by EPA is not likely to be a satisfactory indicator of acceptable impact, and that monthly variations need to be taken into account.

- Dust deposition is a good indicator of amenity. In many cases dust deposition is episodic in nature. Traditional monitoring techniques are crude and do not allow a sound understanding of the impacts of short-term variations of deposition on amenity. Hence, criteria for assessment are not focussed on the short-term events. Furthermore, short-term events are difficult to predict because of inaccurate emissions data.

- Dust mitigation techniques to be employed by White Mining involve a range of controls which include progressively modifying operations including suspension of mining, depending on wind strength, direction and monitored PM_{10} concentrations. If diligently applied, these controls in our opinion represent close to "best practice" and nears the limits of what can feasibly be applied to a mining situation. To our knowledge no other mine suspends mining operation on the basis of adverse meteorological conditions. Short-term (3 day) meteorological forecasts can be used successfully to control dust emissions, as are used by the Alcoa Pinjarra refinery (Section 0 above), and this could be one of the additional measures that White Mining could investigate.

RECOMMENDATIONS

Following are some recommendations based on the review of the EIS and associated documentation. These recommendations are not presented as specific conditions for approval for the Ashton mine, and may be relevant for any new open cut coal mine proposal in the region.

- Use of accurate short-term meteorological predictions (eg 3 day forecasts) as an aid in managing mining and dust generating activities. This is likely to improve dust impacts for Camberwell residents by active management, rather than reactive, post-event controls.

- Monitoring 12-hourly average PM_{10} concentrations rather than 24-hourly average PM_{10} concentrations.

- Posting PM_{10} monitoring data on the Internet or some other means providing ready access to the public (with suitable filtering to permit data to be quality assured before going on public display).

- Quarterly reporting on the performance of control measures and of the monitoring system. These reports would be supplementary to the more comprehensive annual reporting of environmental performance.

- Investigating the relationships between short-term variations in dust levels (TSP and dust deposition especially) and levels of complaint and annoyance, with a view to reviewing the monitoring approaches and criteria for acceptable levels of impact;

- Improving short-term modelling techniques, by better characterising dust source variations and focusing on the feasibility of shorter-term amenity indicators. The short term modelling techniques used by HAS are at the limit of what can feasibly be employed without a substantial, additional research effort.

- Using the data that will be collected from the PM_{10} monitoring stations in a modelling "ground-truthing" modelling study using CALPUFF, to compare model predictions against actual ground level PM_{10} concentrations.

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APPENDIX C – BOWMANS CREEK ALLUVIUM IMPACT ASSESSMENT

August 2002

1. Introduction

This assessment focuses on the key environmental impact of the Ashton Coal Project as originally proposed which is the proposal to underground mine four coal seams below Bowmans Creek and its associated alluvium. This aspect of the proposal is unlike existing approved underground mines in the Hunter Valley since it would directly impact a significant alluvial groundwater system. Alluvial groundwater resources in the Hunter Valley and have been identified as providing an important water resource for economic uses and as support for fragile ecosystems. Alluvial aquifers also support prime agricultural land which is of regional significance in the Hunter Valley.

The recent Healthy Rivers Commission final report into the Hunter River System (HRC, 2001) highlighted the uncertainty in the prediction of long-term cumulative impacts on groundwater and stream water quality of mining proposals that create new connections between aquifers. The report recommends that DMR and DLWC undertake a joint study into the long-term impacts of coal mining on stream and aquifer flows and quality.

The proposed longwall underground mining would cause cumulative subsidence of up to 6 metres in the creek and alluvium. In addition, the Applicant has predicted that, due to the shallow depth of cover, subsidence cracking would to create a direct hydraulic connection between the underground mine workings and the alluvial groundwater and creek itself. This event would give rise to series of key impacts:

1. **Short Term**: Inflow of large volumes of water into the underground mine during its working life;

2. **Medium Term**: Loss of alluvial groundwater and creek habitat during the mine life;

3. **Long Term**: Permanent discharge of highly saline mine water to the alluvium and Bowmans Creek when groundwater levels are re-established post-mining.

The Applicant proposes to mitigate the short term impact by diverting Bowmans Creek around the zone of subsidence. This is primarily a safety requirement for mine operation and would result in the loss of approximately 1km of aquatic habitat since the proposed diversion is shorter than the existing creek.

