NOISE AND VIBRATION IMPACT ASSESSMENT

Abel Upgrade Modification Environmental Assessment

APPENDIX D

Resource Strategies

DONALDSONCOAL
Part of the Yancoal Australia Group

global environmental solutions

Abel Upgrade Modification

Noise Impact Assessment

Report Number 630.10334-R1

28 November 2012

Donaldson Coal Pty Ltd
PO Box 37 Maitland NSW
Australia 2320

Version: Revision 0

Abel Upgrade Modification

Noise Impact Assessment

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EXECUTIVE SUMMARY

SLR Consulting Australia Pty Ltd (SLR Consulting) has been commissioned by Donaldson Coal Pty Ltd, to conduct a noise impact assessment for the Abel Underground Mine Upgrade Modification (the Modification).

The Modification involves changes in the method of mining at the Abel Underground Mine, resulting in increased efficiency of coal recovery and an increase in the coal processed at the Bloomfield Coal Handling and Preparation Plant. In addition, the Modification involves an increase in run-of-mine coal received at the Abel Underground Mine from the Tasman Underground Mine due to the Tasman Extension Project.

The objective of the assessment was to assess the potential noise and blasting impacts associated with the Modification.

Operational Noise Predictions

A computer model was used to predict noise emissions from the Modification. Noise levels were predicted for the operational scenarios with the inclusion of the noise mitigation and management procedures.

Operational noise levels from the Modification are predicted to meet the project specific noise criteria at all receiver locations under prevailing weather conditions.

The operational scenario modelled is likely to represent an acoustically worst-case scenario, and therefore actual operational noise levels are likely to be less than those predicted for the Modification.

Sleep Disturbance Assessment

The predicted maximum noise levels from the Modification meet the sleep disturbance criteria at all locations and therefore, are not likely to cause sleep disturbance at any assessed residential location.

Rail Traffic Noise Assessment

The increase in rail traffic generated by the peak number of trains using the Bloomfield rail loop is predicted to increase the existing rail noise level by less than 0.1 dBA. This increase is negligible and such an increase would not be discernible by receivers near the rail line.

Construction Noise Assessment

The predicted noise levels from construction will meet the Interim Construction Noise Guideline (ICNG) highly noise affected management level at all locations. Exceedances of the ICNG noise affected management level are predicted during construction of the downcast ventilation shaft at the two closest receivers for the daytime only.

Construction noise management measures would be implemented during construction activities to minimise noise impacts, and potentially affected receivers would be notified of the construction activities and their duration prior to works commencing.

Cumulative Impact Assessment

The cumulative impacts of the Modification and other mining in the area surrounding the Abel Underground Mine, including the existing Bloomfield Coal Mine, are predicted to comply with the relevant amenity criteria set in accordance with the New South Wales Industrial Noise Policy (INP).

EXECUTIVE SUMMARY

Blasting

An assessment of underground blasting was conducted for the Modification. Minimum offset distances were calculated, such that vibration from underground blasts would meet relevant criteria at receiver locations. Blasting would be avoided within the calculated minimum offset distance, however should blasting be required the blast size would be reduced, such that blasts comply with relevant criteria.

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1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR Consulting) has been commissioned by Donaldson Coal Pty Ltd (Donaldson Coal) to conduct a noise impact assessment (NIA) for the Abel Underground Mine Upgrade Modification (the Modification).

The Abel Underground Mine is an existing mining operation, owned and operated by Donaldson Coal. Under the Project Approval 05_0136 for the Abel Underground Mine run-of-mine (ROM) coal is extracted from the underground mining area and transported via internal roads to the Bloomfield Coal Handling and Preparation Plant (CHPP) for processing. The Bloomfield CHPP is also approved to receive coal from other mining operations, including the Tasman Underground Mine, which is also owned and operated by Donaldson Coal.

The Modification involves changes in the method of mining at the Abel Underground Mine, resulting in increased efficiency of coal recovery and an associated increase in the amount of ROM coal processed at the Bloomfield CHPP. In addition, the Modification would involve the receipt of ROM coal associated with the Tasman Extension Project.

The objective of the NIA was to assess the potential noise and blasting impacts associated with the Modification.

The NIA includes consideration of the operation of the mine, coal handling and processing at the Bloomfield CHPP and the associated rail and road traffic movements. Advice with regard to effective mitigation strategies has been provided where necessary. In addition, the potential impacts associated with underground blasting at the Abel Underground Mine have been assessed.

The NIA has been prepared with reference to Australian Standard AS 1055:1997 *Description and Measurement of Environmental Noise* Parts 1, 2 and 3 and in accordance with the New South Wales (NSW) *Industrial Noise Policy* (INP), NSW *Interim Construction Noise Guideline* (ICNG), NSW *Road Noise Policy* (RNP), *Rail Infrastructure Noise Guideline* (RING) and *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* (IGANRIP). Where issues relating to noise are not addressed in the INP, such as sleep disturbance, reference has been made to the NSW *Environmental Noise Control Manual* (ENCM). Blasting impacts have been assessed in accordance with the Australia and New Zealand Environment and Conservation Council (ANZECC) guidelines.

2 EXISTING OPERATIONS AND MODIFICATION DESCRIPTION

2.1 Existing and Approved Operations

Donaldson Coal, a wholly owned subsidiary of Yancoal Australia Limited, owns and operates the Abel Underground Mine located approximately 23 kilometres (km) north-west of the Port of Newcastle, NSW within the Newcastle Coalfield (**Figure 1**). The Abel Underground Mine is approved to operate in accordance with Project Approval 05_0136 dated 7 June 2007 by the then NSW Minister for Planning pursuant to section 79J of the NSW *Environmental Planning and Assessment Act 1979*.

The Abel Underground Mine is approved to extract up to 4.5 million tonnes per annum (Mtpa) ROM coal. ROM coal from the Abel Underground Mine is transported along an internal, sealed haul road to the Bloomfield CHPP and rail loading facility where the coal is processed prior to rail transport to the Port of Newcastle (**Figure 1**) for export or to other customers.

The potential environmental impacts of the existing Abel Underground Mine were assessed in the *Abel Underground Mine Part 3A Environmental Assessment* (Abel EA).

Under Project Approval 05_0136, approval was granted for the construction and use of an overland conveyor for the transportation of ROM coal from the Abel Underground Mine entrance to the Bloomfield CHPP. The overland conveyor has not been constructed, and as described in the Abel EA, would only be constructed should financial circumstances permit.

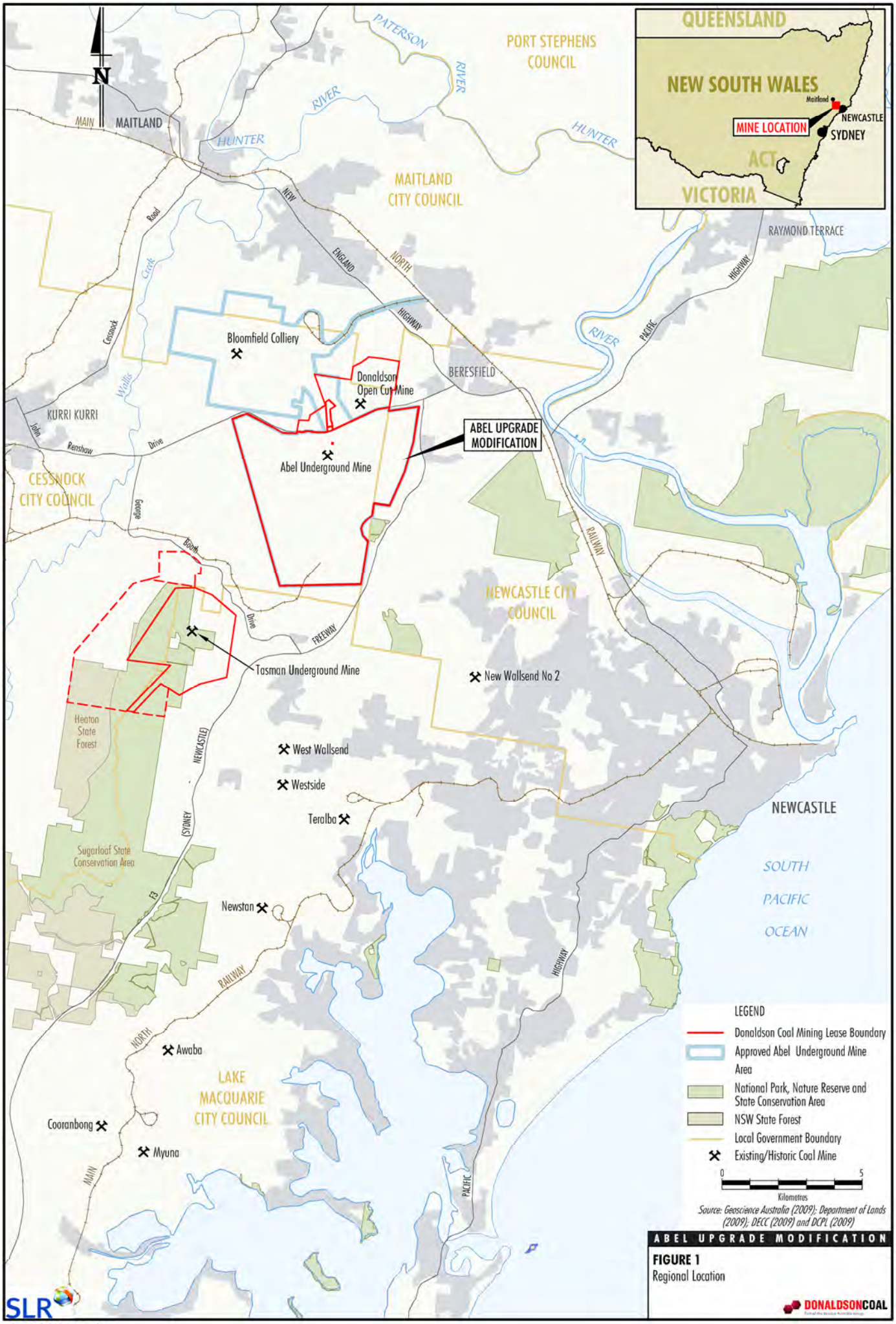
In addition, approval was granted for modifications to the Bloomfield CHPP, including increased stockpile areas and modifications to increase the capacity of the CHPP, however, some of these modifications, including the full extension of the stockpile areas, have not been implemented.

In accordance with Project Approval 05_0136, the Bloomfield CHPP is approved to process up to 6.5 Mtpa ROM coal from the Abel Underground Mine, Tasman Underground Mine, Donaldson Open Cut Mine, Bloomfield Colliery and other sources.

2.1.1 Previous Noise Assessment

Noise impacts associated with Abel Underground Mine were assessed in Heggies Report 30_1409R1R1 *Noise Impact Assessment Proposed Abel Coal Mine* dated 19 July 2006.

The Abel Underground Mine was modified in 2010 (05_0136 Mod 1) and 2011 (05_0136 Mod 2) for the construction and installation of downcast and upcast ventilation shafts, respectively. Noise impacts associated with the upcast ventilation shaft were assessed in SLR Consulting Report 630 10097 R1 20110314 *Abel Underground Coal Mine Upcast Ventilation Shaft 75W Modification Noise Assessment*. As the downcast ventilation shaft does not require power, no assessment of noise impacts was required.


QUEENSLAND
NEW SOUTH WALES
Maitland
NEWCASTLE
MINE LOCATION
SYDNEY
ACT
VICTORIA
N
PATERSON RIVER
PORT STEPHENS COUNCIL
HUNTER RIVER
MAITLAND
MAIN
MAITLAND CITY COUNCIL
NEW ENGLAND HIGHWAY
RAYMOND TERRACE
PACIFIC HIGHWAY
Bloomfield Colliery
Donaldson Open Cut Mine
BERESFIELD
ABEL UPGRADE MODIFICATION
Abel Underground Mine
KURRI KURRI
CESSNOCK CITY COUNCIL
Tasman Underground Mine
NEWCASTLE CITY COUNCIL
New Wallsend No 2
Heaton State Forest
West Wallsend
Westside
Teralba
NEWCASTLE
Sugarloaf State Conservation Area
Newstan
SOUTH PACIFIC OCEAN
Awaba
LAKE MACQUARIE CITY COUNCIL
Cooranbong
Myuna
LEGEND
Donaldson Coal Mining Lease Boundary
Approved Abel Underground Mine Area
National Park, Nature Reserve and State Conservation Area
NSW State Forest
Local Government Boundary
Existing/Historic Coal Mine
0
5
Kilometres
Source: Geoscience Australia (2009); Department of Lands (2009); DECC (2009) and DCPL (2009)
ABEL UPGRADE MODIFICATION
FIGURE 1
Regional Location
SLR
DONALDSONCOAL
DCL-09-01 AMod2012 Noise_101A

2.2 Modification Overview

Donaldson Coal has requested a modification of Project Approval (05_0136) for upgrades to underground mining operations at the Abel Underground Mine to increase the efficiency of coal recovery (ie the Modification). The Modification would involve the continuation of underground mining within the approved area and approved seams, using a combination of longwall, shortwall and bord and pillar mining. In addition, the Modification would involve the receipt of ROM coal associated with the Tasman Extension Project (subject to approval of the Tasman Extension Project [Application SSD-4962]).

The key components of the Modification relevant to potential noise impacts are summarised below:

- Increased annual ROM coal production of up to 6.1 Mtpa, associated with the changes in the method of mining.
- An extension of the mine life of approximately two (2) years (ie until 31 December 2030).
- An increase in the amount of ROM coal from the Abel Underground Mine and the Tasman Extension Project transported to the Bloomfield CHPP.
- Increased throughput of coal at the Bloomfield CHPP and rail load out facility.
- Modifications and upgrades to the Bloomfield CHPP, including an additional CHPP module and associated feed and product conveyor systems.
- Increased annual and total quantity of fine and coarse rejects from the Bloomfield CHPP disposed at the Bloomfield Colliery.
- Construction and use of a downcast ventilation shaft.

