

Proposed Transport Route Survey Area

Four Aboriginal heritage sites were also identified along the proposed transport route corridor. These are also listed in **Table 4.25**.

4.6.4 Significance Assessment

4.6.4.1 Introduction

An assessment of the significance of all sites, Aboriginal places, and archaeological material is required to firstly determine whether appropriate safeguards can be put in place to enable a development proposal to proceed. Secondly, it provides information to the Department of Environment and Conservation (NPWS) on the future management of the area. The assessment addresses both the actual cultural significance of the feature or site as well as the potential it offers for research into the history of an area.

4.6.4.2 Cultural Significance

The Aboriginal or cultural significance of Aboriginal relics and sites can only be assessed by the Aboriginal Community, and in particular, the Elders. In this instance, two Aboriginal groups were involved in the investigation, and both have provided statements of their recommendations for the management of the sites.

Red Chief LALC recommended the following.

- The following sites should remain in situ and be re-evaluated if they are likely to be affected by any future mining or related activities: NASO 2, GGOS 1, GGOS 2, GGOS 3, GGOS 4, and NST 1 (the recommendation for NST 1 was dated 21st March 2003).
- Applications for a Permit under Section 90 of the *National Parks and Wildlife Act 1974*, for “salvage purposes”, be lodged with DEC for sites NASO 1 and NISO 1.
- The salvaged artefacts should be relocated to the Cumbo Gunerah Keeping Place.
- All sites should be registered on the Aboriginal Heritage Information Management System (DEC).
- Monitors should be on site for all turf (soil) stripping on the Project Site and along Sections 1, 3 and 4 of the proposed transport route and for any other ground disturbance work.



Bigundi Biame Gunnedarr Traditional People recommended the following.

- Applications for a Permit under Section 90 of the *National Parks and Wildlife Act 1974*, for “salvage purposes”, be lodged with DEC for sites NASO 1 and NISO 1.
- The salvaged artefacts should be relocated to the Cumbo Gunerah Keeping Place.
- All sites should be registered on the Aboriginal Heritage Information Management System (DEC).
- Monitors should be on site for all turf (soil) stripping on the Project Site and along the proposed transport route.
- Bigundi Biame be notified of any future changes to the proposed transport route.

Copies of the recommendations provided by the two Aboriginal groups contacted are provided in full as Appendices to ASR (2005).

4.6.4.3 Research Potential

Of the eight sites recorded (see **Table 4.25**), only the four sites along the alignment of the proposed transport route were assessed to have research potential. These sites (GGOS 1 to GGOS 4) included at least sixty artefacts and probably many more of smaller and less obvious dimensions.

These sites are considered to be of research potential due to the source of material from which the artefacts were manufactured: the artefacts were notable in that they each appeared to have been manufactured from selected, rather than from opportunistically collected material. The materials used such as chalcedony, malachite and porcellanite are neither abundant nor easily identifiable amongst an array of water-worn conglomerate pebbles, but each are highly silicified and ideal for knapping into diagnostically different tool types. As a consequence, it is probable that close analysis would identify the particular knapping techniques used, and lead to a greater understanding of how the artefacts were made and for what purpose.

Although each of the four locations was in a cleared and exposed location, there did not appear to be a great deal of disturbance to sub-surface soils. It is probable that broad-scale excavation would uncover many more artefacts. It should be stressed, however, that as the proposed transport road has been realigned to avoid the sites by a wide margin there is no impending threat to them and they would remain in situ awaiting future research opportunities.

4.6.5 Design and Operational Safeguards

The proposed East Boggabri Coal Mine development as a whole would result in disturbance to two of the eight recorded sites, namely NASO 1 and NISO 1. In line with the recommendations of the two Aboriginal groups consulted (Red Chief - Local Aboriginal Land Council and Bigundi Biame Gunerah Traditional People), an application for a Section 90 Permit under *National Parks and Wildlife Act 1974* would be made with the artefacts salvaged and relocated to the Cumbo Gunerah Keeping Place.



Disturbance to all other sites would be avoided. It is notable that although the initial mine plans would have resulted in disturbance to sites NST1, GGOS 2 and GGOS 3, the location and orientation of overburden emplacements and the proposed transport route were subsequently revised to accommodate for their retention.

Additional operational safeguards and controls to be adopted by the Proponent include the following.

- (i) Aboriginal monitors would be invited to site for all soil stripping and ground disturbance activities.
- (ii) The scarred tree NST1 would be enclosed within a fenced area of at least 20m radius from the tree with the location and words “Culturally Sensitive Area – Aboriginal Scarred Tree” marked on all mine plans.
- (iii) All employees would be made aware of their responsibility under the *National Parks and Wildlife Act 1974* to notify the mine manager should any additional sites be identified with work to cease in this area immediately. The Red Chief Local Aboriginal Land Council, Bigundi Biame Gunerah Traditional People and cultural heritage officers of the DEC would be informed and work would not recommence until the site has been inspected and permission from DEC to proceed provided.

4.6.6 Assessment of Impacts

The design and operational safeguards proposed by the Proponent illustrate a commitment to ensuring the Aboriginal heritage sites are appropriately managed, with the salvage of those artefacts at those sites to be disturbed in line with the requests of the local Aboriginal groups. Fencing off the most sensitive of these further demonstrates the Proponent’s commitment to avoiding impact to these sites. It is noted that air and ground vibration associated with blasting can potentially damage some Aboriginal heritage sites. In the case of those sites to remain in situ during the operation of the proposal (isolated scatters of small artefacts and a scarred tree), these do not represent site types likely to be damaged by vibration. In light of this, and the proposed design and operational safeguards, the impact of the proposed East Boggabri Coal Mine development on Aboriginal heritage is assessed to be acceptable.

The management of items of Aboriginal heritage significance identified by the archaeologist for the Boggabri Coal Project would ultimately be determined following consultation between IBC, their consultant archaeologist, local Aboriginal groups and the DEC. However, considering the minimal impact associated with the proposed East Boggabri Coal Mine and the likelihood that the identified sites of the Boggabri Coal Project would have to be managed in a similar fashion, the probable cumulative impact on Aboriginal heritage is considered acceptable.



4.7 EUROPEAN HERITAGE

4.7.1 Desktop Search of Heritage Listed Items

Searches of the Australian Heritage Database, the NSW State Heritage Register, the NSW State Heritage Inventory, the Narrabri LEP – 1992, were conducted on 1 April 2005 for items of cultural heritage significance within the Narrabri and Gunnedah LGAs.

These desktop searches did not identify any sites of European heritage significance in the vicinity of the Project Site. Only one site was listed within a 20km radius of the Project Site, that being Kelvin Sate Forest and Adjacent Areas (NSW State Heritage Register, Australian Heritage Database) approximately 14km east-southeast.

4.7.2 Operational Safeguards

Due to the distance of the Project Site from the nearest recorded heritage items, no specific operational safeguards are considered necessary.

4.7.3 Assessment of Impacts

No impact on items of European heritage significance is anticipated as a result of the proposed mining operation or associated transportation activities.

4.8 NOISE

4.8.1 Introduction

Noise would be generated by a number of activities at the proposed East Boggabri Coal Mine, including:

- site preparation and construction activities including tree clearing, road construction and Project Site traffic;
- recovery of topsoil and subsoil;
- drilling and blasting;
- on-site transportation of overburden, interburden and Run-of-Mine coal;
- operation of the coal processing plant and other activities within the coal processing and mine facilities areas; and
- transportation of the coal between the coal processing area and Whitehaven CHPP and rail loading facility.

This sub-section describes the existing noise environment surrounding the Project Site and proposed transport route and presents the noise criteria relevant to the proposal. The design and operational safeguards, and management procedures to be employed to meet these criteria are presented, together with predicted noise levels and likely impacts arising from the proposal.



The approach to predicting future noise levels and assessing their impacts has been drawn from the results of a comprehensive noise assessment conducted by Spectrum Acoustics Pty Ltd, specialist acoustic consultants, whose report is provided in full as Part 7 of the *Specialist Consultant Studies Compendium*. The noise assessment focussed upon the non-project related residences surrounding the proposed East Boggabri Coal Mine and proposed transport route, ie. those residences not on land owned by the Proponent.

The responsibility for the control of noise emissions in New South Wales is vested in local government and the Department of Environment and Conservation (DEC). The DEC (as the former Environment Protection Authority (EPA)) released an Industrial Noise Policy (INP) in January 2000. The INP provides a framework and process for deriving noise criteria for development consents and licences that would enable the EPA to regulate premises that are scheduled under the *Protection of the Environment Operations Act 1997* (POEO Act). The proposed East Boggabri Coal Mine would be scheduled under that Act.

The objectives of the Industrial Noise Policy relevant to the proposal are to:

- establish noise criteria that would protect the community from excessive intrusive noise and preserve amenity for specific land uses;
- use the criteria as the basis for deriving project-specific noise levels;
- promote uniform methods to estimate and measure noise impacts, including a procedure for evaluating meteorological effects;
- outline a range of mitigation measures that could be used to minimise noise impacts;
- provide a formal process to guide the determination of feasible and reasonable noise limits for consents or licences that reconcile noise impacts with the economic, social and environmental considerations of industrial development; and
- carry out functions relating to the prevention, minimisation and control of noise from premises scheduled under the POEO Act.

The DEC also relies upon its guideline entitled “Environmental Criteria for Road Traffic Noise” and relevant sections of the Environmental Noise Control Manual to assess the acceptability of projects.

The sub-section concludes with an assessment of the cumulative impacts associated with the concurrent operation of the proposed East Boggabri Coal Mine and the Boggabri Coal Project.

4.8.2 Existing Noise Climate

4.8.2.1 Noise Sources

The existing sources of noise in the vicinity of the Project Site are typical of a rural environment with minor contributions from transport noise. The principal sources of noise that contribute to background noise levels around the Project Site and the northern section of the proposed transport route include:

- farm equipment such as tractors and cultivators;
- insect noise such as cicadas, especially during spring and summer months;



- livestock and other farm and native animals;
- wind through vegetation; and
- through traffic on the local road network.

4.8.2.2 Noise Measurements

Spectrum Acoustics determined that site-specific noise measurements around the Project Site were unnecessary as the rural nature of the surrounding environment meant that background noise would be expected to be low and that the 30dB(A) default background level identified in the INP would be appropriate for this assessment. This approach was supported by the results of the noise study conducted in 1982 by Louis Challis & Associates (LCA, 1982) for the Boggabri Coal Project. During that study, noise measurements were taken at several residences on properties in the area surrounding the Boggabri Coal Project (and therefore within the vicinity of the proposed East Boggabri Coal Mine Project Site) with the noise sources measured similar to those described in Section 4.8.2.1.

The results of LCA (1982), ie. daytime background noise levels (L_{A90}) of around 30dB(A), and night-time levels as low as 23dB(A), are typical of rural areas away from major roads and industries. Given that there has been no appreciable changes in the acoustic environment in the intervening years, these background levels have been adopted for the present assessment. Based on the DEC *Industrial Noise Policy* (EPA, 2000) requirement that noise levels below 30dB(A) shall be taken as 30dB(A) for the purposes of assessing industrial noise, 30dB(A) (L_{A90}) would be adopted as the background level for all residential receivers during the day, evening and night. The level of 30dB(A) is referred to in the remainder of this sub-section as the Rating Background Level (RBL).

4.8.3 Environmental Noise Criteria

4.8.3.1 Introduction

The assessment of impacts of the proposal upon the local noise climate (Section 4.8.5) has been undertaken by calculating likely noise levels during both the construction and operational stages of development and comparing those noise levels against the noise criteria established through reference to:

- relevant sections of the DEC Environmental Noise Control Manual (ENCM) - for site construction activities (EPA, 1994);
- the Industrial Noise Policy (INP) - for site operational noise (EPA, 2000); and
- NSW Environmental Criteria for Road Traffic Noise (ECRTN) (EPA, 1999).

Criteria relevant to assessing the likelihood of sleep disturbance are drawn from current EPA considerations which as yet are not fully documented.



For the purposes of defining relevant criteria, the DEC (EPA) nominate the following times relevant to daytime, evening, night-time periods, ie. for Monday to Saturday. For Sundays and public holidays, night-time extends from 10.00pm to 8.00am.

- Daytime – 7.00am to 6.00pm
- Evening – 6.00pm to 10.00pm
- Night-time – 10.00pm to 7.00am

4.8.3.2 Construction Noise Criteria

The proposal would require construction works including tree clearing and topsoil removal, road construction, construction of the processing plant and installation of offices, amenities and services to the Project Site. It is anticipated that this construction activity would occur during the first 6 months of the life of the proposal and as such the following criterion, as outlined in the DEC ENCM, applies.

- Construction noise ($L_{A10(15\text{ min})}$) should be restricted to the RBL + 10dB(A) during daytime period only, ie. 40dB(A).

4.8.3.3 Operational Noise Criteria

Intrusiveness Criterion

The environmental noise criteria for the operation of the proposed East Boggabri Coal Mine need to consider both the intrusiveness and amenity criteria. The “intrusiveness” criterion, which limits L_{Aeq} noise levels from industrial sources to the RBL + 5dB(A), needs to be considered when determining appropriate noise criteria for the proposal. The “intrusiveness” criterion considers the relative increase in noise levels as a result of an industrial noise source and would cover all operations on the Project Site including mining, processing and on-site truck movements.

Amenity Criterion

The “amenity” criterion considers cumulative noise impacts in areas with competing industrial noise sources.

Considering there is no existing major noise generating industry in the vicinity of the Project Site, and that current and projected future traffic levels would be negligible, the “amenity” criterion need not be applied for this proposal. Cumulative impacts associated with the development and operation of the Boggabri Coal Project are assessed in Section 4.8.5.4.

4.8.3.4 Sleep Disturbance

To help protect against people waking from their sleep, the DEC recommends that LA_1 noise levels, effectively L_{Amax} noise levels, ie. maximum noise levels recorded over one minute, should not exceed the background level by more than 15dB(A) when measured/computed at a building facade. The L_{Amax} is the preferred description given it is far more practical to measure an L_{Amax} noise level than an LA_1 noise level. The “sleep disturbance” criterion is only applicable to night-time operations.



4.8.3.5 Traffic Noise Criteria

The NSW *Environmental Criteria for Road Traffic Noise* (ECRTN) (EPA, 1999) applies to noise generated by vehicle movements on public roads. The concept of “principal haulage routes” has previously been discussed and endorsed by the (then) Department of Urban Affairs and Planning’s North Coast Extractive Industries Standing Committee, 1997, reflecting the often remote location of quarries and mines with respect to major product transport facilities. The concept of ‘principal haulage routes’ is specifically mentioned in Section 2.2 of the ECRTN under the heading Functional Categories of Roads, viz:

“Ways of identifying ‘principal haulage routes’ and managing associated adverse impacts have not yet been fully identified. Where local authorities identify a ‘principal haulage route’, the noise criteria for the route should match those for collector roads, recognising the intent that they carry a different level and mix of traffic to local roads.”

Table 4.26 identifies ECRTN traffic noise criteria with the proposed transport route considered as a collector road.

Table 4.26
Road Traffic Noise Criteria

Type of Development	Recommended Criteria – dB(A)		
	Day 7:00am to 6:00pm)	Evening (6:00pm to 10:00pm)	Night (10:00pm to 7:00am)
11. Land use developments with potential to create additional traffic on collector roads.	$L_{Aeq(1hr)}60$	$L_{Aeq(1hr)}60$	$L_{Aeq(1hr)}55$
Source: Spectrum Acoustics (2005) – Table 3			

Transportation of coal by road would be restricted to daytime and evening hours only (7:00am to 10:00pm). Based upon the criteria nominated in **Table 4.26**, traffic noise from the proposal is therefore assessed against the ECRTN criterion of $L_{Aeq(1hr)} 60$ dB(A) for the proposed transport route between the proposed East Boggabri Mine and the existing Whitehaven Coal Mine and the Whitehaven Coal Mine and Whitehaven CHPP. This criterion is consistent with the 60dB(A) criterion which currently applies to the existing transport route from the Whitehaven Coal Mine to the Whitehaven CHPP and rail loading facility

4.8.3.6 Noise Criteria for the Proposed East Boggabri Coal Mine

The adopted noise criteria for the proposed East Boggabri Coal Mine are as follows.

- Construction Noise ($L_{A10(15\ min)}$) : Given the RBL for all residences has been set as 30dB(A), the construction noise criteria for the proposed East Boggabri Coal Mine would be 40dB(A).
- Operational Noise ($L_{Aeq(15\ minute)}$) : The “intrusiveness” noise criterion for the proposed East Boggabri Coal Mine is 35dB(A).



Sleep Disturbance : Equal to the “intrusiveness” criterion plus 10dB(A), that
(L_{Amax}) is, 45dB(A).

Traffic Noise
Proposed Transport : 60dB(A) for daytime and evening traffic.
Route Traffic ($L_{Aeq(1hr)}$)

4.8.4 Design and Operational Safeguards

The safeguards to limit the noise generated by the proposal include a combination of:

- design features of the mine itself;
- the sequence of development;
- noise controls; and
- operational procedures to limit noise generation or attenuate the noise generated.

The nearest residences to the proposed East Boggabri Coal Mine are located to the east and south of the Project Site and as such are likely to be most effected during the latter years of the proposed life of the mine, ie. as mining and overburden placement activities move to the more southeasterly areas within the Project Site.

A preliminary acoustic assessment identified that the placement of overburden within the southern emplacement would likely generate noise levels above the Project Site noise criteria, especially during adverse meteorological conditions involving either a temperature inversion or a northwesterly breeze. In order to minimise the potential for any such noise exceedance, the following controls would be adopted.

Construction Noise Controls

- (i) Under inversion and/or northwesterly wind conditions, construction activities would be restricted to only one of the more noisy activities at a time eg. tree felling or topsoil stripping.
- (ii) Undertaking these noisier activities simultaneously would only occur during calm conditions or when wind is from outside the northwest quadrant.

Operational Noise Controls

- (iii) An initial 15m acoustic bund would be constructed at the leading edge of the southern emplacement during calm conditions or when winds are outside the northwestern quadrant. It is noted from **Figure 3.6**, that the proportion of time when winds blow from the northwest quadrant vary from 2.5% to 3.0% in summer to 4.0% to 8.5% in winter (see **Figure 3.6**), thereby leaving a substantial period of time for the required activities.
- (iv) Following the initial development of the open cut, there would always be two active overburden emplacement areas, one on the out-of-pit (northern or southern) emplacements and one within the open cut area referred to as the “in-pit emplacement”. This would enable overburden placement to occur in-pit during adverse meteorological conditions, behind the 15m high leading edge of the out-of-pit emplacement during calm conditions and at the leading edge during favourable meteorological conditions, ie. southeasterly winds.



- (v) The 15m high acoustic bund would be maintained throughout the formation of the southern emplacement to provide acoustic shielding during adverse meteorological conditions ie. until the upper 15m section is reached. By that time, site experience would dictate the most appropriate controls to adopt during the closing stages of the emplacement's construction. Placement of overburden on the southern emplacements would be avoided during night-time operations. If required for operational or safety reasons, out-of-pit overburden placement at night would always be conducted behind and within 30m of the 15m high acoustic bund and then, only following monitoring that has previously confirmed the night-time noise criteria can be satisfied.
- (vi) In the unlikely event that insufficient favourable conditions (winds outside the northwest quadrant) are available to allow the construction of the 15m acoustic bund of the southern emplacement, the Proponent would replace the proposed Cat 789 dump trucks with smaller (and quieter) Cat 777s. Spectrum Acoustics (2005) notes that the Cat 777 is 4dB(A) to 5dB(A) quieter than the larger Cat 789 truck and would further reduce noise levels received at nearby residences.
- (vii) A Noise Management Protocol (NMP) would be prepared by the Proponent prior to the commencement of mining activities. The Protocol would incorporate details relating to controls (i) to (v) and the measurement of prevailing weather conditions.

Transport Noise Controls and Operational Procedures

- (i) All roads comprising the proposed transport route would be sealed and regularly maintained under a contribution plan with Gunnedah and Narrabri Shire Councils.
- (ii) Strict adherence to approved hours of coal transportation.
- (iii) Strict adherence to hours of operation, including transport activities would be enforced by Mine Management.
- (iv) All truck drivers would be instructed to avoid the use of engine brakes when approaching the mine site entrance and intersections with Manilla Road and Hoads Lane and to be mindful of noise when accelerating. The need to introduce restrictions upon the use of engine brakes at any other location along the proposed transport route would be evaluated throughout the life of the project.

Other Noise Controls and Operational Procedures

In addition to the design and operational features of the proposal, the Proponent would apply the following noise controls.

- (i) Equipment with lower sound power levels would be used in preference to more noisy equipment.
- (ii) All equipment used on-site would be regularly serviced to ensure the sound power levels remain at or below the levels used in the modelling to assess generated noise levels and compliance with the criteria.
- (iii) Mid-high frequency broadband reverse beepers would be fitted to mobile mining equipment, decreasing sound power levels by 2 dB(A) to 3dB(A).



- (iv) The on-site road network would be well maintained to limit body noise from empty trucks travelling on internal roads.
- (v) The Proponent would maintain dialogue with its neighbours and the local community to ensure any concerns over construction, operational or transport noise are addressed.

4.8.5 Assessment of Impacts

4.8.5.1 Method of Assessment

The assessment of potential noise impacts arising from activities within the Project Site was based on computer model predictions undertaken by Spectrum Acoustics for a range of operational scenarios throughout the life of the mine at the five closest non-project related residences (“Assessment Locations”). The assessment also considered the noise likely to be generated by product coal transportation between the Project Site and the Whitehaven CHPP and rail loading facility. The cumulative noise impacts associated with the operation of both the proposed East Boggabri Coal Mine and the Boggabri Coal Project were also modelled.

Table 4.27 presents a summary of the construction, operational, transport and cumulative impact scenarios modelled with a complete description of each presented in Spectrum Acoustics (2005). **Figure 4.17** presents the locations of noise generating activities for two of the modelled scenarios, ie. Scenario 3 – End Year 3 Mining and Scenario 6 – End Year 6 Mining. The number and location of noise generating activities is indicative of those used for the other scenarios. Project Site transport activities were modelled separately, with the results of this modelling incorporated into the final noise modelling predictions for each scenario.

Noise modelling was undertaken as an iterative process with many of the noise controls described in Section 4.8.4 introduced as a result of early modelling predictions in order to achieve compliance with DEC noise criteria with respect to the cumulative assessment. The most up-to-date information on the approved operations of the Boggabri Coal Project was incorporated into the noise modelling. However, where there was uncertainty over aspects of the Boggabri Coal Project, the detail contained within the EIS (BHP-AGIP-Idemitsu, 1987) was relied upon.

The results of the noise modelling and assessment of impacts on surrounding residents are presented as:

- impacts attributable to the proposed East Boggabri Coal Mine (Section 4.8.5.3); and
- cumulative impacts associated with the concurrent operation of the proposed East Boggabri Coal Mine and approved Boggabri Coal Project (Section 4.8.5.4).

The impact of noise generated by the proposal on livestock has been assessed through reference to Hunt (1999), a report which assessed the impacts of noise, blasting and dust deposition on livestock and pastures, and the results of the noise modelling undertaken.

The assessment of impacts presents the predicted noise levels assuming the adoption of the various design and operational safeguards as described in Section 4.8.4.



Table 4.27
Noise Modelling Scenarios

Modelled Scenario	Description
1. Construction and Site Establishment	Including the following activities - tree clearing and topsoil removal; - construction of mine entrance and access road; and - construction of coal processing area.
2. Commencement of Mining	Excavation at ground level in the X and N pits; overburden placement at the northwestern toe of the northern emplacement on-site; coal processing and coal transportation to mine site entrance.
3. End Year 1 Mining	Excavation 20m below ground level in the X and N pits; overburden placement on the northern end of the half completed northern emplacement; on-site coal processing and coal transportation to mine site entrance.
4. End Year 3 Mining	Excavation 50m below ground level in the X and N pits; overburden placement on the southern end of the completed northern emplacement; on-site coal processing and coal transportation to mine site entrance.
5. Start Year 4 Mining	Excavation 50m below ground level in the X and N pits; overburden placement at ground level at the southeastern toe of the southern emplacement; on-site coal processing and coal transportation to mine site entrance.
6. End Year 6 Mining	Excavation 40m below ground level in the C and S pits, overburden placement on eastern edge of the almost-completed southern emplacement; on-site coal processing and coal transport to mine site entrance.
7. Sleep Disturbance	Mining operations modelling general impact of noise from mining and overburden placement activities, coal loading into empty trucks and dozer tracks. Sound power levels of modelled L_{Amax} noise sources. Note: coal product truck not operating.
8. Product Transportation	Product transportation has been modelled based on 25 truck movements per hour with noise generated assessed over a 1 hour period $L_{Aeq}(1 \text{ hour})$
9. Cumulative Mining Development	Considers two worst-case scenarios (commencement of mining and start Year 4 Mining) where the two mines commence operations simultaneously. Commencement of mining at the Boggabri Coal Project is from the southern extent of mining with mining activities at surface level. The noise sources included in the model are provided in Spectrum Acoustics (2005).
Notes: Modelling was conducted for the following atmospheric conditions. - Daytime lapse – 20°C, 70% relative humidity (RH), no wind, -1°C/100m vertical temperature gradient (dry adiabatic lapse rate, DALR). - Inversion – 10°C, 70% R.H., +4°C/100m vertical temperature gradient. - Wind – 20°C, 70% R.H., 3m/s wind from NW.	
Source: Modified after Spectrum Acoustics (2005) – Section 6	

4.8.5.2 Assessment Locations

Table 4.28 identifies the five non-project related residences assessed in the modelling of project related construction and operational noise and the two non-project related residences identified as closest to the proposed transport route between the Project Site and the Whitehaven Coal Mine, together with their direction and distance to the closest noise source. These are collectively referred to as “assessment locations”. Additional assessment locations including “Flixton”, and “Jeralong” were also considered initially. However, given their similar direction and greater distances than the five “assessment locations” presented in **Table 4.28**, it is assumed that compliance at the assessment locations would imply compliance at these more distant locations.