The Applicant has assessed the relative economic and environmental values of the Bowmans Creek alluvial aquifer and considers that the value of this resource would be significantly less than that of the coal resource to be extracted. On these terms, the Applicant concludes that the medium term impacts of the proposal are justified.

The Applicant has predicted that water levels in the alluvial aquifer would be re-established approximately 30 years after mining ceases (50 years after commencement of the mine). Due to the hydraulic connection created by subsidence, highly saline waters from aquifers in the coal seams would cause salinity in the alluvium, Bowmans Creek, and the Hunter River to increase. The Applicant's assessment indicates that this impact would be minor, and a proposal has been developed to mitigate the diffuse salinity discharge by planting deep rooting salt tolerant trees and grasses. This is a method that is increasingly being used to manage dryland salinity.

The Department considers that the key issue in its assessment is the predicted long-term impacts of the proposal. The Department has completed a technical assessment of the Applicant's impact predictions and consulted extensively with the Department of Land and Water Conservation (DLWC), Environment Protection Authority (EPA), NSW Fisheries, and NSW Agriculture on this issue. In the Department's view, the high degree of uncertainty and potential scale of long-term impacts of the proposal require that a precautionary approach be taken to any approval for the Ashton Coal Project. In summary, the key concerns of the Department and other Government agencies are:

1. **Subsidence**: Prediction of induced cracking is based on limited empirical data and significant assumptions. Location and extent of cracking that causes connectivity with the alluvium is poorly understood;

2. **Groundwater and Surface Water**: Prediction of hydraulic characteristics of subsided geological strata is subject to a high degree of uncertainty. The potential for error is not reflected in the Applicant's predictions;

3. **Proposed Mitigation Strategy**: The proposed mitigation technique is currently poorly understood and has only been applied to dryland salinity situations, not localised diffuse sources such as that predicted; and,

4. **Intergenerational and long-term management issues**: Salinity impacts of the proposal would not occur until 30 years post-mining. Under current mine management frameworks administered by the Department (through development consents) and the Department of Mineral Resources (through mining leases), long-term management of such impacts is not logistically feasible. The Applicant has made no commitment to continued management of salinity over the timeframe for predicted impacts.

   A detailed analysis of each of the above issues is provided below.

2. Subsidence

The subsidence report in the EIS prepared by GE Holt & Associates states that the cumulative subsidence due to the longwall mining of four coal seams will be between 5 and 6 metres. Subsidence would occur in trenches aligned along the proposed longwall panels. Longwall panels 4, 5, and 6 would create subsidence that would impact significantly on Bowmans Creek (see attached figure, tagged "A").

The Applicant initially indicated that minimum depth of cover to prevent connection between the surface and underground workings through cracking was 200m. In subsequent information provided to the Department this figure was modified to 60-80m depth of cover, citing empirical evidence from nearby mines such as Cumnock. In a further clarification submitted in later correspondence, the Applicant again modified the minimum depth of cover required to prevent hydraulic connection quoting 150m as the appropriate figure. The Department believes that the inconsistencies in the Applicant's position are due to the lack of available published data on subsidence cracking below water bodies and the reliance on empirical data from other mines.

Depth of cover on the Pikes Gully Seam, the upper seam to be mined, ranges from 90m to approximately 150m below the Bowmans Creek alluvium. Water inflow from the creek and surrounding alluvial groundwater into the underground workings is therefore likely to occur over longwall panels 4, 5, and 6. The Applicant prepared a plan rating the risk of hydraulic connection as either moderate to high, moderate, or moderate to low according to the depth of cover over the alluvium. Due to the impacts of subsidence, the

Applicant proposes to divert the creek beyond the zero subsidence limit. The impacts of subsidence on the original creek alignment mean that it would not be possible to re-route the creek back to its original course after cessation of mining.

The Applicant stresses that the subsidence predictions are based on the assumption that there are no geological structures present on the site, such as dykes, faults, or massive sandstone units. The EIS notes that any geological faults present would increase connectivity due to cracking but that no faults have been detected during geological investigations. While it is unlikely that any major unknown geological structures exist, such as those present at Cumnock mine, there is certainly the possibility that smaller structures are present in the rock strata.