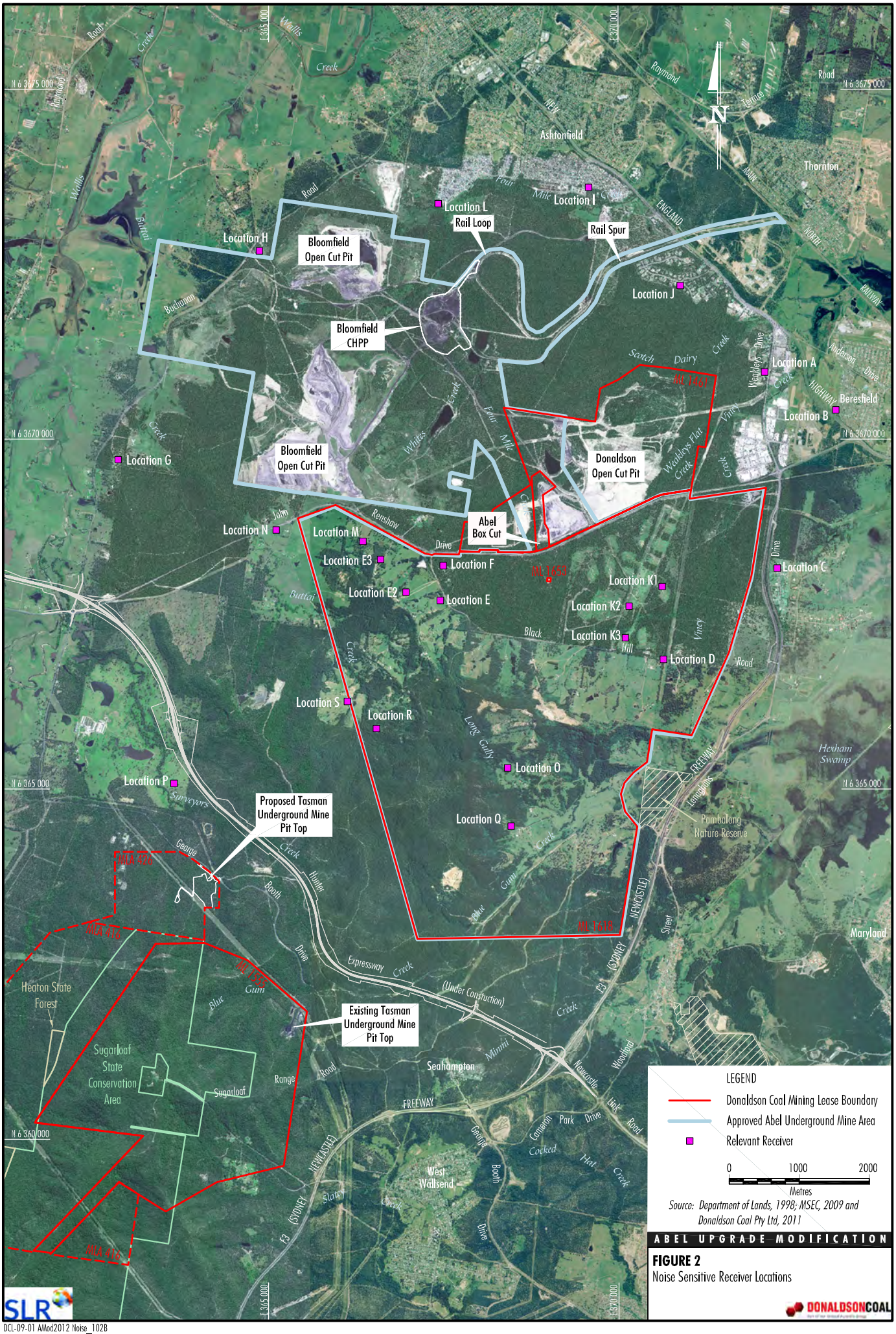
3 RESIDENTIAL RECEIVERS

Consistent with previous noise assessments conducted for the Abel Underground Mine (**Section 2.1**) and noise monitoring locations specified in Project Approval 05_0136 the nearest potentially affected residential receivers to the site are characterised by the locations contained in **Table 1** and are shown in **Figure 2** and **Appendix A**. Additional receiver locations (ie O, P, Q, R and S) contained in **Table 1** are relevant to the construction of the proposed downcast ventilation shaft only.

Table 1 Residential Receivers

A	Weakleys Drive, Beresfield
B	Yarrum Road, Beresfield
C	Phoenix Road, Black Hill
D	Black Hill School
E	Browns Road, Black Hill
F	Black Hill Road, Black Hill (owned by Donaldson Coal)
G	Buchanan Road, Buchanan
H	Mt Vincent Rd, Louth Park
I	Lord Howe Dr, Ashtonfield
J	Kilarney Street, Avalon Estate, Thornton
K	former residences on Catholic Diocese land (now not habited)
L	Kilshanny Avenue, Ashtonfield
O*	150 Dog Hole Road, Stockrington
P*	George Booth Drive, Buchanan
Q*	203 Dog Hole Road, Stockrington
R*	281 Lings Road, Buttai
S*	189 Lings Road, Buttai

* Receivers relevant to the construction of the proposed downcast ventilation shaft only.



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4 EXISTING CONSENT CONDITIONS

4.1 Project Approval 05_0136

Abel Underground Mine currently operates in accordance with consent conditions provided within the Project Approval 05_0136. An extract of the consent conditions relevant to noise is as follows:

Noise Limits

The proponent shall ensure that the noise generated by the Project does not exceed at any privately-owned residence the levels set out in Table 1 for the monitoring locations nearest that resident.

Table 1 Noise Limits dBA

Day	Evening	Night		Location and Locality
$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$	
50	48	41	51	**A** Weakleys Dr, Beresfield **B** Yarrum Rd, Beresfield
49	47	40	50	**J** Kilarney St, Avalon Estate
46	46	40	53	**L** Kilshanny Ave, Ashtonfield
44	46	38	48	**I** Lord Howe Dr, Ashtonfield
43	44	38	50	**C** Phoenix Rd, Black Hill
43	41	36	46	**G** Buchanan Rd, Buchanan **H** Mt Vincent Rd, Louth Park
41	40	37	46	**K** Catholic Diocese (Former Bartter) K1, K2, K3
41	40	36	46	**D** Black Hill School **E** Brown Rd, Black Hill **F** Black Hill Rd, Black Hill

Notes:

- *To determine compliance with the $L_{Aeq(15\ minute)}$ limit, noise from the project is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the development is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The Modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.*

- *To determine Compliance with the $L_{A1(1\ minute)}$ limit, noise from the project is to be measured at 1 metre from the dwelling facade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).*

- *These limits apply under the relevant meteorological conditions outlined in the assessment procedures in Chapter 5 of the NSW Industrial Noise Policy.*

- *These limits do not apply if the Proponent has an agreement with the relevant owner/s of these residences to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.*

Noise Monitoring

The Proponent shall prepare and implement a Noise Monitoring Program for the Project to the satisfaction of the Director-General. This program must:

(a) Be submitted to the Director General for approval within 6 months of this approval;

(b) Be prepared in consultation with the DECC; and

(c) Use a combination of attended and unattended monitoring measures to monitor the performance of the project.

4.2 Statement of Commitments

3 Noise

3.1 Construction Activities

The following noise control measures will be implemented prior to commencement of construction of the Abel Underground Mine or the upgrade of the Bloomfield CHPP;

(a) Maintain all machinery and equipment in working order;

(b) No construction activities at the Abel pit top will take place on Sundays or Public Holidays;

(c) Where possible locate noisy site equipment behind structures that act as barriers or at the greatest distance from noise sensitive areas;

(d) Orient equipment so that noise emissions are directed away from noise sensitive areas;

3.2 Noise Control Measures

(a) The following noise control measures will be implemented prior to the mining of coal from the Abel Underground Mine:

- *Orientation of the ventilation fan towards the north-west, away from residential receivers and angle the output parallel to the ground.*
- *The sound power level of the front end loader to be used near the portal should not exceed 113 dBA and will be fitted with a noise sensitive reversing alarm.*

(b) The following noise control measures will be implemented prior to the Bloomfield CHPP receiving any ROM coal from the Abel Underground Mine:

- *Noise mitigation works including partial enclosure and noise screening of drives and conveyors of the Bloomfield CHPP to screen residences to the north of the site.*

3.3 Monitoring

Within 6 months of this approval being granted a Noise Monitoring Program shall be prepared and implemented for the Abel Underground Mine and the Bloomfield CHPP, to the satisfaction of the Director-General. The Noise Monitoring Program shall include a combination of real-time and supplementary attended monitoring measures, and a noise monitoring protocol for evaluating compliance with the noise environmental assessment. This plan will be integrated with the monitoring plans for the Tasman, Donaldson and Bloomfield Mines to provide a single integrated Noise Monitoring Program for all 4 mines.

3.4 Continuous Improvement

The Company shall:

(a) Report on these investigations and the implementation of any new noise mitigation measures on site in the AEMR, to the satisfaction of the Director-General.

- *The operator of the Bloomfield CHPP shall:*

(b) Investigate ways to reduce the noise generated by the Bloomfield CHPP, including maximum noise levels which may result in sleep disturbance;

(c) Implement all reasonable and feasible best practice noise mitigation measures on the site; and

(d) Report on these investigations and the implementation of any new noise mitigation measures on site in the AEMR, to the satisfaction of the Director-General.

4.3 Independent Environmental Audit

In November 2011, an Independent Environmental Audit was conducted by Trevor Brown and Associates for the Abel Underground Mine. In regard to noise, the independent Environmental Audit concluded:

> *Abel Project mine operations are inaudible at the locations nominated in Project Approval Schedule 4 condition 23. The noise survey results therefore indicate that the Abel Project noise contribution to the noise experienced at receivers would not exceed the specified criteria and are therefore in compliance with the Project Approval*.

An extract of the consent conditions relevant to noise provided within Project Approval 05_0136, and comments from the Independent Environmental Audit regarding existing compliance with these conditions, is provided in **Appendix B**.

5 CONSTRUCTION NOISE ASSESSMENT CRITERIA

The ICNG sets out noise management levels, in relation to construction type activities, for residential and other sensitive receivers and how they are to be applied. A summary of the noise management levels from the ICNG is contained in **Table 2** and **Table 3**.

Table 2 Interim Construction Noise Guideline (Residences)

Time of day	Management level $L_{Aeq(15minute)}$	How to apply
Recommended standard hours Monday to Friday 7am to 6pm Saturday 8am to 1pm No work Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq(15minute)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences. 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community.

L_{Aeq} = equivalent continuous noise level.
RBL = rating background level.
dB = decibel.
dBA = A-weighted decibel.

Table 3 Interim Construction Noise Guideline at Sensitive Land Uses (other than residences)

Land Use	**Management Level, $L_{Aeq(15minute)}$ (applies when properties are being used)**
Classrooms at schools and other educational institutions	Internal noise level 45 dBA
Hospital wards and operating theatres	Internal noise level 45 dBA
Places of worship	Internal noise level 45 dBA
Active recreation areas[1]	External noise level 65 dBA
Passive recreation areas[2]	External noise level 60 dBA
Community Centres	Depends on the intended use of the centre Refer to the recommended 'maximum' internal levels in AS 2107 for specific uses.

1. Characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion.
2. Characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation.

6 EXISTING ACOUSTICAL ENVIRONMENT

6.1 Ambient Background Noise Monitoring

Abel Underground Mine

Ambient noise surveys have been conducted to characterise and quantify the acoustic environment in the area surrounding the existing Abel Underground Mine, Donaldson Open Cut Mine and Bloomfield Colliery. Noise surveys were conducted by SLR Consulting in October 2000 prior to the construction of Abel Underground Mine and the commencement of the Donaldson Open Cut Mine. Additional ambient monitoring was conducted in 2006 at new residential premises to the north of the Bloomfield CHPP at Ashtonfield. These ambient measurements along with the predicted impact of the Abel Underground Mine were used as the basis for the consent conditions contained in **Section 4**.

Following the approval of the Abel Underground Mine in 2007, in accordance with the requirements of Schedule 4 of Project Approval 05_0136 and Section 3.3 of the Statement of Commitments, a Noise Monitoring Program (NMP) was prepared for the Abel Underground Mine (*Abel Mine Project Noise Monitoring Program* [Heggies, 2007]). In accordance with this NMP, SLR Consulting has conducted *Donaldson Coal Mine and Abel Coal Project Quarterly Noise Monitoring* from December 2008 to the present.

In all cases, it is apparent that background (ie non-mining) noise levels in the area have generally increased over time since the baseline noise surveys were carried out in October 2000. Significant sources of background noise in the Abel Underground Mine region include the following major roads and highways (**Figure 2**):

- John Renshaw Drive.
- The New England Highway.
- F3 (Sydney – Newcastle) Freeway.
- Weakley's Drive.

Operator-attended noise surveys accompanying the unattended noise monitoring generally note that the noise environment at receiver locations is dominated by road traffic noise as well as other natural noises such as insect, cricket and bird noise.

Graphs showing the ambient noise levels trends since 2000 are contained in **Appendix B**. Since Abel Underground Mine noise monitoring commenced in 2008, noise emissions from the mine have been less than the consent conditions at all residential locations and typically inaudible at most monitoring locations.

Donaldson Open Cut Mine

The Donaldson Open Cut Mine is located to the north of John Renshaw Drive, as shown in **Figure 2**.

Quarterly noise monitoring is conducted for the Donaldson Open Cut Mine in accordance with Condition 15, Section 2 of the Development Consent (Development Application [DA] 98/01173 and DA 118/698/22).

As detailed in the Donaldson Open Cut Mine Annual Environment Management Reports, operations from the mine have been recorded as being audible (e.g. at locations K, A, F and G) during some operator attended surveys. Generally, noise levels from the Donaldson Open Cut Mine have been below the noise limits specified in Development Consent.

It should be noted that operations at the Donaldson Open Cut Mine are scheduled to cease at the end of 2013 (ie prior to the commencement of changes at the Abel Underground Mine associated with the Modification). As such, there would likely be a marginal improvement to the noise environment of receivers surrounding the Donaldson Open Cut Mine and Abel Underground Mine.