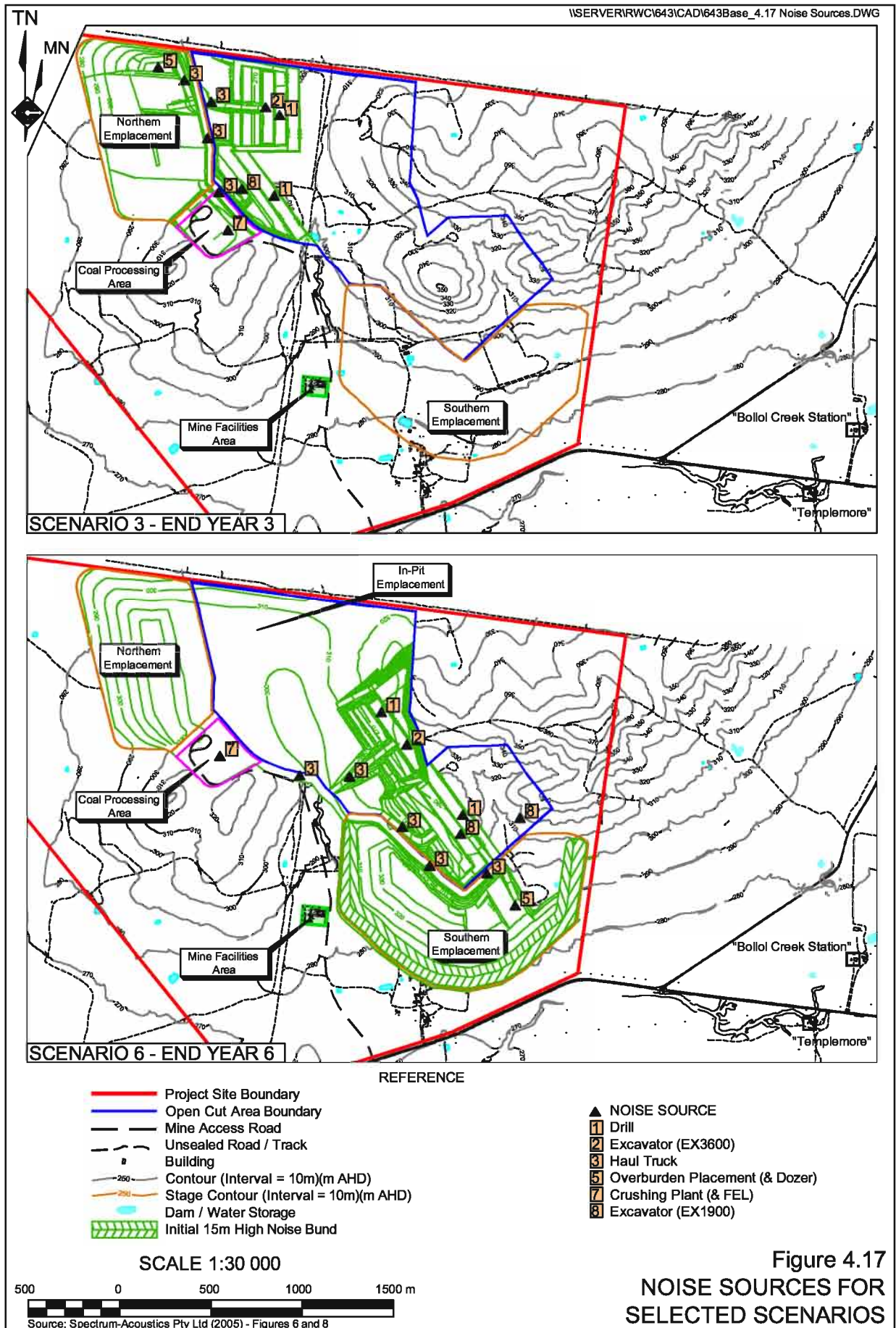


Figure 4.17
 NOISE SOURCES FOR
 SELECTED SCENARIOS

Table 4.28
Assessment Locations

Assessment Location	Direction	Distance to Closest Noise Source
Surrounding Project Site		
“Tarrawonga”	south-southwest	3.03km (start Year 4)
“Ambardo”	south-southeast	2.89km (end Year 6)
“Templemore”	southeast	1.42km (end Year 6)
“Bollol Creek Station”	east	1.52km (end Year 6)
“Matong”	east-southeast	3.32km (end Year 6)
Adjacent to proposed Transport Route (Northern Section)		
“Pine Grove”	east	0.25km
“Kyalla”	south	0.20km

Source: Modified after Spectrum Acoustics (2005) – Section 6

4.8.5.3 Impacts Attributable to the Proposed East Boggabri Coal Mine

4.8.5.3.1 Construction Noise

Table 4.29 presents a summary of the predicted construction noise during the first 6 months of site activities. No noise exceedance of the criterion is predicted at any of the assessment locations for any modelled meteorological condition.

Table 4.29
Predicted Noise Levels during Construction and Site Establishment

Assessment Location	Meteorological Condition				
	Lapse	Inversion	NW wind	Criterion	Differential
Predicted noise levels from earthworks during construction of coal processing area and mine access road					
(1) “Tarrawonga”	<20	<20	<20	40	<-20
(2) “Ambardo”	<20	23	<20	40	-17
(3) “Templemore”	<20	22	21	40	-18
(4) “Bollol Creek Station”	<20	<20	<20	40	<-20
(5) “Matong”	<20	<20	<20	40	<-20
Predicted noise levels from tree clearing and topsoil removal during the construction phase					
(1) “Tarrawonga”	<20	23	<20	40	-17
(2) “Ambardo”	<20	28	24	40	-12
(3) “Templemore”	34	40	39	40	0
(4) “Bollol Creek Station”	30	38	36	40	-2
(5) “Matong”	<20	23	21	40	-17
Combined construction noise levels from surface preparation and construction works					
(1) “Tarrawonga”	<20	24	<20	40	-16
(2) “Ambardo”	21	29	25	40	-11
(3) “Templemore”	34	40	39	40	0
(4) “Bollol Creek Station”	30	38	36	40	-2
(5) “Matong”	<20	24	21	40	-16

Source: Modified after Spectrum Acoustics (2005) – Tables 5, 6 and 7



4.8.5.3.2 Operational Noise

Table 4.30 presents a summary of the predicted noise levels generated by the proposal over the life of the mine assuming the adoption of all the design and operational controls. With the incorporation of the noise controls, all operational noise criteria would be met at all assessment locations. **Figure 4.18** presents the noise contours predicted for Scenarios 3 and 6.

Table 4.30
Predicted Operational Noise Levels - dB(A), $L_{eq}(15min)$

Location	Meteorological Condition				
	Lapse	Inversion	NW wind	Criterion	Differential
2. Commencement of mining					
(1) "Tarrowonga"	<20	34	30	35	-1
(2) "Ambardo"	<20	33	31	35	-2
(3) "Templemore"	<20	34	34	35	-1
(4) "Bollol Creek Station"	<20	33	33	35	-2
(5) "Matong"	<20	28	28	35	-17
3. End Year 1					
(1) "Tarrowonga"	23	33	31	35	-2
(2) "Ambardo"	<20	30	31	35	-4
(3) "Templemore"	<20	32	33	35	-2
(4) "Bollol Creek Station"	<20	31	32	35	-2
(5) "Matong"	<20	27	28	35	-7
4. End Year 3					
(1) "Tarrowonga"	28	33	31	35	-2
(2) "Ambardo"	22	30	30	35	-5
(3) "Templemore"	23	33	33	35	-2
(4) "Bollol Creek Station"	<20	33	32	35	-2
(5) "Matong"	<20	28	28	35	-7
5. Start Year 4					
(1) "Tarrowonga"	22	34	29	35	-1
(2) "Ambardo"	22	32	30	35	-3
(3) "Templemore"	25	35	35	35	0
(4) "Bollol Creek Station"	24	34	34	35	-1
(5) "Matong"	<20	28	28	35	-7
6. End Year 6					
(1) "Tarrowonga"	21	31	28	35	-4
(2) "Ambardo"	20	31	29	35	-4
(3) "Templemore"	21	32	33	35	-2
(4) "Bollol Creek Station"	20	32	32	35	-3
(5) "Matong"	<20	28	28	35	-7

Source: Modified after Spectrum Acoustics (2005) – Tables 8 to 12



4.8.5.3.3 Sleep Disturbance

The impact on sleep disturbance was assessed for each of the five assessment locations.

- Scenario 4 - End Year 3 Mining - incorporating the placement of overburden on the partially completed northern emplacement under both neutral or non noise-enhancing and adverse or noise-enhancing meteorological conditions; and
- Scenario 6 - End Year 6 Mining - incorporating the placement of overburden on the partially completed southern emplacement behind and within 30m of the 15m high acoustic bund, under adverse or noise-enhancing meteorological conditions.

Tables 4.31 and 4.32 present the predicted L_{max} noise levels for the identified scenarios. It is noted that the prevailing southeasterly wind, which is dominant during summer and autumn (see Figure 3.6), causes a reduction in noise levels at all residences.

Table 4.31
Predicted Noise Levels – End Year 3 Mining dB(A), L_{max}

Location (Source*)	Neutral				SE wind			
	1	2	3	4	1	2	3	4
(1) "Tarrawonga"	<20	<20	34	35	<20	<20	27	28
(2) "Ambardo"	<20	<20	29	30	<20	<20	25	26
(3) "Templemore"	<20	<20	29	30	<20	<20	26	27
(4) "Bollol Creek Station"	<20	<20	20	20	<20	<20	<20	<20
(5) "Matong"	<20	<20	21	20	<20	<20	23	23
Location (Source)	NW wind				Inversion			
	1	2	3	4	1	2	3	4
(1) "Tarrawonga"	27	<20	36	36	30	21	38	39
(2) "Ambardo"	25	32	33	34	27	29	35	36
(3) "Templemore"	29	36	36	37	31	24	38	39
(4) "Bollol Creek Station"	28	31	35	36	33	31	37	38
(5) "Matong"	20	29	29	29	23	31	31	31
*Noise sources included in the L_{max} Calculations: 1. Filling trucks at coal processing facility; 2. Excavator and haul trucks 10m below ground level in the N Pit;					3. Placing overburden at the southern end of the northern emplacement area; and 4. Dozer operating at the emplacement area.			
Source: Modified after Spectrum Acoustics (2005) – Tables 13(a) and 13(b)								

Given the Proponent's commitment to avoid construction of the 15m high acoustic bund on the southern emplacement during night time and to undertake all night-time out-of-pit overburden placement activities behind and within 30m of the bund, the sleep disturbance noise criteria would be met at all assessment locations. The Proponent would also, unless unavoidable for operational or safety reasons, preferentially place overburden within the in-pit emplacement between the hours of 10:00pm and 7:00am, thereby further reducing the possibility of sleep disturbance.



Table 4.32
Predicted Noise Levels – End Year 6 Mining dB(A),L_{max}

Location (Source*)	Neutral				SE wind			
	1	2	3	4	1	2	3	4
(1) "Tarrawonga"	<20	<20	<20	<20	30	30	24	24
(2) "Ambardo"	<20	<20	<20	<20	26	35	21	22
(3) "Templemore"	<20	<20	31	31	24	30	30	31
(4) "Bollol Creek Station"	<20	<20	29	30	24	29	30	31
(5) "Matong"	<20	<20	24	24	22	32	23	23
Location (Source)	NW wind				Inversion			
	1	2	3	4	1	2	3	4
(1) "Tarrawonga"	22	26	34	35	30	30	37	39
(2) "Ambardo"	25	33	37	38	26	35	40	41
(3) "Templemore"	26	27	51	53	24	30	52	53
(4) "Bollol Creek Station"	26	27	48	50	24	29	49	51
(5) "Matong"	20	31	39	40	22	32	40	41
(6) "Flixton"	<20	28	35	36	<20	29	36	37
*Noise sources included in the LA _{max} calculations: 1. Filling trucks at coal processing facility; 2. Excavator and haul trucks 10m below ground level in the C Pit; 3. Placing overburden at the eastern end of the southern emplacement area; and 4. Dozer operating at the emplacement area.								
Source: Modified after Spectrum Acoustics (2005) – Tables 14(a) and 14(b)								

4.8.5.3.4 Transportation Noise and Vibration

Transportation Noise

Transportation noise for the proposed East Boggabri Coal Mine was considered for the northern section of the proposed transport route between the Project Site and the Whitehaven Coal Mine, as well as the southern section between the Whitehaven Coal Mine and the Whitehaven CHPP. Given the existing use of the southern section of the proposed transport route between Whitehaven Coal Mine and the Whitehaven CHPP for the transportation of coal from the Whitehaven Coal Mine, transportation of coal from the proposed East Boggabri Coal Mine was assessed as a cumulative impact (see Section 4.8.5.4.2).

The closest non-project related residences to the northern section of the proposed transport route are the 'Kyalla' and 'Pine Grove' residences, located 200m and 250m respectively from the route. All other non-project related residences are >250m from the northern section of the proposed transport route with localised intervening topography and/or vegetation. As such, compliance with traffic noise criteria at the 'Kyalla' and 'Pine Grove' residences would indicate compliance at all other residences along the entire northern section of the proposed transport route.

For truck movements in the vicinity of the 'Pine Grove' residence, a truck speed of 60km/hr was assumed, given the approach distance to the intersection with Manilla Road. Similarly, it was assumed in the modelling that the use of exhaust brakes near 'Pine Grove' would be prohibited.



Adopting worst-case meteorological conditions with respect to the “Kyalla” and “Pine Grove” residences, worst case noise levels at these residences of 43dB(A) and 41dB(A) $L_{eq(1 \text{ hour})}$ respectively were predicted. Whilst, this is well within the traffic noise criteria of 60dB(A) $L_{eq(1 \text{ hour})}$ it is likely that residents of “Kyalla” and “Pine Grove” would notice the change in the noise climate.

Vibration

Vibration can be caused by trucks travelling on public roads. Extensive research by Rainer (1982) established that there would be “no danger of cracks originating from passing traffic if the vibration acceleration limit for a building is $<50\text{mm/s}^2$ ”.

The previous assessment of traffic-related vibration associated with the Whitehaven Coal Mine (WCM, 2004) established that the vibration level at 70m from Blue Vale Road from a passing truck would be 7.5mm/s^2 or only 16% of the 50mm/s^2 recommended limit. In light of this calculation and its continued relevance, no adverse impacts are predicted for residences on properties adjoining the proposed transport route.

4.8.5.4 Cumulative Impacts

4.8.5.4.1 Project Site Noise

Table 4.33 presents the predicted cumulative noise levels at the five assessment locations in the vicinity of the Project Site, assuming the worst-case scenarios described in **Table 4.28**.

Table 4.33
Cumulative Noise Predictions

Assessment Location	Meteorological Condition							Criterion	Differential
	Inversion			NW wind					
	EBCM ¹	BCP ²	Total	EBCM	BCP	Total			
Initial Mining Scenario									
(1) “Tarrawonga”	34	25	35	30	22	31	35	0	
(2) “Ambardo”	33	25	34	31	25	32	35	-1	
(3) “Templemore”	34	32	36	34	32	36	35	1	
(4) “Bollol Creek Station”	33	32	36	33	32	36	35	1	
(5) “Matong”	28	28	31	28	28	31	35	-4	
Start Year 4 Scenario									
(1) “Tarrawonga”	34	25	35	29	21	30	35	0	
(2) “Ambardo”	32	24	33	30	23	31	35	-2	
(3) “Templemore”	35	30	36	35	30	36	35	1	
(4) “Bollol Creek Station”	34	30	36	34	30	36	35	1	
(5) “Matong”	28	25	30	28	26	30	35	-5	
¹ East Boggabri Coal (values from Table 4.29) ² Boggabri Coal Company. EBCM = proposed East Boggabri Coal Mine BCP = Boggabri Coal Project Source: Modified after Spectrum Acoustics (2005) – Tables 16 and 17									



A minor exceedance of 1dB(A) is predicted at the closest residences, ie. “Templemore” and “Bollol Creek Station” during worst-case operational scenarios and meteorological conditions.

The likelihood of these worst-case configurations is considered small, noting the Boggabri Coal Project was modelled with all mining at surface level. The impact of these unlikely and minor exceedances is therefore considered minor and manageable through a maintained dialogue with the residents of the two affected residences.

4.8.5.4.2 Transportation Noise

An understanding of the level of noise currently produced by trucks travelling between the Whitehaven Coal Mine and the Whitehaven CHPP was achieved in December 2004 through the placement of a noise logger 20m from the edge of the transport route. Average $L_{Aeq}(1 \text{ hour})$ levels of between 56dB(A) and 61dB(A) were recorded with 61dB(A) adopted as the noise level of the existing coal transport operations along Sections 5 to 7 of the southern section of the proposed transport route. Transportation of coal from the proposed East Boggabri Coal Mine could result in an increase of up to 150% in the number of trucks using the route.

Increasing the number of identical vehicles by this amount would result in a cumulative level of 65dB(A) $L_{Aeq}(1 \text{ hour})$ at a distance of 20m. Assuming a 3dB(A) decrease in noise level with a doubling of distance as noted in the Environmental Criteria for Road Traffic Noise, compliance with traffic noise criteria of 60dB(A); $L_{Aeq}(1 \text{ hour})$ at the predicted traffic levels would be satisfied at a distance of approximately 60m.

The closest residences to the southern section of the proposed transport route have been recorded as:

- 70m on Blue Vale Road;
- 90m on the Kamilaroi Highway; and
- 650m on Hoads Lane.

The traffic noise criterion of 60dB(A) would therefore be met for cumulative noise impacts associated with the concurrent transport operations from the Whitehaven Coal Mine and the proposed East Boggabri Coal Mine.

4.8.6 Monitoring

A noise monitoring program would be established by the Proponent, in consultation with the DEC, prior to the commencement of the proposed East Boggabri Coal Mine. The monitoring would be designed to initially validate the predictions arising from the modelling and then record noise levels against the project noise criteria. Two forms of monitoring are proposed.

- (i) Noise Model Validation: attended and unattended monitoring at the “Templemore” and “Bollol Creek Station” residences during construction and site establishment activities and during initial mining activities. Assuming validation of model predictions, monitoring would revert to ongoing compliance monitoring.



- (ii) Ongoing compliance monitoring: yearly attended and unattended monitoring at the “Templemore” and “Bollol Creek Station” residences to monitor compliance with operational noise criteria. Annual attended monitoring would also be undertaken at the “Kyalla” and “Pine Grove” residence and an agreed location along Sections 5 to 7 of the proposed transport route to monitor compliance with traffic noise criteria.

Monitoring would also be considered at any other residence whose occupants consider noise levels attributable to the mine development are excessive.

The results of monitoring would be provided to the DEC/DIPNR in the AEMR along with the identification of any refinements to safeguards and noise controls implemented as a consequence of the monitoring.

4.9 BLASTING

4.9.1 Introduction

Blasting of the competent overburden and interburden materials would be undertaken generally in accordance with proposed blasting design parameters previously described in Section 2.4.4.3.

The following sub-sections identify the emissions resulting from blasting, the criteria adopted for assessing blast impacts and the proposed design and operational safeguards, and provide an assessment of impacts from the proposed blasting activities at the surrounding residences. The criteria for assessment and the resulting ground vibration and airblast overpressure impacts have been drawn from the blasting component of a noise and vibration assessment conducted by Spectrum Acoustics Pty Ltd whose report is provided in full as Part 7 of the *Specialist Consultant Studies Compendium*.

4.9.2 Emissions From Blasting

The potential blasting emissions include:

- ground vibrations;
- air vibrations (noise and airblast);
- fly rock; and
- dust.

Each of these emissions is highly transient and, through the implementation of appropriate safeguards in blast design and procedures, can be limited to a level where:

- (i) the safety of the public, mine employees and visitors is not threatened;
- (ii) ground vibration from blasting is at acceptable levels and ensures the continued integrity of any nearby dwellings, structures and facilities;



- (iii) noise and ground and air vibrations have no impact on livestock adjacent to, or on, the Project Site;
- (iv) noise and air vibration levels at nearby residences are within acceptable limits and compatible with the safety and comfort of human beings; and
- (v) the generation of dust is minimised and maintained at acceptable levels.

4.9.3 Assessment Criteria

Annoyance Criteria

The impacts associated with blasting are assessed based on the ANZECC “annoyance” criteria which are routinely specified in development consents and environment protection licences for open cut coal mines.

- The recommended maximum overpressure level for blasting is 115dB (Linear).
- The level of 115dB (Linear) may be exceeded for up to 5% of the total number of blasts over a 12 month period, but should not exceed 120dB (Linear) at any time.
- The recommended maximum vibration velocity for blasting is 5mm/s Peak Vector Sum (PVS).
- The PVS level of 5mm/s may be exceeded for up to 5% of the total number of blasts over a 12 month period, but should not exceed 10mm/s at any time.
- Blasting is only permitted during the hours of 9:00am to 5:00pm Monday to Saturday, and should not take place on Sundays and Public Holidays.
- Blasting occurs no more than once per day.

Criteria could also be developed based on issues related to building damage. However, as the annoyance criteria discussed above are significantly more stringent than the building damage criteria, they would be taken as the governing criteria for the proposal.

Safety Criteria

It is fundamental that blasting does not injure any person or animal or damage property through the generation of fly rock. Blasting, by its very nature, requires rocks to be broken and propelled away from the blast site.

For the purpose of this document, the area in which blasted rock should normally fall is referred to as the blast envelope with any rock propelled beyond the blast envelope referred to as “fly rock”. From a safety perspective, the Department of Primary Industries (Mineral Resources) typically nominates a distance of 500m from a blast in a coal mine as a safe distance. This distance is not site specific and consequently is recognised to be conservative. Invariably, coal mines comparable in size to the proposed East Boggabri Coal Mine operate with a blasting envelope of 100m to 200m from a blast site.



4.9.4 Design and Operational Safeguards

4.9.4.1 General Blast Design

Central to all safeguards is the conservative design and careful implementation of each blast to minimise impacts, ie. designing each blast to satisfy environmental and public safety requirements as the first priority, with ongoing blast design refinement based on measured operational and environmental performance. Blast design and implementation would be undertaken by a suitably qualified blasting engineer and/or experienced and appropriately certified shot-firer.

Careful design is also fundamental to safe, successful blasting. Industry has developed best practice procedures centred around the design of blasts that ensure:

- (i) airblast overpressure and ground vibration levels are within nominated limits;
- (ii) the require fragmentation (the size of broken rock) is achieved; and
- (iii) all rock that is blasted is contained in a pre-determined blast envelope.

Blast design for the proposal would include the following features to meet these industry standards.

- Ensuring that burden distances and stemming lengths are such that explosion gases are almost completely without energy by the time they emerge into the atmosphere.
- Ensuring that charges consistently detonate in carefully designed sequences.

4.9.4.2 Air Vibrations (Noise and Airblast)

When a confined explosive charge (ie. a charge within a blasthole) detonates, the resulting explosion gases break and then displace the rock to produce a well fragmented and loose pile of blasted rock (or muckpile).

If some of the gaseous expansion energy escapes into the atmosphere, it is manifested as:

- **Noise** - the audible part of the air vibration spectrum; and
- **Airblast** - the remaining sub-audible part of the air vibration spectrum.

Airblast is also created where a rock face, ie. a rock/air interface, is heaved forwards or upwards by the explosion gases. However, where blast design is sub-standard, airblast can vibrate buildings, thereby disturbing or possibly annoying or worrying the occupants. The noise level created by a blast is, however, a very poor indicator of damage potential.



Noise and airblast generation would be controlled by ensuring that all, or nearly all, of the explosion energy is consumed in fragmenting and displacing the overburden by the time the gases vent (via the broken burden rock and/or ejected stemming material) into the atmosphere. This objective would be met by ensuring that:

- where practicable, the blast face is orientated away from or at an oblique angle to nearby residences;
- blasthole spacing is implemented in accordance with blast design;
- the burden distance and stemming length are carefully selected and then implemented precisely;
- appropriate materials, eg. 20mm aggregates, are used for stemming;
- charges detonate in the correct sequence and with inter-row delays that provide good progressive release of burden; and
- the maximum weight of explosive detonated in a given delay period (the maximum instantaneous charge (MIC)) is limited to conservative and proven levels.

Subsequent refinements of these controls would be implemented on the basis of the blast monitoring program.

4.9.4.3 Ground Vibrations

When a confined explosive charge detonates, a fraction of the liberated energy is manifested as seismic energy, ie. as ground vibrations. The magnitude of ground vibrations depends upon:

- (a) the MIC for the blast;
- (b) the distance between the blast and a residence or sensitive structure; and
- (c) the characteristics of the intervening material (rock, soils, geological structures, etc.) through which the ground vibration wave propagates.

Ground vibration would be controlled by ensuring:

- the minimum practicable weight of explosive detonates at an instant, ie. minimising the MIC, by using the maximum number of delay periods in each blast; and
- most of the energy liberated by the charge(s) on a given delay number is consumed in providing good fragmentation, adequate displacement and/or a loose, highly diggable muckpile, rather than in creating ground vibrations, ie. by ensuring that the burden distance and effective sub-drilling are not too large.



4.9.4.4 Dust and other Post-blast Emissions

When a blast is initiated, some dust would be created as a result of:

- (a) partial or complete ejection of the stemming column;
- (b) the escape of explosion gases through discontinuities and cracks in the face; and/or
- (c) impacts between rock fragments and between rock fragments and the active floor of the mine.