The Department notes that the Applicant's prediction of subsidence impacts focuses on whether subsidence cracking connecting the alluvium to the underground workings would occur. The conclusion in this regard is clearly affirmative. The key information missing from the Applicant's assessment is an estimate of the likely **extent** of cracking and the subsequent effects on hydraulic conductivity or permeability of the subsided strata. This information is critical for the prediction of groundwater impacts which are discussed in the following section.

3. Groundwater and Surface Water

Post-mining impacts include saline mine water flows into Bowmans Creek and, to a lesser extent, the Hunter River caused by diffuse leakage from the aquifers once they become fully charged. This is predicted approximately 30 years after mine closure. The Applicant predicts that average groundwater quality in the alluvium may rise from about 1200 us/cm to about 1700 us/cm which is stated to be within the natural range of salinity in the existing Bowmans Creek and alluvium (up to about 2000 us/cm). The change in groundwater quality is therefore assessed to have "small and negligible impacts" on salinity during low flows in Bowmans Creek and the Hunter River.

Discussions with officers from DLWC and EPA indicate that there are outstanding concerns centred around the accuracy of the Applicant's groundwater impact predictions and experience with other mines such as Wambo Mine, which undermined South Wambo creek causing water to enter underground workings, Ulan Coal, Great Greta Coal mine closure, Bulga Coal, and Cumnock mine among others.

Despite several requests for detailed analysis and evaluation of the uncertainty and assumptions in the Applicant's groundwater modelling, none has been provided. The Department has therefore assessed the information as provided in the EIS.

To provide context to the assessment, the Department has included comparison of impact prediction methods with the nearby Cumnock underground mine. An extension of the Cumnock underground mine was approved by the Minister in November 2001. The EIS for the Ashton project regularly refers to the Cumnock mine and highlights the similarity between the two projects which include longwall mining at similar depths, multi-seam longwall mining, and mining below a creek (Davis Creek in the case of Cumnock). It should be noted, however, that the Cumnock proposal differs from the Ashton proposal in the following key aspects:

- Davis Creek does not have a significant alluvial groundwater system;
- Subsidence cracking predictions for Cumnock indicated that no hydraulic connection would be created between Davis Creek and the underground mine.

Groundwater Model

The groundwater model used by the Applicant to predict post-mining impacts was based on the model used for impacts during active mining. The post-mining model differs from the active mining model in the following respects:

1. mine dewatering is removed and groundwater is allowed to recharge;
2. hydraulic conductivity of the various strata are modified to simulate the effect of subsidence cracking;
3. rainfall infiltration rates are increased to simulate additional infiltration over disturbed and subsidence cracked areas.

The Applicant then evaluated the results of this model when groundwater levels reach a steady-state (fully recharged) to obtain an estimate of the likely flow of highly saline water from the underground aquifers to the Bowmans Creek alluvium. The flow was estimated as 0.022 ML/day. The accuracy of these results is critical for the assessment of potential salinity impacts and the required scale and effectiveness of mitigation measures.

The Applicant assessed the sensitivity of the model for active mining to changes in the values of hydraulic conductivity, finding that this factor alone had the most significant impact on seepage rates from the Bowmans Creek alluvium and that a 50% change in hydraulic conductivity caused seepage rates to nearly double. No sensitivity analysis was performed for the post-mining model.

Due to the lack of specific data on extent of subsidence cracking from the Applicant's subsidence impact study, accurate prediction of values of hydraulic conductivity post-mining is difficult. The Department has compared the methodology used by the Applicant with that used in the Cumnock Mine extension groundwater study due to the similarity between the two mines, as outlined above. The comparison is shown in Table 1 below:

Table 1 – Comparison of Hydraulic Conductivity Prediction Methodology

Section of Strata	**Cumnock – Post Mining** (hydraulic conductivity, m/day)		**Ashton – Undisturbed**[5] (hydraulic conductivity, m/day)		**Ashton – Post-Mining** (hydraulic conductivity, m/day)	
	Vertical	Horizontal	Vertical (max)	Horizontal (max)	Vertical	Horizontal
Overburden above top seam	100 x undisturbed	10 x undisturbed	0.01	0.1	1	0.5
Coal seams and goaf	50 m/day	50 m/day	N/A	N/A	12.6	12.6
Interburden	100 x undisturbed	10 x undisturbed	function	function	12.6	12.6