6.2 Complaints

A log of complaints received by Donaldson from 2007 to current has been reviewed. No complaints reviewed were due to noise or vibration from the Abel Underground Mine. All complaints reviewed that did relate to noise and vibration have been associated with the Donaldson Open Cut Mine which will cease operations at the end of 2013.

7 INP ASSESSMENT OF PREVAILING WEATHER CONDITIONS

7.1 Wind

Wind has the potential to increase noise at a receiver when it is light and stable and blows from the direction of the source of the noise. As the strength of the wind increases the noise produced by the wind will obscure noise from most industrial and transport sources.

Wind effects need to be considered when wind is a feature of the area under consideration. Where wind blows from the source to the receiver at speeds up to 3 m/s for more than 30% of the time in any seasonal assessment period (ie day, evening or night), then wind is considered to be a feature of the area and noise level predictions must be made under these conditions.

Heggies Report 30-1409R1R1 *Noise Impact Assessment Proposed Abel Coal Mine* dated 19 July 2006, analysed weather for a period of 12 months, from a NSW Environment Protection Authority (EPA) weather station located at Francis Greenway High School near to Beresfield. This location is approximately 7 km north east of the Abel Underground Mine. The data from the Beresfield site was used in favour of that collected at the Donaldson Open Cut Mine site as the station at Donaldson is shielded by trees meaning that lower than normal wind speeds are recorded at this location.

For this NIA, 12 months of data from the Beresfield weather station for the year 2011 has been analysed.

In accordance with the INP, the Beresfield data was analysed to determine the frequency of occurrence of winds up to speeds of 3 m/s for daytime, evening and night-time in each season. A summary of the most frequently occurring winds is contained within **Table 4, Table 5** and **Table 6**. The percentage occurrence figures provided in bold are those that meet or exceed the 30% threshold specified in the INP.

Table 4 Seasonal Frequency of Occurrence of Wind Speed Intervals – Daytime

Period	Calm	Wind Direction	0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Summer	12.7%	SE±45^{o}	9.6%	20.0%	**29.5%**
Autumn	10.3%	SSE±45^{o}	12.1%	10.4%	22.5%
Winter	2.3%	NW±45^{o}	9.6%	7.4%	17.1%
Spring	1.6%	SE±45^{o}	10.3%	16.9%	27.2%

Table 5 Seasonal Frequency of Occurrence of Wind Speed Intervals – Evening

Period	Calm	Wind Direction	0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Summer	13.1%	SE±45^{o}	**37.5%**	12.7%	**50.1%**
Autumn	17.7%	S±45^{o}	28.5%	4.2%	**32.7%**
Winter	12.0%	W±45^{o}	15.9%	7.5%	23.4%
Spring	8.5%	E±45^{o}	25.5%	10.6%	**36.1%**

Table 6 Seasonal Frequency of Occurrence of Wind Speed Intervals – Night-time

Period	Calm	Wind Direction	0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Summer	19.5%	S±45^{o}	**36.4%**	5.6%	**42.0%**
Autumn	16.4%	WNW±45^{o}	27.8%	14.5%	**42.3%**
Winter	6.2%	WNW±45^{o}	22.9%	17.4%	**40.3%**
Spring	14.3%	WNW±45^{o}	22.8%	8.2%	**31.0%**

Seasonal wind records indicate that winds from the southern and eastern sector in the evening and north-western sectors at night are a feature of the area. This is generally consistent with the winds determined to be a feature of the area, as detailed in Heggies Report 30-1409R1R1 *Noise Impact Assessment Proposed Abel Coal Mine* dated 19 July 2006.

7.2 Temperature Inversion

Temperature inversions, when they occur, have the ability to increase noise levels by focusing sound waves. Temperature inversions occur predominantly at night during the winter months. The NSW INP states that temperature inversions need only be considered for the night-time period. Note that the night-time period for determining inversion frequency is from one hour before sunset to one hour after sunrise (taken to be 6.00pm to 7.00am).

Temperature inversions were determined not to be a feature of the area in Heggies Report 30-1409R1R1 *Noise Impact Assessment Proposed Abel Coal Mine* dated 19 July 2006 (ie the frequency of occurrence was determined to be less than 30% during the night-time, based on 12 months of data from the Beresfield weather station).

The occurrence of atmospheric stability classes during the winter night-time period at Beresfield are presented in **Table 7.**

Table 7 Night-time (6.00pm – 7.00am) Stability Frequency of Occurrence – Beresfield

Stability Class	Frequency of Occurrence Percentage During Winter
A	0.0%
B	0.0%
C	0.0%
D	**42.7%**
E	13.0%
F	**44.0%**
G	0.3%

The frequency of occurrence of F Class temperature inversions, as determined in accordance with methodology provided in the INP, is greater than 30% and therefore this weather condition has been considered as part of this NIA.

8 NOISE CONTROLS

8.1 Existing Abel Underground Mine

As detailed in Section 4, the following mitigation measures have been implemented at the Abel Underground Mine and Bloomfield CHPP in accordance with the requirements of Project Approval 05_0136 and the Abel Underground Mine Statement of Commitments:

- The initial ventilation fan for the underground workings was installed below the Donaldson Open Cut Mine high wall, reducing the potential for noise impacts at the natural surface level.
- The surface vehicles and equipment used near the portal to the underground mine were fitted with reversing 'quackers' rather than beepers. In addition, this equipment is also operated below the Donaldson Open Cut Mine high wall, which mitigates potential noise impacts at the natural surface level.
- The Bloomfield CHPP has had noise screening enclosures fitted to its drives and conveyors to reduce potential noise impacts at residences to the north of the CHPP.

8.2 Abel Upgrade Modification

Mining associated with the Modification will be underground, and as such, potential noise sources are limited to surface infrastructure. In addition to the mitigation measures described above that are currently implemented at the Abel Underground Mine, the following mitigation measures would be implemented to surface infrastructure:

- Should financial circumstances permit the use of the approved overland conveyor for the transportation of ROM coal from the Abel Underground Mine entrance to the Bloomfield CHPP, would reduce potential noise impacts associated with internal truck haulage.
- Mitigation measures would be implemented to the proposed CHPP module such that the sound power levels (SWL) would be equal to (or less) than the existing module.
- Mitigation measures would be implemented such that the proposed additional breaker SWL would be at or below 117 dBA.

9 PROJECT SPECIFIC NOISE EMISSION CRITERIA

9.1 Operational Noise Criteria

The noise assessment criteria adopted for the Modification are shown in **Table 8**. These noise criteria are consistent with the noise limits specified in Project Approval 05_0136, as provided in **Section 4**.

Table 8 Abel Underground Mine Project Specific Noise Criteria

Location	Locality	Period	Noise Criteria $L_{Aeq(15minute)}$
A	Beresfield	Day	50 dBA
B		Evening	48 dBA
		Night	41 dBA
C	Ebenezer Park	Day	43 dBA
		Evening	44 dBA
		Night	38 dBA
D	Black Hill	Day	41 dBA
E		Evening	40 dBA
F		Night	36 dBA
G	Buchanan & Louth Park	Day	43 dBA
H		Evening	41 dBA
		Night	36 dBA
I	Ashtonfield	Day	44 dBA
		Evening	46 dBA
		Night	38 dBA
J	Thornton	Day	49 dBA
		Evening	47 dBA
		Night	40 dBA
K	Catholic Diocese	Day	41 dBA
		Evening	40 dBA
		Night	37 dBA
L	Ashtonfield	Day	46 dBA
		Evening	46 dBA
		Night	40 dBA

Note: Noise criteria presented here are consistent with the Project Approval 05_0136.

9.2 Sleep Disturbance Noise Criteria

The relevant sleep disturbance noise criteria for each residential area are provided in **Table 9**. These criteria are $L_{Aeq(1minute)}$ consent criteria contained in **Section 4**.

Table 9 Sleep Disturbance Noise Goals

Location	Locality (Noise Amenity Area)	Period	Sleep Disturbance Criteria $L_{A1(1minute)}$
A	Beresfield	Night	51 dBA
B			
C	Ebenezer Park	Night	50 dBA
D	Black Hill	Night	46 dBA
E			
F			
G	Buchanan & Louth Park	Night	46 dBA
H			
I	Ashtonfield	Night	48 dBA
J	Thornton	Night	50 dBA
K	Catholic Diocese	Night	46 dBA
L	Ashtonfield	Night	53 dBA

9.3 Rail Noise Goals

9.3.1 Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects (IGANRIP)

The EPA released IGANRIP in April 2007. Rail noise assessment trigger levels for new and redeveloped rail lines are provided in the IGANRIP and are reproduced in **Table 10.**

Table 10 Airborne Rail Traffic Noise Trigger Levels for Residential Land Uses

Type of Development	Residential noise trigger levels (dBA)		
	Day (7:00 am to 10:00 pm)	**Night (10:00 pm to 7:00 am)**	**Commentary**
New rail line development	Development increases existing rail noise levels and Resulting rail noise levels exceed:		These numbers represent levels of noise that trigger the need for a rail infrastructure project to conduct an assessment of potential noise impacts. An increase in existing rail noise levels is taken to be an increase of 2.0 dB or more in L_{Aeq} in any hour or an increase of 3.0 dB or more in L_{Amax}
	60 $L_{Aeq(15hour)}$	55 $L_{Aeq(9hour)}$	
	80 L_{Amax}	80 L_{Amax}	
Redevelopment of existing rail line	Development increases existing rail noise levels and Resulting rail noise levels exceed:		
	65 $L_{Aeq(15hour)}$	60 $L_{Aeq(9hour)}$	
	85 L_{Amax}	85 L_{Amax}	

Note: L_{Amax} = maximum sound pressure level 'A' weighting.

9.3.2 EPA Requirements for Rail Traffic Generating Developments

The EPA also released "Environmental Assessment Requirements for Rail Traffic-Generating Developments" in October 2009.

Rail noise assessment trigger levels are provided in the EPA requirements and are reproduced in **Table 11**.

Table 11 EPA Rail Noise Assessment Trigger Levels for Rail Traffic Generating Developments

Descriptor	Residential noise trigger levels (dBA)
$L_{Aeq(24hour)}$	60 dBA
Maximum Passby L_{Amax} (95th percentile)	85 dBA

Note: 95th percentile equates to the 5% exceedance value.

The EPA states that where the cumulative noise level exceeds the noise assessment trigger levels and where the L_{Aeq} noise level increases are more than 2 dBA, strong justification should be provided why it is not reasonable and feasible to reduce noise.

9.3.3 Rail Infrastructure Noise Guideline (RING)

In February 2012 the EPA published the draft RING for public consultation. The RING contains a number of key proposed changes to the IGANRIP which are relevant to this assessment as follows:

- ***Clarification of noise trigger levels*** *- The noise trigger-levels for rail projects in IGANRIP are not mandatory goals that must be achieved and this has not changed. Section 3.1 clarifies that if the noise trigger levels are likely to be exceeded, the noise impact assessment must demonstrate what feasible and reasonable mitigation measures have been considered to reduce noise down towards these trigger levels.*

- ***New guidance on disused rail lines -*** *Additional guidance is proposed for infrastructure projects involving a heavy rail line being brought back into operation after a period of disuse (see section 1.4.2 'redeveloped rail line'). This issue is important because land-use patterns can change while the rail line is not being used.*

  The proposed guidance clarifies that rail noise on such lines should be considered in the same way as for redeveloped lines − unless the track is substantially realigned. If the track is substantially realigned, there may be opportunities to consider additional noise mitigation options that would not be possible if the track remained in its original place. Hence, realigned sections would need to be designed according to the more stringent 'new line' triggers.

  Note that if no works are involved in re-opening the disused track, the guideline would not apply. The track owner must still comply with any relevant conditions under its environment protection licence.

- ***Rail traffic generating developments*** *- Current noise trigger levels for assessing non-rail land-use developments (e.g. mining and extractive industries) that are likely to generate additional rail traffic are published on EPA's website. It is proposed to incorporate these trigger levels into the revised guideline.*

  The trigger levels have been brought into line with current rail noise policy by replacing the older 24-hour noise descriptor with separate day/night descriptors (see Appendix 2)

In accordance with the RING, the rail noise assessment trigger levels for the Bloomfield rail loop are reproduced in **Table 12** and **Table 13.**

Table 12 RING Rail Traffic Noise Trigger Levels for Residential Land Uses

Type of Development	Noise trigger levels (dBA) (External)	
	Day (7:00 am to 10:00 pm)	**Night (10:00 pm to 7:00 am)**
Redevelopment of existing rail line	Development increases existing LAeq(period) rail noise levels by 2 dBA or more, or existing L_{Amax} rail noise levels by 3 dBA or more and Predicted rail noise levels exceed:	
	65 $L_{Aeq(15hour)}$ 85 L_{Amax}	60 $L_{Aeq(9hour)}$ 85 L_{Amax}

Table 13 RING Rail Noise Assessment Trigger Levels for Rail Traffic Generating Developments

Descriptor	Residential noise trigger levels (dBA)
$L_{Aeq(15hour)}$	60 dBA
$L_{Aeq(9hour)}$	55 dBA
Maximum Passby L_{Amax} (95^{th} percentile)	80 dBA

Note: 95^{th} percentile equates to the 5% exceedance value.

9.4 Construction Noise Management Levels

The relevant construction noise management levels for each residential area are provided in **Table 14**. These levels are $L_{Aeq(15\ minute)}$ noise level set in accordance with the ICNG outlined in **Section 5**.

Table 14 Abel Underground Mine Construction Noise Management Level

Location	Locality	Period	Noise Management Level $L_{Aeq(15minute)}$	
			Noise Affected	**Highly Noise Affected**
A	Beresfield	Day	55 dBA	75 dBA
B				
C	Ebenezer Park	Day	48 dBA	75 dBA
D	Black Hill	Day	46 dBA	75 dBA
E				
F				
G	Buchanan & Louth Park	Day	48 dBA	75 dBA
H				
I	Ashtonfield	Day	49 dBA	75 dBA
J	Thornton	Day	54 dBA	75 dBA
K	Catholic Diocese	Day	46 dBA	75 dBA
L	Ashtonfield	Day	51 dBA	75 dBA
O, P, Q, R, S*	Buchanan, Stockrington, and Buttai	Day	40 dBA	75 dBA
		Evening	35 dBA	N/A
		Night	35 dBA	N/A

* Receivers relevant to the construction of the proposed downcast ventilation shaft only.