Blast-generated dust would be minimised by ensuring that stemming columns are not ejected for considerable distances into the atmosphere. Stemming column lengths would be such that their ejection velocities are low.

Additionally, the blasting contractor would be required to use aggregates for blasthole stemming and to use nonel delay-type or electronic detonators to initiate charges. The use of nonel-type delay or electronic detonators would avoid the requirement for detonating cord downlines and, with the absence of detonating cord trunklines (ie. surface lines), prevents the dust cloud that is formed when such trunklines detonate on a dry dusty surface.

4.9.4.5 Community Notification

Given that blast-generated noise is impulsive and may startle people if unexpected, the Proponent would employ the following blast notification procedures.

- The proposed blasting schedule would be provided to all residents within 3km of the blast ie. to the residents of each of the “Nagero”, “Thuin”, “Merriown”, “Templemore”, “Bollol Creek Station”, “Tarrawonga” and “Ambardo” . The notification procedures, which would include advance notice of the intended date and time of each proposed blast and a verbal confirmation on the day of the blast, would be continued throughout the life of the proposed open cut mine. Documentary evidence of the notification, together with the results of the blast monitoring, would be retained at the mine office.
- The Proponent would erect a blast notice board near the mine entrance on Goonbri Road notifying passing motorists when the next blast is programmed, and at what time.

4.9.5 Assessment of Impacts

4.9.5.1 Introduction

This sub-section assesses the potential impacts associated with blast-induced ground and air vibration, blast rock and dust. The potential blast-induced noise and vibration impacts are addressed in detail in Spectrum Acoustics (2005), while dust and other gas emissions associated with blasting are addressed in detail as part of the air quality assessment provided as Part 8 of the *Specialist Consultant Studies Compendium*.



The predictions of impacts discussed in this sub-section are supported by the experience gained during the mining operations at the Whitehaven Coal Mine over the past 5 years. During that period, blasts comparable to those planned for the proposed East Boggabri Coal Mine have not caused any reported conflicts regarding the personal safety of any neighbouring residents or stock.

It is noted that due to the short duration and highly infrequent nature of the blasts, cumulative impacts were not assessed. Put simply, it would be unlikely for both the proposed East Boggabri Coal Mine and Boggabri Coal Project to initiate blasts on the same day and highly unlikely for blasts to occur simultaneously. As such, there is no need to assess impacts cumulatively. Notwithstanding, the Proponents would liaise with the operators of the Boggabri Coal Project to eliminate the possibility of simultaneous blasts.

4.9.5.2 Assessment Methodology

Based on the initial drilling and blasting parameters presented in **Table 2.5**, airblast overpressure and ground vibration were predicted using the following equations:

$$\text{Airblast Overpressure (OP)} = 165 - 24(\log_{10}(D) - 0.3 \log_{10}(Q)),$$

where D is distance from the blast to the assessment point (m), and
 Q is the weight of explosive per delay (MIC, kg).

As this equation has often been found to underestimate blast overpressure levels by up to 3dB(A), so 3dB(A) has been added to the predicted levels for presentation in this report.

Blast (Ground) Vibration levels calculated as Peak Particular Velocity, may be predicted using the following equations.

$$\text{PPV} = 1140 \left(\frac{D}{Q^{0.5}} \right)^{-1.6}, \text{ mm/s (for average ground type)}$$

$$\text{PPV} = 500 \left(\frac{D}{Q^{0.5}} \right)^{-1.6}, \text{ mm/s (for hard rock)}$$

where D is distance from the blast to the assessment point (m), and
 Q is the weight of explosive per delay (MIC, kg).

Based on the relatively hard conglomerate interburden above and between the coal seams, a coefficient value of 700 is considered appropriate by Spectrum Acoustics (2005) for predicting ground vibrations levels.



4.9.5.3 Air and Ground Vibration

Figure 4.19 presents the predicted airblast overpressure and ground vibration using values of 960kg and 1 952kg to represent the MICs in medium and large blasts, with the predicted values at the nearest non-project related residences identified. These curves indicate the proposal would be comply with air and ground vibration criteria at all non-project related residences. As a result, there would unlikely be any significant impact associated with either airblast overpressure or ground vibration on surrounding residences.

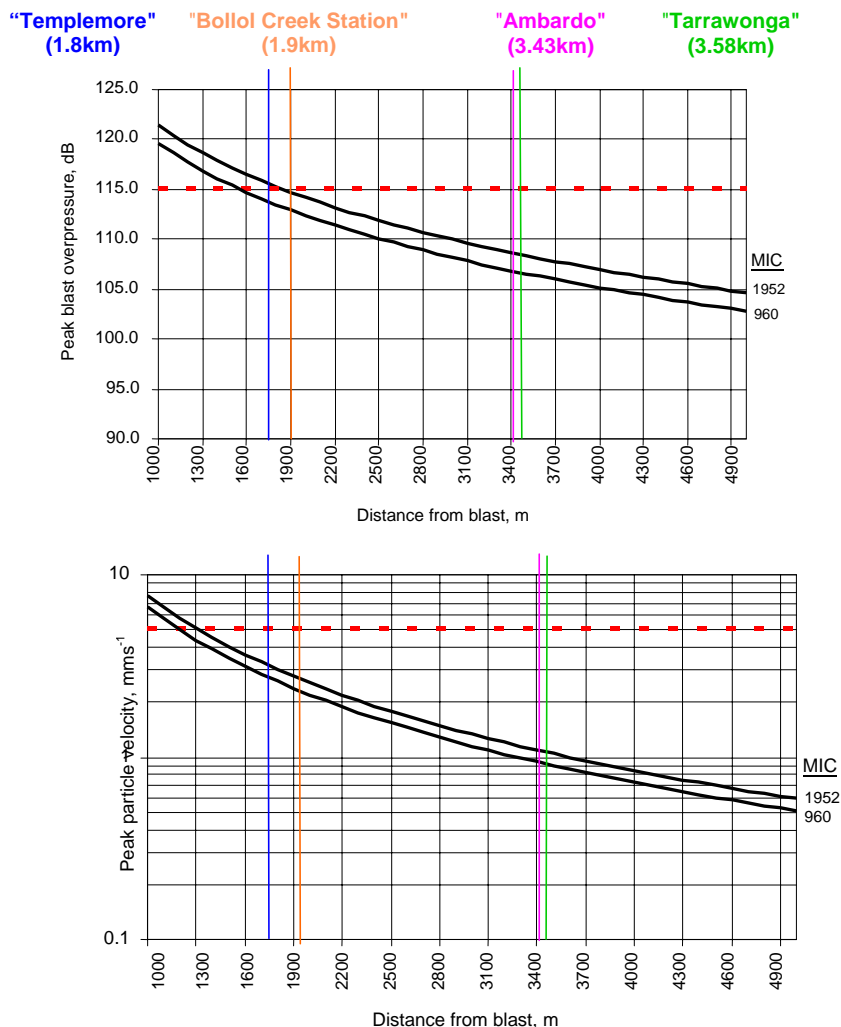


Figure 4.19
Predicted Airblast Overpressure and Ground Vibration

Notwithstanding, the Proponent and nominated blasting engineer would closely monitor the blasting impacts and relate measured airblast and ground vibration levels to the MIC and other factors. This information would enable the blasting engineer to adjust the MIC to ensure that blasting criteria are satisfied at all surrounding residences. It is also noted that because mining is planned to commence at the most distant part of the open cut from the assessment locations, the opportunity would exist to demonstrate blasts are appropriately designed well before moving closer to these residences.



4.9.5.4 Fly Rock

The proposed approach to blast design and monitoring of any rock propelled from the blast site would ensure that an acceptable level of impact is achieved and that no person or stock is endangered.

4.9.5.5 Dust and Other Gas Emissions

Dust and other gas emissions generated as a result of blasting are assessed as part of an air quality impact assessment (see Section 4.10). The adoption of the safeguards described in Section 4.10.5, however, would ensure dust generated as a result of blasting is minimised.

4.9.5.6 Livestock

Animals are generally more affected by airblast than ground vibration resulting from blasting. Research into the effects of sonic booms from aircraft (Bond, 1974), which are similar in character to airblast waves, has shown that while an initial startle response after each boom was noticed in beef cattle or ponies, the degree of startle declined rapidly after the first boom and no affect on eating patterns, feed intake or behavioural activity was noted.

Animals exposed to ground vibration for the first time would startle but, without continuance of the vibration, would normally settle quickly and with each additional exposure, the startle response would diminish. Hunt (1999) reported that in paddocks of the Orange Agricultural College adjacent to a rail line, it is common to feel ground vibrations as the XPT passes at speed, but that the sheep, horses and cattle do not seem to react to that vibration.

4.9.6 Blast Monitoring

Blast vibration / airblast overpressure monitors would initially be positioned at the “Bollol Creek Station”, “Templemore” and “Tarrawonga” residences. Additional monitors would be installed as required at other surrounding residences and within the Project Site itself. Data obtained would be assessed following each blast and analysed to more accurately determine the local ground characteristics and to develop site laws for the overburden / interburden.

Following each blast, the blast monitors would be downloaded and the monitoring results forwarded to the appropriate mine personnel for review and, if required reporting.

4.10 AIR QUALITY

4.10.1 Introduction

This sub-section describes the existing air quality surrounding the proposed East Boggabri Coal Mine, identifies air quality guidelines and criteria relevant to the proposal and presents the air quality goals to be adopted by the Proponent. The proposed operational safeguards, mitigation measures and management procedures proposed are outlined and the sub-section concludes with the assessment of the potential impacts of the proposal on the local air quality. The information presented is drawn largely from an air quality impact assessment undertaken by Richard Heggie Associates Pty Ltd (RHA, 2005) whose report is reproduced in full as Part 8 of the *Specialist Consultant Studies Compendium*.



Dust generation would be one of the main air quality issues on the Project Site. Depending upon the size and concentration of particles in the air and their composition, airborne dust has the potential to affect human health as well as contribute to the general degradation of the environment. The human respiratory system has a built-in defensive system that prevents particles with an aerodynamic diameter larger than about $10\mu\text{m}$ from reaching sensitive areas of the respiratory system. Particles smaller than this are referred to as PM_{10} particles. As particles larger than $10\mu\text{m}$ can also contribute to environmental degradation, the air quality assessment also considers the total mass of particles suspended in the air, ie. Total Suspended Particulate matter (TSP). Particles that have an aerodynamic sufficiently large so as not to be suspended in air are referred to as deposited dust.

Large amounts of fuel would be used each year as part of the proposal with an estimated 5 250kL required for mining and processing activities and a further 2 600kL for transportation between the coal processing area and Whitehaven CHPP. NO_2 , SO_2 and greenhouse gases are emitted as a result of fuel use and, where present in substantial concentrations, can have detrimental environmental effects such as damaging leaf surfaces, limiting plant growth and in worst case scenarios, may lead to acid rain formation and acidification of soils. High concentrations of NO_2 and SO_2 have also been shown to impact on human health through decreasing lung function, lung inflammation and general exacerbation of symptoms in individuals with respiratory conditions such as asthma (DEC, 2000). The effects of greenhouse gas emissions on global temperatures, most notably the Greenhouse Effect, are well documented.

As a consequence of these potential impacts, the air quality assessment also investigates the predicted emission of these gases.

4.10.2 Existing Air Quality

4.10.2.1 Introduction

Air quality standards and goals refer to pollutant levels which include both the operational and existing sources. To fully assess impacts against all the relevant air quality standards and goals, it is therefore necessary to have information or estimates on existing dust and particulate matter concentrations and deposition levels, and the existing concentrations of SO_2 and NO_2 .

In the absence of site-specific air quality data, estimates for background dust and particulates, and emissions of SO_2 and NO_2 , have been attained through an assessment of the local environment and comparison to monitoring undertaken at nearby locations.

4.10.2.2 Dust Deposition

An estimate of background dust deposition levels for the Project Site has been derived from dust deposition data obtained from monitoring points within and surrounding the Whitehaven Coal Mine approximately 10km south of the Project Site. Monitoring of dust deposition levels has been undertaken since July 2000 at up to 18 locations. The results presented in **Table 4.34**, which represent dust deposition attributable to the agricultural activities on the surrounding



landholdings, natural sources and the activities undertaken at the Whitehaven Coal Mine, would provide an overestimate of background levels. Consequently, in the absence of Project Site specific data, an annual average of 1.3g/m²/month as obtained from gauges distant from the Whitehaven Coal Mine, is considered a conservative and appropriate estimate of background levels.

Table 4.34
Background Dust Deposition Levels (Whitehaven Coal Mine)

Site Location	Monitoring Period	Total Insoluble Solids (Non Filtrable Residue) g/m ² /month	Non Combustible Material (Ash) g/m ² /month
Gauges located adjoining the Whitehaven Coal Mine			
WD1 "Whitehaven"	Jan 03 – Dec 03	1.6	1.0
WD10 "Merton"	Jan 03 – Dec 03	2.7	1.6
WD11 "Merton"	Jan 03 – Dec 03	2.6	1.8
WD13 "Womboola"	Jan 03 – Dec 03	3.3	2.4
Average		2.5	1.7
Gauges located distant from the Whitehaven Coal Mine			
WD2 "Merton"	Jan 03 – Dec 03	2.9	1.3
WD5 "Wilga"	Jan 03 – Dec 03	1.0	0.7
WD6 "Bungalow"	Jan 03 – Dec 03	0.7	0.3
WD7 "Will-gai"	Jan 03 – Dec 03	1.1	0.6
WD8 "Gundawarra"	Jan 03 – Dec 03	1.3	0.9
WD9 "Woodlands"	Jan 03 – Apr 03	0.1	0.1
WD14 "Bungalow"	Jan 03 – Dec 03	1.7	0.6
Average		1.3	0.6
Source: Modified after RHA (2005) - Table 2			

4.10.2.3 Particulate Matter

"*Particulate matter*" refers to airborne particles typically 0.1µm to 50µm in aerodynamic diameter. Particles less than 10µm and 2.5µm are referred to as PM₁₀ and PM_{2.5} particles respectively.

Background particulate matter has been estimated using verified data from 2003 for 24-hour average PM₁₀ concentrations at the NSW DEC air quality monitoring site in Tamworth, approximately 110km southeast of the proposed East Boggabri Coal Mine. Data from 2003, which was used in preference to that from more recent years as this data set represents the most recent validated data set available from the DEC (as of March 2005), identifies the annual average PM₁₀ concentration as 18µg/m³ ⁽⁸⁾. A conservatively high background total suspended particulate (TSP) level, estimated by multiplying the annual average PM₁₀ concentrations by a factor of 2 (US EPA, 2001), has been established as 36µg/m³.

⁸ Elevated PM₁₀ concentrations (>40µg/m³) occurring between 8 January 2003 and 22 March 2003 have been excluded from the data set as these are likely a result of bushfire activity in the Tamworth area during this time (DEC, 2004)



4.10.2.4 Nitrogen Dioxide and Sulfur Dioxide

Current emissions of both nitrogen and sulfur dioxide are assumed to be insignificant, as they only occur due to human activities (of which there are none of any significance within the immediate vicinity of the Project Site).

4.10.2.5 Summary of Existing Air Quality

Background deposition, particulate matter and nitrogen and sulfur dioxide emission levels are summarised in **Table 4.35**.

Table 4.35
Background Air Quality Environment for Assessment Purposes

Air Quality Parameter	Averaging Period	Assumed Background Level
TSP	Annual	36µg/m ³
PM ₁₀	24-Hour	Varies*
	Annual	18µg/m ³
Dust	Annual	1.3g/m ² /month
NO ₂ /SO ₂	All Periods	Negligible
*Note: Daily-varying 24-hour average PM ₁₀ concentrations have been used within the PM ₁₀ modelling.		
Source: Modified after RHA (2005) – Table 3		

4.10.3 Potential Sources of Air Contaminants

4.10.3.1 Particulate Emissions

The main sources of dust generated during the development and operation of the proposed mine and use of the proposed transport route would include:

- mining activities (including vegetation clearing, soil stripping, overburden ripping and placement, and drilling and blasting activities);
- road and hardstand area construction (on-site);
- road construction and delivery of road construction materials;
- coal processing area activities (crushing / screening plant, front-end loader);
- wind erosion off areas within the open cut area, emplacements and soil stockpiles;
- general movement of heavy vehicles on unsealed roads within the site (haul truck wheel dust); and
- transportation of product coal between the Project Site and the Whitehaven CHPP and rail loading facility.



4.10.3.2 Greenhouse and Other Gas Emissions

The proposal has the potential to generate greenhouse and other polluting gas emissions from a number of sources, including:

- the combustion of fuel by diesel-powered equipment and vehicles, including front-end loaders, excavators, bulldozers, scrapers, graders, drill rigs, explosives trucks and haul trucks;
- combustion of diesel fuel for on-site power generation for the processing plant, mine facilities, and lighting towers;
- the use of explosives during blasting; and
- the release of coal bed methane.

Although carbon dioxide (CO₂) would be the principal gas produced, greenhouse gases emitted as a result of the proposed coal mining operations at the proposed East Boggabri Coal Mine would also include carbon monoxide (CO), methane (CH₄), oxides of nitrogen (NO_x), SO₂ and non-methane volatile organic compounds (NMVOCs).

4.10.3.3 Boggabri Coal Project

Construction and operation of the Boggabri Coal Project would result in the generation of particulate matter, vehicle exhaust emissions and greenhouse gases from sources similar to those of the proposed East Boggabri Coal Mine. It has also been assumed that the generation of particulate matter and other contaminants from each source would be at rates similar to those of the proposed East Boggabri Coal Mine. Greater detail is provided in Section 4.10.6.2 as to how this assumption was used to assess the cumulative impacts on air quality.

4.10.4 Air Quality Guidelines

4.10.4.1 Particulate Matter and Dust Deposition

The NSW DEC specifies air quality criteria in their document “*Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales*”. These criteria have been used to establish the air quality goals for the proposal to protect surrounding residents from adverse health effects and also maintain the amenity of the surrounding environment. The air quality goals used during the air quality assessment are presented in **Table 4.36**.

Deposited dust, though not affecting public health can, if present at sufficiently high levels, cause nuisance impacts and reduce the amenity of an area to such an extent that lifestyles or activities such as farming cease to be either enjoyable or viable. The NSW DEC sets criteria for dust deposition levels under which nuisance would be avoided. These criteria are summarised in **Table 4.37**.



Table 4.36
Air Quality Goals for Particulate Matter Concentrations

Pollutant	Standard	Averaging Period	Agency
Total suspended particulate matter (TSP)	90µg/m ³	Annual mean	NHMRC
Particulate matter <10µm (PM ₁₀)	50µg/m ³	24-hour maximum	NSW DEC
	30µg/m ³	Annual mean	NSW DEC long-term reporting goal
	50µg/m ³	(24-hour average, 5 exceedances permitted per year)	NEPM
Particulate matter <2.5µm (PM _{2.5})	8µg/m ³	Annual mean	NEPM*
	25µg/m ³	24-hour maximum	NEPM*
*Long-term reporting goal, not yet applied to projects in NSW			
Source: Modified after RHA (2005) – Section 3			

Table 4.37
DEC Criteria for Allowable Dust Deposition

Averaging Period	Maximum Increase in Deposited Dust Level	Maximum Total Deposited Dust Level
Annual	2g/m ² /month	4g/m ² /month
Source: NSW DEC (2001)		

4.10.4.2 Nitrogen and Sulfur Dioxide Emissions

The World Health Organisation (WHO) has established recommended guideline values for NO₂ and SO₂ emissions as outlined in **Table 4.38**. In June 1998, the (Australian) National Environment Protection Council of Environment Ministers agreed to set uniform health standards for ambient air quality to apply to all States and Territories. These standards are contained in the National Environment Protection Measure (NEPM) for ambient air quality. Over an averaging period of one hour the NEPM standard for NO₂ has been set as 230µg/m³. The allowable exceedance for this standard is one day per year.

Table 4.38
World Health Organisation Air Quality Guidelines – NO₂ and SO₂

Pollutant	Averaging Time	Maximum Concentration	Agency
Nitrogen dioxide (NO ₂)	1 Hour Maximum	230µg/m ³	NEPM
	Annual	40µg/m ³	WHO
Sulfur Dioxide (SO ₂)	10 Minutes	500µg/m ³	WHO
	24 Hours	125µg/m ³	WHO
	Annual	50µg/m ³	WHO/NEPM
Source: Modified after RHA (2005) – Tables 5 and 6			



4.10.4.3 Greenhouse Gas Emissions

While no specific guidelines are provided as to the maximum emissions of greenhouse gases, the *National Greenhouse Gas Inventory* (Australian Greenhouse Office, 1990) estimates of the carbon dioxide emissions allow for an assessment as to the relative level of impact the proposal would have on Australian greenhouse gas emissions. The emission estimates for Australia and the Energy and Transformation sub-sector are as follows.

- 1990 Total Australian Emissions: 503 299 kilotonnes CO₂-equivalent.
- 1990 Energy and Transformation Sub-sector: 142 284 kilotonnes CO₂-equivalent.

4.10.4.4 Project Air Quality Goals

The specific goals being applied to the proposed East Boggabri Coal Mine, which conform to current DEC air quality goals, are as follows.

PM₁₀: A 24-hour maximum of 50µg/m³ (DEC/NEPM)
An annual average of 30µg/m³ (DEC)

PM_{2.5}: A 24-hour maximum of 25µg/m³ (NEPM)
An annual average of 8µg/m³ (NEPM)

Dust: Nuisance expected to impact on residential areas when annual average dust deposition levels exceed 3.3g/m²/month (DEC)

SO₂: A 10-minute maximum of 500µg/m³ (WHO)
A 24-hour maximum of 125µg/m³ (WHO)
An annual average of 50µg/m³ (WHO / NEPM)

NO₂: A 1 hour maximum of 230µg/m³ (NEPM)
An annual average of 40µg/m³ (WHO)

4.10.5 Operational Air Quality Controls

4.10.5.1 Introduction

The Proponent would apply a wide range of air pollution control measures to ensure air quality standards are not compromised by its activities. These operational controls have been categorised as either dust control measures or controls for other air contaminants.



4.10.5.2 Dust Control Measures

The proposed controls to the primary dust generation sources identified in Section 4.10.3.1 are presented as follows.

- | | |
|--|---|
| Vegetation clearing and soil stripping | <ul style="list-style-type: none"> • Cleared trees and branches would be retained for use in stabilising slopes identified for rehabilitation with native woodland communities. No burning of vegetation would be permitted. • Where practicable, soil stripping would be undertaken at a time when there is sufficient soil moisture to prevent significant lift-off of dust. • Whenever possible, the Proponent would avoid stripping soil in periods of high winds. • Dust suppression by water application would be used to increase soil moisture should stripping occur during periods of high wind or low soil moisture. |
| Drilling and blasting activities | <ul style="list-style-type: none"> • The drill rig would utilise water injection or alternatively, be fitted with dust collectors. • The use of aggregates for blast hole stemming to prevent venting of explosion gases. • Conducting blasting both before the establishment, and after the break-up of low-level atmospheric temperature inversions which typically occur after 4:00pm and can remain until 8.00am. |
| Overburden ripping and placement | <ul style="list-style-type: none"> • Ripping of softer overburden material would be avoided during periods of high wind. |
| Coal Mining | <ul style="list-style-type: none"> • Low moisture coal would be sprayed with water prior to excavation to raise moisture content to >5.5%. |
| Road and hardstand area construction (on-site) | <ul style="list-style-type: none"> • Clearing ahead of construction activities would be minimised. • Cleared areas would be watered regularly during construction. |
| Road Construction and delivery of construction materials | <ul style="list-style-type: none"> • Clearing ahead of road construction would be minimised. • Active construction areas would be watered regularly. • Truck speeds on roads under construction would be restricted to <60kph. • Transport route sections 2, 3 and 4 would be sealed prior to transportation of construction materials for Section 1. • Some flexibility would exist to temporarily cease dust generating operations in the event of protracted dry periods, high winds, and significant dust generation and dispersal towards the surrounding residences. |



- Crushing and screening
- Notwithstanding the moist nature of the ROM coal, water would be applied to the coal at the feed hopper, crusher and at all conveyor transfer and discharge points at the rate of approximately 1.5L/t coal processed. This rate of application has been established to be effective at the nearby Whitehaven Coal Mine.
 - All conveyors would be fitted with appropriate cleaning and collection devices to minimise the amount of material falling from the return conveyor belts.
 - Some flexibility would exist to temporarily cease operation in the event of protracted dry periods, high winds, and significant dust generation and dispersal towards the surrounding residences.
- Wind erosion of open pit and stockpiles
- Minimising the extent of clearing/site preparation in advance of mining.
 - Clear definition of any access or haul roads and the restriction of vehicles and equipment to those roads.
 - Routine application of water with or without chemical dust suppressants. Water would be sprayed onto stockpiles and hardstand areas at a rate of approximately 17kL/hr in winter and 35kL/hr in summer during 4 x 15 minute watering periods each day.
 - Progressive rehabilitation of areas of disturbance including topsoil and subsoil stockpiles.
 - Installation of bund walls and windbreaks as required.
- Internal coal transport and general movement of heavy vehicles within the Project Site
- The road for the transportation of coal between the mine facilities area and mine entrance would be sealed. The remainder of the mine access road to the coal processing area would be regularly maintained and watered.
 - Internal haul roads would be regularly watered. The frequency of water application to the various internal haul roads and exposed surfaces would be dependent on climatic factors, in particular wind and temperature, and usage. Generally, water would be applied at a rate of $>2L/m^2$ /application with an estimated 70-75ML to be used each year for the purpose of dust suppression.
- Transportation of product coal between the Project Site and the Whitehaven CHPP
- Coal would not be loaded above the truck body sides, thereby preventing the accidental loss of the coal from the trucks during transportation.
 - All trucks carrying product coal from the mine would be covered with approved covers and the tailgates securely fixed to prevent windblown dust emission or spillages.



