WORKING WITH THE COMMUNITY TO MINIMISE MINE NOISE IMPACTS AT BULGA COAL

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Abstract

Bulga Open Cut (BOC) is a large open cut mine located in close proximity to the local wine and tourism industry near the villages of Broke and Bulga in the Hunter Valley. It forms part of Bulga Coal, a Glencore operated business which also includes Bulga Underground Operations (BUO) and a shared Coal Handling and Preparation Plant (CHPP) and rail load out facility. The mine has gained a high level of acceptance within the local community because it listened to noise concerns raised by the community and responded appropriately. In late 2009 following community concerns regarding mine noise impacts, the mine undertook an investigation and consulted with both the local community and the NSW Department of Planning and Environment. Subsequently, Bulga Coal committed to a number of initiatives including:

- Contemporised the noise criteria and management within the Development Approval;
- Invested $173million on a fully noise attenuated mining fleet; and
- The development of a real-time noise monitoring management system implemented by a control room to proactively reduce noise impacts.

Bulga Coal has continued to educate mining supervisors and the entire workforce on the importance of reducing mining noise impacts from operations and has continually refined and improved the noise management system. A key design element of the recently approved Bulga Optimisation Project (December 2014) is the establishment of a large noise and visual bund. The outer face of the bund will be constructed during daytime only in order to reduce the noise impacts on the community. The Bulga Optimisation Project has extended the mine life by approximately 20 years and was approved with minimal community opposition. Initially, the noise impacts are very similar to the existing operational scenario and then progressively reduce after the first few years due the establishment of the noise and visual bund. The development of the bund is in addition to the changes to the mine plan to mine away from neighbouring communities to reduce noise impacts.These initiatives have enabled Bulga Coal to operate an open cut mine in near proximity to the local wine and tourism industry with a high level of community acceptance.

1. Introduction

Bulga Coal is a mine located near the villages of Broke and Bulga in the Hunter Valley of NSW. It forms part of a Glencore operated business which includes the Bulga Open Cut (BOC), Bulga Underground Operations (BUO) and a shared Coal Handling and Preparation Plant (CHPP) and rail load out facility. Bulga Coal produces around 12 million tonnes of product coal per year, and exports thermal coal for power generation (approximately 70%) and semi-soft coking coal (approximately

30%), for steel making via the port of Newcastle. Bulga Coal has a very long and proud history of operating in the region. Open cut coal mining commenced in the 1982 as the Saxonvale Mine under the ownership of BHP, with underground mining commencing in 1994, as the South Bulga Mine. The Broke and Bulga area is a unique setting for a coal mine, with a number of vineyards, olive groves and boutique wineries in the area. The area also sustains a growing tourism industry.

2. Working with the Community to Minimise Mine Noise Impacts

Bulga Coal has established and maintained a strong relationship with the local community since the commencement of operations. The relationship has been developed by engaging with the community on a regular basis, listening to their concerns, and managing impacts, such as noise, in a responsible manner. In the late 2000's, the surrounding community raised concerns about mine noise impacts, which prompted Bulga Coal to undertake a review of its mining operations in 2009. On investigation, Bulga Coal concluded that whilst it was meeting its statutory requirements in regards to noise, there were aspects in which the management of noise impacts could be improved. Following subsequent consultation with the local community and the NSW Department of Planning and Environment (DPE), Bulga Coal modified the Development Approval (DA) [1] for the mine to contemporise the noise impact criteria and monitoring and management obligations. As a result a number of leading practice noise management initiatives were implemented.

Previously, Bulga Coal was operating under a Development Consent for open cut mining, granted in 1999, with the noise criteria in the approval derived from a noise impact assessment carried out in accordance with the NSW Environmental Protection Authority's (EPA) *Environmental Noise Control Manual* (ENCM) [2]. At that time, the noise assessment only assessed the noise impacts under neutral atmospheric conditions. Additionally the BOC and BUO operated under separate DA's which included separate noise criteria which were measured and reported independent of the contribution of the other operation.