When the methods are compared it can be seen that the hydraulic conductivity of subsided strata has been calculated by applying a factor to the hydraulic conductivity of undisturbed strata. This was explained clearly in the case of Cumnock, as indicated in

[5] Note that Ashton model used a function that varied hydraulic conductivity with depth and only maximum values of that function are quoted.

the table. In the case of Ashton, while it was not explicitly stated in the assessment, it can be calculated that the post-mining hydraulic conductivities for the strata above the underground mined zone are 100 x undisturbed (vertical) and 5 x undisturbed (horizontal). Therefore the methodology for prediction of post-mining hydraulic conductivity was essentially the same for both mine proposals, however lower conductivities were used for the coal seams and goaf for the Ashton assessment and the post-mining horizontal conductivity used a factor of 5 instead of 10.

The key difference between the two proposals, however, is that at Cumnock no subsidence cracking connecting the underground mine to the surface was predicted in the subsidence study. Therefore, the Applicant has made not made a conservative allowance for the influence of connective cracking on hydraulic conductivity of the fractured strata.

The key source of error, however, is likely to be the Applicant's use of a groundwater model which is based on the simulation of groundwater flow through essentially homogenous strata. The movement of groundwater through subsidence cracks connecting the underground aquifers to the alluvium would be expected to have entirely different flow characteristics to groundwater moving through homogenous strata. This type of flow would be independent of the hydraulic conductivity of the rock mass around the cracks and predictions of the bulk conductivity of the fractured rock, as used by the Applicant, are likely to be inaccurate.

The Department concludes that the post-mining groundwater impact assessment conducted by the Applicant is likely to underestimate saline water flows to the Bowmans Creek aquifer due to:

1. the difficulty in predicting hydraulic parameters of subsidence fractured rock;
2. the Applicant's omission of specific predictions, in addition to those modelled, of the likely leakage from the deep saline aquifers in the area where the underground mine would be directly connected to the alluvium;
3. the inability of the model used by the Applicant to predict flow through cracks connecting the surface/alluvium to the underground workings.

Salinity Impacts

Based on the above analysis, the Applicant's conclusions relating to post-mining water quality impacts are likely to be significantly underestimated. The degree to which the predictions have been underestimated is difficult to ascertain without detailed monitoring, analysis, and modelling of subsidence fractured rock strata.

The Department has identified significant uncertainty in the Applicant's assessment and without further detailed analysis is unable to predict the likely range of potential impacts on surface water quality.

4. Proposed Mitigation Strategy

Based on the results of its groundwater impact predictions, the Applicant predicted that salinity levels in Bowmans Creek would rise by approximately 70 us/cm to 300 us/cm in low flows. The corresponding increase calculated in Hunter River salinity in low flows would be approximately 14 us/cm.

In order to mitigate these impacts the Applicant proposes to plant deep rooting, salt-tolerant trees and grasses in areas that would be affected by saline groundwater and in groundwater recharge areas. This is a technique currently being trialled to manage dryland salinity problems caused by clearing of native vegetation.

Trees would be planted in three zones and grasses in a fourth zone. The Applicant calculates that a maximum of 17 ha of trees (3,400 plants) would be required to uptake all rainfall recharge (0.09 ML/day) and leakage from the coal measures and underground mine (0.022 ML/day). The Applicant proposes to plant 95 ha of trees (19,000 plants) and 100 ha of deep-rooting pasture to manage salinity, however, and concludes that the calculated salinity impact would be completely mitigated.

The Department and government agencies have assessed this mitigation strategy and note the following areas of significant uncertainty in the Applicant's analysis:

1. **Applicability of Methodology**: The mitigation strategy is based on a dryland salinity situation. As discussed above, the salinity impact due to underground mining would be highly variable over the mined area due to variability in subsidence cracking, the predicted direct hydraulic connection between the alluvium, and the deep saline aquifers in the coal measures. This is not a traditional dryland salinity application and is therefore the effectiveness of the proposal is subject to increased uncertainty;
2. **Source of Recharge:** The key source of increased salinity in the post-mining scenario is from the deep saline aquifers in the coal measures via leakage through subsidence cracking. The proposed strategy fails to specifically address how this leakage would be reduced in the long term by tree planting. The source of recharge for these aquifers is likely to be remote from the site and the proposed tree plantings in local recharge areas on the site would not reduce this recharge or the driving force for leakage of saline water. Any strategy to provide tree plantings in the recharge areas of the deep saline aquifers would be extremely difficult to develop due to limited knowledge of the locations of recharge areas and likely effectiveness of planting at such distances.
3. **Potential for Negative Impact from Plantings:** Following on from the previous point, the proposed plantings in local recharge areas may have the effect of reducing low salinity rainwater recharge of the Bowmans Creek alluvium, thereby reducing the dilution of leakage from deep saline aquifers and increasing salinity impacts.
4. **Use of Annual Averages:** The Applicant has used annual average rainfall and evapotranspiration rates from trees to calculate mitigating effects of tree plantings. This method disregards seasonal variation such as is winter when rainfall increases and evapotranspiration rates decrease. This would mean that evapotranspiration would not account for all rainfall and some recharge of the aquifer is expected.
5. **Complexity of the Model**: As the above point shows, the Applicant's methodology in calculating tree planting mitigation is relatively simplistic and does not consider the dynamic nature of the natural system. DLWC has suggested that site-specific model would be required that simulates the water/salinity balance and the effect of vegetation planting. This type of modelling is currently being applied for dryland salinity applications.

The Department therefore considers that the effectiveness of the Applicants proposed salinity mitigation strategy is subject to significant uncertainty, and given the analysis of salinity impact predictions in section 3 is likely to be underestimated.

5. Intergenerational and Long-term Management Issues

The timing and irreversible nature of the predicted salinity impacts is of specific concern to the Department and Government agencies. The Applicant has predicted that groundwater recharge and saline water flows to Bowmans Creek and the Hunter River would not occur until approximately 30 years after mine closure.

The environmental impact of the proposal would therefore be largely passed on to future generations. The Applicant's proposed strategy to mitigate the long-term environmental impacts of the mine would also be left to future generations to implement.

The Applicant has committed to establishing the tree and plantings during the operating life of the mine, however responsibility for the ongoing management up to and beyond 30 years post-mining is unclear. The Applicant has acknowledged that long-term management of the pasture and tree plantings, including harvesting and agroforestry, is required to ensure the predicted mitigative effect. In addition, long-term monitoring of salinity impacts would be required to evaluate and modify the mitigation strategy as required.

It must be recognised that the impact of subsidence on the rock strata and the resulting salinity impacts would be irreversible and permanent. This requires that the management of the mitigation and monitoring of the environmental impacts must be forever, not simply the next 50 years.

The Department considers that any development consent for the Ashton project would not be able to ensure effective management of the long-term impacts of the underground mine. The ability to predict the legal status of the requirements of such a consent 50 years into the future is clearly limited. Similarly, any management framework under the *Mining Act 1992* is likely to have dubious application in 50 years time and beyond.

The Department therefore considers that while significant long-term environmental damage and management responsibility would be created by the proposal to mine below the Bowmans Creek aquifer, legal mechanisms for ensuring that the Applicant retains responsibility for its management in perpetuity are very limited.

6. Conclusion and Recommendation

The Department therefore concludes the following regarding the Ashton Coal project's proposal to longwall mine below the Bowmans Creek alluvium:

1. Predictions of subsidence induced cracking are subject to a high degree of uncertainty;
2. Predictions of post-mining groundwater impacts are subject to an increased degree of uncertainty due to limitations in modelling and cumulative uncertainty from subsidence cracking predictions;
3. The Applicant's proposed mitigation strategy is subject to uncertainty due to limited knowledge of groundwater recharge patterns, the applicability of dryland salinity methodology to the situation, the simplistic nature of the modelling of mitigative effects, and cumulative uncertainty from groundwater and subsidence predictions;

4. The predicted impacts of the proposal would be irreversible and permanent and the ability for the Department to ensure responsibility for the impacts remains with the Applicant in perpetuity is very limited.

The Department therefore concludes that the proposal to mine below the Bowmans Creek alluvium is likely to result in a significant environmental legacy for future generations and that it is not consistent with the principles of ecologically sustainable development.

The Department therefore considers that the section of the proposed underground mine below the Bowmans Creek alluvium should be excluded from any development consent for the Ashton Project. This could be achieved through the conditions of any consent and would include the removal of the proposed creek diversion.