4.10.5.3 Control Measures for Other Potential Air Contaminants

Nitrogen dioxide (NO₂), sulfur dioxide (SO₂) and greenhouse gases would be emitted as a result of vehicle exhaust and blasting fumes. The following operational controls would be implemented to reduce the emission of these gases.

Exhausts

Earthmoving equipment and on-site vehicles would be fitted with exhaust controls which satisfy the NSW DEC emission requirements. The Proponent would also ensure that all equipment is properly maintained to ensure no unacceptable exhaust emissions occur and commit to the removal or stand down of any vehicle or item of mobile equipment which is observed not to comply with NSW DEC guidelines. The exhausts of all equipment would be directed upwards or to the side so as not to impinge on the ground and cause dust lift-off.

Blasting Fumes

The following factors contributing to non-ideal detonation behaviour and higher emission concentrations (principally of NO₂), would be avoided whenever possible.

- Weak overburden. Weak overburden which reduces the necessary explosive confinement, would be ripped and excavated in preference to blasting.
- Water infiltration.
- Long explosive columns.
- Explosive pre-compression caused by hole-to-hole shock propagation due to wet overburden and clay veins.

4.10.5.4 Greenhouse Gas Reduction

Renewable energy sources would be impractical given the relatively short life of the proposal (8 to 10 years) and cost associated with establishing larger scale renewable energy sources such as windfarms or multiple solar panels.

4.10.6 Assessment of Impacts

4.10.6.1 Introduction

The assessment of impacts of the proposed East Boggabri Coal Mine was primarily undertaken through computer modelling to establish likely concentrations of PM₁₀, deposited dust, emissions of SO₂, NO₂ and greenhouse gases around the Project Site. The predicted cumulative impacts on air quality as a consequence of the concurrent operation of the proposed East Boggabri Coal Mine and the Boggabri Coal Project has also been considered. The modelling undertaken by RHA (2005) at five of the closest residences (“assessment locations”) assumes the adoption of operational controls as set out in Section 4.10.5. Locational details of the assessment locations are presented in **Table 4.39**.



Table 4.39
Details of Nominated Assessment Locations

Assessment Location	Distance (km) / Direction from Residence			
	Mining	Out-of-pit Emplacement	Crushing / Screening	Mine Access Road
“Bollol Creek Station”	1.9 NW	1.5 W	3.4 NW	1.5 W
“Templemore”	1.8 NW	1.4 NW	3.0 NW	1.3 W
“Tarrawonga”	3.7 NE	3.0 NE	3.7 N	3.1 NE
“Ambardo”	3.4 N	2.9 N	4.3 NW	2.8 N
“Jeralong”	4.6 SW	4.0 SW	4.2 SW	4.4 SW
Source: RHA (2005) – Table 7				

In order to assess the level of impact, the predicted concentrations are compared against the air quality goals established in Section 4.10.4.

4.10.6.2 Air Quality Modelling

Computer predictions of fugitive emissions from the Project Site were undertaken using the Ausplume Gaussian Plume Dispersion Model software (Ausplume) developed by EPA (Victoria). Ausplume combines the particulate emission factors for the various Project Site activities, meteorological data and local topography to predict the dispersion of dust and other particulate matter.

Particulate Emission Factors

The inputs to the Ausplume model have been taken primarily from the default emission factors identified in the *Emission Estimation Technique Manual for Mining* (DEH, 2001). Where the moisture content of materials on the Project Site was not adequately reflected within the defaults emission factors, the equations presented within DEH (2001) were used.

Meteorological Data

The Air Pollution Model (TAPM) software, developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), was used to simulate the meteorology of the area. Data obtained from the Whitehaven Coal Mine weather station was assimilated by TAPM and a 2003 meteorological data set (concurrent with the validated PM₁₀ data set) generated. The generated meteorological data set has been compared with observed wind data from an anemometer located approximately 15km southeast of the Project Site on the “Belmont” property and a good correlation between the generated and observed wind directions and wind speeds obtained (RHA, 2005). This good correlation validates the generated data set and therefore increases the level of confidence that can be placed in the predictions from the modelling.



Local Topography

There are no significant topographic features which would impede atmospheric dispersion between the Project Site and adjacent residences. Considering such uncomplicated near field topography, topography has not been considered in the Ausplume dispersion model.

Modelled Scenarios

Two operational scenarios were modelled to reflect different stages of the proposed mine development, with the scenarios selected to reflect the years of greatest surface exposure. The construction activities on site and the road construction activities within the proposed transport route have not been modelled given their comparatively short duration in any one area and the recognition that adoption of dust controls are standard activities for such works.

The two operational scenarios which also take into consideration the movement of mobile plant and equipment across different sections of the mine area, are as follows.

- (i) Year 2 – mining closest to Leard State Forest, ie. within the X and N pits and overburden placement within the northern and in-pit emplacements.
- (ii) Year 8 - mining closest to the “Bollol Creek Station” and “Templemore” residences ie. within the C and S pits and overburden placement within the southern and in-pit emplacements.

The scenarios were then remodelled to include the concurrent operation of the Boggabri Coal Project to the immediate north and northwest of the Project Site (as presented in **Figure A3.1**). Based on personal communications with IBC representatives, the following assumptions have been made regarding the development and operation of the Boggabri Coal Project.

- The production rate for the Boggabri Coal Project during the Year 2 scenario is 1.5Mtpa.
- The production rate for the Boggabri Coal Project during the Year 8 scenario is 2.0Mtpa.
- The aggregated emission associated with the above annual throughputs has been distributed over a nominal area of 500m by 500m.
- The Boggabri Coal Project mining activities would be undertaken using similar mining methods (and therefore having similar emission factors) as those at the proposed East Boggabri Coal Mine.
- An equivalent emission inventory to that of the proposed East Boggabri Coal Mine has been used.
- A northerly progression over the Boggabri Coal Project mine area is assumed.

RHA (2005) reports that modelling using the above assumptions yielded impacts that are conservatively high relative to the annual production rates. The additional impact of the Boggabri Coal Project has similarly been assessed with the Ausplume model, and this incremental impact is incorporated in dispersion modelling results.



Figures 4.20, 4.21 and 4.22 present the dust deposition, maximum 24 hour and annual average PM₁₀ concentration contours around the Project Site for each of the modelled scenarios. The contours do not, however, include values attributable to the Boggabri Coal Project which were predicted as incremental values only.

4.10.6.3 Dust Deposition

Ausplume predictions for dust deposition at the assessment locations, including the assumed background level of dust deposition of 1.3g/m²/month, are displayed in Table 4.40 both without and with the incremental dust deposition values attributable to the operation of the Boggabri Coal Project. Total mean monthly dust deposition (background plus increment) rates associated with the proposal are predicted to be less than 2.0g/m²/month at all assessment locations for the scenarios modelled and readily satisfy the dust deposition criterion of 3.3g/m²/month.

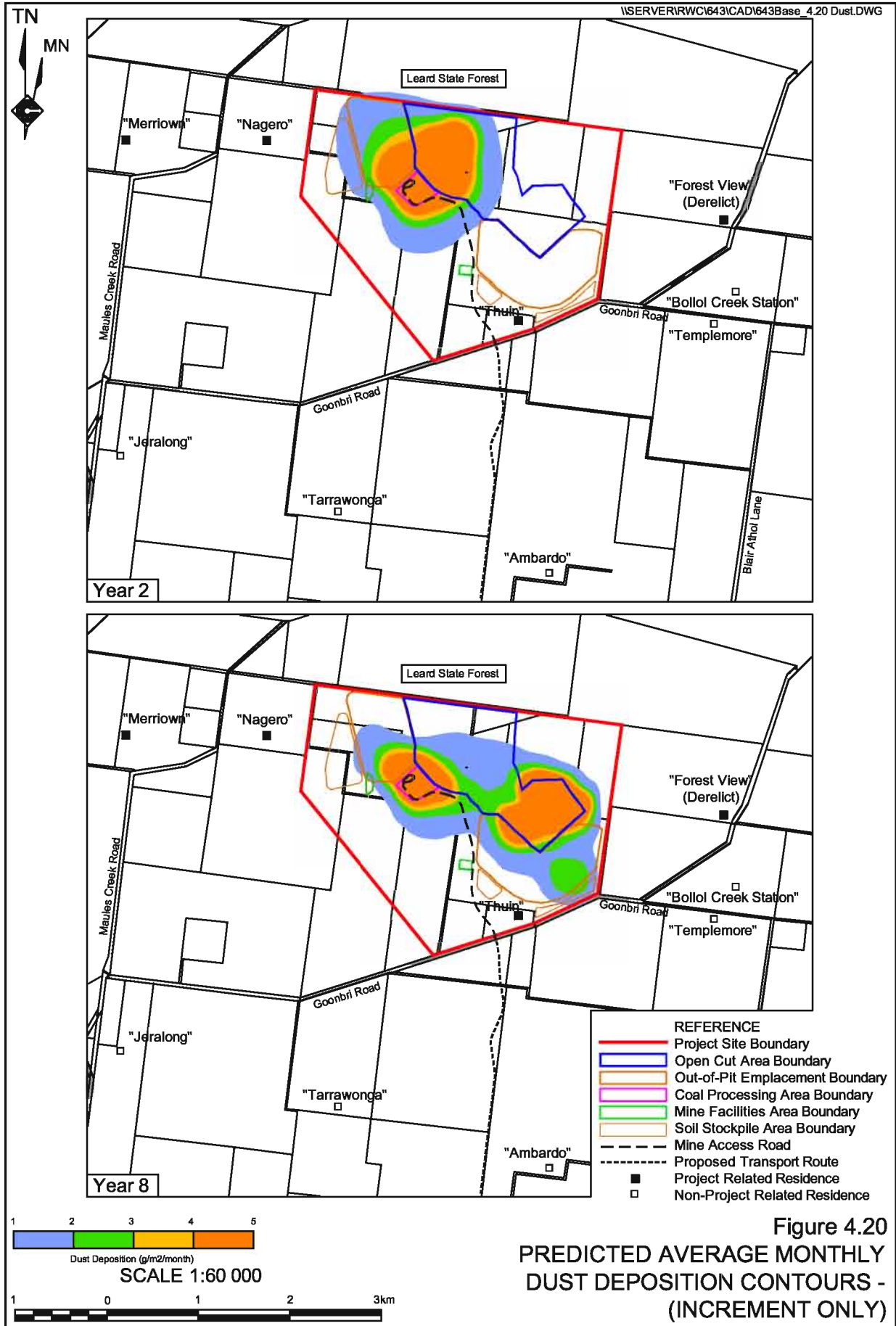
Table 4.40
Dust Deposition at Nearest Assessment Locations

Assessment Locations	Dust – Annual Average g/m ² /month			Project Goals
	Background	Background + Increment - East Boggabri Excavation Only	Background + Increment - Inclusive of Boggabri Coal Project Activities	
Year 2 Scenario				
“Jeralong”	1.3	1.3	1.3	3.3
“Tarrawonga”	1.3	1.4	1.5	3.3
“Ambardo”	1.3	1.4	1.4	3.3
Templemore”	1.3	1.4	1.4	3.3
“Bollol Creek Station”	1.3	1.4	1.5	3.3
Year 8 Scenario				
“Jeralong”	1.3	1.3	1.3	3.3
“Tarrawonga”	1.3	1.4	1.5	3.3
“Ambardo”	1.3	1.4	1.5	3.3
Templemore”	1.3	1.4	1.5	3.3
“Bollol Creek Station”	1.3	1.5	1.6	3.3
Source: RHA (2005) -Table 9				

4.10.6.4 PM₁₀

The maximum 24-hour average PM₁₀ concentration at the nearest assessment locations was predicted using Ausplume over a one-year time frame (see Table 4.41). It has been assumed that background levels of PM₁₀ vary on a daily basis with these background levels incorporated into the model. Appendix A of RHA (2005) provides an explanation regarding the use of varying background PM₁₀ levels.





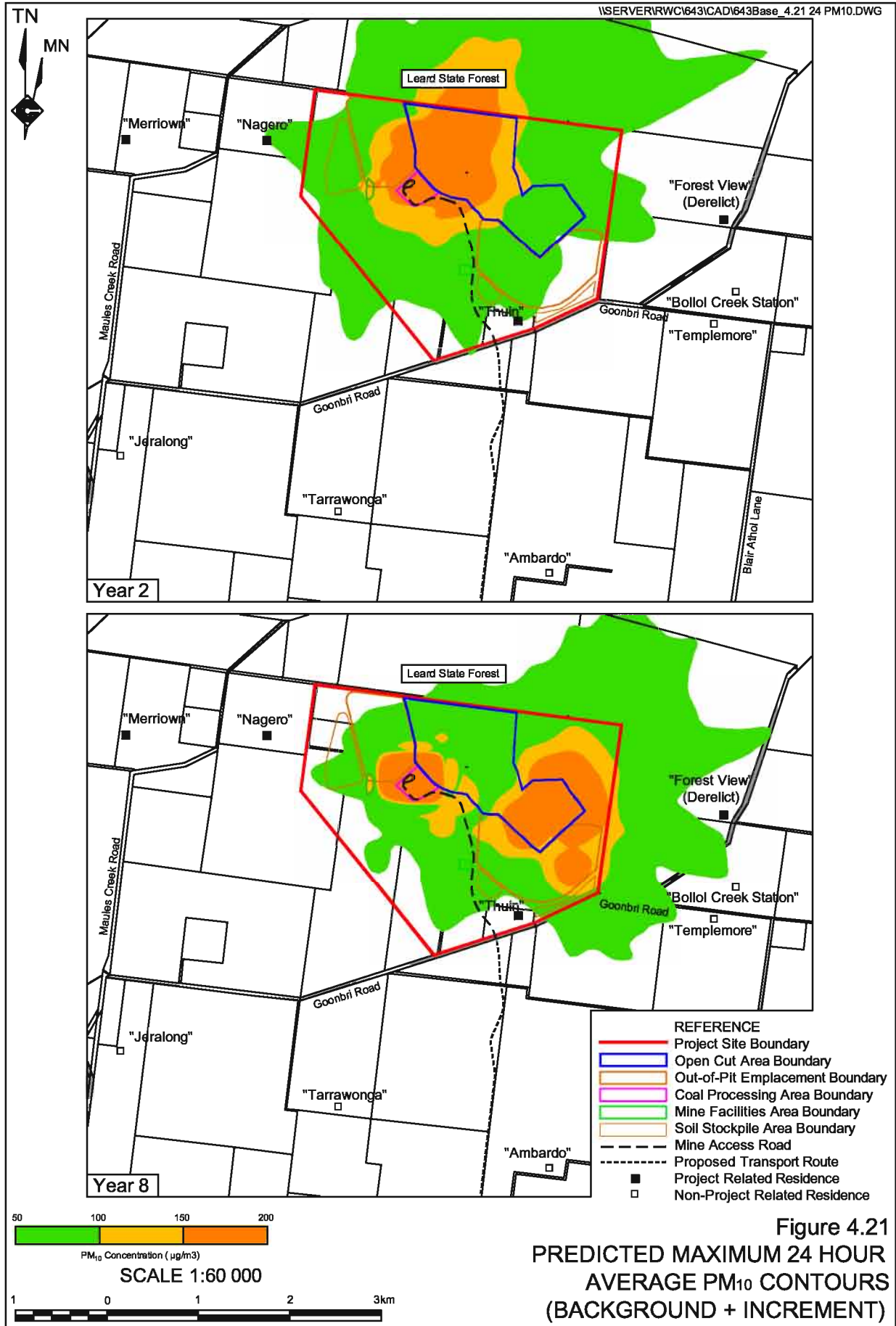


Figure 4.21
PREDICTED MAXIMUM 24 HOUR
AVERAGE PM₁₀ CONTOURS
(BACKGROUND + INCREMENT)

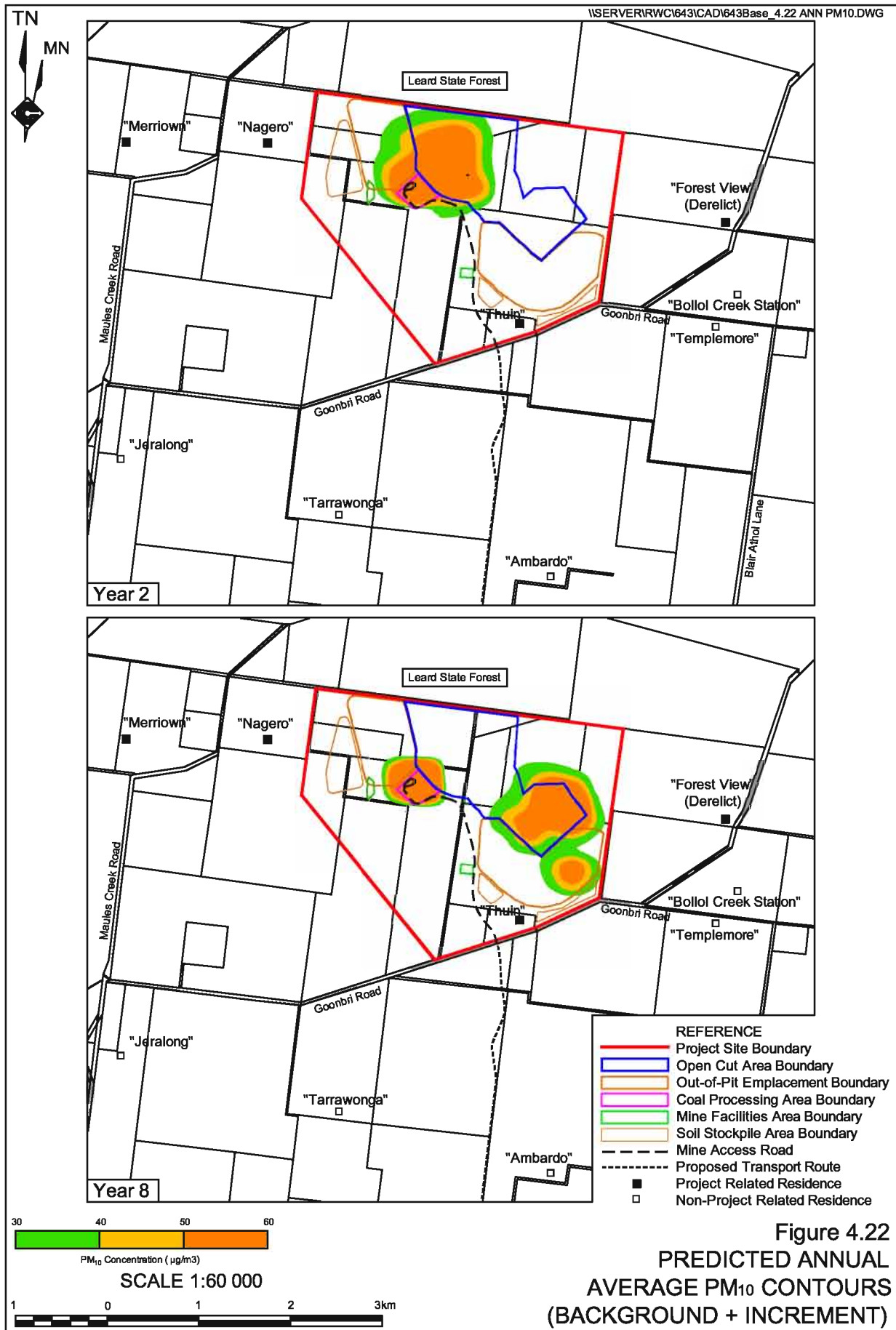


Figure 4.22
 PREDICTED ANNUAL
 AVERAGE PM₁₀ CONTOURS
 (BACKGROUND + INCREMENT)

Table 4.41
24-hour Average PM₁₀ Concentrations at the Nearest Assessment Locations

Assessment Locations	PM ₁₀ – 24 Hour Average µg/m ³			Project Goals
	Background ¹	Background + Increment Proposal Only ²	Background + Increment - Inclusive of Boggabri Coal Project Activities ²	
Year 2 Scenario				
“Jeralong”	37.2 (30.9)	37.2	39.5	50.0
“Tarrowonga”	37.2 (26.5)	37.3	46.4	50.0
“Ambardo”	37.2 (17.9)	37.8	46.9	50.0
Templemore”	37.2 (19.8)	37.2	44.2	50.0
“Bollol Creek Station”	36.6 (26.9)	41.9	48.2	50.0
Year 8 Scenario				
“Jeralong”	37.2 (30.9)	37.2	37.6	50.0
“Tarrowonga”	37.2 (30.9)	37.2	41.1	50.0
“Ambardo”	37.2 (37.2)	38.4	38.7	50.0
Templemore”	30.2 (19.5)	38.0	48.5	50.0
“Bollol Creek Station”	26.9 (26.9)	48.5	61.2	50.0
Note 1	Background observations attributable to predictions inclusive of the Boggabri Coal Project are shown in brackets			
Note 2	Potential exceedances of the project air quality goal are highlighted in bold			
Source: Modified after RHA (2005) - Table 10				

The maximum 24-hour average PM₁₀ concentration at the “Bollol Creek Station” assessment location during Year 8 would exceed the project goal of 50µg/m³, when considered cumulatively with the Boggabri Coal Project. For all other assessment locations, a maximum annual 24-hour average PM₁₀ concentration of less than 48.5µg/m³ (background plus increment and inclusive of the Boggabri Coal Project activities) is predicted. This satisfies the project goal of 50µg/m³.

Following the predicted exceedance of the project goal for 24-hour average PM₁₀ concentrations at “Bollol Creek Station”, an assessment of the likely frequency of exceedance was undertaken, ie. the predicted number of days in any year when the project goal would be exceeded. **Figure 4.23** presents the exceedance frequency plot which established the maximum 24-hour average PM₁₀ concentration is predicted to occur at the nearest assessment locations only one day during Year 8.

Table 4.42 presents the predicted annual average PM₁₀ concentrations assuming a background annual PM₁₀ concentration of 18µg/m³ at the assessment locations. **Table 4.42** shows that for the scenarios modelled, annual average PM₁₀ concentrations as a consequence of the proposed East Boggabri Coal Mine would be less than 20µg/m³, and a consequence of, both the East Boggabri Mine and Boggabri Project, would be less than 21µg/m³ (background plus increment), both of which satisfy the project goal of 30µg/m³.

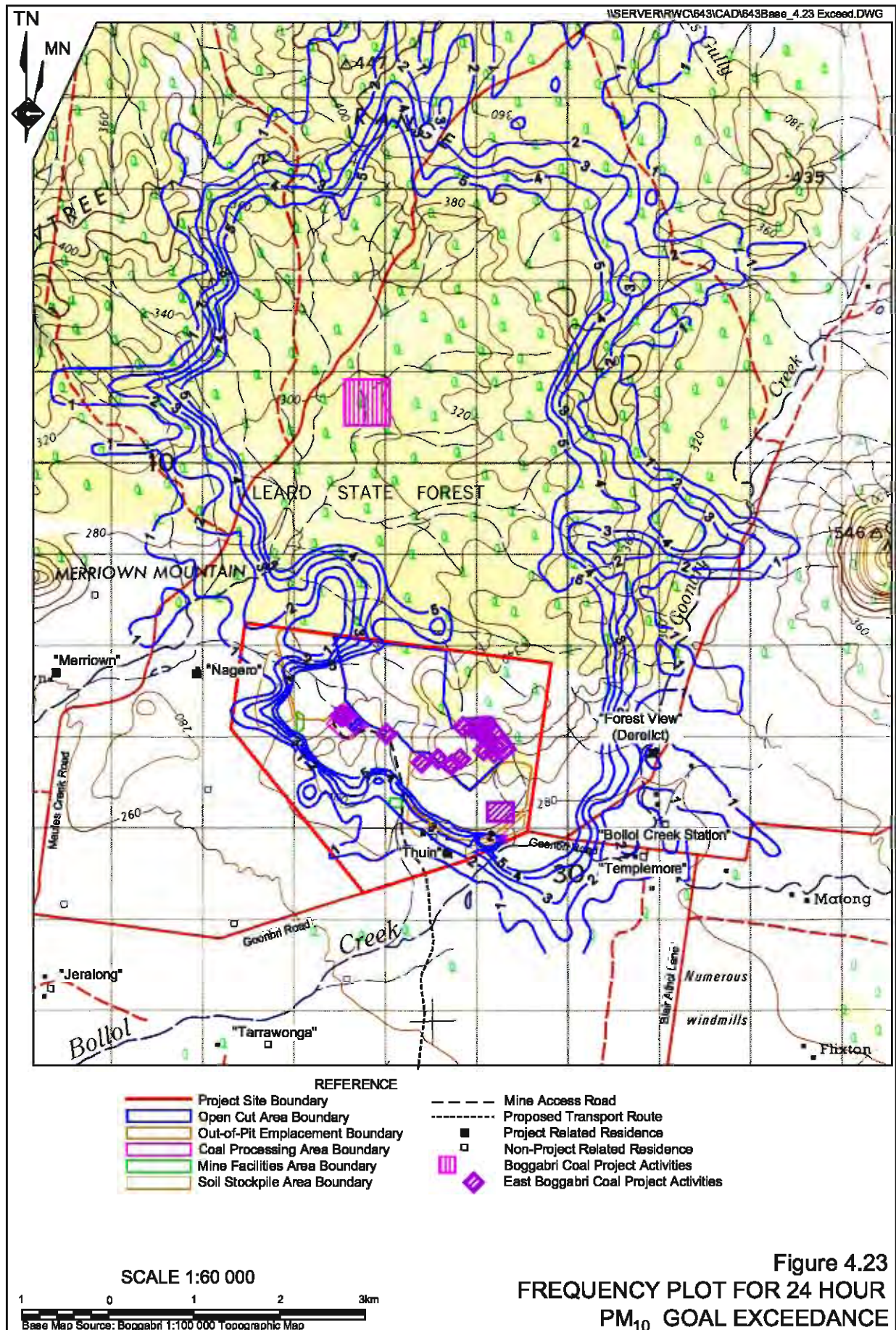


Table 4.42
Annual PM₁₀ Concentrations at the Nearest Assessment Locations

Assessment Locations	PM ₁₀ – Annual Average µg/m ³			
	Background	Background + Increment - East Boggabri Excavation Only	Background + Increment - Inclusive of Boggabri Coal Project Activities	Project Goals
Year 2 Scenario				
“Jeralong”	18.0	18.4	18.9	30.0
“Tarrawonga”	18.0	18.7	19.3	30.0
“Ambardo”	18.0	18.5	18.9	30.0
“Templemore”	18.0	18.7	19.4	30.0
“Bollol Creek Station”	18.0	18.9	19.7	30.0
Year 8 Scenario				
“Jeralong”	18.0	18.3	18.8	30.0
“Tarrawonga”	18.0	18.5	19.0	30.0
“Ambardo”	18.0	18.5	18.8	30.0
“Templemore”	18.0	19.1	19.8	30.0
“Bollol Creek Station”	18.0	19.4	20.1	30.0
Source: RHA (2005) - Table 10				

4.10.6.5 PM_{2.5}

Generalised particulate size distributions for activities likely to contribute to the air quality surrounding the Project Site have been used to derive a relationship between concentrations of the PM_{2.5} and the PM₁₀ particle size fractions. RHA (2005) notes that based on this relationship (ie. approximately 30% of the PM₁₀ particle size fraction would constitute PM_{2.5}), when the annual 24-hour average PM₁₀ concentration goal of 50µg/m³ is achieved, the 24-hour average PM_{2.5} concentration goal of 25µg/m³ would be satisfied. RHA (2005) predicts the annual average PM_{2.5} to be approximately 8µg/m³, thereby satisfying the project goal of 25µg/m³.