With the introduction of the EPA's *Industrial Noise Policy* (INP) in 2000 [3], proponents are required to evaluate the impacts of adverse meteorological conditions, where applicable. In consideration of community concerns, the 2009 noise assessment was undertaken for Bulga Coal complex in line with the modern requirements of the INP including the assessment of noise enhancing impacts from temperature inversions and winds. The noise assessment also included both Open Cut and Underground Operations and associated surface facilities to provide a complete and shared criteria across the complex.

Bulga Coal was also seeking to use the noise modelling to determine the operability limits of the mine, not just to determine the impacts on the community. In order to determine a more complete noise footprint of the operations than was required under the INP assessment method, additional modelling was undertaken using a comprehensive meteorological data set. This approach developed by Global Acoustics has been termed as the 'cumulative distribution method' and in the Bulga case, an atypical year of meteorological data was discretised into 195 different scenarios.

Workshops were held to provide noise impact assessment education and present the results to the community. Marion Burgess AM from UNSW – ADFA was engaged as an independent noise expert to assist with the noise education process. The 2009 DA modification contemporised the noise assessment and committed BOC to upgrading the mining fleet to be fully attenuated, and to implementing a real time noise management system. The DA modification was approved without any objection from the community.

2.1 Noise attenuating the mining fleet

To reduce noise impacts from the mining fleet, Bulga coal progressively upgraded its mobile equipment mining fleet over a period of approximately 18 months. This involved retiring some equipment, fitting noise attenuation to some of the existing fleet, and the purchase of new attenuated haul trucks at a cost of $173 million. Typically, attenuated trucks have a linear sound power that is in the order of 7 to 9 dB lower than standard machines. This is important as it largely equates to the

difference in received noise at distant receptors, and these are the machines that often operate in the most exposed locations.

2.2 Implementing a continuous noise management system

Bulga Coal installed a network of continuous noise monitors in the community to monitor and manage mine noise impacts in a timely manner. These monitors continuously record audio and measure LAeq limited to the band pass of 20-630Hz, to assess the contribution of large stationary and mobile mining plant. This is derived from the 1/3 octave results for the LAeq. Data is uploaded to, and presented on a real-time user interface, known as the repository, in 5-minute intervals, where it is accessed by control room operators and environmental personnel. Each monitor also records continuous audio to 15 minute mp3 files. These files can be requested for playback and review to assist in determining noise sources. Similarly, audio can be streamed live to assist in noise source assessment.

Alarms have been established for each monitor based on the nearest applicable LAeq noise criterion in the Development Approval. An 'early warning alarm' has also been set for each monitor at a level below the applicable criterion. Control room operators and environmental personnel receive an alarm from the repository via an email and/or SMS when noise is approaching or exceeding a noise criterion. This prompts a review of mining activities that may be contributing to the measured noise level, and where required, generates a response to reduce noise. This often involves relocating mining plant to less exposed areas or ceasing activities.

2.3 Training and empowering the workforce on noise management

The introduction of a continuous noise monitoring system and a number of new noise management approaches required an increased level of understanding from the entire workforce. Bulga Coal invested considerable effort in training and educating all levels of the business, from operators to senior management, on their role and the benefits of minimising noise for the business and the local community. Those with direct responsibilities for managing noise such as mining supervisors and control room operators have developed the appropriate knowledge and skills to make changes to the operation to minimise noise. The education and training, coupled with support from all levels of the business has empowered supervisors to help minimise noise.

2.4 Developing a mine plan with reduced noise impacts over the life of the operation

In 2011, Bulga Coal commenced the environmental assessment and approval process for the Bulga Optimisation Project (BOP) [4]. The Project was required to optimise the resource and extend the life of the open cut mine to 2035 at similar annual production rates. To continually improve the management of mine noise impacts and maintain the relationship with the community, potential noise impacts associated with the BOP were included as a key consideration in the Project design. Noise modelling was done on an iterative basis through the design phase to develop a plan that would have acceptable noise impacts. An out of pit emplacement area, referred to as the 'noise and visual bund', was included as a key feature of the design. The noise and visual bund provides reduced noise and visual impacts on private residents to the west and south of the operation and a suitable area for overburden emplacement. The design of the bund was not the most efficient from a mining or cost perspective, however it was considered the most appropriate option with acceptable noise and visual impacts on the community. To manage noise during construction of the noise and visual bund, day and night time operating scenarios were developed for some stages. Day scenarios consider overburden emplacement in more exposed areas, such as the construction of the outer face of the bund, and the establishment of the eastern emplacement area. Evening/night scenarios consider overburden emplacement in more shielded locations such as in-pit and behind dumps constructed during the day period, where appropriate. A commitment was made to dump the outer face of the noise and visual bund during dayshift (7am to 7pm) only, and rehabilitate the outer face of the bund within four years from commencement of construction.