The Applicant has indicated that this would have the effect of reducing the overall coal resource to be extracted by the Ashton Coal Project by 18%. The Department considers that, if the Applicant made a minor modification to the width of the proposed longwall panels this would be reduced to around 12% of the available coal reserves.

The Applicant has indicated that such a change to the mine plan would make the project economically unviable. The Department has no commercial information relating to the proposal and is therefore unable to comment on economic viability.

This approach, however, would not permanently prohibit extraction of coal from below the Bowmans Creek alluvium. The Applicant would be able to make a new application or modify its proposed extraction plan by either changing the proposed mining method to First Workings below the Bowmans Creek alluvium which would eliminate subsidence impacts, or reducing the uncertainty in its predictions through monitoring of the first group of longwalls.

Changing the proposed mining method below the Bowmans Creek alluvium to First Workings would result in sterilization of approximately 50% of the resource extractable by longwall methods, or 6% of the Ashton Coal Project total production. Costs of the project and medium term environmental impacts would be reduced significantly by the elimination of the creek diversion.

The Department therefore recommends that the proposal to underground mine with longwall mining techniques below the Bowmans Creek alluvium be excluded from any development consent for the Ashton Coal Project.

APPENDIX D – SECTION 79C CONSIDERATION

Section 79C requires that the consent authority, when determining a development application, takes into consideration the following matters:

a) The provisions of:

i) any environmental planning instrument;

The following environmental planning instruments are relevant to the proposed development:

- *State Environmental Planning Policy No. 11 – Traffic Generating Developments*
- *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development*
- *State Environmental Planning Policy No. 44 – Koala Habitat Protection*
- *Hunter Regional Environmental Plan (REP) 1989*
- *Singleton Local Environmental Plan (LEP) 1996*

The consistency of the proposal with these planning instruments is assessed in section 3.5 and in Appendix A. The proposal is generally consistent with the provisions of relevant environmental planning instruments.

ii) any draft environmental planning instrument that is or has been placed on public exhibition and details of which have been notified to the consent authority;

There are no draft environmental planning instruments relating to the proposed development.

iii) any development control plan;

The following Development Control Plans apply to the proposed development:

- *Singleton Erosion and Sediment Control Development Control Plan*
- *Singleton Car Parking Development Control Plan*

The Department has assessed the proposed development against the relevant provisions of these development control plans (see Appendix A) and concludes that it is generally in accordance with the aims and provisions of these plans.

iv) any matters prescribed by the regulations that apply to the land to which the development application relates;

Clause 92 of the *Environmental Planning and Assessment Regulation 2000* requires the following matters to be taken into consideration by a consent authority in determining an application:

- *The Government Coastal Policy (where relevant);*

The Government Coastal Policy does not apply to the proposed development site.

- *In the case of a DA for the demolition of a building, the provisions of Australian Standard AS 2601-1991: The demolition of structures, as in force 1 July 1993;*

The recommended instrument of consent, if the Minister determines to approve the proposed development, include a requirement for all demolition works to be carried out

in accordance with the provisions of *Australian Standard AS 2601-1991: The demolition of structures.*

b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality;

Section 5 of this report considers the environmental impacts of the proposed development in detail. The Department is satisfied that all relevant environmental impacts can be appropriately managed and mitigated through the conditions of the recommended instrument of consent, if the Minister decides to approve the development application.

c) the suitability of the site for the development;

The proposed development site is in a region with a large number of existing coal mines due to the location of the coal resource. The proposal is therefore generally consistent with surrounding landuses. Through consideration of each of the relevant impacts posed by the development, detailed in section 5 of this report, the Department concludes that the development can be constructed and operated on the site within appropriate environmental limits. The Department concludes that the site is generally suitable for the proposed development.

d) any submissions made in accordance with this Act or the regulations;

All matters raised in submissions have been given due consideration, as outlined in section 4 and Appendix E of this report, and addressed in relevant parts of section 5.

e) the public interest.

The Department has duly considered each of the issues of concern raised in public submissions. Assessment of each of these issues has concluded that the proposed development can be constructed and operated with appropriate environment limits. The proposal would result in minimal changes to environmental amenity and quality in the locality and the region during mining and provide significant conservation outcomes in the long term. The local community would also benefit economically from the capital expenditure and economic flow on effects of that expenditure. The Department considers that the proposed development is in the public interest.

APPENDIX E – SUMMARY OF SUBMISSIONS