4.10.6.6 Sulfur Dioxide and Nitrogen Dioxide

Atmospheric emissions of SO₂ and NO₂ have been modelled by RHA (2005) based on the diesel consumption presented in Section 2.7.6. Combustion emissions were modelled as a point source emission from the coal processing area assuming:

- 3m release height – this is considered a low height of release. By selecting such a low height, pollutant dispersion potential is reduced, creating the potential for higher concentrations near the source; and
- 5m/s exit velocity – this is considered a relatively low velocity. By selecting a low velocity, plume rise would be reduced, reducing pollutant dispersion and therefore creating the potential for higher concentrations near the source.



Accordingly, emissions of NO₂ and SO₂ from all combustion sources have been modelled in a conservative manner both from the point of view of initial concentration and subsequent dispersion processes.

Emissions (including NO₂) would be released following each blast event but would be quickly dispersed and therefore not impact significantly on either the 1 hour or annual average concentrations of NO₂ at the assessment locations surrounding the Project Site. As such, these are not modelled by RHA (2005). The operational safeguards designed to minimise post-blast emissions are presented in Section 4.9.4.4.

Modelling of SO₂ and NO₂ indicated negligible emissions as a consequence of fuel consumption, and satisfaction of all project goals. Considering the negligible incremental increase in background levels and the similarity of the proposed Boggabri Coal Project, it is assessed that even considering the impacts of the two mines cumulatively, project goals for SO₂ and NO₂ concentrations would be easily met.

4.10.6.7 Vehicle Exhaust Emissions

An estimated maximum 99 600 truck movements between the Project Site and the Whitehaven CHPP and rail loading facility would be required per year during peak production. This equates to a maximum of 332 movements per day during Monday to Saturday. This level of transportation would not impact significantly on the capability of the local airshed to achieve the air quality goals associated with vehicle emissions (principally NO₂, SO₂ and hydrocarbons), as the proposed number of trucks movements is of a comparatively low magnitude of heavy vehicle traffic (when compared to the total traffic levels regionally).

It is not anticipated that particulate emissions from vehicle exhausts would contribute significantly to dust deposition rates in the area immediately adjacent to the Project Site. By sealing all roads of the proposed transport route, wheel-generated dust emissions would be minimal. As such, vehicles travelling from the Project Site to the Whitehaven CHPP and rail loading facility are not anticipated to adversely impact upon the air quality of nearby residences.

4.10.6.8 Greenhouse Gases

Mining and associated activities at the proposed East Boggabri Coal Mine would have the potential to generate greenhouse gas emissions from a number of sources including:

- diesel fuel combustion by mobile equipment and on-site power generation;
- detonation of explosives; and
- the release of coal bed methane as a result of mining activities.



Carbon dioxide (CO₂) would be the major greenhouse gas emitted as a result of complete fuel combustion. Other gases emitted as a result of incomplete combustion, the reaction between air and chemicals within the fuel during combustion, and/or evaporation of fuel include:

- carbon monoxide (CO);
- methane (CH₄);
- oxides of nitrogen (NO_x); and
- non-methane volatile organic compounds (NMVOCs)

In order to quantify the production of greenhouse gases, the non-CO₂ emissions are provided with a “CO₂ equivalence” value based on their relative contribution to the enhancement of the greenhouse effect. The CO₂ equivalence values of relevance to the EIS, calculated using an index called the Global Warming Potential (GWP), are as follows.

- Methane (CH₄) – GWP of 21.
- Nitrous Oxide (N₂O) – GWP of 310.

Other emitted gases including NO₂, CO and NMVOCs are only short lived and vary spatially making it difficult to quantify their GWP. As such, these are not considered further.

RHA (2005) has determined the likely greenhouse gas emissions from the proposed East Boggabri Coal Mine based on the description provided in Section 2 of the EIS and the following estimation techniques.

- The annual emissions from diesel combustion - using Table 56 and 57 of the Australian Greenhouse Office (AGO) document ‘*Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2002 – Energy (Stationary Sources)*’ (AGO, 2002a).
- The annual emissions from blasting - using Table 11 of the AGO document ‘*Factors and Methods Work Book, August 2004*’ (AGO, 2004).
- The emissions of coal bed methane – using Section 1.B.1a(ii) of AGO (2002b).

Table 4.43 presents the predicted emissions attributable to the proposed East Boggabri Coal Mine.

153 266t of CO₂ equivalent per year represents less than 0.04% of the 1990 Australian greenhouse gas emission level (AGO, 1990) and as such is considered a negligible increase (RHA, 2005).

Given the similarity in operations between the proposed East Boggabri Coal Mine and the Boggabri Coal Project, it is expected the greenhouse gas emissions from the two would be comparable. The cumulative impact would therefore represent between <0.04% and 0.08% of 1990 Australian greenhouse gas emissions, which are still considered a negligible increase.



Table 4.43

Total Greenhouse Gas Emissions

Source	Predicted Emissions (tonnes/year)			Total CO ₂ -Equivalent (tonnes/year)
	CO ₂	N ₂ O	CH ₄	
Diesel	25 969.28	0.23	1.39	26 069
Explosives	12.21	ND ¹	ND ¹	12
Coal Bed Methane	N/A	N/A	6 056.47	127 186
TOTAL	25 981.49	0.23	6 057.86	153 266
Note 1: ND – There is no reliable data available to quantify emissions of these gases the specific source. In any event, their contribution is anticipated to be insignificant given the magnitude of blasting activities				
Source: RHA (2005) - Table 15				

4.10.6.9 Impacts on Livestock

Livestock are exposed to dust from many natural sources, including airborne dust as a result of dust storms, yarding or general stock movements. This dust tends to accumulate on the coat or fleece of the animals and generally falls out or is washed out in heavy rain (Hunt, 1999). Increases to dust deposition associated with the proposed mine would be considerably less than 2g/m²/month for all potential grazing land outside the Project Site. It is therefore unlikely there would be any noticeable impact on livestock.

4.10.6.10 Impacts on Pasture

Dust accumulation on pasture at the projected rate of deposition would have no effect on pasture palatability or stock production. In grazing trials with dairy cattle, coal dust added to pasture at a rate equivalent to 8g/m²/day, or 1200 times the maximum incremental increase to dust deposition predicted at the assessment locations surrounding the Project Site, has been shown to have no effect on palatability or production by the cattle (Hunt, 1999).

4.10.7 Monitoring

The Proponent would undertake air quality monitoring programs in order to demonstrate compliance with project air quality goals. Based on the results of atmospheric dispersion modelling summarised in Section 4.10.6, satisfaction of 24 hour average PM₁₀ concentration project goals would illustrate compliance with all other project goals. Accordingly, it is proposed to monitor 24 hour concentrations of PM₁₀ adjacent to at least one of the following assessment locations.

- “Bollol Creek Station”
- “Templemore”
- “Ambardo”



Monitoring would be undertaken in accordance with:

- “Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales”, DEC 2001;
- AS 2922-1987 “Ambient Air - Guide for the Siting of Sampling Units” (NSW DEC Method AM-1); and
- AS 3580.9.6-1990 “Particulate Matter - PM_{10} - high volume sampler with size-selective inlet”.

Monitoring of dust deposition would also be undertaken adjacent to at least three of the assessment locations listed in **Table 4.39**. Monitoring would be undertaken in accordance with:

- AS 2922-1987 “Ambient Air - Guide for the Siting of Sampling Units” (NSW DEC Method AM-1); and
- AS 3580.10.1-1991 “Methods for Sampling and Analysis of Ambient Air - Determination of Particulates - Deposited Matter - Gravimetric Method” (NSW DEC Method AM-19).

If it becomes necessary to demonstrate compliance with 1 hour average NO_2 project goals, a QRAE Plus or similar multi-gas monitor with data logging capability would be used to record NO_2 concentrations at the “Bollol Creek Station” residence for the initial blasts, and if appropriate, representative blasts from each of the four pits.

4.11 VISIBILITY

4.11.1 Introduction

As part of the community consultation process, several local residents identified impacts on their visual amenity as an issue of concern. This sub-section outlines the existing visibility of the Project Site and proposed transport route currently experienced by surrounding and local landowners / residents. The proposed visual controls to be implemented as part of the proposal are presented and an assessment of the likely impact to the visual amenity provided. Consideration is also given to the potential for a significant cumulative impact when considering the concurrent operation of the proposed East Boggabri Coal Mine and the nearby Boggabri Coal Project.



4.11.2 Existing Visual Amenity

4.11.2.1 Introduction

Existing visual amenity is considered in relation to views of the Project Site, the proposed transport route and to a lesser extent, the Boggabri Coal Project. The existing visual amenity has been described with respect to the following non-project related residences assessed as potentially affected by the proposal being the following.

- “Jeralong”
- “Tarrawonga”
- “Pine Grove”
- “Kyalla”
- “Ambardo”
- “Northam”
- “Templemore”
- “Bollol Creek Station”
- “Flixton”
- “Matong”

Views of the Project Site, proposed transport route and Boggabri Coal Project are described as either local (within 1km) or distant (>1km), direct (without significant obstruction from topography or vegetation) or obscured (with significant obstruction from topography or vegetation). **Figure 4.24** presents the affected non-project related residences with an assessment of the view afforded to each of the Project Site and proposed transport route. Local views of the Project Site are also possible from sections of Maules Creek Road, Goonbri Road, Manilla Road and Hoads Lane. The latter views are distant views.

4.11.2.2 Project Site

The existing topography of the local area and Project Site offers limited natural screening of the areas of proposed disturbance. Specifically, a north-south orientated ridge towards the centre of the Project Site would screen mining activities in the X and N Pits and processing activities from residences to the west and southwest.

It is noted, however, that these topographical features would only partially screen proposed on-site activities. From those residences listed in Section 4.11.2.1, the following views would be afforded of the Project Site.

- To the east and southeast, the residences of “Templemore”, “Bollol Creek Station”, “Flixton” and “Matong” would have broken distant views of the southern (and in some cases to a lesser extent, the northern) emplacement and possibly of on-site transport and some clearing activities.
- To the south, the residences of “Jeralong”, “Tarrawonga” and “Ambardo” may have distant views (>2.5km) of the overburden emplacements. Further south, very distant views may also be available from the “Kyalla” “Northam” and “Pine Grove” residences.



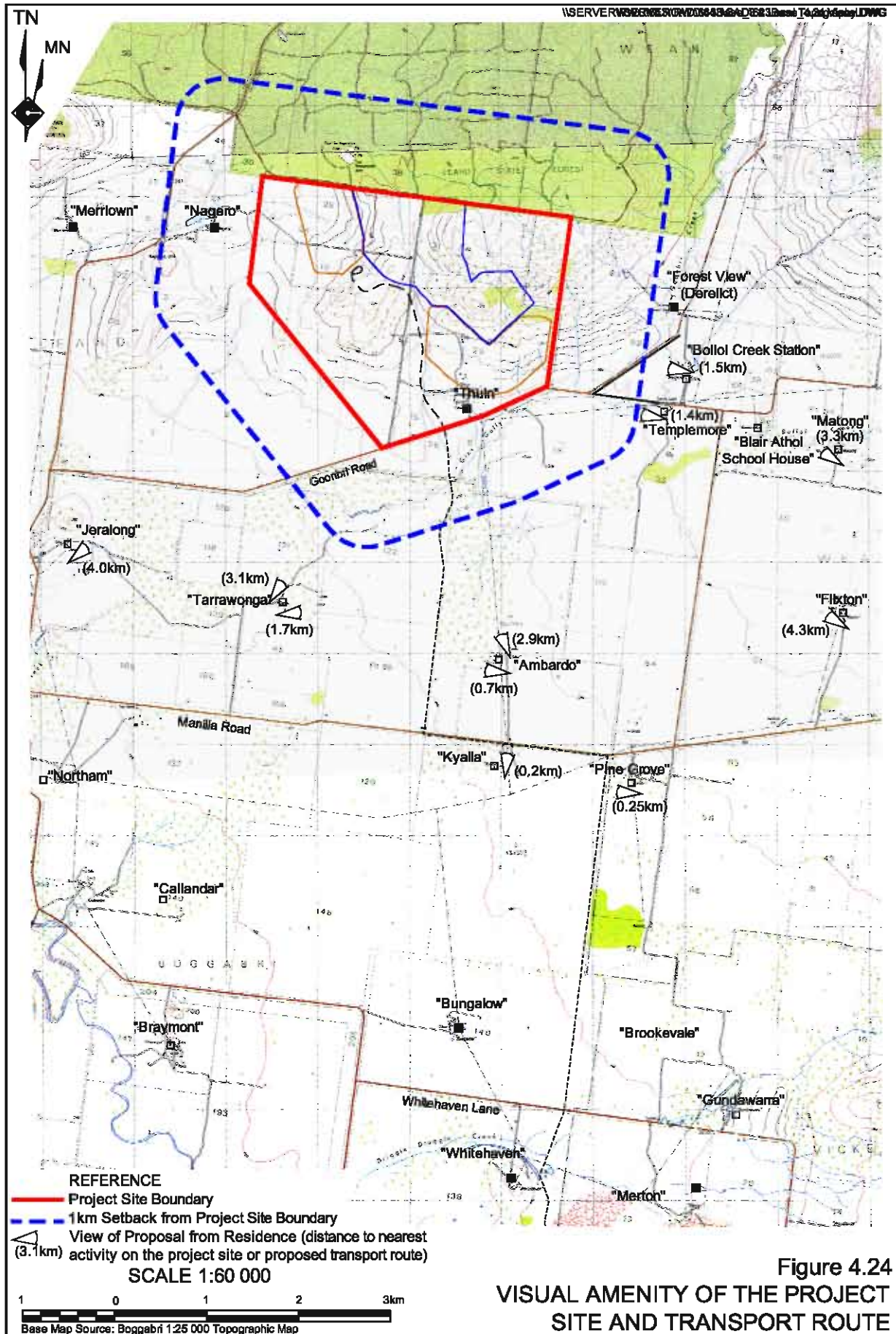


Figure 4.24
VISUAL AMENITY OF THE PROJECT
SITE AND TRANSPORT ROUTE



- No non-project related residences to the west would have any views of Project Site activities with the local topography and vegetation of Leard State Forest providing a natural screen to any residence beyond the Forest and Maules Creek Road.

4.11.2.3 Views of the Proposed Transport Route

Views of the proposed transport route would be possible from a number of the residences identified in Section 4.11.2.1. These views would be of varying distance and clarity.

- Local views of the proposed transport route of between 200m and 900m with varying degree of obstruction would be possible from the “Pine Grove”, “Kyalla”, “Ambardo” and “Tarrowonga” residences.
- Obstructed distant views of parts of the proposed transport route may also be possible from the remaining residences between the Project Site and Whitehaven Coal Mine.
- Along the existing transport route between Whitehaven Coal Mine and the Whitehaven CHPP, local and often obscured views are possible from a number of residences set back from the public roads.

4.11.2.4 The Boggabri Coal Project

The occupants of those residences to the south and southwest of the Project Site that have been referenced as having distant views of the Project Site (see Section 4.11.2.2) may also have distant and often obstructed views of the Boggabri Coal Project Area. Given its location within Leard State Forest, the view of the mining activities, if visible, may be more stark due to the contrast between the existing forest vegetation and cleared agricultural areas of the proposed East Boggabri Coal Mine.

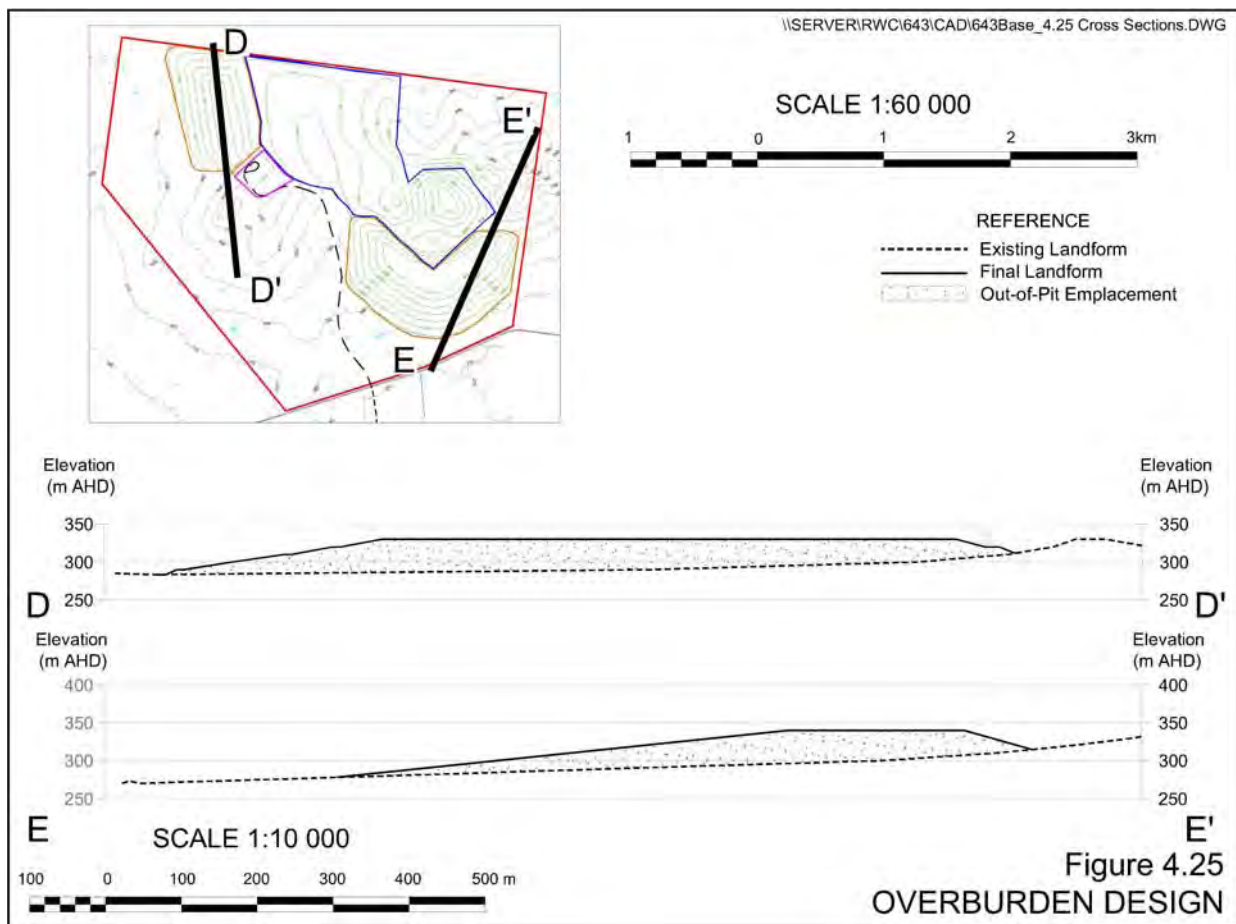
4.11.3 Visual Controls

As the topography and vegetation of the Project Site and local area would offer limited natural screening of the proposed activities on the Project Site and along the proposed transport route, the following additional controls would be implemented.

- The Project Site would be progressively rehabilitated such that cleared or non-vegetated areas would be minimised. In particular, non-persistent cover crops would be sown immediately over areas to be rehabilitated prior to the establishment of the designated vegetation type.
- The construction of a 15m high bund wall along the southern, western and eastern edges of the southern emplacement would not only provide acoustic shielding, but provide a visual screen (grassed with a non-persistent cover crop) for mining, overburden placement and processing activities.



- The overburden emplacements themselves have been designed to provide an element of visual control. As well as screening the surrounding residences from the more pervasive of mining activities, eg. creation of the mine excavation and internal transport of coal and overburden, the emplacements have been designed to, as much as possible, replicate existing topographic features. The southern emplacement has been designed to partially recreate the low hill in the northeastern corner of the Project Site that would be mined and the northern emplacement has been designed to appear an extension of the north-south oriented low ridge. **Figure 4.25** illustrates these design features.



Other more general safeguards and controls to be implemented would include:

- minimising the extent of land disturbance / clearing in advance of mining;
- progressive rehabilitation of all disturbed areas within the Project Site. Significant rehabilitation of the post-mining landform would commence in Year 2;
- implementation of air quality controls as identified in Section 4.10.5; and
- maintaining the mine and associated areas of disturbance in a clean and tidy condition at all times.

Consideration has been given by the Proponent to night-time light emissions which may affect surrounding residents and/or the Siding Spring Observatory at Coonabarabran. A maximum of seven lighting plants would be used for night-time activities and would have a combined illumination of 4 060 000 lumens. This level of illumination would be unlikely to have any impact on the observatory viewing conditions.

Floodlights would be positioned and directed to minimise emissions, with lighting not required at any given time not used. Where the use of floodlights is required in the open cut, on the overburden emplacements or at the processing plant, they would be directed downwards and away from the adjacent residences.

4.11.4 Assessment of Impacts

4.11.4.1 Impacts Attributable to the Proposed East Boggabri Coal Mine

It is acknowledged that occupants of several residences would have variously obstructed views of activities or disturbance on the Project Site and proposed transport route. It is also noted, however, that the Project Site lies within a rural landscape where areas of land are disturbed seasonally for agriculture-related purposes. Given the Proponent's proposal to minimise the extent of surface disturbance in advance of mining and to implement progressive rehabilitation, together with the proposed use of the overburden emplacement to visually shield the mining activity from the majority of residences, the likely visual impact of the proposal is assessed to be acceptable.

Notwithstanding the likely extent of visual impact, the Proponent would maintain regular communications with those residents whose visual amenity is affected by the proposal and implement any reasonable additional controls to further reduce the impact on their visual amenity.

As the Project Site is located approximately 150km from the Siding Spring Observatory, and night time lighting would be limited to no more than seven lighting plants, vehicle lights and building lighting, the impact on the viewing conditions of the observatory would be negligible and almost certainly immeasurable.

Whilst it is acknowledged that the movement of heavy vehicles along the proposed transport route would alter the visual amenity from a limited number of residences set back from the proposed route, movement of heavy vehicles along the local road network is an existing, albeit limited feature. It is concluded that the impact associated with the additional vehicle movements would be noticeable but it has been assessed as acceptable.

As the distance of the closest non-project related residences to the proposed transport route between the Project Site and the Whitehaven Coal Mine (200m), the light emitted from the trucks transporting coal is unlikely to affect occupants of these residences. Between the Whitehaven Coal Mine and the Whitehaven CHPP, a number of residences are in closer proximity to the proposed transport route. This section of the proposed transport route is a public road which is already subject to truck movements after dark, and as such, any impact is considered acceptable.



4.11.4.2 Cumulative Impacts

The concurrent development and operation of two coal mines in close proximity is not likely to result in a significantly greater impact on visual amenity for the following reasons.

- (i) The operations of the Boggabri Coal Project would be barely visible when viewed from those locations where the proposed East Boggabri Coal Mine would be visible.
- (ii) Views from residences with visibility of both mines would be sufficiently distant such that the impact would be negligible.

The cumulative impact associated with the approximate doubling of heavy vehicle movements between the Whitehaven Coal Mine and Whitehaven CHPP is considered acceptable as this part of the transport route is a public road already subject to day-time and night-time truck movements. The additional truck movements would not therefore change the existing visual amenity significantly.

4.12 SOCIO-ECONOMIC SETTING

4.12.1 Background

The proposed East Boggabri Coal Mine is located within a regional and rural setting in central northern NSW which, like many other regional townships, has been in relative decline in socio-economic terms over the past twenty years. Recent demographic trends in Australia have demonstrated acceleration in the trend to the “move to the coast” phenomenon, or to large community centres, placing considerable stress and change on areas in decline.