2.5 Using a comprehensive approach to modelling mine noise impacts

Mining noise impacts for the BOP were assessed by Global Acoustics on behalf of Bulga Coal using a comprehensive and robust modelling approach. Predictions were made using an application of the RTA Technology's Environmental Noise Model (ENM) [5], with mine noise impacts assessed using a cumulative distribution of results method. The following parameters were included in the noise model.

2.5.1 Meteorology

One full year of meteorology from an onsite weather station was used to determine the frequency of occurrence of the 195 meteorological conditions modelled, by season and time period (Day, Evening and Night).

2.5.2 Mining Scenario

Reasonable and feasible worst case operating scenarios over the life of the mine were modelled in the assessment. These included years 1, 4,7,13 and 19 of the Project [4].

2.5.3 Mining Noise Sources

The open cut mining and Coal Handling and Processing Plant noise sources included in the model are shown in Table 1 and Table 2.

Table 1. Bulga optimisation project noise impact assessment – Open cut noise sources

Source Description	LW dB(lin)	LW dB(A)	Plant Quantities				
			Year 1	Year 4	Year 7	Year 13	Year 19
Hitachi EX3600 excavator	124	118	1	1	2	2	2
Hitachi EX5500 excavator	127	120	2	1	1	1	0
Hitachi EX5600 excavator	128	122	1	1	1	1	1
Hitachi EX8000 excavator	124	118	1	1	0	0	0
P&H 4100XPC shovel	123	116	1	1	1	1	0
Source Description	LW Lin dB	LW A wt dB	Year 1	Year 4	Year 7	Year 13	Year 19
P&H 9020 dragline	125	118	1	1	1	0	0
LeTourneau 1850 front end loader	125	122	1	1	1	1	1
Komatsu WA900 front end loader	124	118	1	1	1	1	1
Cat 834H rubber tyre dozer	116	111	1	2	1	1	0
Catepillar 789C XQ rear dump truck	121	115	9	11	11	9	14
Catepillar 793D XQ rear dump truck	121	115	28	30	31	25	16
Catepillar 797F XQ rear dump	124	117	7	8	8	8	0
Catepillar 789C XQ water truck	121	115	3	3	3	3	2
Caterpillar 16H/16M grader	114	108	3	2	2	3	2
Caterpillar 24H/24M grader	117	110	1	2	2	1	0
Terex SKSw75 drill	125	103	3	3	3	3	2

Table 2. Bulga optimisation project noise impact assessment – Coal handling processing plant noise sources

Source Description	LW dB(lin)	LW dB(A)	Quantity
Locomotives on rail loop (3 x 90 class idle)	109	106	3
Reject Bin	121	116	1
Rail load out bin	121	116	1
ROM conveyor (per 100m length)	109	102	1
Reject conveyor (per 100m length)	109	102	1
Overland to CHPP conveyor (per 100m length)	109	102	1
Overland to CHPP conveyor (per 100m length)	109	102	1
CHPP clean coal conveyor (per 100m length)	109	102	1
Skyline conveyor (per 100m length)	109	102	1
Rail load out conveyor (per 100m length)	109	102	1
Transfer stations	121	116	2
CHPP north facade	121	111	1
CHPP east facade	125	116	1
CHPP south facade	119	111	1
CHPP west facade	123	115	1

A maximum sound power level, based on ’in-service” attenuated levels, was assigned to each item of plant proposed to be operated by Bulga Coal, including plant proposed to be operated at Bulga Underground (based on previously measured levels). All plant was modelled at the maximum sound power level, and assuming that all plant operates continuously and simultaneously, with the exception of locomotives, which were modelled as idling on the rail loop. An availability rate of 85 percent was applied to the haul truck and ancillary equipment (e.g. graders, dozers) fleet.