10 ASSESSMENT OF NOISE IMPACT

10.1 Noise Modelling

A computer model was used to predict noise emissions for the Modification. The noise modelling was undertaken using SoundPLAN v7.1 software, developed by Braunstein and Berndt Gmbh in Germany. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. The model used the terrain map, together with noise source data, ground cover, shielding by barriers and/or adjacent buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers.

Topographic contours and drawings of the Modification were supplied by Donaldson Coal.

Noise levels were predicted at the residences which represent the nearest, most potentially affected locations, as detailed in **Section 2.2**. Noise emission levels were modelled for calm, prevailing weather and F class temperature inversion weather conditions.

10.2 Noise Modelling Parameters

The predicted noise emission levels for the operation of the proposed development at potentially affected receivers have been calculated under the meteorological parameters shown in **Table 15**.

Table 15 Noise Modelling Parameters

Assessment Condition	Temp	Wind Speed / Direction	Relative Humidity	Temperature Gradient
Day – Calm	20°C	N/A	65%	N/A
Day – Prevailing Wind	20 °C	3 m/s SE	65%	N/A
Evening – Calm	20°C	N/A	65%	N/A
Evening – Prevailing Wind	20°C	3 m/s ENE, E, ESE, SE, SSE, S, SSW	65%	N/A
Night – Calm	10°C	N/A	85%	N/A
Night - Inversion	10°C	N/A	85%	3°C/100 m
Night – Prevailing Wind	10°C	3 m/s SE, SSE, S, SSW, WSW, W, WNW, NW, NNW	85%	N/A

°C = degrees Celsius
m = metre

Other assumptions made in modelling the proposed operation include the following:

- All acoustically significant plant and equipment operates simultaneously.
- Mobile noise sources, such haul trucks, were modelled at typical locations and assumed to operate in repetitive cycles.
- All relevant noise control measures described in **Section 8** are implemented.

10.3 Operational Noise Modelling Scenarios

Two proposed operational scenarios have been modelled for the Modification and are provided in **Table 16**.

Table 16 Operational Scenarios

Scenario	Description
Scenario 1	Total operational emissions with ROM coal from Abel and Tasman transported via trucks to the CHPP
Scenario 2	Total operational emissions with ROM coal from Abel transported via conveyer and from Tasman transported via trucks to the CHPP.

Equipment in operation for each scenario is provided in **Table 17**. Equipment considered in operation is marked with a 'tick' (✓) and those not considered to be in operation are marked with a 'cross' (×). Where a 'tick' or 'cross' are separated by a slash indicates whether the selected equipment is operational during the day, evening and night-time period respectively. For instance ✓/✓/× would indicate that the equipment is operational during the day and evening periods but not during the night-time period.

Table 17 Modelled Operational Noise Sources

Plant and Equipment	Scenario 1	Scenario 2
Ventilation fan	✓/✓/✓	✓/✓/✓
FEL loading coal trucks ROM stockpile near portal	✓/✓/✓	×/×/×
Radial stacker ROM stockpile near portal	✓/✓/✓	✓/✓/✓
Coal trucks hauling to CHPP from Abel Mine (movements every 15 minute period)	✓/✓/✓ (13)	×/×/×
Coal trucks hauling to CHPP from Tasman (movements every 15 minute period)	✓/✓/× (4)	✓/✓/× (4)
Coal trucks hauling coal rejects to Bloomfield (movements every 15 minute period)	✓/✓/✓(2)	✓/✓/✓(2)
Eimco near portal	✓/✓/✓	✓/✓/✓
Bloomfield CHPP with modifications	✓/✓/✓	✓/✓/✓
Breaker (Bloomfield CHPP)	✓/✓/✓(2)	✓/✓/✓(2)
Dozer on product stockpile (Bloomfield CHPP)	✓/✓/✓	✓/✓/✓
Coal truck unloading	✓/✓/✓	✓/✓/×
FEL at ROM coal Stockpile (Bloomfield CHPP)	✓/✓/✓ (2)	✓/✓/✓(2)
Rail noise - Locomotives - Wagons (bunching etc)	 ✓/✓/✓ ✓/✓/✓(3)	 ✓/✓/✓ ✓/✓/✓(3)
Coal loader loading rail wagons	✓/✓/✓	✓/✓/✓
Proposed Conveyer System from Abel to CHPP	×/×/×	✓/✓/✓

FEL = front–end loader.

Note: Numbers in parentheses indicate the number of plant modelled

10.4 Plant and Equipment Sound Power Levels

Comparative to noise modelling conducted in 2006 the Abel EA, the following changes have been made to the plant and equipment modelled for the Abel Underground Mine operations:

Changes associated with existing operations (2007 to 2012):

- Revised SWL associated with the CHPP, due to the implementation of additional mitigation measures (Section 8). The revised SWL for the CHPP was confirmed by on site measurements taken by SLR Consulting on 28 February 2012.
- Revised SWL of the rail loader, as on site measurements were taken by SLR Consulting on 28 February 2012.
- Inclusion of the upcast ventilation shaft, as assessed in 2011 (Project Approval 05_0136 Mod 2).
- No truck hauling ROM coal from the Tasman Extension Project along internal roads to the Bloomfield CHPP during the night-time period.

Changes during the Modification (2012 onwards):

- Increased trucks hauling ROM coal from the Abel Underground Mine to the Bloomfield CHPP (Scenario 1 only).
- Overland conveyor transporting ROM coal from the Abel Underground Mine to the Bloomfield CHPP (Scenario 2 only).
- Increased trucks hauling ROM coal from the Tasman Extension Project along internal roads to the Bloomfield CHPP.
- Additional CHPP module and associated feed infrastructure (e.g. conveyors).
- Additional product stockpile dozer.
- Inclusion of trucks hauling coarse reject material to the Bloomfield Colliery (to assess the increase in reject material associated with the increased CHPP throughput).

SWL's of relevant existing operational equipment have been obtained from Heggies Report 30-1409R1R1 Noise Impact Assessment Proposed Abel Coal Mine dated 19 July 2006. As described above, on-site measurements of SWL's of the existing CHPP and rail loader were taken by SLR Consulting on 28 February 2012. Details of the SWL's are contained with **Appendix D**.

10.5 Operational Noise Modelling Results and Discussion

Operational noise emission levels were predicted for the two (2) operational scenarios described in **Table 16** including the noise control and management procedures described in **Section 8**. Noise from all sources that contribute to the total noise from the site have been examined to identify characteristics that may cause greater annoyance (for example tonality and impulsiveness). The appropriate modifying factors, as outlined in the INP, have been applied where these characteristics are considered to be present. A summary of the predicted operational noise levels are contained within **Table 18** and **Table 19**.

Table 18 Predicted Operational Noise Levels – Scenario 1

Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)			Project Specific Consent Conditions(L_{Aeq})
		Calm	Adverse Weather Conditions*	Temperature Inversion	
A Weakleys Drive Beresfield	Day	< 30 dBA	< 30 dBA	n/a	50 dBA
	Evening	< 30 dBA	< 30 dBA	n/a	48 dBA
	Night	< 30 dBA	< 30 dBA	< 30 dBA	41 dBA
B Yarrum Road Beresfield	Day	< 30 dBA	< 30 dBA	n/a	50 dBA
	Evening	< 30 dBA	< 30 dBA	n/a	48 dBA
	Night	< 30 dBA	< 30 dBA	< 30 dBA	41 dBA
C Phoenix Road Black Hill	Day	< 30 dBA	< 30 dBA	n/a	43 dBA
	Evening	< 30 dBA	< 30 dBA	n/a	44 dBA
	Night	< 30 dBA	< 30 dBA	< 30 dBA	38 dBA
D Black Hill School	Day	< 30 dBA	< 30 dBA	n/a	41 dBA
	Evening	< 30 dBA	< 30 dBA	n/a	40 dBA
	Night	< 30 dBA	< 30 dBA	<30 dBA	36 dBA
E Browns Road Black Hill	Day	<30 dBA	< 30 dBA	n/a	41 dBA
	Evening	<30 dBA	32 dBA	n/a	40 dBA
	Night	< 30 dBA	30 dBA	32 dBA	36 dBA
F Black Hill Road Black Hill	Day	<30 dBA	32 dBA	n/a	41 dBA
	Evening	<30 dBA	34dBA	n/a	40 dBA
	Night	30 dBA	33 dBA	33 dBA	36 dBA
G Buchanan Road Buchanan	Day	< 30 dBA	< 30 dBA	n/a	43 dBA
	Evening	< 30 dBA	< 30 dBA	n/a	41 dBA
	Night	< 30 dBA	< 30 dBA	< 30 dBA	36 dBA
H Mt Vincent Rd Louth Park	Day	< 30 dBA	< 30 dBA	n/a	43 dBA
	Evening	< 30 dBA	< 30 dBA	n/a	41 dBA
	Night	< 30 dBA	< 30 dBA	< 30 dBA	36 dBA
I Lord Howe Dr. Ashtonfield	Day	< 30 dBA	36 dBA	n/a	44 dBA
	Evening	< 30 dBA	36 dBA	n/a	46 dBA
	Night	< 30 dBA	36 dBA	34 dBA	38 dBA
J Kilarney Street Avalon Estate	Day	< 30 dBA	< 30 dBA	n/a	49 dBA
	Evening	< 30 dBA	< 30 dBA	n/a	47 dBA
	Night	< 30 dBA	33 dBA	32 dBA	40 dBA
K Catholic Diocese	Day	<30 dBA	< 30 dBA	n/a	41 dBA
	Evening	<30 dBA	<30 dBA	n/a	40 dBA
	Night	<30 dBA	37 dBA	36 dBA	37 dBA
L Kilshanny Avenue Ashtonfield	Day	35 dBA	40 dBA	n/a	46 dBA
	Evening	35 dBA	40 dBA	n/a	46 dBA
	Night	36 dBA	40 dBA	40 dBA	40 dBA

* Results shown in this column are from the highest predicted noise level under prevailing wind conditions in Table 15.

Table 19 Predicted Operational Noise Levels – Scenario 2

Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)			Project Specific Consent Conditions(L_{Aeq})
		Calm	Adverse Weather Conditions*	Temperature Inversion	
A Weakleys Drive Beresfield	Day	< 30 dBA	< 30 dBA	n/a	50 dBA
	Evening	< 30 dBA	< 30 dBA	n/a	48 dBA
	Night	< 30 dBA	< 30 dBA	< 30 dBA	41 dBA
B Yarrum Road Beresfield	Day	< 30 dBA	< 30 dBA	n/a	50 dBA
	Evening	< 30 dBA	< 30 dBA	n/a	48 dBA
	Night	< 30 dBA	< 30 dBA	< 30 dBA	41 dBA
C Phoenix Road Black Hill	Day	< 30 dBA	< 30 dBA	n/a	43 dBA
	Evening	< 30 dBA	< 30 dBA	n/a	44 dBA
	Night	< 30 dBA	< 30 dBA	< 30 dBA	38 dBA
D Black Hill School	Day	< 30 dBA	< 30 dBA	n/a	41 dBA
	Evening	< 30 dBA	< 30 dBA	n/a	40 dBA
	Night	< 30 dBA	< 30 dBA	<30 dBA	36 dBA
E Browns Road Black Hill	Day	< 30 dBA	< 30 dBA	n/a	41 dBA
	Evening	< 30 dBA	31 dBA	n/a	40 dBA
	Night	< 30 dBA	30 dBA	31 dBA	36 dBA
F Black Hill Road Black Hill	Day	< 30 dBA	31 dBA	n/a	41 dBA
	Evening	< 30 dBA	33dBA	n/a	40 dBA
	Night	< 30 dBA	33 dBA	33 dBA	36 dBA
G Buchanan Road Buchanan	Day	< 30 dBA	< 30 dBA	n/a	43 dBA
	Evening	< 30 dBA	< 30 dBA	n/a	41 dBA
	Night	< 30 dBA	< 30 dBA	< 30 dBA	36 dBA
H Mt Vincent Rd Louth Park	Day	< 30 dBA	< 30 dBA	n/a	43 dBA
	Evening	< 30 dBA	< 30 dBA	n/a	41 dBA
	Night	< 30 dBA	< 30 dBA	< 30 dBA	36 dBA
I Lord Howe Dr. Ashtonfield	Day	< 30 dBA	36 dBA	n/a	44 dBA
	Evening	< 30 dBA	36 dBA	n/a	46 dBA
	Night	< 30 dBA	36 dBA	34 dBA	38 dBA
J Kilarney Street Avalon Estate	Day	< 30 dBA	< 30 dBA	n/a	49 dBA
	Evening	< 30 dBA	< 30 dBA	n/a	47 dBA
	Night	< 30 dBA	33 dBA	31 dBA	40 dBA
K Catholic Diocese	Day	< 30 dBA	< 30 dBA	n/a	41 dBA
	Evening	< 30 dBA	< 30 dBA	n/a	40 dBA
	Night	< 30 dBA	37 dBA	36 dBA	37 dBA
L Kilshanny Avenue Ashtonfield	Day	35 dBA	40 dBA	n/a	46 dBA
	Evening	35 dBA	40 dBA	n/a	46 dBA
	Night	36 dBA	40 dBA	40 dBA	40 dBA

* Results shown are from the highest predicted noise level under prevailing wind conditions in Table 15**.**

It should be noted that Location F is currently owned by Donaldson Coal and Location K, located on Catholic Land, is currently unoccupied.

Operational noise levels are predicted to meet the relevant criteria under calm and adverse weather conditions (winds and temperature inversion) at all assessed residential locations.

Since the operational scenario modelled is likely to represent an acoustically worst-case scenario, actual operational noise levels are likely to be less than those predicted.