Regional areas are often sensitive to employment loss where the economic support for villages and townships can be relatively single dimensional, ie. dominated by a single industry or even a single employer. Technology change, industry reform and rationalisation have led to closure of many regional businesses including key employers and economic drivers in a region. For example, Gunnedah has witnessed the closing of the abattoirs and three coal mines since the late 1990s; Barraba, the closure of the asbestos mine; and Werris Creek, the redundancy of the railway system terminal.

As a consequence of reduced employment and economic activities, there has been a shift in the hierarchy of economics and social activity within regional NSW. The 2001 Census data illustrates larger centres like Tamworth and Armidale have sustained growth whereas smaller centres and villages are at best static and in many cases experiencing decline in population. Many of the smaller towns and villages of the region, and regional NSW in general, have witnessed the retreating of professional services, national retail outlets, financial institutions and branch functions of large commercial organisations. These towns have in many cases had difficulties in responding to changes in the underlying economic and social circumstances, particularly where employment generators have diminished or been lost from their economies.

In recognition of this change, many areas have sought to correct the balance by actively seeking new business and service providers for the smaller towns and in this context, the proposed East Boggabri Coal Mine has the potential to provide an economic driver and support for the region.



It should be noted however, that the structure within the towns likely to benefit from the development and operation of the proposal may be tested in terms of their social structure and their employment and housing capacity.

In this context, an assessment of the social and economic impacts associated with the proposed development and operation of the East Boggabri Coal Mine was undertaken by Key Insights Pty Ltd (social impact assessment) and Castlecrest Consulting (economic impact assessment). The two assessments consider the existing socio-economic climate, attitudes of the communities likely to be affected, potential for these communities to service and sustain such a development, the likely impacts (both positive and negative) and the proportional distribution of these impacts. The combined socio-economic impact assessment (KICC, 2005) is provided in full as Part 10 of the *Specialist Consultant Studies Compendium*, with a summary presented in the following sub-sections.

4.12.2 Existing Socio-economic Setting

4.12.2.1 Introduction

The proposed East Boggabri Coal Mine is located within the northern statistical region of NSW as defined by the Australian Bureau of Statistics. The closest rural town to the Project Site is Boggabri, approximately 15km to the southwest with the larger centres of Gunnedah and Narrabri located approximately 42km south-southeast and 60km northwest from the Project Site respectively. Boggabri and Narrabri fall within the local government area (LGA) of Narrabri while Gunnedah is the major township within the Gunnedah LGA. All three towns are supported by a number of small villages throughout the respective LGAs.

This summary of the existing socio-economic setting focuses on the LGAs of Gunnedah and Narrabri. The towns of Gunnedah and Boggabri are included in the analysis with comparisons drawn between these areas and the NSW state as a whole.

4.12.2.2 Social Advantage/Disadvantage

The ABS assigns an Index of Relative Social Advantage/ Disadvantage to areas. The index is based upon incomes, education, skills and occupation. The LGA of Narrabri is well below the Australian and NSW figures with Gunnedah LGA, receiving a score almost in line with the Australian figure. These figures suggest that the Narrabri LGA may benefit substantially from the introduction of a new industry and employer within the LGA.

4.12.2.3 Population and Age Characteristics

Population numbers in the LGAs of Narrabri and Gunnedah have been largely static or slightly declining in recent years (University of New England, 2003). The population of the Narrabri LGA has fallen from 16 000 in 1981 to 14 537 in the 2001 census. During the same period, Gunnedah LGA fell from 13 250 to 12 569.

Figure 4.26 shows the breakdown of population by age groups with Gunnedah LGA, Narrabri LGA and Boggabri exhibiting significant drop-off of younger people (20-39 year age brackets).



This is generally associated with the transition to work and the uptake of educational opportunities only available in larger population centres and is typical of non-metropolitan areas.

Figure 4.26 also illustrates a higher proportion of the older generations than within the whole of NSW. This pattern, the low proportion of residents of working age, is common for non-metropolitan areas and potentially poses problems for the sustainability of some regional areas.

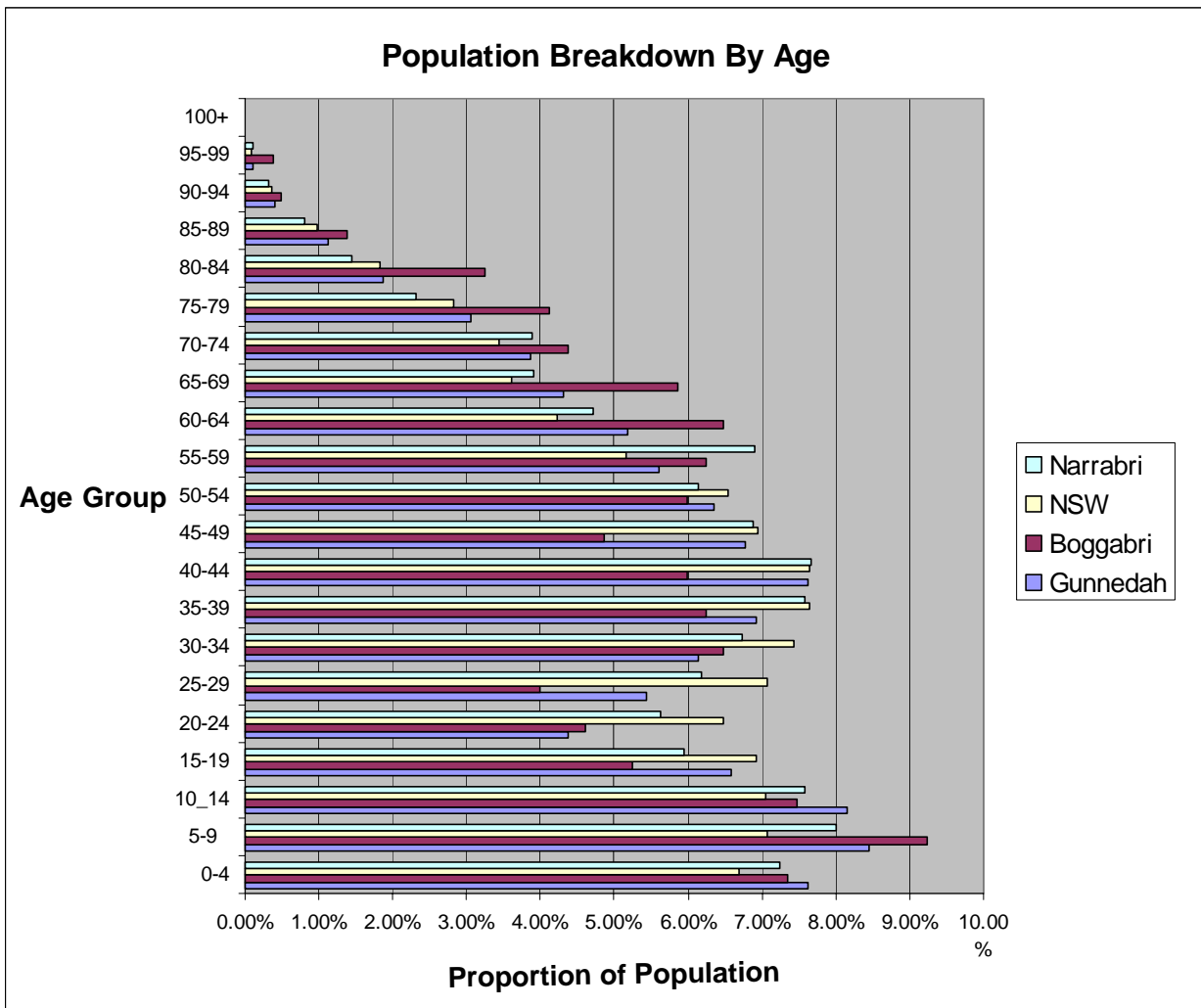


Figure 4.26
POPULATION BREAKDOWN BY AGE

4.12.2.4 Education, Employment and Income

Education

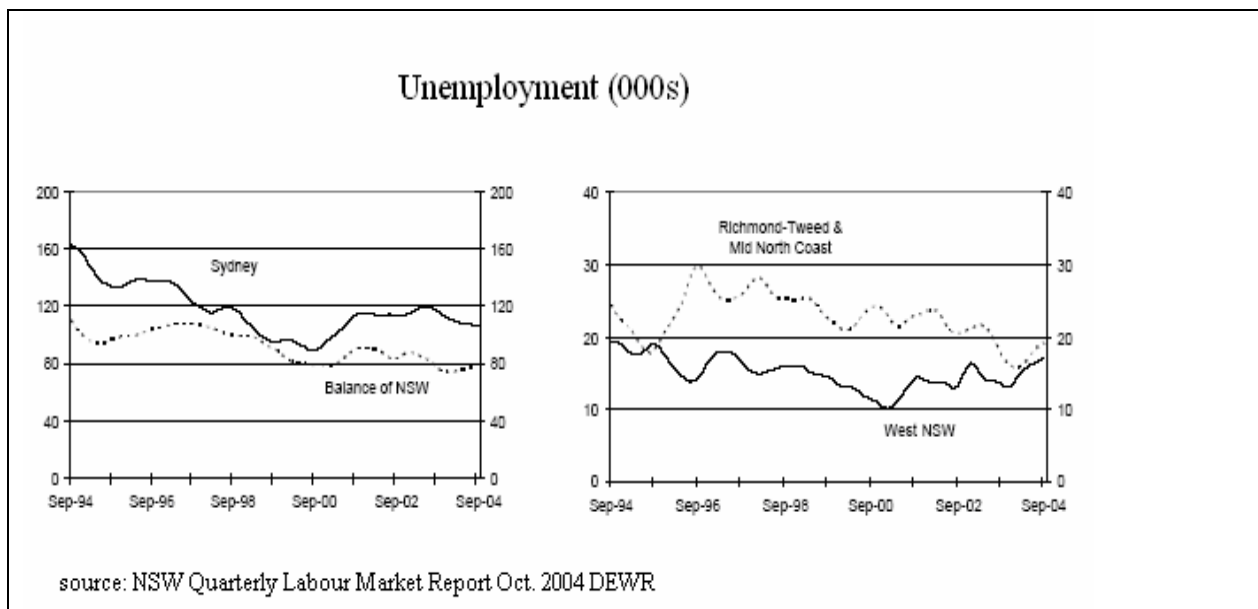
With a larger than average proportion of young children in the Gunnedah and Narrabri LGAs, it follows that schooling is an important issue.



Both LGAs have a significantly higher proportion of the population attending primary school and preschool than the State average. This proportional representation within educational facilities steadily reduces through primary, secondary and tertiary or further education. Tertiary education attendance for the LGAs and towns assessed is below the State average, however, it is interesting to note, that with the exception of Boggabri, which displays educational attendance below the State average for all but primary schooling, attendance at secondary and technical and further education is higher than the State average.

Employment

Whilst the State has enjoyed an overall trend of falling unemployment over the last 10 years, some areas in Western NSW have been suffering from rising numbers of unemployed. This can be attributable to a range of effects including changing industry structure of regional areas and the effects of one of the most serious droughts on record. **Figure 4.27**, shows an almost doubling of the number of unemployed in Western NSW since September 2000, while the balance of NSW remains largely static.



source: NSW Quarterly Labour Market Report Oct. 2004 DEWR

Figure 4.27
UNEMPLOYMENT NUMBERS

While unemployment within the LGAs of Gunnedah and Narrabri remains moderately above the State average, particular locations, for example Boggabri, have very high rates. The rate of male unemployment in Boggabri (25.3%) is more than three times the average male unemployment rate in NSW (7.8%). The town of Gunnedah also exhibits unemployment well above the state average, though not as extreme as Boggabri. The unemployment rate of Males in Gunnedah Township is 11.6%.

While labour force participation rates within the Gunnedah and Narrabri LGAs generally follow the standard pattern, workforce participation in the region is lower than the State average. This is especially apparent in Boggabri where male participation rates dramatically fall away from the state average from approximately 24-34 years of age, while female participation falls away from the age of 20-24.



When there is this combination of high unemployment and low participation rates it flags another potential problem within the labour market, “hidden unemployment”. This occurs when people are so discouraged by poor employment prospects that they drop out of the labour market altogether. As a result they do not show up as unemployed, hence the published figures may not show the extent of the problem. In the case of Boggabri, the fact that both Males and Females show very low rates of workforce participation indicates that there may be considerable hidden unemployment.

Agriculture stands out as dominant employer of male workers in the Gunnedah and Narrabri LGAs. The retail industry is another main employer, especially of younger workers. The other prominent sector is manufacturing. Female employment is not dominated in such an obvious way by agriculture with a greater number of industries employing a significant proportion of the female workforce. Health and community services, retail, education and agriculture are the most significant employers of women.

Income

Residents in the town of Gunnedah tend to earn lower income than the State average. Median individual weekly income is \$200-\$299, compared with \$300-\$399 for NSW. Median family income is considerably lower at \$600-\$699, compared with the State median of \$800-\$999. The lower than average income is offset by cheaper costs of living for some factors in the area. Housing is much cheaper. The median weekly rent is \$100-\$149, compared to the State median of \$150-\$199. The average monthly home loan repayment is also lower. \$600-\$799, compared with \$1,000-\$1,199 across NSW

4.12.2.5 Housing and Real Estate

Most people in Australia, even in the most densely populated cities, live in separate houses. In non-metropolitan areas like the LGAs of Gunnedah and Narrabri, living in separate houses is even more prevalent.

Residents within the Gunnedah and Narrabri LGAs live overwhelmingly in separate houses. In the town of Gunnedah most houses are either fully owned (1 337), or are in the process of being purchased (603). A further 21 dwellings are occupied on a rent/buy scheme and there are 903 dwellings that are rented. Interestingly, of the dwellings classified as “flat, unit or apartments” a vast majority are being rented. The proportion of dwellings rented in Gunnedah Township (29%) is similar to other regional and suburban areas within NSW.

4.12.2.6 Local Facilities and Services

In order to assess the capacity of the communities in the district surrounding the proposal to service the increased demand associated with growth in mining, an overview of existing key services and facilities provided.



Educational Facilities

Boggabri is serviced by 1 pre-school, 1 public primary school, 1 catholic primary school, a playgroup and a Family Day Care service. Generally students living in Boggabri will travel to Gunnedah to attend high school.

There are 3 primary schools, and 1 high school in Narrabri. Narrabri High School is fed by a number of other primary schools operating in small villages around the Narrabri Shire. The Narrabri township has a range of occasional and daycare centres and pre-schools. Narrabri TAFE College operates from Barwon St. Narrabri.

In Gunnedah there are four primary schools: 2 State schools, 1 Catholic and 1 Christian Community School. There are also two high schools in Gunnedah, a State school and a Catholic High School, St Mary's College. Gunnedah is served by a range of childcare centres and preschools.

Gunnedah TAFE operates from Hunter Street, providing a range of state approved courses, and local content. It is most likely that Gunnedah TAFE will benefit from mining growth in the region and is likely to provide flexible delivery options to new and young workers.

The nearest university campus is the University of New England, which has a campus in Armidale.

Healthcare Facilities

The Boggabri Hospital and Health Service was officially opened in August 2002 and provides multiple health services under one roof, including:

- 16 aged care accommodation places and associated facilities;
- 4 inpatient beds;
- emergency;
- day care;
- radiology;
- community health services; and
- ambulance service.

Boggabri residents have access to 2 local GPs. There is no chemist in Boggabri, but a script drop off / pick up service operates through the post office.

Narrabri is serviced by a District Group Level 2 (community acute) Health Service. This service provides:

- acute care;
- medical;
- surgical;
- maternal;
- pediatric services; and
- 24hr emergency department.



Gunnedah has a hospital providing 50 beds. The hospital provides a high standard of general medical and surgical services including a Slow Stream Rehabilitation Unit and a day surgery care facility together with a Public Health Dental Clinic and a Physiotherapy Unit.

Gunnedah Community Health Service provides:

- adult mental health;
- aged health;
- alcohol and drug services;
- child health;
- community nursing;
- counselling;
- dental services;
- domiciliary nursing;
- family health services;
- health promotion;
- HIV/AIDS services;
- speech therapy; and
- women's health.

A range of aged care facilities are available in Gunnedah. The Gunnedah Nursing Home has 58 nursing home places. The Alkira has 32 hostel places and McAuley Aged care has 22 hostel places. Yalambi has 13 units. The Frail Aged hostel provides 24 hour-a-day care.

Other health care options in Gunnedah include:

- NSW Ambulance;
- baby health centre;
- X-ray facilities; and
- pathology services.

General Facilities

Both Gunnedah and Narrabri, as larger regional centers, provide numerous sporting and recreational clubs, sporting grounds and facilities, restaurants, retail facilities and several franchises.

A focal point for activity of a cultural nature within Gunnedah and surrounding areas is the Gunnedah Cultural Centre. It includes the Civic theatre, which houses new cinema/theatre facilities. Also included are the original town hall and the creative arts centre. The creative arts centre displays the Shire's art collection. Gunnedah also boasts a swimming centre which includes a 50m Olympic pool, 25m indoor heated pool, children's wading pool, kiosk and BBQ facilities.

Gunnedah sees itself as attractive to business because of its rail and road transport links. There is an airport at Gunnedah with daily connections to Sydney, but it is expensive compared to flying in and out of Sydney and Brisbane from Tamworth.



Gunnedah has the following business and industry groups:

- Gunnedah and District Chamber of Commerce and Industry;
- Gunnedah Stock and Station Agents Association;
- New South Wales Farmers Association;
- Tourism Gunnedah (Gunnedah Visitors Information Centre); and
- Gunnedah District Unlimited. (Main Street Program).

For a small town, Boggabri enjoys a reasonable level of service from local organisations. Facilities include:

- service station;
- court house;
- caravan park;
- motel;
- supermarket;
- take away food store;
- post office;
- RSL club, Bowling Club and Hotels;
- 9 hole golf course;
- bowling club;
- police station;
- NRMA offices and service centre;
- library;
- fire brigade;
- a variety of churches; and
- sporting fields.

4.12.2.7 Major Issues Facing the Local Communities

As part of the social impact assessment, Ms Ellen Davis-Meehan of Key Insights Pty Ltd interviewed key stakeholders within the Narrabri and Gunnedah LGAs as well as attending an information evening on the proposal to assess the key issues facing these communities and to determine the general response of each to the proposal.

Boggabri

Boggabri is considered to be well serviced for a small town and have a positive community spirit. The proposed development of the East Boggabri Coal Mine has created a degree of anticipation within the community which is generally very positive about the proposal.

The issues of greatest relevance and importance to the town to be as follows.

- Employment, specifically that which will hold younger people in the town. Currently there is nothing to keep school leavers in Boggabri.
- Boggabri needs something for the youth who are not interested in sport cultural.
- Boggabri requires an increase in population to make viable the establishment of new businesses and services, eg. chemist.



A need to upgrade existing services and provide adequate training to prospective employees has been recognized by key community stakeholders as being of considerable importance to the ability of Boggabri to support the proposal. Rental accommodation is rare in Narrabri Shire and particularly hard to find in Boggabri. To accommodate for a possible increase in population Narrabri Shire Council has identified some small rural blocks to the west of the town and earmarked the area for development

Gunnedah

Gunnedah is well serviced with growing economic activity in the area associated with the established industries of agriculture and those of the health and public sectors. It is being developed as a niche market for aged care with emphasis being placed on developing tourism and the industrial sector. The councilors interviewed saw the reintroduction of mining to the area is considered a good fit with the other established and developing industries.

Issues of concern within the town include.

- **Crime** - The Gunnedah Shire Council's Crime Prevention Plan lists as its main priority area the need to develop greater awareness and prevention of Domestic Violence. Domestic violence is responsible for the majority of assaults locally and the number of incidents has significantly increased over the last 3 years.
- **Youth** - Young people in a rural community are disadvantaged in the labour market. Many leave town for further work and study, those who remain are often unemployed.
- **Housing** - An increase of 500-600 people associated with the reintroduction of coal mining to the Gunnedah LGA over the next 5 years is anticipated. There may be a gap in supply in the housing market.

Gunnedah has the existing services and facilities to handle the likely increase in population resultant from the development of the proposed East Boggabri Coal mine and other mines over the next 5 to 10 years. The local community is generally supportive of the proposal and knowledgeable as to the social and economic impacts that mining delivers to rural towns. Gunnedah Shire Council intends to increase availability to land and let market demand drive development in order to provide the additional housing requirements likely to be created by the proposal.

Narrabri

Like other rural towns, there is currently a lack of employment opportunities in Narrabri for local young people who tend to move away from the town. The proposed development of one or more mines locally would provide greater incentive and job opportunities for local school leavers.



The range of clubs, service organisations, facilities and government services available in Gunnedah and Narrabri Shires indicate a well serviced community with high levels of social capital. This is also true in Boggabri, however the small population in that community makes a full range of services unsustainable and commercially unviable (the loss of the Chemist in recent years being a relevant example). An increase in population associated with the establishment of the proposal would help communities establish critical mass and attract more services and facilities.

The key area that requires enhancement to accommodate the demands of population growth associated with mining activity is the housing sector which is essentially demand driven.

4.12.3 Potential Impacts of the Proposal, Safeguards and Mitigation Measures

Recruitment: Mining employs a small proportion of people with trade, and to a lesser extent, degree qualifications. The local lack of appropriately trained people and a very tight labour market on a State-wide scale (especially for people with industrial trades) might make it hard to attract these skilled persons locally.

As discussed in Section 2.10.2, the Proponent intends to use its association with other operational mines in the region to provide the training required for the bulk of its workforce. Given the reliance of modern farming on heavy machinery, the transition of local residents previously employed in agriculture to mining would be relatively simple. Furthermore, there are a number of former employees from the previous coal mines that still live in the Gunnedah area who have expressed an interest in re-joining the industry.

Housing: Almost all local stakeholders consulted indicated that housing, and particularly rental accommodation, was in short supply and there may be problems, at least initially, in identifying available accommodation for the influx in population that may result.

Land in and around Boggabri and Gunnedah has been or is earmarked for residential development. Until such time as this becomes available, the Proponent would minimize the impacts by firstly encouraging and promoting the employment of people already residing in the area. A short-term worker accommodation plan would be considered by the Proponent which could involve the provision of temporary accommodation whilst more permanent accommodation is identified.

The Proponent would also inform the local Councils of the predicted increase in population to each of the local towns based on employment at the proposal.

Rural amenity: The development of a coal mine in a rural setting and the increase in heavy vehicle movements has the potential to impact on the “peaceful” lifestyle enjoyed by many residents.

In addition to the safeguards discussed in Sections 4.8.4, 4.9.4, 4.10.5, 4.11.3 and 4.13.3 to manage noise, blasting, air quality, visual amenity and traffic, the Proponent would support and promote a Community Consultative Committee and work through this group to keep the local community informed and to provide a communication mechanism between the Proponent and the community.



Integration of immigrating workforce

and families: With the likely immigration of some skilled workers to the local area from other regions where coal mining is a more established industry, there is the potential for these employees and their families to not integrate with the community and therefore remain in the district for only a short period.

To assist in the community integration process, the Proponent would provide assistance, where possible, in identifying job opportunities for the partners of potential employees. The Proponent would also provide a local induction kit to new workers including contact details for community groups and services throughout the region.

4.12.4 Assessment of Impacts

4.12.4.1 Social Impacts

Following qualitative research with local community people, Council staff and professionals associated with the proposed East Boggabri Coal Mine, KICC (2005) concludes the proposed East Boggabri Coal Mine would have significant positive social impacts on Boggabri and the surrounding area, particularly the neighbouring Shire of Gunnedah. These impacts will be amplified and enhanced if the Boggabri Coal Project proceeds at the same time.

By establishing a new major industry in the region, there is an opportunity to reduce existing unemployment in the Narrabri and Gunnedah LGAs and contribute to reversing the existing trend for the exodus of younger people in search of greater employment or educational opportunities. The proposed East Boggabri Coal Mine would provide 30 jobs in construction and subsequently 80 jobs during operation while the combined number created by the concurrent operation of the Boggabri Coal Project is predicted to be 177.

The employment generated by the proposed mines would have social benefits beyond the direct value of the employment itself. These indirect benefits would include the following.

- Generating greater economic activity in the towns supporting the increased employment. This in turn would generate greater income within the retail and services sectors and result in further employment opportunities.
- Encouragement to the hidden unemployed to re-enter the labour market.
- With the increased employment opportunities to school leavers and younger people, a healthier population structure would be created.
- With increased employment opportunities and the creation of a healthier age distribution would provide a boost for community morale which would likely increase community participation, club membership and volunteer services.



In summary, the development of the proposed East Boggabri Coal Mine would deliver the following positive social impacts:

- a reduction of social stress through provision of local jobs and enhanced economic well being;
- training opportunities for local people, including young people and indigenous people, in a growth industry (mining);
- assistance to Boggabri in reaching a critical population mass so as to attract more services and commerce to the town;
- greater contribution to the diversity of the economic base in Narrabri and Gunnedah LGAs therefore enhancing the sustainability of rural communities within the Shires;
- stimulus to local businesses, particularly in Gunnedah and Boggabri, including motel and hotel trade, cafes and restaurants, mining related engineering and surplus spending activity such as gyms, cinema, recreational goods and services, beauty salons, and hair dressers;
- increased population to participate in locals clubs, sporting groups, cultural activities, and organisations, therefore contributing to stronger social networks and social capital;
- more volunteers for community service organizations; and
- the extension of the ability of a proven good corporate citizen (Whitehaven Coal Mining Limited) to act as benefactor to the local community for local community needs.