LAeq (15 minute) sound power data was used for all stationary sources. For mobile plant such as haul trucks, graders and water carts the acoustic energy was averaged over the length of their operating route by creating a string of points to represent their path around site. An example of a noise source distribution is presented in Figure 1 Year 1 Mining Scenario.

Haul truck sound power levels were incorporated into haul routes by creating haul route strings consisting of an equivalent 30 second sound power for all haul trucks along the length of a haul route. This method distributes the acoustic energy of the haul trucks along the length of the haul route. Routes comprised a string of segments of varying lengths, each having an LAeq(30 second) sound power determined by the following:

- Sound power for type of trucks on route. Trucks travelling down ramps greater than 5% grade were allocated a reduced sound power;
- Number of each truck type on route in 15-minute period, based on loading unit capacity;
- Speed of truck on segment grade toward dump/ROM; and
- Speed of truck on segment grade toward dump/ROM.

Graders and water carts were allocated sound powers in a similar manner.

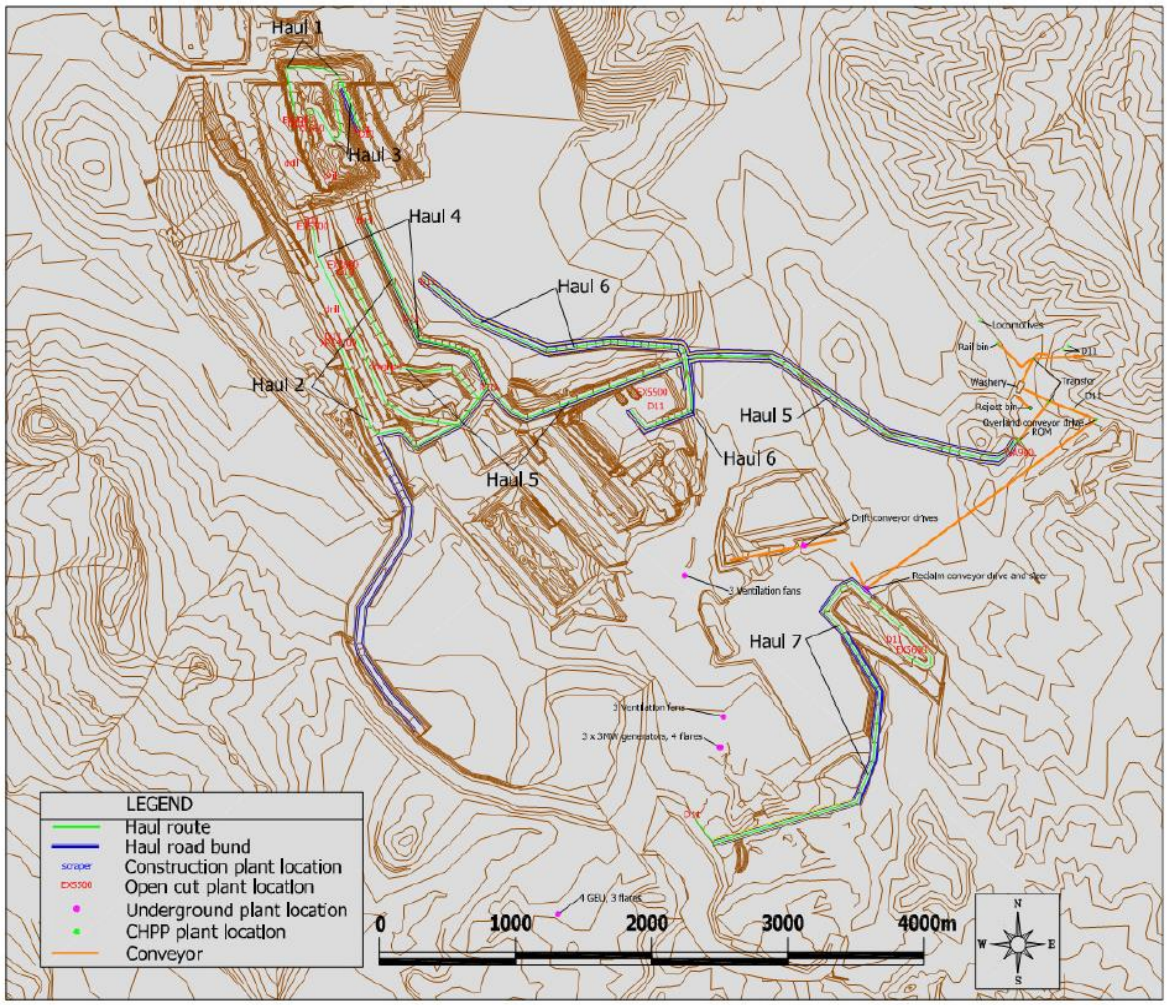

Figure 1. Bulga optimisation project noise impact assessment, Year 1 evening/night scenario

2.5.4 Noise criteria

The noise criteria applicable to any private residence surrounding Bulga Coal mine is LAeq(15 minute) 35 dB [1]. Where levels of mine noise are predicted to exceed 37 dB(A), then the mine must consider offers of architectural treatment to those properties. Where mine noise is predicted to exceed 40 dB(A), then the mine must consider offers to acquire the affected properties [6].

2.5.5 Noise receptors

All private residence locations in the local area, shown on Figure 2, were considered in the assessment. Additionally, vacant lots located within the predicted noise management zone (within the maximum extent 35dB noise contour) were assessed to determine whether 25 percent or more of the lot area is predicted to exceed either LAeq (15minute) 35 or 40dB.