With specific reference to rail operations, the operational scenario modelled considers locomotives, wagon noise (bunching etc) and rail loading as three distinct noise sources. When the locomotives are at their highest noise level the rail loading source will not exist (since the train would be in motion). Further, while a train is loading, the locomotives would be at or near idle and therefore operating at a lower SWL than that utilised in the noise model. In addition to this, during loading there would be little wagon noise since the train would be moving very slowly. Since all three sources have been modelled to occur simultaneously, it is considered that the modelled rail operations represent an acoustically worst case scenario.

As noted above, the operational noise scenario is considered to represent the worst case noise impact from trains on the Bloomfield rail loop which occurs when trains are being loaded with coal. However, the private rail loop extends to the Main Northern Rail line. The noise associated with the movement of trains along the private rail loop, while defined as an onsite operational noise level, are likely to be viewed by receivers as a transport source as would any other train movement.

Notwithstanding, measurements of noise from a passing train were undertaken as part of the original Abel Underground Mine NIA (Heggies Report 30_1409R1R1 *Noise Impact Assessment Proposed Abel Coal Mine* dated 19 July 2006) at the boundary of residences off Barrington Grove, at Avalon Estate, which are representative of the closest residential area to the private rail spur. These measurements indicated that a train pass-by would meet the $L_{Aeq(15minute)}$ criteria for day, evening and night at this location.

Operational Noise Monitoring

As described above, operational noise levels are predicted to meet the relevant criteria at all relevant residential locations. On this basis, and given that there would be no change in the locations of noise sources, the existing noise monitoring conducted for the Abel Underground Mine in accordance with Project Approval 05_0136 (**Section 3**) is considered to be suitable for the Modification.

10.6 Sleep Disturbance Analysis

In assessing sleep disturbance, typical L_{Amax} noise levels of acoustically significantly plant and equipment to be used at the subject site were used as input to the acoustic model and predictions of noise emissions were made at the nearest residential areas under adverse weather conditions at night. Noise events considered included loading an empty coal truck near the portal, a dozer near the ROM stockpile and the coal loader at the Bloomfield CHPP. The use of the L_{Amax} noise level provides a worst-case prediction since the $L_{A1(1minute)}$ noise level of a noise event is likely to be less than the L_{Amax}.

A summary of the predicted maximum noise levels at the most affected locations are contained within **Table 20** and **Table 21**.

Table 20 Predicted Maximum Noise Levels at Night – Scenario 1

Location	Period	Predicted Noise Level L_{Amax} (dBA)			Sleep Disturbance Criteria ($L_{A1\ (1minute)}$)
		Calm	Adverse Weather Conditions	Temperature Inversion	
A Weakleys Drive Beresfield	Night	<30 dBA	30 dBA	32 dBA	54 dBA
B Yarrum Road Beresfield	Night	<30 dBA	32 dBA	33 dBA	51 dBA
C Phoenix Road Black Hill	Night	<30 dBA	<30 dBA	<30 dBA	50 dBA
D Black Hill School	Night	<30 dBA	<30 dBA	<30 dBA	47 dBA
E Browns Road Black Hill	Night	<30 dBA	30 dBA	32 dBA	46 dBA
F Black Hill Road Black Hill	Night	<30 dBA	33 dBA	34 dBA	46 dBA
G Buchanan Road Buchanan	Night	<30 dBA	<30 dBA	<30 dBA	49 dBA
H Mt Vincent Rd Louth Park	Night	<30 dBA	<30 dBA	<30 dBA	46 dBA
I Lord Howe Dr. Ashtonfield	Night	34 dBA	40 dBA	40 dBA	48 dBA
J Kilarney Street Avalon Estate	Night	31 dBA	37dBA	38 dBA	50 dBA
K Catholic Diocese	Night	<30 dBA	38 dBA	37 dBA	46 dBA
L Kilshanny Avenue Ashtonfield	Night	42dBA	47 dBA	47 dBA	53 dBA

Table 21 Predicted Maximum Noise Levels at Night – Scenario 2

Location	Period	Predicted Noise Level L_{Amax} (dBA)			Sleep Disturbance Criteria ($L_{A1\ (1minute)}$)
		Calm	Adverse Weather Conditions	Temperature Inversion	
A Weakleys Drive Beresfield	Night	<30 dBA	32 dBA	33 dBA	54 dBA
B Yarrum Road Beresfield	Night	<30 dBA	<30 dBA	<30 dBA	51 dBA
C Phoenix Road Black Hill	Night	<30 dBA	<30 dBA	<30 dBA	50 dBA
D Black Hill School	Night	<30 dBA	<30 dBA	<30 dBA	47 dBA
E Browns Road Black Hill	Night	<30 dBA	30 dBA	31 dBA	46 dBA
F Black Hill Road Black Hill	Night	<30 dBA	33 dBA	34 dBA	46 dBA
G Buchanan Road Buchanan	Night	<30 dBA	<30 dBA	<30 dBA	49 dBA
H Mt Vincent Rd Louth Park	Night	<30 dBA	<30 dBA	<30 dBA	46 dBA
I Lord Howe Dr. Ashtonfield	Night	34 dBA	40 dBA	40 dBA	48 dBA
J Kilarney Street Avalon Estate	Night	31 dBA	37dBA	37 dBA	50 dBA
K Catholic Diocese	Night	<30 dBA	38 dBA	37 dBA	46 dBA
L Kilshanny Avenue Ashtonfield	Night	42dBA	47 dBA	47 dBA	53 dBA

The RNP provides further guidance with regard to sleep disturbance and calls upon a number of studies that have been conducted into the effect of maximum noise levels on sleep. The EPA policy document acknowledges that, at the current level of understanding, it is not possible to establish absolute noise level criteria that would correlate to an acceptable level of sleep disturbance. However, the RNP provides that maximum internal noise levels below 50 dBA to 55 dBA are unlikely to cause awakening reactions and one or two events per night, with maximum internal noise levels of 65 to 70 dBA (inside dwellings) are not likely to significantly affect health and wellbeing. The predicted maximum external noise levels (presented in **Table 20** and **Table 21**) correlate to noise levels below 50 dBA inside dwellings at each location. Based on the preceding, maximum noise levels produced by operation of the Abel Underground Mine are not likely to cause sleep disturbance at any assessed residential location.

10.7 Rail Noise

The transportation of coal from the site will utilise the Main Northern Railway Line.

It is envisaged that there will be a peak number of six (6) rail despatches (12 movements) per day on the Bloomfield rail loop during the life of the Modification. This compares to the approved average number, considered in the original Abel EA, of three (3) to six (6) movements per day. It should be noted that the assessment of the impact of the peak number of rail despatches is seen as a conservative measure when compared to the average rail movements assessed in the original Abel EA.

The estimated existing daily rail traffic movements for the section of the Main Northern Railway in the vicinity of the Bloomfield rail loop were provided by Australian Rail Track Corporation (ARTC) and are summarised in **Table 22**.

Table 22 Daily Rail Traffic Movements

Description	Daily Movements
Existing Movements	
Passenger (Intercity)	96
Passenger (Country Link)	6
General Freight	32
Coal	106
Total	**240**
Approved Coal (coal terminal output)	56
Proposed Coal (coal terminal output)	92
Cumulative existing, approved and proposed	**388**

The increase in rail traffic due to the Modification (ie an additional six (6) movements per day during peak times) represents a 2.5% increase in relation to existing rail traffic and 1.5% in relation to the cumulative existing, approved and proposed rail movements.

Rail traffic noise levels have been predicted from the rail line based on the existing rail traffic movements along the Main Northern Railway Line and the additional rail traffic due to the Modification (ie an additional six (6) movements per day during peak times). Rail traffic noise predictions are provided in **Table 23** at a variety of distances from the rail line.

Table 23 Rail Traffic Noise Predictions

Receiver	Daytime Rail Traffic Noise Prediction				
	Existing Rail Traffic		**Total Rail Traffic Including Bloomfield Loop Rail Traffic**		**Noise Level Increase**
	$L_{Aeq(15hour)}$	L_{Amax}	$L_{Aeq(15hour)}$	L_{Amax}	$L_{Aeq(15hour)}$
50 m	68 dBA	91 dBA	68 dBA	91 dBA	<0.1 dBA
100 m	65 dBA	97 dBA	65 dBA	87 dBA	<0.1 dBA
150 m	63 dBA	85 dBA	63 dBA	85 dBA	<0.1 dBA
200m	62 dBA	84 dBA	62 dBA	84 dBA	<0.1 dBA
250m	61 dBA	82 dBA	61 dBA	82 dBA	<0.1 dBA
300m	60 dBA	81 dBA	60 dBA	81 dBA	<0.1 dBA
350m	59 dBA	80 dBA	59 dBA	80 dBA	<0.1 dBA
400m	59 dBA	79 dBA	59 dBA	79 dBA	<0.1 dBA
450m	58 dBA	79 dBA	58 dBA	79 dBA	<0.1 dBA
500m	58 dBA	78 dBA	58 dBA	78 dBA	<0.1 dBA
	Night-time Rail Traffic Noise Prediction				
	Existing Rail Traffic		**Total Rail Traffic Including Bloomfield Loop Rail Traffic**		**Noise Level Increase**
	$L_{Aeq(9hour)}$	L_{Amax}	$L_{Aeq(9hour)}$	L_{Amax}	$L_{Aeq(9hour)}$
50 m	68 dBA	91 dBA	68 dBA	91 dBA	<0.1 dBA
100 m	65 dBA	97 dBA	65 dBA	87 dBA	<0.1 dBA
150 m	64 dBA	85 dBA	64 dBA	85 dBA	<0.1 dBA
200m	62 dBA	84 dBA	62 dBA	84 dBA	<0.1 dBA
250m	61 dBA	82 dBA	61 dBA	82 dBA	<0.1 dBA
300m	61 dBA	81 dBA	61 dBA	81 dBA	<0.1 dBA
350m	60 dBA	80 dBA	60 dBA	80 dBA	<0.1 dBA
400m	59 dBA	79 dBA	59 dBA	79 dBA	<0.1 dBA
450m	59 dBA	79 dBA	59 dBA	79 dBA	<0.1 dBA
500m	58 dBA	78 dBA	58 dBA	78 dBA	<0.1 dBA

The increase in rail traffic on the Bloomfield rail loop is predicted to increase the existing daytime $L_{Aeq(15hour)}$ and existing night $L_{Aeq(9hour)}$ rail noise level by less than 0.1 dBA. This increase is negligible and such an increase would not be discernible by receivers near the rail line.

10.8 Cumulative Noise Assessment

Existing and proposed mining in the vicinity of the Abel Underground Mine includes the existing Bloomfield Colliery, Donaldson Open Cut Mine and the Tasman Underground Mine. Given the distance that separates the Tasman and Abel Underground Mine (approximately 7.5 km), cumulative impacts from these mines are expected to be negligible and therefore have not been considered.

Donaldson Open Cut Mine

Donaldson Open Cut Mine is scheduled to cease operations by the end of 2013 (ie prior to the commencement of changes at the Abel Underground Mine associated with the Modification). Therefore, the operation of the Donaldson Open Cut Mine has not been included in the cumulative noise assessment.

Bloomfield Colliery

The INP prescribes detailed calculation routines for establishing "project specific" $L_{Aeq(15minute)}$ intrusive criteria and $L_{Aeq(Period)}$ amenity criteria at potentially affected receivers for a development (in isolation).

Potential cumulative noise impacts from existing and successive developments are embraced by the INP procedures by ensuring that the appropriate noise emission criteria (and consent limits) are established with a view to maintaining acceptable noise *amenity* levels for residences.

Therefore, the cumulative impact of the proposed Abel Underground Mine with existing industrial noise sources (including Bloomfield Colliery) has been assessed in the determination of the amenity levels and associated Project Specific Noise Criteria.

Notwithstanding, cumulative noise impacts of approved operations at Bloomfield Colliery (which may be greater than existing operations) and the Modification have been assessed, based on predicted intrusive noise levels from the *Bloomfield Colliery Completion of Mining and Rehabilitation Part 3A Environmental Assessment*, dated November 2008 and this NIA.

To assess the cumulative impacts from the approved Bloomfield Colliery and the Modification, predicted intrusive noise levels (ie $L_{Aeq[15minute]}$) from the Bloomfield Colliery and the Modification have been logarithmically added, with the resulting noise level adjusted (by -3 dBA) to the equivalent amenity level (ie $L_{Aeq[Period]}$) for comparison with the relevant amenity criteria for each location.

The predicted cumulative noise amenity levels during adverse weather conditions, for areas with greatest potential for cumulative impact, are presented in **Table 24**.

The cumulative impacts from the approved operations of the Bloomfield Colliery plus the Modification are not predicted to exceed the amenity criteria at relevant receiver locations.

Table 24 Predicted Cumulative Noise Impact

Location	Period	Intrusive Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)		Cumulative Amenity Level $L_{Aeq(period)}$	Amenity Criteria (L_{Aeq})
		Abel Modification	Approved Bloomfield Colliery*		
		Adverse	Adverse	Adverse	
D Black Hill School	Day	< 30 dBA	<30 dBA (calm)	30 dBA	55 dBA
	Evening	< 30 dBA	< 30 dBA	30 dBA	45 dBA
	Night	< 30 dBA	<30 dBA	30 dBA	40 dBA
E Browns Road Black Hill	Day	<30 dBA	<30 dBA (calm)	30 dBA	55 dBA
	Evening	32 dBA	< 30 dBA	31 dBA	45 dBA
	Night	30 dBA	<30 dBA	30 dBA	40 dBA
F Black Hill Road Black Hill	Day	32 dBA	<30 dBA (calm)	31 dBA	55 dBA
	Evening	34dBA	< 30 dBA	32 dBA	45 dBA
	Night	33 dBA	<30 dBA	32 dBA	40 dBA
G Buchanan Road Buchanan	Day	< 30 dBA	37 dBA (calm)	35 dBA	55 dBA
	Evening	< 30 dBA	42 dBA	39 dBA	45 dBA
	Night	< 30 dBA	37 dBA	35 dBA	40 dBA
H Mt Vincent Rd Louth Park	Day	< 30 dBA	<30 dBA (calm)	30 dBA	55 dBA
	Evening	< 30 dBA	32 dBA	31 dBA	45 dBA
	Night	< 30 dBA	<30 dBA	30 dBA	40 dBA
I Lord Howe Dr. Ashtonfield	Day	36 dBA	<30 dBA (calm)	34 dBA	55 dBA
	Evening	36 dBA	< 30 dBA	34 dBA	45 dBA
	Night	36 dBA	<30 dBA	34 dBA	40 dBA
K Catholic Diocese Land	Day	< 30 dBA	<30 dBA (calm)	30 dBA	55 dBA
	Evening	<30 dBA	< 30 dBA	30 dBA	45 dBA
	Night	37 dBA	<30 dBA	35 dBA	40 dBA
L Kilshanny Avenue Ashtonfield	Day	40 dBA	<30 dBA (calm)	37 dBA	55 dBA
	Evening	40 dBA	34 dBA	38 dBA	45 dBA
	Night	40 dBA	<30 dBA	37 dBA	40 dBA

* Predicted noise levels from the Bloomfield Colliery Completion of Mining and Rehabilitation Part 3A Environmental Assessment, dated November 2008.