The potential negative social impacts are discussed in Section 4.12.3, however, with the implementation of the proposed safeguards and the support of local Councils, the likelihood of these negative impacts becoming significant are considered minimal. Of the potential negative impacts associated with the proposal, the availability of adequate housing, either rental or purchase, has been highlighted as the most likely to have a major effect on the local communities of Boggabri, Gunnedah and the LGAs within which they are located. Local stakeholders consulted indicated that while initially housing might be in short supply, there was land approved or identified for residential development and market forces would be sufficient to see any shortfall quickly made up. Section 4.12.4.2, as part of an assessment of the economic impacts of the proposal, provides a quantitative assessment of the likely housing requirements and availability over the life of the proposal. The Proponent remains confident from approaches received to date that they will easily achieve the anticipated 80% local employment level when the mine is underway, thereby limiting the pressure on local rental houses.

The local community appear to fully understand the connection between sustainable economic growth and desirable community and social outcomes. There is enthusiasm for the proposal and mining in general because of the people it would bring to town, the increase in dollars spent locally, the provision of local jobs and the potential from increased participation in community events and clubs. They also expect that the mine would be managed properly, meet its environmental requirements and take due care with transportation on the local road system.



4.12.4.2 Economic Impacts

To assess the impacts of the proposal as well as the cumulative impacts associated with the concurrent development and operation of the Boggabri Coal Project, the likely employment levels of the two mines over time was determined. Based on these employment levels and the projected source of these employees, impacts associated with income generated and likely housing requirements were determined. **Table 4.44** outlines the workforce estimates over time for the proposed East Boggabri Coal Mine and Boggabri Coal Project. As the principal components of the two mines are staggered in timing, this will consequently lead to peaks and troughs in labour demand. The respective stages comprise the following characteristics.

- (i) Construction workforce required to build the mine infrastructure such as the entrance, access and internal roads, mine facilities and coal processing areas along with the initial coal production workforce required to establish the initial workings of the mine.
- (ii) Coal production workforce over the life of the proposed East Boggabri Coal Mine, ie. 8 to 10 years.
- (iii) the theoretical full coal production workforce of the Boggabri Coal Project based on a production rate of 5.0Mtpa.

Table 4.44
Workforce Projections – Boggabri and East Boggabri Coal Mines

Category	Boggabri Coal Project			Proposed East Boggabri Coal Mine	
	Establishment ¹	Operation ²	Maximum ³	Establishment ⁴	Operation ²
Construction⁽⁶⁾	50	-	-	30	-
Mine Operations					
Professional and Site Management	4	6	30		6
Clerical	8	1	40		1
Technical	10	2	133		2
Plant Operator	10	33	133		33
Labour	5	10	64		10
Transport	11	20	80		20
Other	2	8	15		8
Sub-Total	50	80	495		80
Total	100	80	495		80
Notes:					
1. Establishment of mine, year 1			4. Construction, mine establishment and initial mining, year 1		
2. Production, years 2 to 10			6. Generally contract works for relatively short periods (1 to		
3. Maximum production, years 10+ (based on employment figures provided by BHP-AGIP-Idemitsu (1987))			years)		
Source: Boggabri Coal Project EIS, August 1983; East Boggabri joint venture					



Table 4.45 presents the sequence over time of employment requirements for the proposed East Boggabri Coal Mine and **Table 4.46** presents the cumulative sequence of employment requirements when considering the concurrent development of the two mines. **Table 4.45** and **Table 4.46** include estimates of the likely source of the labour force (local and other) along with the forecast population change consequential to the use of labour other than that sourced locally.

Construction:	80% local workforce		
Mine Operations:	Proposed East Boggabri Coal Mine	-	80% local
	Boggabri Coal Project skilled	-	60% local
	Boggabri Coal Project unskilled	-	80% local

Table 4.45
Indicative Mine Operations Employment and Population Impact
East Boggabri Coal Mine

Category	Number
Employment Category	
Skilled ⁽¹⁾	18
Unskilled ⁽²⁾	62
Total	80
Employment Source	
Local	64 (80%)
Other	16 (20%)
Total	80 (100%)
Population Change (by persons)	
Singles ⁽³⁾	5
Families ⁽⁴⁾	28
Total	33
Households⁽⁵⁾	
Boggabri ⁽⁶⁾	7
Other	7
Total	14
Notes:	
1. Includes Professional and Site Management, clerical, Technical and Other (Table 7.1).	4. Estimate based on average and forecast household density.
2. Includes Plant Operator, Labourer and Transport.	5. Assumes 50% household yield for singles.
3. Assumes 30% of new residents will be single.	6. Assumes 50% demand to Boggabri
Source: East Boggabri and Boggabri Project EIS; Castlecrest Estimates	

The assumption of a greater proportion of the mine operations workforce being source locally for the proposed East Boggabri Coal Mine is a consequence of WCM's policy to train local persons rather than relocate personnel.



Table 4.46
Indicative Mine Operation Employment and Population Impact
Boggabri and East Boggabri Coal Mine Projects

Year/Period		0-1	10 ⁽⁷⁾ -13	Total
Employment Category	Skilled ⁽¹⁾	39	35	74
	Unskilled ⁽²⁾	115	142	257
	Total	154	177	331
Employment Source	Local	118 (77%)	128 (72.5%)	246 (74%)
	Other	36 (23%)	49 (27.5%)	85 (26%)
	Total	154	177	331
Population Change (by persons)	Singles ⁽³⁾	12	16	28
	Families ⁽⁴⁾	62	85	147
	Total	74	101	175
Households⁽⁵⁾	Boggabri ⁽⁶⁾	15	20	35
	Other	15	21	36
	Total	30	41	71
Notes:				
1. Includes Professional/Management, Clerical, Technical and Other (Table 7.1).		4. Estimate based on average and forecast household density.		
2. Includes Plant Operator, Labourer and Transport.		5. Assumes 50% household yield for singles.		
3. Assumes 30% of new residents will be single.		6. Assumes 50% demand to Boggabri		
		7. Forecast end of mine operations for East Boggabri project.		
Source: East Boggabri and Boggabri Project EIS; Castlecrest Estimates				

Housing

Tables 4.45 and 4.46 forecast that by the completion of the proposed East Boggabri Coal Mine, the cumulative impact of the two coal mines would be the creation of 177 jobs resulting in an increase in population of 101. An additional 41 households would be created as a consequence with the majority of these required within the first year of commencement of the proposal. Assimilating this demand for housing in Boggabri could produce demand for up to 20 dwellings in an area where, based on the 2001 Census, there were 73 dwellings being rented. However, there was a pool of unoccupied dwellings and it cannot be assumed that the labour requirement would all seek rental accommodation as opposed to the opportunity to purchase within the area. It is considered that the larger centre of Gunnedah would have sufficient rental stock available to supply the predicted 21 households with the potential to meet the surplus demand should suitable accommodation not be immediately available in Boggabri.

It is therefore assessed that despite the concern noted over the ability of the towns surrounding the proposed East Boggabri Coal Mine and Boggabri Coal Project to accommodate the predicted increase in population, there should be sufficient accommodation available initially with market demand stimulating greater residential development which would ease any pressure within the rental or home-buyer markets. Circumstances that could lead or exacerbate any accommodation shortage in Boggabri are also potentially mitigated by proposals to relocate existing workforce and retrain within the structures of the Werris Creek and Whitehaven Coal Mines. The Proponent is confident the scheme will succeed in maximising the number of local residents employed at the proposed East Boggabri Coal Mine, with the closing of the Whitehaven Coal Mine in the next 2 to 3 years further assisting in availability of local employees within the requisite skills and qualifications.



Local Economy

The activity concerned with the development, construction and operation of the proposal would produce a range of distinctive economic outputs. These are principally analysed in terms of:

- (i) employment output as both the mine and other businesses employ additional workers to service the industry; and
- (ii) income derived from the additional wages and salaries paid within the respective industries and local economy.

The proposed construction work would also generate impacts consequential to the development of the proposal.

The output from the proposed East Boggabri Coal Mine would in terms of employment and income have significant impacts through the local and regional economy. The assessment of the values is presented in constant dollar terms with direct employment income based on average mine employment income of \$78 000pa⁹. Indirect employment income is based on average household income for the Northern Statistical Region of the 2001 Census of \$33 800pa. and the assessment of values assumes the economy remains stable during the forecast period.

The analysis of economic impacts performed by KICC (2005) was based on accepted input/output multipliers of the Australian Bureau of Statistics (ABS, 1994/1995).

Based on the employment figures presented in **Table 4.44**, the predicted impacts of the proposal are as follows.

Employment	- Direct	30 Jobs
	- Indirect	51 Jobs
Income	- Direct (\$2001)	\$2 340 000
	- Indirect	\$1 723 800

The employment and income impact associated with construction occurs on a year on year basis. That is, the benefit lasts for the duration of the actual construction work and is not enduring.

The forecast operation workforce for the Proposed East Boggabri Coal Mine will grow over time. **Table 4.47** presents a summary of the predicted employment and income resultant from the operation of the proposal.

⁹ Based on advice received from Roche Mining, May 2005.



Table 4.47
Predicted Income and Employment Impacts

	Direct	Indirect
Mining		
Employment	60	177
Income ⁽¹⁾	\$4,134,000	\$5,982,600
Transport		
Employment	20	28
Income ⁽¹⁾	\$900,000	\$946,400
Notes:1 "Direct" transport income based on annual income of \$45,000 based on Roche Mining estimates		
Source: ABS Input/Output 1994/95; Castlecrest Estimates		

These income and employment impacts only consider the proposal, however, considering the Boggabri Coal Project would be of similar size and scale to the proposed East Boggabri Coal Mine, the cumulative impacts could conservatively be considered to be approximately double those presented in **Table 4.47** and predicted to be as follows.

Construction

Employment	- Direct	-	80 Jobs
	- Indirect		136 Jobs
Income	- Direct		\$1 622 400
	- Indirect		\$4 596 800

Operations

Employment	- Direct		177 Jobs
	- Indirect		454 Jobs
Income	- Direct		\$13 806 000
	- Indirect		\$15 345 200

The proposal would provide a positive impact to the local economies of Boggabri, Gunnedah and the LGAs within which they are located.

4.12.4.3 Conclusion

The proposed East Boggabri Coal Mine would be a significant economic driver for the towns of Boggabri and Gunnedah. The demographic analysis demonstrates the local area is sufficiently broad based to be able to support new and additional development. Education and training characteristics as well as social and cultural facilities would be able to meet the challenges produced by change.

The proposed East Boggabri Coal Mine has the capacity to create direct and indirect employment for 285 persons. The majority of these employees would be sourced locally, however, there would be a direct population increase of approximately 33 persons and 14 households. Considering the cumulative employment created as a consequence of the concurrent operation of the two mines, direct employment would increase to 177 by the completion of the proposed East Boggabri Coal Mine with a commensurate increase in the



number of indirect jobs created (estimated as 454). This increased employment could result in an increased population of 101 and 41 households. KICC (2005) considers there is sufficient room within the existing local accommodation markets to accommodate this increase.

The potential negative impacts from the proposal are also mitigated by the income impacts arising from the wages and salaries paid to the employees within the Coal Mine projects. This will have significant local impact on retail and other urban services and supply chain businesses.

As a consequence of this assessment we believe the impacts are acceptable within their scale and the peaks of demand within the housing and labour force and the possible negative impacts which arise from the change, will be mitigated and absorbed within the local area.

4.13 TRANSPORTATION ASPECTS

4.13.1 Introduction

This sub-section focuses upon the road network external to the Project Site that would be used for the delivery of coal products and by other vehicles travelling to and from the Project Site. The design and construction aspects of the internal road network are largely covered in Section 2.6 whilst the design and construction details of the external road network are covered in Section 2.8. This sub-section presents details of the existing transportation network, existing traffic levels, the operational safeguards to be implemented and the likely impact(s) of the proposal on the existing transport network and road users. Impacts relating to noise and vibration at residences fronting onto the proposed transport route are addressed in Section 4.8.5.3.4.

4.13.2 Existing Transport Network

4.13.2.1 Roads

Figure 4.28 presents the existing road network relevant to the proposal with those roads forming part of the proposed transport route along with those likely to be used for mine-related traffic identified.

The Project Site is located approximately 15km northeast of Boggabri adjacent to the Goonbri Road (SR 26) and between Maules Creek Road (SR 19) and Blair Athol Lane (SR 154). Goonbri Road and the other local roads adjacent to the Project Site are unsealed and essentially link local properties and landholdings with the urban centre of Boggabri to the west and southwest and Gunnedah to the south-southeast. Approximately 3.4km to the south of Goonbri Road, and forming Section 2 of the proposed transport route, is the Manilla Road (MR 357), a 70km long unsealed road linking Boggabri with Manilla and Barraba.



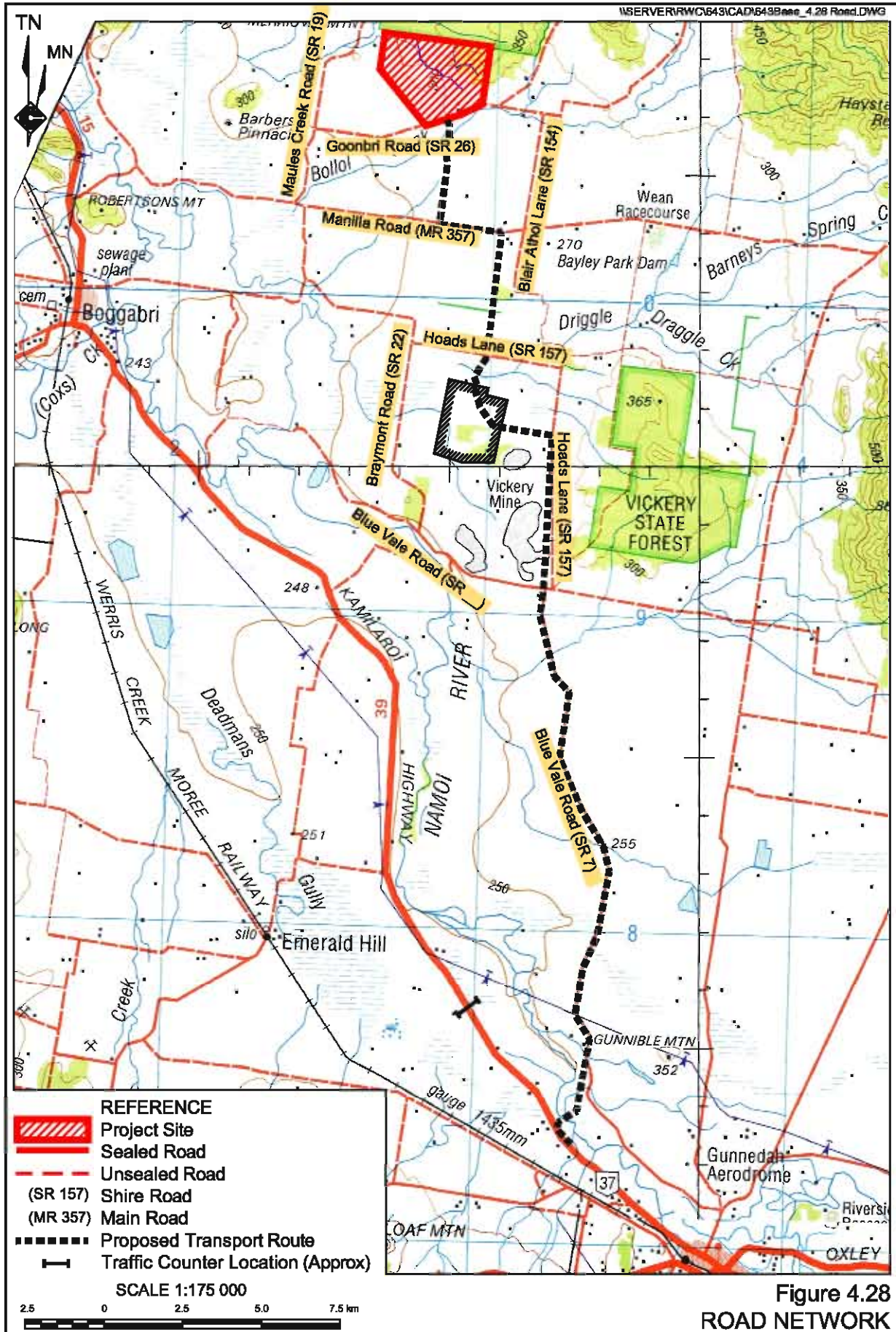


Figure 4.28
ROAD NETWORK



Other roads of significance to the proposal include the following.

Maules Creek Road (SR 19): an unsealed road which intersects with Goonbri Road approximately 3.3km west of the proposed mine entrance. Maules Creek Road links traffic from Leard State Forest and local properties with Boggabri.

Hoads Lane (SR 157): is divided into two sections. The first is an unsealed, east-west oriented section (formerly referred to as Whitehaven Lane) which provides access for the “Whitehaven”, “Bungalow”, “Merton”, “Braymont” and “Gundawarra” properties. The second section is a north-south oriented road which comprises an 8m wide crowned gravel pavement with “V” drains and mitre drains for a distance of 2.3km to the entrance to the Whitehaven Coal mine after which the road has a 6m to 7m wide sealed pavement. This north-south section of Hoads Lane provides access for the “Silkdale”, “Woodlands” and “Will-gai” properties.

Blue Vale Road (SR 7): The part of Blue Vale Road between Hoads Lane and the Kamilaroi Highway which forms part of the proposed transport route is 18.4km in length and comprises a 7m to 8m wide sealed pavement with 1m wide gravel shoulders. Pavement condition is generally good, with WCM currently contributing 85% of all maintenance expenditure on the road. Both edge and centre line markings are provided. Blue Vale Road incorporates eleven causeways/floodways with flood indicators to 2m depth, and seven school bus parking bays with or without shelters. The speed limit on Blue Vale Road is signposted at 100kph.

The intersection of Hoads Lane and Blue Vale Road occurs on a long sweeping bend, with visibility of 300m to the west and 800 m to the south. Traffic signs indicate the presence of the intersection to southbound travellers on Hoads Lane. This intersection was upgraded in accordance with Condition A5 of Development Consent No. 182/1999. The upgrading work was undertaken by WCM enable the concurrent safe movement of coal trucks and local vehicles, and to prevent the continuing movement of gravel from Hoads Lane (prior to road sealing) onto the sealed Blue Vale Road pavement.

The intersection of Blue Vale Road and the Kamilaroi Highway comprises:

- a free flow slip lane and acceleration lane for eastbound vehicles leaving Blue Vale Road;
- a lane for west-turning vehicles leaving Blue Vale Road. The right turn lane and free flow slip lanes are separated by a concrete barrier and island;
- a deceleration lane for eastbound vehicles on the highway entering Blue Vale Road; and
- a separate slip-through lane for eastbound vehicles on the Kamilaroi Highway. The eastbound slip-through and acceleration lanes extend from the intersection to the east of the entrance to the Whitehaven CHPP.

With the exception of Manilla Road and the Kamilaroi Highway, all the local roads identified on **Figure 4.28** are Shire roads and are controlled by the relevant local Council.



Manilla Road is described as a regional main road (MR 357), due to it linking Boggabri (and Gunnedah) with Manilla and Barraba. The Kamilaroi Highway, designated State Highway (SH 37) links Gunnedah with various centres to the north such as Narrabri. Both Manilla Road and the Kamilaroi Highway are maintained with RTA funding.

Collectively, Hoads Lane, Blue Vale Road and Kamilaroi Highway form part of the existing transport route between the Whitehaven Coal Mine and the Whitehaven CHPP. WCM currently contributes 85% of all maintenance costs for Hoads Lane and Blue Vale Road and has committed to re-sheeting Blue Vale Road within 10 years.

4.13.2.2 Traffic Type and Levels

Under normal circumstances, the Shire roads surrounding the Project Site would carry minimal light and heavy vehicle traffic associated with the movement of local landowners, residents and visitors between local properties and the towns of Boggabri, Gunnedah and to a lesser extent Manilla. Traffic count data supplied by Gunnedah and Narrabri Shires for the public roads around the Project Site and between Whitehaven Coal Mine and the Whitehaven CHPP are presented in **Table 4.48**. A substantial proportion of the traffic recorded on Blue Vale Road comprises vehicles travelling to and from the Whitehaven Coal Mine. The traffic data for Blue Vale Road was recorded in March 2002 when annual coal production at the Whitehaven Coal Mine was approximately 750 000 tonnes.

Table 4.48
Traffic Levels on Local/Regional Roads

Traffic Counter Location ⁵ (see Figure 4.25)	5 day Average ^{*1}			7 day Average ^{**2}		
	Light ³	Heavy ⁴	Total	Light ³	Heavy ⁴	Total
Kamilaroi Highway	1 570 (69%)	698 (31%)	2 268	1 535 (74%)	585 (26%)	2 120
Blue Vale Road (south of Hoads Lane)	124 (38%)	205 (62%)	329	115 (41%)	167 (59%)	282
	108 (33%)	221 (67%)	329	101 (35%)	185 (65%)	286
Manilla Road ⁶	30 (87%)	4 (13%)	34	30 (87%)	4 (13%)	34
^{*1} Monday – Friday ^{**2} Monday – Sunday ³ Class 1 and 2 vehicles ⁴ Class 3 – 12 vehicles (3-5 are rigid, 6-12 are articulated) ⁵ Traffic counts were not available from Goonbri Road, Maules Creek Road or Hoads Lane ⁶ 5 day average and 7 day average not differentiated by traffic count for Manilla Road						
Sources: Narrabri and Gunnedah Shire Councils and Howard Haulage Pty Ltd						

Table 4.49 lists the estimated average daily and worst case hourly vehicle movements attributable to the mine-related traffic based upon the despatch of 1.1Mtpa from the mine. Assuming the level of light traffic has remained comparable to March 2003 levels, the 5 day average proportion of heavy vehicles travelling along the Kamilaroi Highway and Blue Vale Road would currently amount to 33% and 67% respectively.



Table 4.49

Operational Traffic Movements – Whitehaven Coal Mine *1

Activity	Vehicle Type	Estimated Average Daily Movements *2 3		Worst Case Hourly Vehicle Movements *5	
		Heavy Vehicles	Light Vehicles	Heavy Vehicles	Light Vehicles
Coal transport / coarse reject backloading	Semi-trailer	244	-	22	-
Equipment / supplies delivery	Semi-trailer / rigid trucks	8	-	4	-
Workforce *4	Passenger vehicles	-	40	-	16
Miscellaneous	Various light vehicles	-	8	-	4
TOTAL		252	48	26	20
*1	based on an annual production of 1.1 million tonnes				
*2	assumes 300 day/year operations				
*3	one round trip = 2 movements				
*4	assumes 1.5 employees per vehicle				
*5	assumes maximum hourly coal truck movements exceeds average by approximately 30%				

Between 1.0Mtpa and 1.2Mtpa of coal is currently transported annually along the existing coal transportation route from the Whitehaven Coal Mine to the Whitehaven CHPP and coal loading facility.

Manilla Road (MR 357) carries slightly higher levels of light and heavy vehicle traffic than the surrounding Shire roads given that it links several towns in the region. The proportion of heavy vehicle traffic is acknowledged to be minor and limited predominantly to the movement of stock, agricultural supplies, equipment and products between the local properties and towns.

4.13.2.3 School Bus Services

Table 4.50 identifies the periods of the day when school buses are likely to be on, or within the vicinity of the public roads proposed as part of the proposal transport route.

Traffic along the Kamilaroi Highway, a main link between Gunnedah (and areas east) and Boggabri/Narrabri (and areas west), includes both tourist and school buses.

4.13.3 Design Features, Operational Safeguards and Ongoing Maintenance

4.13.3.1 Design Features

The following features have been incorporated into the design of the proposed transport route to ensure the impact on local roads and road users is minimised. Where these have been previously outlined or discussed, reference is made to the relevant sub-section.

- (i) The intersections constructed with Goonbri Road, Manilla Road and Hoads Lane would conform with the appropriate Austroads standards (see Section 2.8.3.4).
- (ii) All roads to be constructed or incorporated into the proposed transport route would be sealed. At each intersection with existing public roads, the public road would be sealed for a distance of 50m on both sides of the intersection (see Section 2.8.3.4). This also includes the intersection with the current mine access road at the Whitehaven Coal Mine and its intersection with Hoads Lane.



- (iii) Design and engineering details for each of the above would be submitted to the relevant Council and/or the RTA for approval prior to construction.
- (iv) Stop signs would be erected at each constructed intersection with right of way provided to traffic on the public roads.
- (v) All public road sections of the proposed transport route would be marked with centre and edge line markings.

Table 4.50
School Bus Services

Local Road	Periods of Bus Presence, Direction of Travel* and Status**					
	Morning	Direction	Status	Afternoon	Direction	Status
Hoads Lane	7:30 am – 7:40 am	O	NC	3:50 pm – 4:00 pm	O	C
	7:40 am – 8:00 am	I	C	4:00 pm - 4:15 pm	I	NC
Blue Vale Road	7:15 am - 7:30 am	O	NC	3:30 pm - 4:00 pm	O	C
	8:00 am - 8:30 am	I	C	4:00 pm - 4:30 pm	I	NC
Goonbri Road	7:30 am – 7:40 am	O	NC	3:45 pm - 4:00 pm	O	C
	8:00 am - 8:30 am	I	C	4:15 pm - 4:30 pm	I	NC
* O = Outbound, i.e. from Gunnedah, I = Inbound, i.e. to Gunnedah						
** C = Children on board, NC = No children on board						

4.13.3.2 Operational Safeguards

The following safeguards would be implemented to ensure impacts on local road users are minimised.