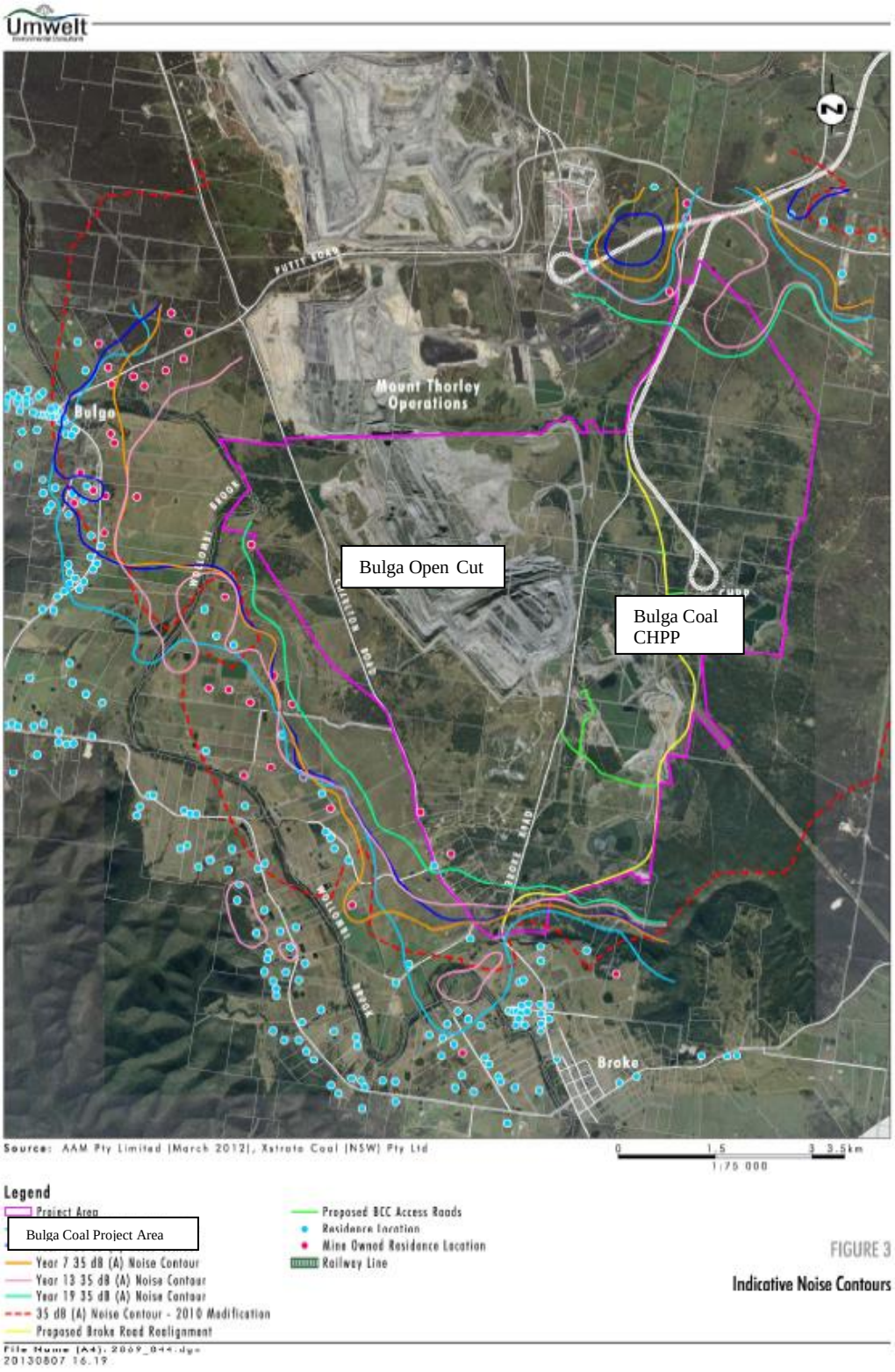

Figure 2. Bulga Optimisation Project Indicative Noise Contours (LAeq, 15 minute)

Results were determined using the cumulative distribution method as previously described including the calculation of 195 meteorological scenarios for each receptor. The 90th percentile was then determined based on the percentage distribution of meteorological conditions, and used to determine the intrusive noise impact from the mine. Results for each private receptor were assessed against a relevant Project Specific Noise Criterion.

This method is considered a more comprehensive and rigorous approach than the method suggested in the INP, which requires the assessment of potentially enhancing meteorological

conditions only if they occur more than 30 percent of a time period in any season. This may mean that meteorological conditions that enhance noise and result in high noise levels and may occur for significant periods of time, but less than 30 percent of the time, are not assessed.

The cumulative distribution method also allows the likely percentage occurrence of any noise level to be determined for any mining scenario modelled. This provides additional information to the community and regulators on the expected level of annoyance, allowing comparison with the NSW Government goal of protecting 90% of the population from being highly annoyed for 90% of the time. Bulga Optimisation Project Noise Impact model results indicated that 42 private residences (similar to the pre-approval exposure) would experience exceedance of the LAeq (15minute) 35dB project specific noise criteria early in the project and that by year four this number would drop below 20 and by year 7 it would drop below 7. As with the 2009 DA modification, the