10.9 Construction Noise Assessment

Construction activities that may occur during the life of the Modification would include:

- construction of the downcast ventilation shaft;
- construction of the overland conveyor; and
- modifications to the CHPP

Overland Conveyor and Modification to the CHPP

Potential noise impacts associated with the construction of surface infrastructure, including the overland conveyor, were approved as part of the Abel Underground Mine.

Notwithstanding, the activities associated with the construction of the approved conveyor and the modifications to the CHPP have been assessed in this NIA as these construction activities would occur simultaneously with modified operations (ie due to the Modification).

The construction fleet modelled for the modifications to the CHPP, the construction of the overland conveyor and construction of the downcast ventilation fan are contained within **Table 25**.

Table 25 Construction Scenario CHPP and Overland Conveyor

Plant and Equipment	Day
Excavator	✓(2)
Backhoe	✓(2)
Dozer*	✓
Grader	✓
Crane	✓(2)
Truck 6 wheeler	✓(3)
Compactor sheeps foot	✓
Compactor flat	✓
Water cart	✓

* Existing operational fleet item would be used for construction.

The construction activities would occur simultaneously with operations at the Abel Underground Mine during standard construction hours (7.00 am to 6.00 pm Monday to Friday, and 8.00 am to 1.00 pm Saturdays).

Due to the fact that the modifications to the CHPP and construction of the overland conveyor would occur simultaneously with operations (and at similar locations to operational noise sources), cumulative noise levels for construction and operations during the day have been compared with the operational noise criteria, as shown in **Table 26**.

For the overland conveyor, the construction fleet has been modelled at the location representing the southern extent of the proposed conveyor route. For the modifications to the CHPP, the construction fleet has been modelled around the CHPP area.

No exceedances of the ICNG or consent criteria are predicted due to the construction activities associated the CHPP modifications or the construction of the overland conveyor, even when construction occurs simultaneously with the operation of the Modification.

Table 26 Predicted Noise Levels CHPP Modification and Overland Conveyor Construction

Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)		ICNG Noise Affected Criteria L_{Aeq} (dBA)	Consent Criteria (L_{Aeq}) dBA
		Worst Case	Cumulative with Operation		
A Weakleys Drive Beresfield	Day	<30 dBA	<30 dBA	55 dBA	50 dBA
B Yarrum Road Beresfield	Day	<30 dBA	<30 dBA	55 dBA	50 dBA
C Phoenix Road Black Hill	Day	<30 dBA	<30 dBA	48 dBA	43 dBA
D Black Hill School	Day	<30 dBA	<30 dBA	46 dBA	41 dBA
E Browns Road Black Hill	Day	<30 dBA	<30 dBA	46 dBA	41 dBA
F Black Hill Road Black Hill	Day	<30 dBA	32 dBA	46 dBA	41 dBA
G Buchanan Road Buchanan	Day	<30 dBA	<30 dBA	48 dBA	43 dBA
H Mt Vincent Rd Louth Park	Day	<30 dBA	<30 dBA	48 dBA	43 dBA
I Lord Howe Dr. Ashtonfield	Day	<30 dBA	36 dBA	49 dBA	44 dBA
J Kilarney Street Avalon Estate	Day	<30 dBA	<30 dBA	54 dBA	49 dBA
K Catholic Diocese	Day	<30 dBA	<30 dBA	46 dBA	41 dBA
L Kilshanny Avenue Ashtonfield	Day	<30 dBA	40 dBA	51 dBA	46 dBA

***** Refer to **Tables 18 and 19** for noise levels from operations only

Downcast Ventilation Shaft

Construction activities associated with the downcast ventilation shaft construction would involve the clearing of vegetation, drilling of the ventilation shaft and installation of ancillary equipment.

The ventilation shaft would be constructed using the 'raise bore' method. A pilot hole would be drilled from the surface prior to the remainder of the shaft being excavated from the bottom of the shaft upwards. Using this method, material from the excavation would be removed from the bottom of the shaft via the existing underground system.

Noise associated with the construction of the downcast ventilation shaft would be limited to a period of approximately 12 weeks. Construction activities would be undertaken during daytime hours, with the exception of the raise bore drilling. Drilling of the raise bore would be undertaken up to 24 hours a day, seven days a week for a period of approximately three to four weeks.

During actual 'raise boring' operations, the ventilation shaft would be fully enclosed in a temporary shed. The drilling equipment and shed would be oriented so that the two sides with the smallest surface areas are directed towards the South West and North East of the project site.

Construction noise modelling was carried out using the computer noise model developed for the operational scenario. A summary of the construction modelling scenario is contained within **Table 27**. Equipment considered in operation is marked with a 'tick' (✓) and those not considered to be in operation are marked with a 'cross' (×). Where a 'tick' or 'cross' are separated by a slash indicates whether the selected equipment is operational during the day, evening period and night-time period respectively. For instance ✓/✓/× would indicate that the equipment is operational during the day and evening periods but not during the night-time period. The details of the SWL used in the construction modelling are contained within **Appendix D**.

Table 27 Construction Scenarios

Plant and Equipment	Day/Evening/Night
Construction of the Downcast Ventilation Fan	
Compressor (earthworks scenario)	✓(2)/×/×
Dozer (earthworks scenario)	✓/×/×
Drill within full enclosure (drilling scenario)	✓/✓/✓
Crane (installation scenario)	✓/×/×

Noise emission levels at relevant receiver locations were predicted from the proposed construction scenarios contained in **Table 27** and are summarised in **Table 28**, **Table 29** and **Table 30**.

Table 28 Predicted Construction Noise Levels - Earthworks

Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)		Management Level (L_{Aeq}) dBA
		Calm	Prevailing Weather Conditions	
O	Day	<30 dBA	<30 dBA	40
P	Day	<30 dBA	<30 dBA	40
Q	Day	<30 dBA	<30 dBA	40
R	Day	**50 dBA**	**46 dBA**	40
S	Day	38 dBA	**43 dBA**	40

Note: Bolded values indicate an exceedance of the ICNG Management Level.

Table 29 Predicted Construction Noise Levels – Drilling within full enclosure

Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)			Management Level (L_{Aeq}) dBA
		Calm	Adverse Weather Conditions	Temperature Inversion	
O	Day	<30 dBA	<30 dBA	n/a	40
	Evening	<30 dBA	<30 dBA	n/a	35
	Night	< 30 dBA	< 30 dBA	< 30 dBA	35
P	Day	<30 dBA	<30 dBA	n/a	40
	Evening	<30 dBA	<30 dBA	n/a	35
	Night	< 30 dBA	< 30 dBA	< 30 dBA	35
Q	Day	<30 dBA	<30 dBA	n/a	40
	Evening	<30 dBA	<30 dBA	n/a	35
	Night	< 30 dBA	< 30 dBA	< 30 dBA	35
R	Day	31 dBA	<30 dBA	n/a	40
	Evening	31 dBA	33 dBA	n/a	35
	Night	31 dBA	33 dBA	32 dBA	35
S	Day	< 30 dBA	33 dBA	n/a	40
	Evening	< 30 dBA	33 dBA	n/a	35
	Night	< 30 dBA	32 dBA	< 30 dBA	35

Table 30 Predicted Construction Noise Levels - Installation

Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)		Management Level (L_{Aeq}) dBA
		Calm	Adverse Weather Conditions	
O	Day	<30 dBA	<30 dBA	40
P	Day	<30 dBA	<30 dBA	40
Q	Day	< 30 dBA	< 30 dBA	40
R	Day	**41 dBA**	37 dBA	40
S	Day	30 dBA	35 dBA	40

Note: Bolded values indicate an exceedance of the ICNG Management Level.

The predicted noise levels from construction of the downcast ventilation shaft meet the ICNG management level at all locations, with the exception of Locations R and S, where exceedances of the ICNG management level are predicted for earthworks and installation during the daytime only. Locations R and S represent the closest two dwellings to the downcast ventilation shaft site. Additional noise modelling confirmed that no exceedances are predicted at dwelling locations further from the downcast ventilation shaft than Locations R and S.

The predicted construction noise levels will be below the highly affected noise level of 75 dBA at all receiver locations.

It should be noted that the downcast ventilation shaft has been located as far from receiver locations as possible, while still meeting operational requirements (ie the downcast ventilation shaft must be located along the Lower Donaldson Seam main headings, but outside areas of historic mining in seams that overlie the Lower Donaldson Seam).

In accordance with the ICNG, noise levels during construction of the downcast ventilation shaft would be managed through the implementation of a number of measures, including:

- Enclose the drilling activities in a temporary acoustic shed.
- Require construction workers to undergo briefings in regard to operating equipment in ways that minimise noise.
- Ensure that equipment is appropriately maintained and is turned off when not in use.

In addition, and in accordance with the ICNG, Donaldson Coal would consult with the landowners at relevant receiver locations prior to works commencing. This consultation would include notification of the works expected to occur, their duration and the noise management measures that would be implemented, as well as the provision of Donaldson Coal contact details.

Noise monitoring would be conducted during 24 hour per day construction activities. If monitored noise levels are greater than the predicted noise levels, construction activities would be modified until noise levels reduce to the predicted noise levels.

10.10 Road Traffic Noise

The Modification does not involve the transportation of coal on public roads. Potential noise impacts associated with ROM coal haulage from the Tasman Extension Project to the Abel Underground Mine were assessed in SLR Consulting Report 630 01054 R1 20120509 – *Tasman Extension Project Noise and Vibration Impact Assessment*.

Additional road traffic due to the Modification would be associated with an increase in employees from 375 to 400 at the Abel Underground Mine and from 94 to 117 at the Bloomfield CHPP/Bloomfield Colliery, as well as some increase in the number of visitors and deliveries to the site.

Vehicles would access the site via the Abel Underground Mine Access Road or Four Mile Creek Road (for the Bloomfield CHPP), which are located off John Renshaw Drive and the New England Highway (Figure 1), respectively.

The road transport review prepared for the Modification (refer to GTA Consulting report 12S9024000 - *Abel Underground Mine Modification Road Transport Review* dated September 2012) predicted that the Modification would result in increases in daily traffic on John Renshaw Drive and the New England Highway of less than 0.5% and 0.2%, respectively, and that any increases would likely be within the day-to-day variations in traffic movements which would occur on these roads regardless of the Modification.

Given that only minor increases in traffic are predicted, no material change to the road traffic noise currently experienced at receiver locations is predicted due to the Modification

11 BLASTING AND VIBRATION ASSESSMENT

Igneous rock dykes may intersect some underground mining areas and require removal in order to continue mining. The use of explosives may be required to dislodge and fracture the dykes to enable their extraction and removal. To achieve this, holes would be drilled into the rock in a designed pattern giving strict attention to their angle, depth and spacing. These holes would then be filled with an explosive charge and initiated with the aid of primers and detonators. The detonation of holes would be delayed in a pre-designed sequence to ensure that holes are fired in quick succession. A delayed firing technique improves the efficiency of the blast and also reduces its environmental impacts.

11.1 Blast Emission Criteria

Residential Disturbance

The ANZECC guidelines are the most commonly used guideline for assessing potential residential disturbance arising from blast emissions. The ANZECC guidelines provide assessment criteria with the aim of minimising annoyance from noise and vibrations caused by blasting activities and are as follows:

- The recommended maximum level for airblast is 115 dB Linear. This level may be exceeded for up to 5% of the total number of blasts over a 12 month period but should not exceed 120 dB Linear at any time.
- The recommended maximum for ground vibration is a Peak Vector Sum (PVS) vibration velocity of 5 mm/s. This level may be exceeded for up to 5% of the total number of blasts over a 12 month period but should not exceed 10 mm/s at any time.
- Blasting should generally only be permitted during the hours of 9.00 am to 5.00 pm Monday to Saturday. Blasting should not take place on Sundays and public holidays.
- Blasting should generally take place no more than once per day.

The ground vibration and airblast levels which cause concern or discomfort to residents are generally lower than the relevant building damage limits.

As the blasting would be conducted underground, airblast pressure would propagate from the blast location through the underground workings where it would eventually exit through openings to the surface such as ventilation shafts and the portal. The airblast level would attenuate as it travels through the underground workings and is likely to have no measureable impacts at the nearest sensitive receivers. As such, the impact of airblast from underground blasting has not been predicted at residential locations as part of this assessment.

Surface Infrastructure

British Standard (BS) 7385: Part 2-1993 *Evaluation and measurement for vibration in buildings Part 2* provides criteria against which the likelihood of building damage from ground vibration can be assessed.

Sources of vibration which are considered in the standard include blasting (carried out during mineral extractions or construction excavation), demolition, piling, ground treatments (compaction), construction equipment, tunnelling, road and rail traffic and industrial machinery.

The recommended limits (guide values) for transient vibration to ensure minimal risk of ***cosmetic*** damage to commercial and residential buildings are presented numerically in **Table 31**.