- (i) All transport activities would be undertaken strictly in accordance with the development consent and environment protection licence. Deliveries of any “oversize” loads, eg. processing plant or large earthmoving/mining equipment, would be undertaken in accordance with RTA and Council restrictions on transport hours and safety/warning requirements. The despatch of product coal from the mine would be restricted to the hours of 7.00 am to 9.15 pm Monday to Friday, and 7:00am and 5:15pm Saturday. Early morning truck movements would be staggered to limit the number of empty truck movements along the proposed transport route before 7.00am.
- (ii) On school days, the Proponent would maintain and extend the communication system currently in use at the Whitehaven Coal Mine between the truck drivers and local school bus drivers. The system has been negotiated between WCM and local bus drivers and involves two-way radio communication between the truck and bus drivers to ensure that trucks are stationary as a school bus travels through common intersections. The regular communication of a morning and afternoon for the short period when the school buses are operational provides for a high level



of safety and minimal disruption to coal transportation. It is noted that the need for regular two-way communication is not necessary for trucks and buses travelling along Blue Vale Road as a number of sealed bus bays are in place. These bus bays were constructed during the development of the former Vickery Coal Mine although only a few are now in use.

- (iii) Applying a covered load policy to all trucks transporting coal from the mine and backloading coarse reject from the Whitehaven CHPP.
- (iv) Ensuring all trucks transporting coal are well maintained and that the drivers act in a courteous manner at all times. Trucks assessed to be unroadworthy or not carrying covers would not be loaded.
- (v) All drivers would be required to operate in accordance with a Transport Policy and Code of Conduct. The Policy and Code, which would be similar to that developed for the Whitehaven Coal Mine, would identify aspects such as travelling speeds, general behaviour, avoidance of exhaust brakes, load coverage, complaints and disciplinary procedures. The Policy and Code would apply to all employee and contractor-owned vehicles.
- (vi) The stop signs on the approaches to each intersection along the proposed transport route would be strictly adhered to.
- (vii) Landowners and surrounding residents would be contacted prior to initial construction and the commencement of any upgrading works to inform each of the operational safeguards to be implemented and discuss the adoption of any additional safeguards proposed by the landowner/resident.
- (viii) Routine liaison with local residents to ensure their satisfaction with all aspects of the transportation of coal along the transport route.

4.13.3.3 Ongoing Road Management

The Proponent recognises the potential for traffic generated by the proposal to damage the surfaces of the local roads, especially those that form part of the proposed transport route. An agreement would be reached, prior to the determination of the proposal, between the Proponent and Narrabri and Gunnedah Shire Councils for a proportional contribution to the maintenance of all public roads affected by the proposed East Boggabri Coal Mine. It is anticipated emphasis would be placed upon maintaining:

- (i) the sealed surface and drainage control along the sealed sections of Manilla Road, Hoads Lane and Blue Vale Road that form part of the proposed transport route;
- (ii) the intersections constructed with public roads, eg. Goonbri Road, Manilla Road and Hoads Lane; and
- (iii) other local roads used by the proposed East Boggabri Coal Mine employees, contractors and other visitors.



4.13.4 Assessment of Impacts

4.13.4.1 Impacts Attributable to the Proposed East Boggabri Coal Mine

In assessing the potential impact of the proposal on local roads, traffic and road users, the following points were considered pertinent.

- The northern section of the proposed transport route would primarily comprise a purpose-built, private road between the Project Site and the Whitehaven Coal Mine – approximately 80% of the route would be private road.
- The only section of public road incorporated into the northern section of the transport route, Manilla Road, is classified as a regional Main Road (MR 357) which already carries a small proportion of heavy vehicles laden with farm-related supplies, equipment and products is established. Mine-related traffic would be required to stop and give way to all traffic on public roads at the proposed intersections.
- The southern section of the proposed transport route is already an established route for the transportation of coal produced at the Whitehaven Coal Mine. Road users on Hoads Lane and Blue Vale Road have experienced this type of traffic for the past 5 years and on Blue Vale Road, since the early 1990s.
- WCM currently contributes 85% of all road maintenance costs on Hoads Lane and Blue Vale Road to ensure the road surface and drainage control is maintained at an appropriate level. The Proponent proposes to negotiate a similar arrangement with both local Councils prior to the determination of the proposal, to ensure the structural integrity of the public road surfaces and associated drainage are maintained.

Table 4.51 displays the existing and proposed traffic movements on the local road network.

Table 4.51
Proportional Changes in Local Traffic

	Manilla Road (5 day Average)			Blue Vale Road (5 day Average)			Kamilaroi Highway (5 day Average)		
	Heavy	Light	Total	Heavy	Light	Total	Heavy	Light	Total
Existing	4	29	33	205 ¹	124	329	698	1 570	2 268
Proposed	266	84 ³	350	320 ²	84 ³	404	320	84 ³	404
Total	270	113	383	525	208	733	1 018	1 654	2 672
¹ Incorporates approximately 200 truck movements from Whitehaven Coal Mine ² Assumes maximum rate of transportation between Whitehaven and East Boggabri Coal Mines (ie. 520 truck movements per day) ³ An over-estimate as some light vehicles will travel from Boggabri									

As a consequence of low existing traffic levels, increases in traffic, especially heavy vehicle traffic, would be proportionally greater on Manilla Road. It is noted, however, that the proposed traffic levels associated with coal transportation on Manilla Road are similar to those currently experienced associated with coal transportation from the Whitehaven Coal Mine on Blue Vale Road. The integration of coal transportation and light vehicles on Blue Vale Road

without reported accidents to date provide confidence that, assuming similar design features and operational safeguards between the Whitehaven Coal Mine and proposed East Boggabri Coal Mine transportation activities, the level of impact on local roads users would continue to be acceptable.

Considering the above information, and the fact that the majority of the proposed transport route would comprise either private roads specifically designed for the proposal or public roads already serving as a principal transport route, the impacts upon local traffic, local roads and road users are assessed as follows.

Local Traffic: The proposal would result in an increase in traffic levels on roads surrounding the Project Site but, with the exception of the proposed transport route, these increases would be associated predominantly with the movement of employees, contractors and visitors between the Project Site and the surrounding towns. Whilst the change in the number of vehicles travelling on local roads would be noticeable, particularly before and after shift changes, the absolute number of vehicles on the local roads would remain small. There would be a noticeable increase in traffic on the public roads or intersections forming part of the proposed transport route, particularly heavy vehicle traffic. The adoption of the operational safeguards noted in Section 4.13.3.2 would minimise the impact of this increase in traffic levels on the roads and road users, with the impacts assessed below.

Local Roads: As all public roads to be incorporated into the proposed transport route would be sealed and an agreement ensuring these are maintained established between the Proponent and the local Councils, the impact on the ongoing structural integrity of local public roads would be managed and all roads would be maintained in a safe and stable condition at all times.

Road Users: The construction of private roads over the majority of the northern section of the proposed transport route would reduce the interaction between mine-related and public traffic, with all mine-related traffic required to stop and give way to other traffic on the public roads providing a further safeguard. Of the remaining sections of the proposed transport route, Hoads Lane and Blue Vale Road are part of an established haulage route and as such, existing road users would be accustomed to the vehicles used to transport coal to the Whitehaven CHPP and rail loading facility. It is assessed that given these points, and the operational safeguards noted in Section 4.13.3.2, the impact on local road users would be minor.

4.13.4.2 Cumulative Impacts

As a consequence of the concurrent operation of the proposed East Boggabri Coal Mine and the Whitehaven Coal Mine, the number of heavy vehicles using Hoads Lane, Blue Vale Road and the Kamilaroi Highway would increase by the amounts shown on **Table 4.51**.



Noise impacts associated with this concurrent operation are discussed in Section 4.8 and assessed as compliant with relevant noise criteria.

WCM, a joint venture partner, has demonstrated that the haulage route between the Whitehaven Coal Mine and the Whitehaven CHPP offers a safe route, with no reported traffic accidents involving any mine vehicles (heavy or light). Increasing the number of vehicles is unlikely to significantly alter the safety or level of service of the road and intersections as the mine-related traffic would be the main traffic on these roads. As such, the cumulative impact to users of these roads is assessed as acceptable.

At this stage, no formal assessment of the roads structural capacity or remaining life has been undertaken. However, the Proponent's commitment to negotiate and implement an agreed level of contribution of road maintenance with the Narrabri and Gunnedah Shire Councils, demonstrates its commitment to remediating any damage caused (as a result of the cumulative impact associated with transport from the two mines).

4.14 LANDOWNERS, RESIDENTS AND LAND USE

4.14.1 Introduction

The preceding sub-sections have evaluated the impact of a range of environmental issues that either individually or collectively would or could have an impact on surrounding landowners and residents. These issues relate principally to water resources, noise, blasting, air quality, transportation and visual amenity.

A critical component of the design of the proposal has been the selection of a mine design and operational procedures that would ensure that no surrounding resident or landowner would lose access to water resources, is subjected to unacceptable levels of noise or dust or suffers any significant loss of visual amenity. Notwithstanding the implementation of appropriate design and operational safeguards, the landowners in the vicinity of the proposal would be aware of the development of the mine to varying degrees, principally through unfamiliar noises from the mine (within relevant criteria), the change in visual outlook from some vantage points and the progressive clearing, disturbance, construction and revegetation of a modified landform.

A description of the existing land ownership and land use surrounding the Project Site was provided in Section 3.4. This sub-section assesses how the proposal would impact on these aspects and identifies the operational procedures and safeguards to ensure any impact is minimised and largely limited to the life of the proposal.

4.14.2 Proposed Future Land Uses

The final land use would incorporate elements of the existing land uses including:

- (i) agricultural activities (226ha); and
- (ii) conservation of native vegetation (500ha). This includes a 130ha "offset" area, ie. an area of agricultural land which would be fenced and set aside to encourage natural regeneration in the absence of grazing and provide linkages between existing and re-established areas of native vegetation. Approximately 50ha of this offset area is located beyond the Project Site immediately to the south of Goonbri Road.



4.14.3 Operational Controls and Offset Strategies

4.14.3.1 Land Use

Agricultural activities on a substantial area of the Project Site would be suspended for the duration of mining with approximately 130ha of the existing grazing and cropping land fenced from the outset of project development to allow for natural regeneration and revegetation with local tree and shrub species. In the longer term, approximately 226ha of land would be set aside for ongoing grazing/cropping uses.

In order to minimise impact on the “Templemore” and “Bollol Creek Station” properties, a buffer of 50m would be maintained along the eastern and southern Project Site boundaries. This buffer would be fenced to provide a separation from adjoining properties and would also serve as a biological offset for disturbance to native vegetation.

The Proponent has negotiated to use small parts of the “Tarrawonga” and “Kyalla” properties for sections of the proposed transport route. Topsoil stripped along the route would be provided to each landowner for use on other areas of their properties. Suitable subsoil would also be made available for additional construction activities on these properties. To further minimise impacts on these properties, the proposed transport route would be fenced along its entire length to prevent vehicle / stock interaction. Access would be provided to the property homesteads where required through the use of gates.

4.14.3.2 Amenity

The operational controls to reduce impacts on the amenity of surrounding landholders and residents have been covered elsewhere in the document.

- Surface and Groundwater, Sections 4.1.4 and 4.2.4.
- Land Capability and Agricultural land suitability; Section 4.3.4.
- Noise, Section 4.8.4.
- Blasting Vibration, Section 4.9.4.
- Air Quality, Section 4.10.5.
- Visual amenity, Section 4.11.3.
- Transport issues, Section 4.13.3.

Notwithstanding the coverage of impacts in the above sections of the EIS, the Proponent acknowledges there may still be impacts, either real or perceived, to some landholders and/or residents. The Proponent is committed to a process of ongoing consultation and issues resolution with these landholders/residents.

4.14.4 Ongoing Consultation

The Proponent intends to keep surrounding landholders and residents informed about the proposal and provide appropriate forums for complaints and suggestions to be made. This practice, which was initiated during the planning phase for the proposal, has already been recognised to have had benefits with respect to the identification of potential impacts the proposal might have on future land uses, the livelihood and/or lifestyle of the local community.



As a consequence of consultation undertaken to date, emphasis has been placed on ensuring the access of surrounding residents to groundwater is maintained and the re-establishment of agricultural land in the final landform design.

4.14.5 Assessment of Impacts

4.14.5.1 Land Use and Lifestyle

During the life of the proposal, there would be a significant impact on the land use on the Project Site, although, this should not influence the land use on surrounding properties. As discussed in previous sub-sections, there would likely be some impact from noise, dust and changes to visual amenity at some surrounding residences. However, the operational safeguards and/or offset strategies adopted would ensure these satisfy local and/or State government guidelines or criteria and/or reasonable community expectations. The Proponent is, however, committed to maintaining consultation with surrounding residents affected by the proposal and implementing further controls in response to any reasonable community expectations or complaints.

4.14.5.2 Impacts on Livestock

The Project Site is located amongst land that is used for grazing livestock, typically cattle, and cultivation of pasture. Noise issues that might impact on livestock grazing adjacent to, or on, the Project Site include:

- excavation and earthmoving activities;
- blasting; and
- truck movements.

Little information is available on the impact various mining-related noises might have on different livestock. Anecdotal evidence provided by Bond (1974) and Hunt (1999) indicates that livestock quickly become accustomed to their noise environment with no impact on eating patterns, feed intake or general behavioural activity. Cattle do not appear to react to noise associated with truck movements (Hunt 1999) and therefore, the proposed maximum of 25 truck movements per hour along the northern section of the proposed transport route would be unlikely to have any effect on the livestock on and surrounding the Project Site. As such, it is unlikely the noise associated with the proposal would have any direct or indirect impact on livestock grazing adjacent to, or on, the Project Site.

Additional discussion on the impact of blasting and dust on livestock is presented in Sections 4.9.5.6 and 4.10.6.9 respectively.



4.14.5.3 Cumulative Impacts

The land to be disturbed by the Boggabri Coal Project is presently used for forestry and nature conservation with a small part of the “Nagero” property used for grazing and rotational cropping. In reality, the land uses impacted upon by the two mines would be largely separate. As a result, there would not be a significant cumulative impact on land uses around the Project Site as a result of the concurrent operation of the proposed East Boggabri Coal Mine and Boggabri Coal Project.

4.15 PLANNING INSTRUMENT COMPLIANCE

4.15.1 Introduction

This sub-section identifies each of the planning instruments discussed in Section 1.5 and demonstrates how the proposed East Boggabri Coal Mine would address the requirements or the relevant objectives of each instrument.

4.15.2 State Planning Compliance

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

The development application of the Proponent would be referred to the RTA by DIPNR, as development for the purpose of mining requires this under paragraph (m), Clause 7 of the policy. The proposal would result in an increase in traffic, especially heavy vehicle traffic on local roads. Of these roads, Manilla Road is operating effectively as a collector road and is recognised to carry light and heavy vehicles between the urban centres of Boggabri, Manilla and Barraba as well as service those properties throughout the local area. As such, the proposed increase in traffic is unlikely to have a significant impact on the current users of the road. Hoads Lane and Blue Vale Road are already considered part of a “principal haulage route”. Other sections of public roads, ie. intersections with the private sections of the proposed transport route, would be constructed to RTA standards and managed to provide right-of-way to public road users and as such minimise any impact associated with these intersections.

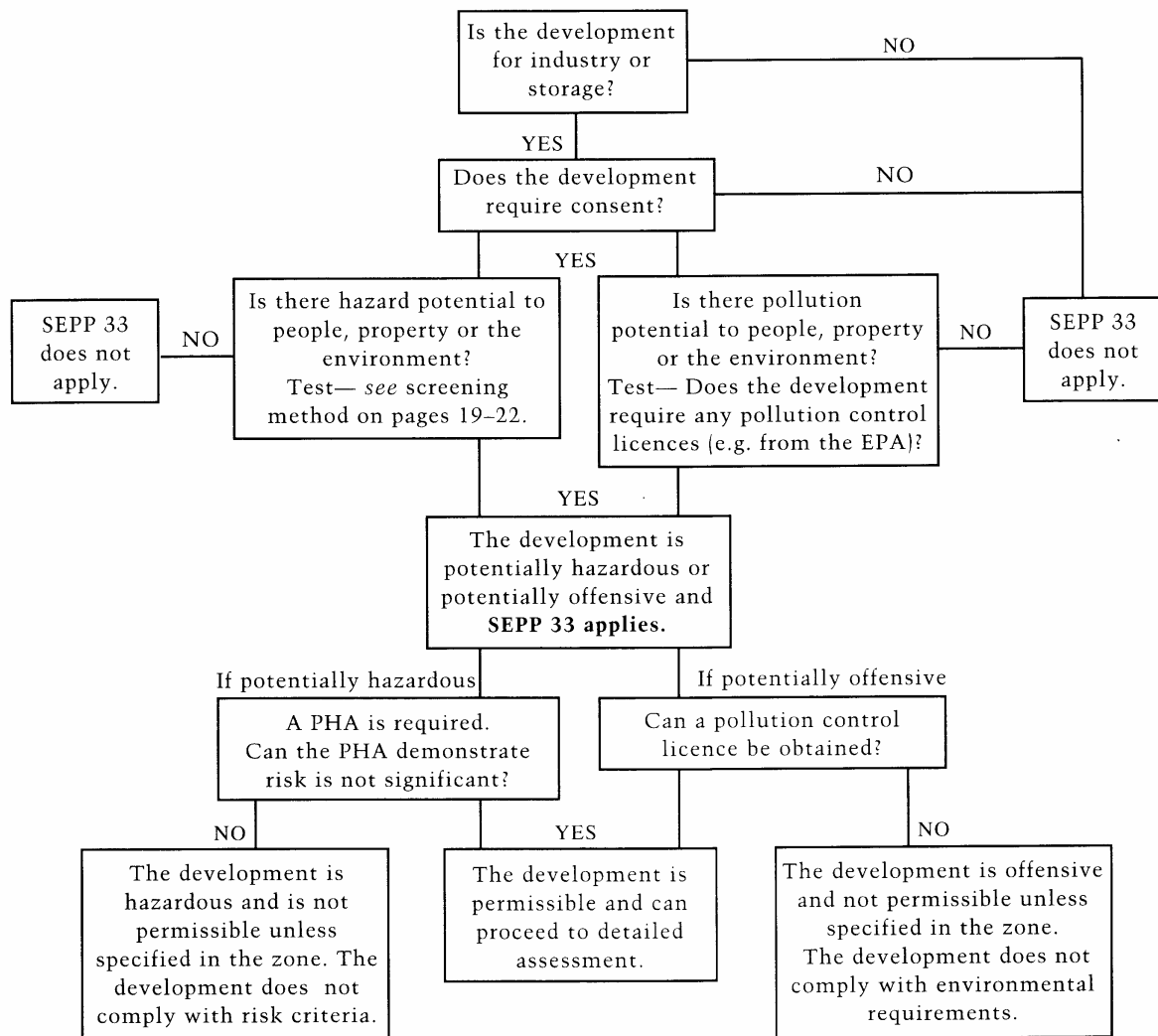
State Environmental Planning Policy No. 33 (SEPP 33) – Hazardous and Offensive Developments

The guidelines for applying SEPP 33, “Applying SEPP33” 2nd Eds. (DUAP, 1997) have been reviewed and applied as presented in **Figure 4.29**.

The proposed East Boggabri Coal Mine has been assessed in terms of the components of the procedure identified in **Figure 4.29**.

- Is the development for industry or storage?
 - Yes
- Does the development require consent?
 - Yes





Source: DUAP (1997) – Figure 1

Figure 4.29
APPLYING SEPP 33

Assessing the proposal as a “potentially offensive” or “offensive” industry.

- Is there pollution potential to people, property or the environment?
 - Yes – the development would require an Environmental Protection Licence. Therefore the development is “potentially offensive”.
- Would the potential discharge of pollutants, eg air contaminants, noise and water contaminants have a significant adverse impact on the locality.
 - No

The proposal is not “offensive” industry and is permissible with development consent.



Assessing the proposal as a “potentially hazardous” or “hazardous” industry.

- Is there hazard potential to people, property or the environment?
 - Yes, a Preliminary Hazard Analysis (PHA) has been undertaken in accordance with the specifications included in Appendix 4 of DUAP (1997). The hazardous material to be stored on the Project Site are restricted to diesel fuel and the separate components of ANFO explosives (Nitro pril and diesel). As such, a qualitative PHA is considered sufficient for the purpose of the assessment.

Preliminary Hazard Analysis

- Diesel Fuel
 - Up to 110 000L of diesel would be stored within the mine facilities and coal processing areas.
 - The diesel would be stored in two 50 000L tanks and one 10 000L tank, each bunded to contain 110% of the tank volume.
 - Accidental spillage or leakage from these tanks would be unlikely as the bunding would prevent accidental contact with vehicles or mobile equipment.
 - There are no nearby areas of environmental sensitivity to the proposed storage areas.
- ANFO
 - Nitro-pril bags, diesel and detonators, when stored on the Project Site, would all be stored separately either in designated magazines or the previously noted diesel storage areas.
 - Storage of these materials (Nitro-pril and detonators) would generally be sufficient for the upcoming blast event only.
 - Restricted access and separate storage removes the risk of accidental detonation.
 - There are no nearby areas of environmental sensitivity that might be adversely affected by the storage and use of these materials.
 - Only authorised personnel such as the nominated blasting contractor, blasting engineer and mine management would have access to these materials and storage areas.

The storage and use of diesel fuel and ANFO in the correct manner represent an insignificant risk. The proposal is therefore NOT “hazardous” industry and permissible with development consent.



State Environmental Planning Policy No. 44 (SEPP 44) - Koala Habitat Protection

The flora survey established that part of the northern section of the proposed transport route is potential Koala habitat whereas the fauna assessment concluded that the section of the route is not core Koala habitat. The flora survey established the vegetation on the Project Site was not potential Koala habitat. Notwithstanding these outcomes, it was concluded that the proposal would not have any of significant impact upon any Koala population or potential Koala habitat (see Section 4.5.7.1).

State Environmental Planning Policy No. 34 (SEPP 34) – Major Employment Generating Industrial Development

The aims of SEPP 34 and how the proposal would be developed and operated consistent with these, are provided below.

- To promote and co-ordinate the orderly and economic use and development of land and the economic welfare of the State.

The proposal was designed following a comprehensive consultation and assessment phase including consultation with the local community, local government and relevant State government agencies as well as the assessment by independent, professional consultants of all aspects of the proposal with the potential to impact on the existing environment. The proposal allows the economic use of the land for mining purposes with the future return of part of the land to agricultural purposes incorporated into the design. The State would benefit through generation of employment, payment of taxes and income derived from the export of the coal.

- To facilitate certain types of major employment-generating industrial development of State significance;

As coal mining is classified under Clause 7 of this instrument as a “State significant” development, development consent is being sought from the Minister for Infrastructure and Planning, with the proposed coal mine to be developed and operated in compliance with conditions of the development consent.

- To facilitate the carrying out of labour intensive rural industrial development of State significance;

Not relevant to this proposal.

- To achieve appropriate planning controls in respect of such development;

The proposal has been designed following a comprehensive consultation process with both local and State government agencies. The proposed mine would be developed and operated in compliance with all conditions of any development consent granted.



- To provide for public participation and involvement in the assessment of applications for consent to carry out such development.

The local community has been afforded several avenues to obtain information or raise concerns over the proposal. These have included:

- *an information evening held in Boggabri on 7 April 2005; and*
- *personal visits to local property owners by the Proponent's representatives between 14 February 2005 and 30 March 2005.*

The EIS would be displayed publicly at both Narrabri Shire Council, Gunnedah Shire Council and the Proponent's office in Boggabri.

4.15.3 Regional Planning Compliance

Orana Regional Environmental Plan (REP) No 1 - Siding Spring

The Proponent acknowledges that while the Project Site falls outside the 100km radius requiring consultation and consultation with the Observatory Director, it is within a 200km radius of the Siding Spring Observatory and therefore the proposal could be assessed by the relevant authority during the determination of the proposal.

4.15.4 Local Planning Compliance

Narrabri Local Environmental Plan (LEP) 1992

The proposal meets the general objective of the Narrabri LEP (1992) through the “proper management, development and conservation of:

- (i) timber, mineral, soil, water and other natural resources;
- (ii) areas of ecological significance; and
- (iii) the environmental heritage of the Shire of Narrabri.”

The proposal meets the objectives of zone 1(a) (General Rural) as:

- (a) protecting, enhancing and conserving;
 - i. agricultural land in a manner which sustains its efficient and effective agricultural production potential;
 - ii. soil stability by controlling and locating development in accordance with soil capability;
 - iii. forests of existing and potential commercial value for timber production;
 - iv. valuable deposits of minerals, coal, petroleum and extractive materials by controlling the location of development for other purposes in order to ensure the efficient extraction of those deposits;



- v. trees and other vegetation in environmentally sensitive areas where the conservation of the vegetation is significant to scenic amenity or natural wildlife habitat or is likely to control land degradation;
- vi. water resources for use in the public interest;
- vii. areas of significance for nature conservation, including areas with rare plants, wetlands and significant habitats;
- viii. places and buildings of archaeological or heritage significance, including the protection of Aboriginal relics and places;

The Development of the proposed East Boggabri Coal Mine would enhance valuable coal deposits, minimise disturbance to soils, native vegetation and water resources, and protect or conserve forests of commercial value, areas of environmental significance and places of archaeological significance (including Aboriginal artefacts and sites).

- (b) preventing the unjustified development of agricultural land for purposes other than agriculture;

The recovery of coal resources within the Narrabri LGA justifies the temporary use of agricultural land for other purposes.

- (c) preventing residential development on prime crop and pasture land, except where it is ancillary to agriculture or another use permissible in the zone;

The proposal does not involve residential development.

- (d) facilitating farm adjustments;

This is not applicable to the proposal.

- (e) ensuring that any allotment created for an intensive agricultural pursuit is potentially capable of sustaining a range of such purposes or other agricultural purposes;

This is not applicable to the proposal.

- (f) minimising the cost to the community of fragmented and isolated development of rural land;

This is not applicable to the proposal.

- (g) providing, extending and maintaining public amenities and services; and

The proposal would not require, or diminish, public amenities and services.

The proposal therefore meets the general objectives of the Narrabri LEP (1992) and specific objective of Zone 1(a) (General Rural) and is permissible with development consent.