BOP noise impact assessment results were communicated to the community via workshops and with the assistance of an independent noise consultant. The BOP included approximately 970 ha of additional overburden emplacement beyond the existing footprint and continuation of mining at similar production rates till 2035, with substantially reduced noise impacts as a result of the construction of the noise and visual bund within four years.

The BOP was approved in December 2014 with minimal community objection and without triggering any property acquisition requirements because of predicted noise impacts.

3. Summary and Conclusion

In 2009 Bulga Coal listened to the concerns of the community and acted in a responsible manner by contemporising the noise criteria, spending $173 M on a fully attenuated mining fleet and implementing a best practice real time noise management system. These actions bought trust within the local community and support the contention that "*good community consultation is worth 5 dB(A)*"[7] and allowed mining to be continued in a sustainable manner.

The Bulga Optimisation Project was developed with noise as a key design consideration, providing substantially reduced noise impacts within 4 years of a 20 year mine life. The project was approved with minimal community opposition.

References

[1] NSW Department of Planning and Environment. *Bulga Coal Management Pty Ltd Development Consent SSD-4960*, 2014.

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[5] Renzo Tonin & Associates, Environmental Noise Model. RTA Technology, Sydney.

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[7] Parnell, J. and Wassermann, J. "Communicating the noise message", *Proceedings of Internoise* 2014, Melbourne, Australia, 16-19 November 2014.