Table 31 Transient Vibration Guide Values – Minimal Risk of Cosmetic Damage (BS 7385.2)

Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced of framed structures - Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures - Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note: Values referred to are at the base of the building being considered.
Hz = Hertz

The standard states that the guide values in **Table 31** relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in **Table 31** may need to be reduced by up to 50%.

German Standard 4150-3 1999 *Structural Vibration Part 3: Effects of Vibration on Structures* also provides guideline criteria for evaluating the short and long-term effects of vibration on structures.

The relevant vibration damage criteria are summarised in **Table 32**.

Table 32 Vibration Velocity Damage and Annoyance Risk Criteria (mm/s)

Receiver Area	Damage Risk (mm/s) (DIN4150-3)	
	Horizontal	Vertical
Residential/Dwellings	15	5
Commercial/Offices	40	20
Industrial/Workshops	40	20
Mechanical (On/Off)	20/5	20/5
Electronic/Computers	5	5
Subsurface Infrastructure/Pipework	50-100	50-100

11.2 Prediction of Blasting Impacts

Site law formulas provide specific relationships between the level of blast emissions and Scaled Distance. The Scaled Distance is a fundamental relationship between distance and the maximum instantaneous explosive charge mass (MIC). Normally in blast analysis large amounts of recorded blast events are statistically analysed to obtain the site law formulas.

Methodology

In this case no detailed blasting information was available. In the absence of field data it is possible to predict ground vibration using generic site law models developed by ICI Australia Ltd (now Orica) following extensive research into the area of blast transmission. The charge weight scaling law for ground vibration is:

$$PPV = \mathrm{K}\left(\frac{\mathrm{D}}{\sqrt{\mathrm{m}}}\right)^{-1.6}$$

Where:

PPV = Peak Particle Velocity (mm/s)
m = Maximum Instantaneous Charge mass (kg MIC)
D = Distance (m)
K = Site constant

The K value is dependent on the blast interface and the type of rock the blast is being transferred to. For free face blasting of hard or highly structured rock a K value of 500 is typical, for a free face of average rock approximately 1140 and for near field heavily confined blasting values of up to 5000 are not uncommon.

Previous blasting assessments conducted Donaldson Coal (refer Terrock Consulting Engineers report *DCM-0708-270907 Donaldson Coal – Tasman Mine Vibration Effects of Blasting Through Igneous Dykes in an Underground Coal Mine* dated 15 October 2007) have used a K factor of 1900. This is considered an appropriate K factor for the assessment of surface vibration levels from underground blasting from the modifications to Abel Underground Mine.

The MIC (maximum explosive mass to be detonated in any 8 millisecond interval) proposed for blasting at the Abel Underground Mine is 12.2 kg.

Predicted Impacts

In order to determine the impact of blasting at vibration sensitive receivers the minimum safe distance of blasting was predicted. **Table 33** details the minimum safe blasting distance required from infrastructure and buildings to remain within the recommended vibration criteria.

Table 33 Minimum Blast Distance

Receiver Type	Vibration Level (mm/s)	Predicted Minimum Blast Distance (m)
Subsurface Infrastructure/Pipework	100	22
Subsurface Infrastructure/Pipework	50	34
Commercial/Offices/workshops/Industrial	20	61
Residential/Dwellings	5	144

The minimum depth of cover for the mine plan is approximately 60 m (refer to the Subsidence Assessment prepared for the Modification [Appendix A of the Environmental Assessment]).

On this basis there appears to be no blasting impact likely on any surface or subsurface infrastructure or commercial/ industrial premises.

The mine plan extends close to residences on Blackhill Drive where the depth of cover approaches 130 m to 140 m. No blasting is expected to be required in the vicinity of these residences. However, should additional geological features be encountered during mining in the vicinity of these (or other) residences, no blasting would occur within the minimum offset distance (ie blasting would not occur within 144 m) or the blast design would be modified to meet the relevant criteria.

Monitoring

Should blasting be required within the minimum offset distances specified in **Table 33**, monitoring would be conducted to ensure that the modified blasts comply with relevant criteria.

11.3 Vibration from Underground Mining Equipment

SLR Consulting has previously monitored vibration during underground road heading development. At a distance of 15 m, road heading vibration levels were 0.07 mm/s. This is approximately two orders of magnitude below the damage criteria of 5 mm/s for private dwellings. The minimum depth of cover for the mine plan is approximately 60 m. Based on the above, vibration from underground mining equipment is not predicted to result in any exceedance of vibration criteria (**Table 32**) at receiver locations.

12 CONCLUSION

SLR Consulting has conducted a NIA for the Modification.

Operational Noise Predictions

A computer model was used to predict noise emissions from the operation of the Modification.

Operational noise levels are predicted to meet the project specific noise criteria at all receiver locations.

Since the operational scenario modelled is likely to represent an acoustically worst-case scenario, actual operational noise levels are likely to be less than those predicted.

Sleep Disturbance Assessment

The predicted L_{Amax} noise levels meet the sleep disturbance criteria at all locations and therefore, are not likely to cause sleep disturbance at any assessed residential location.

Rail Traffic Noise Assessment

The increase in rail traffic generated by the peak number of trains using the Bloomfield rail loop is predicted to increase existing rail noise levels by less than 0.1 dBA. This increase is negligible and such an increase would not be discernible by receivers near the rail line.

Construction Noise Assessment

The predicted noise levels from construction will meet the ICNG highly noise affected management level at all locations. Exceedances of the ICNG noise affected management level are predicted during construction of the downcast ventilation shaft at the two closest receivers for the daytime only.

Construction noise management measures would be implemented during construction activities to minimise noise impacts, and potentially affected receivers would be notified of the construction activities and their duration prior to works commencing.

Cumulative Impact Assessment

The cumulative impact of mining in the area surrounding the Abel Underground Mine, including the Bloomfield Colliery, is predicted to comply with the relevant amenity criteria set in accordance with the INP.

Blasting

An assessment of underground blasting was conducted. To ensure compliance with criteria, blasting would be avoided within the minimum offset distances determined; however should blasting be required the blast size would be reduced, such that blasts comply with relevant criteria.

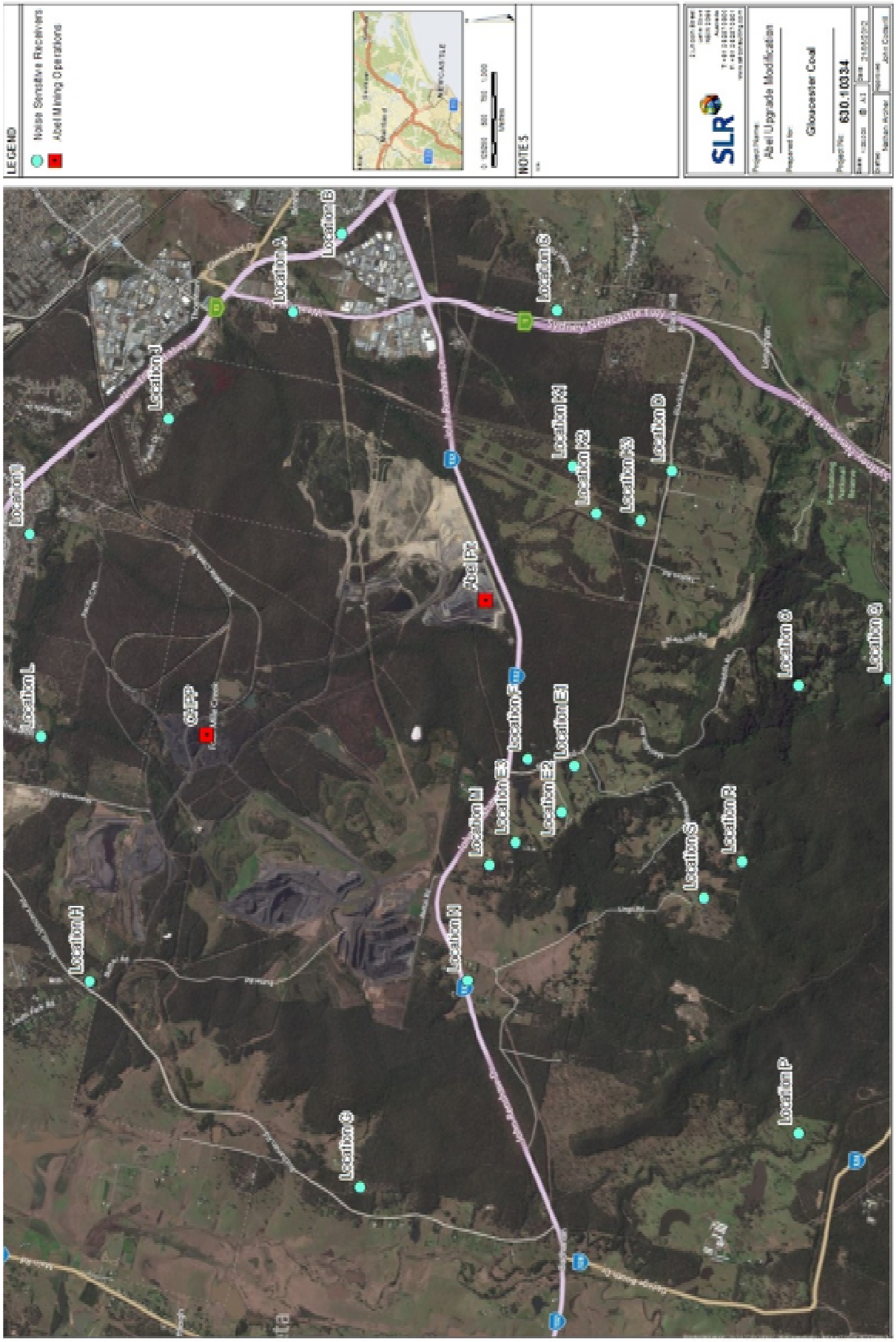
Monitoring

The existing noise monitoring conducted for the Abel Underground Mine in accordance with Project Approval 05_0136 is considered to be suitable for the Modification.

Blasting

An assessment of underground blasting was conducted for the proposed modifications to the Abel Underground Mine. A series of minimum safe distances were calculated for a range of vibration sensitive receivers including residential dwellings. Should additional geological features be encountered during mining in the vicinity of residences, no blasting would occur within the minimum offset distance or the blast design would be modified to meet the relevant criteria.

Monitoring and Assessment Locations



Compliance with Existing Consent Conditions and Statement of Commitments

Ref.	Condition	Status (as detailed in November 2011 Independent Environmental Audit)	Comments (from November 2011 Independent Environmental Audit)
Schedule 4 of Project Approval (05_0136)			
23.	**NOISE** **Noise Limits** The Proponent shall ensure that the noise generated by the project does not exceed the noise limits in Table 1 on any residence on privately-owned land. *Table 1: Noise Limits dB(A)*	**Compliant**	*Noise monitoring was conducted by Heggies at the nearest potentially affected receivers identified in Table 1, during drilling activities at the Abel Coal Project site on 29 April 2008. The attended noise measurements concluded that no audible mine contribution to the noise measured was detected at Blackhill School (location D) and the drilling activities were not audible at location F.* *Refer to SoC 3.2 for noise reduction works conducted on the Bloomfield CHPP to screen residences to the north of the CHPP site.* *Quarterly Noise Monitoring has been conducted by Heggies at the nearest potentially affected receivers between 2008 and 2011 with the latest attended and unattended monitoring being conducted during June, September and December 2010 and March, June and September 2011. Abel mine operations were inaudible at all surrounding locations where monitoring was conducted.*

Day $L_{Aeq(15min)}$	Evening $L_{Aeq(15min)}$	Night $L_{Aeq(15min)}$	Night $L_{A1(1min)}$		Location and Locality
50	48	41	51	**A** **B**	Weakleys Drive, Beresfield Yarrum Road, Beresfield
49	47	40	50	**J**	Kilarney Street, Avalon Estate
46	46	40	53	**L**	Kilshanny Avenue, Ashtonfield
44	46	38	48	**I**	Lord Howe Drive, Ashtonfield
43	44	38	50	**C**	Phoenix Road, Black Hill
43	41	36	46	**G** **H**	Buchanan Road, Buchanan Mt Vincent Road, Louth Park
41	40	37	46	**K**	Catholic Diocese (Former Bartter) K1, K2, K3
41	40	36	46	**D** **E** **F**	Black Hill School Brown Road, Black Hill Black Hill Road, Black Hill

24.	**Noise Monitoring** The Proponent shall prepare and implement a Noise Monitoring Program for the project to the satisfaction of the Director-General. This program must: (a) be submitted to the Director-General for approval within 6 months of this approval; (b) be prepared in consultation with the DECC; and (c) use a combination of attended and unattended monitoring measures to monitor the performance of the project.	**Compliant** *The Abel Coal Mine noise monitoring program was prepared in September 2007:* *(a) The Noise Monitoring Program was submitted to the Director-General in September 2007, within 6 months of the Project Approval (dated June 2007). Comments were received from DoP on 13 November 2007. The Noise Management was approved 2 June 2008.* *(b) Consultation occurred with the DECC by correspondence.* *(c) The proposed program included both attended and unattended noise monitoring of the project activities.* *SoC 3.3 includes an outline of the proposed noise monitoring program and integration of the programs conducted for the Donaldson Mine, Tasman Mine and Bloomfield facilities*

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Abel Underground Mine Statement of Commitments

3	**Construction Activities**	**Compliant**	*It was advised that the construction activities for the Abel Coal Mine were undertaken in compliance with these requirements.*
3.1	The following noise control measures will be implemented prior to commencement of construction of the Abel Underground Mine or the upgrade of the Bloomfield CHPP:		
	(a) Maintain all machinery and equipment in working order;		*(a) Mine activities are undertaken in a manner that includes maintenance of machinery and equipment;*
	(b) No construction activities at the Abel pit top will take place on Sundays or Public Holidays;		*(b) Aboveground construction activities occurred during normal working hours Monday to Saturday with no work on Sundays or public holidays.*
	(c) Where possible locate noisy site equipment behind structures that act as barriers or at the greatest distance from noise sensitive areas;		*(c) and (d) Location and orientation of equipment was managed to reduce potential for noise nuisance to sensitive receivers (e.g. generators and extraction fans were installed below the high wall to reduce noise dispersion from the operational area).*
	(d) Orient equipment so that noise emissions are directed away from noise sensitive areas.		

3.2 Noise Control Measures

(a) The following noise control measures will be implemented prior to the mining of coal from the Abel Underground Mine:

- orientation of the ventilation fan towards the north-west, away from residential receivers and angle the output parallel to the ground.
- the sound power level of the front end loader used near the portal should not exceed 113 dBA and be fitted with a noise sensitive reversing alarm.

(b) The following noise control measures were implemented prior to the Bloomfield CHPP receiving any ROM coal from the Abel Underground Mine: Noise mitigation works including partial enclosure and noise screening of drives and conveyors of the Bloomfield CHPP to screen residences north of the site.

Compliant

(a) Installation of the ventilation fan for the underground workings was installed below the high wall to reduce potential for noise impact on sensitive receivers. The vehicles and equipment used near the portal to the underground mine are fitted with reversing 'quackers' rather than beepers to reduce noise nuisance.

(b) The Bloomfield CHPP has had noise screening enclosures fitted to the drives and conveyors to reduce noise emission to residences to the north.

Noise monitoring was conducted to assess noise from the ventilation shafts in 2008-2009 and it was reported that "noise emissions did not exceed noise emission goals including night-time sleep arousal criteria) and were in compliance with the Project Approval for the Abel mine".

Figure 1 – Bloomfield CHPP Conveyor

Partial enclosure of drives and conveyors of the Bloomfield CHPP for noise mitigation.

3.3 Monitoring

Within 6 months of this approval being granted a Noise Monitoring Program shall be prepared and implemented for the Abel Underground Mine and the Bloomfield CHPP, to the satisfaction of the Director-General. The Noise Monitoring Program shall include a combination of real-time and supplementary attended monitoring measures, and a noise monitoring protocol for evaluating compliance with the noise environmental assessment. This plan will be integrated with the monitoring plans for the Tasman, Donaldson and Bloomfield Mines to provide a single integrated Noise Monitoring Program for all 4 mines.

Compliant

The Noise Monitoring Program for the Abel Coal Project was prepared by Heggies in consultation with the DEC and was submitted DoP on 2 October 2007. Comments from DoP were received on 13 November 2007 and NMP revised for submission to the DoP on 2 May 2008. DoP comments on the revised NMP were received on 12 May 2008. The NMP was amended and submitted to DoP. Approval received on 2 June 2008.

The Abel Mine Noise Monitoring Program was incorporated in the Integrated Environmental Monitoring Plan for the Donaldson, Tasman, Abel Mines and Bloomfield CHPP.

3.4 Continuous Improvement

The Company shall:

(a) report on these investigations and the implementation of any new noise mitigation measures on site in the AEMR, to the satisfaction of the Director-General.

The operator of the Bloomfield CHPP shall:

(b) investigate ways to reduce the noise generated by the Bloomfield CHPP, including maximum noise levels which may result in sleep disturbance;

(c) implement all reasonable and feasible best practice noise mitigation measures on the site; and

(d) report on these investigations and the implementation of any new noise mitigation measures on site in the AEMR, to the satisfaction of the Director-General.

Compliant

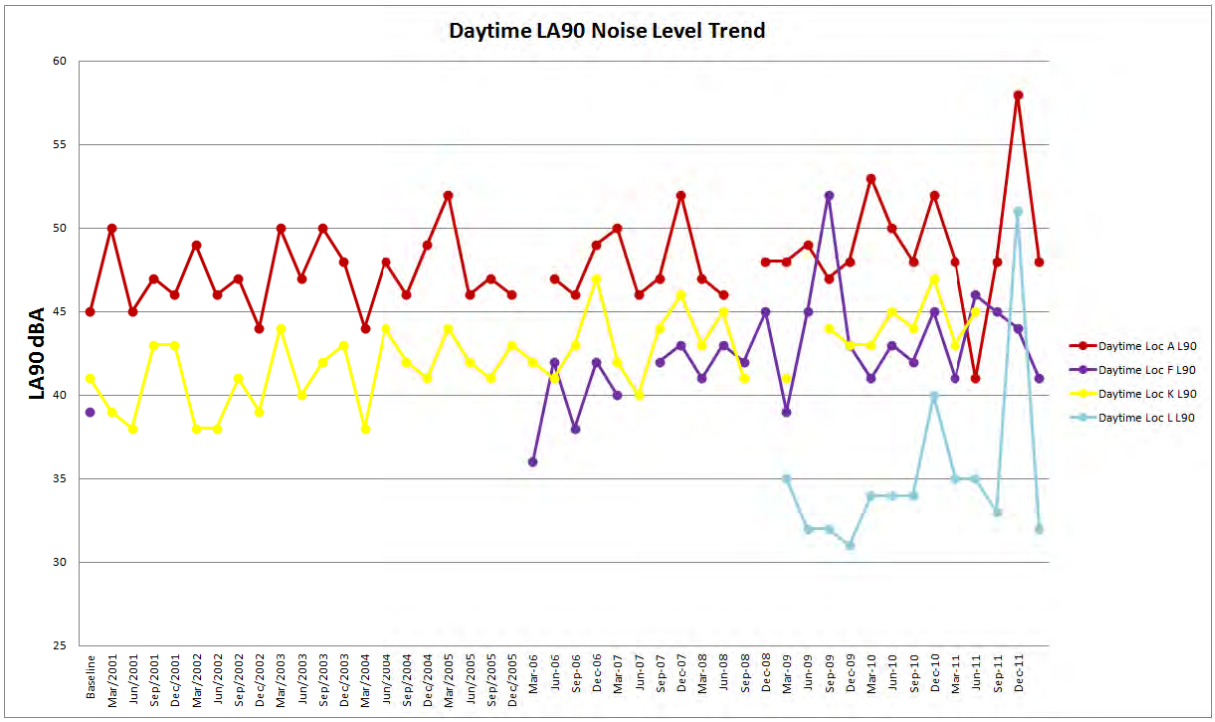
(a) Quarterly Noise Reports have been conducted on the Abel operations and the results reported in AEMR's. No additional noise measures are considered warranted at this time as the noise emissions from the operations are not generally audible at the closest receivers.

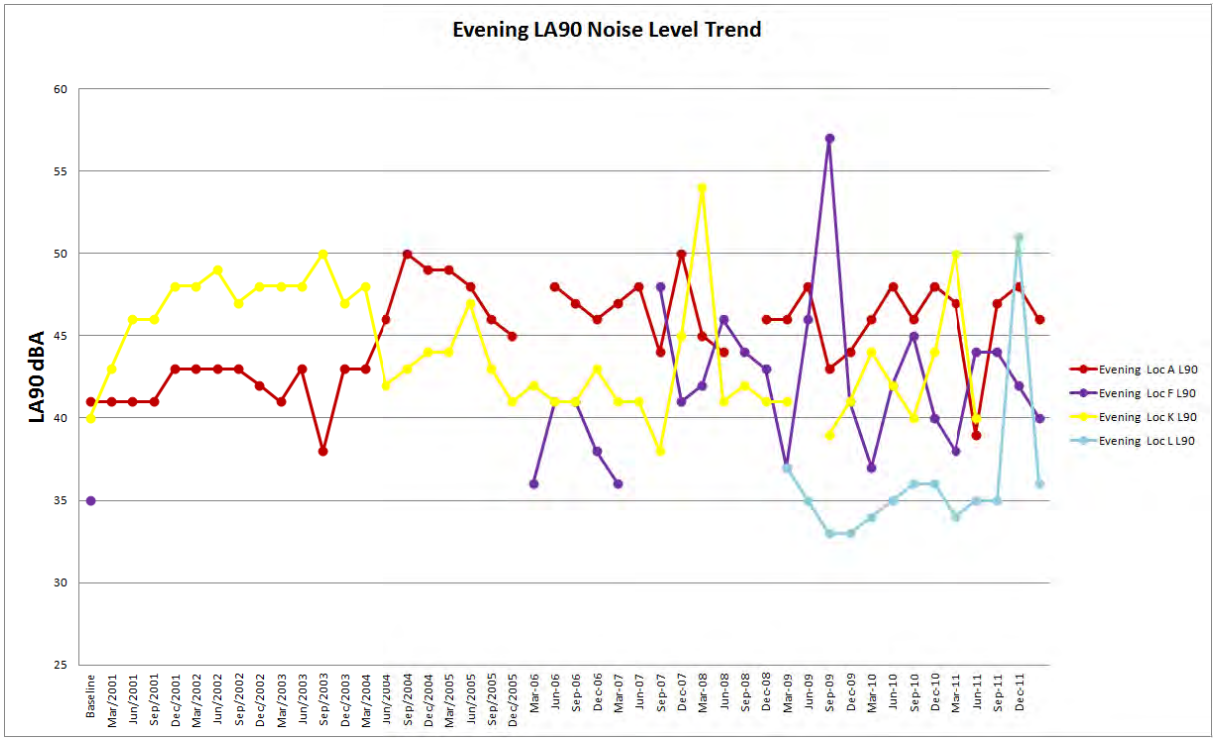
(b) Bloomfield installed shielding at the CHPP to reduce noise emissions. An inspection of the Bloomfield CHPP confirmed that the shielding had been installed and appeared to be effective in reducing noise emission from the plant.

Figure 2: Bloomfield CHPP

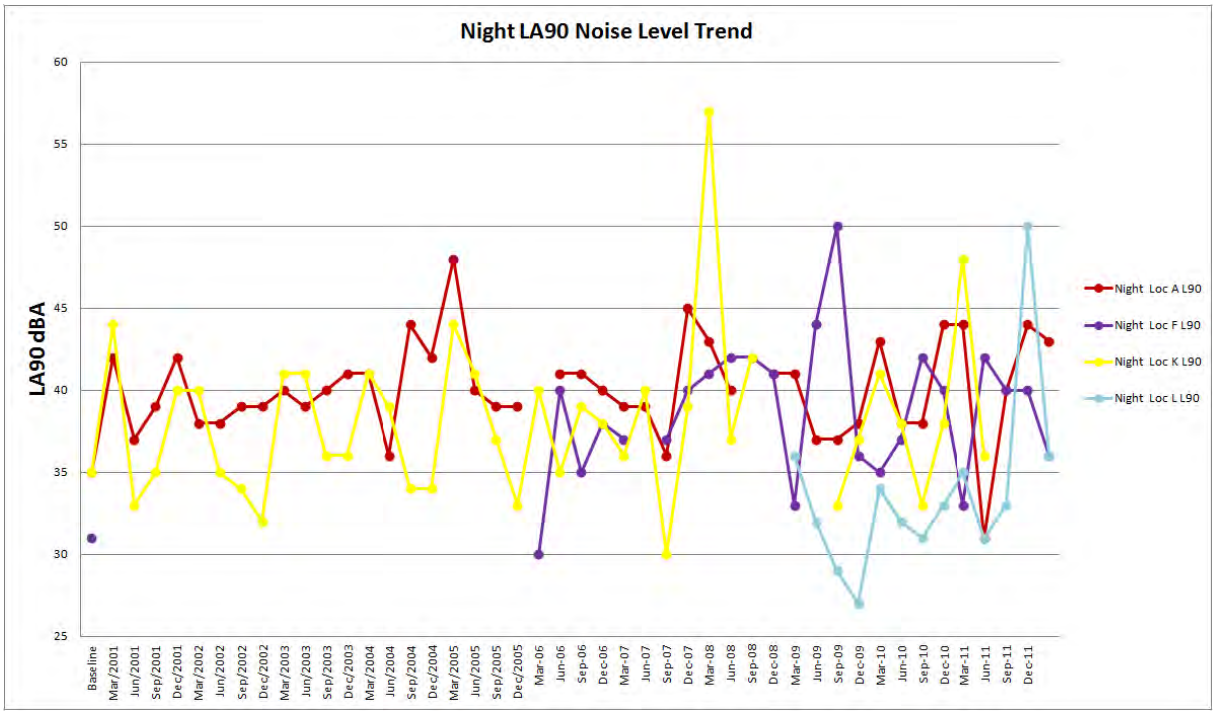
Bloomfield CHPP with new shielding on the plant to reduce noise emissions

Previous Noise Monitoring Results





Previous Noise Monitoring Results



Equipment Description	Octave Band Centre Frequency (Hz) - dBL re 1pW									
	63	125	250	500	1000	2000	4000	8000	Lin	dBA
Operation										
Ventilation Fan	121	123	124	118	111	110	105	99	128	120
Loader Near Portal	109	120	110	111	110	109	104	95	122	115
Road Truck (per Truck)	115	111	99	92	93	96	91	86	117	102
Eimco	104	109	109	108	107	103	98	90	115	111
Stock Pile Discharge	85	85	87	89	90	87	84	81	96	94
Wagons (per m)	81	79	74	72	68	65	60	59	88	74
Three (3) Diesel Loco's	112	109	102	102	98	93	92	83	120	103
Breaker (per Component)	125	123	118	118	115	112	109	101	131	120
CHPP (per Component)	123	118	113	114	114	109	103	97	131	117
Dozer (per Dozer)	114	111	108	110	106	106	99	87	118	112
Rail Loader	108	104	102	108	102	101	92	84	114	108
Loader at ROM Coal Stock Pile (per Loader)	107	118	108	109	108	107	102	93	120	113
Proposed Conveyor (per meter)	74	72	70	73	69	69	61	55	81	75
Construction										
Compressor	102	98	93	90	86	86	79	73	108	93
Crane	106	96	96	99	97	93	89	87	109	101
Dozer	114	111	108	110	106	106	99	87	118	112
Drill	108	102	102	100	100	98	92	82	111	104
Excavator	104	107	103	104	99	94	86	76	111	105
Backhoe	94	93	92	97	94	88	101	95	105	104
Grader	109	111	112	108	106	101	96	83	117	111
Compactor sheeps foot	104	109	112	107	105	102	96	90	116	110
Compactor flat	104	109	112	107	105	102	96	90	116	110
Water cart	115	113	106	109	108	104	99	95	119	112