# Noise Management in the NSW Coal Industry

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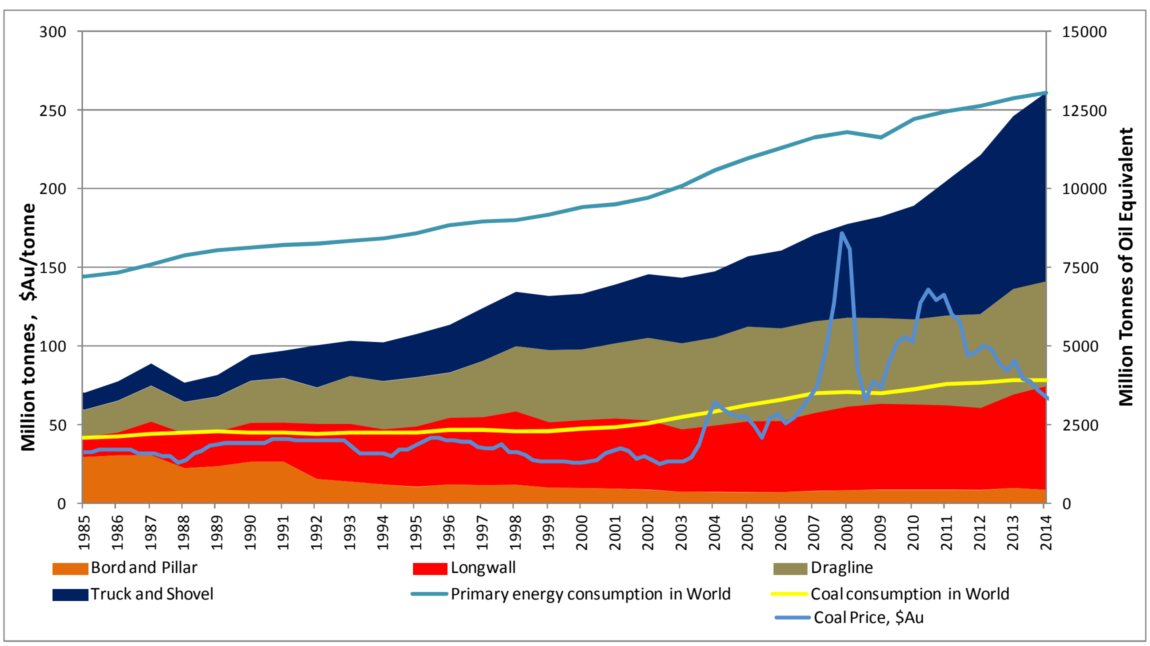
## ABSTRACT

This paper describes the iterative evolution of noise assessment and management in the NSW coal industry during the last three decades. The volatile and dynamic nature of the global demand for coal has encouraged an increase in coal production resulting in a sustained mining boom since the mid 1980s. Parallel to this boom in coal mining is the growth of community dissatisfaction with noise exposures, and the increased efforts of the noise regulators to design and implement effective noise regulations for the industry (such as the *NSW Industrial Noise Policy* (EPA 2000)). This paper describes the key factors that have shaped the changes in environmental noise assessment and management of mining operations and how the coal industry has responded.

## 1. INTRODUCTION: THE MINING BOOM, A CONTEXT FOR CHANGE IN COMMUNITY NOISE EXPOSURE

An increase in global demand for energy has resulted in a near doubling of metallurgical and thermal coal consumption since the mid 1980s (*BP Statistical Review of World Energy*, 2016). To meet this demand for coal the production of raw coal from underground and open cut coal mines in NSW has increased 270 per cent from approximately 70 million tonnes per annum (Mtpa) in 1984/85 to 261 Mtpa in 2013/14 (NSW Department of Trade and Investment, Regional Infrastructure and Services, 2014). At the time of release of the NSW *Industrial Noise Policy* (EPA 2000) approximately 65 per cent of the NSW raw coal production of 131 Mtpa was from the Hunter region, predominantly from 16 open cut coal mines (NSW Department of Mineral Resources, 2001).

Figure 1 shows the increase in raw coal production in NSW by mining method versus the increase in worldwide consumption of energy since 1985.




Source 1: NSW Department of Trade and Investment, 2014. *2014 New South Wales Coal Industry Profile*
Source 2: BP Statistical Review of World Energy June 2016
Source 3: QUADAL Databases

**Figure 1: NSW Raw Coal Production verse Global Energy Consumption**

The worldwide consumption of coal remained relatively constant between 1988 and 1999 followed by an increase in coal demand commencing in 2001/2002. Figure 1 shows that the increase in coal demand in 2001/2002 was followed by an increase in underground production from NSW mines in 2004/2005. Figure 1 also shows a sharp increase in open-cut coal production in 2010/2011.

Since the mid 1980s developments in technology have enabled underground operations to move from bord and pillar mining to longwall mining, increasing underground production from 1984/85 to 2013/14 by 77 per cent. Advances in technology also allowed production from open cut coal mines to increase. Over the same period raw coal production from open cut coal mines increased by 570 per cent.

Up until the mid 1990s the dominant technology for the removal of overburden in open cut coal mines was the walking dragline. During the 1980s equipment suppliers were starting to introduce hydraulic excavators with bucket capacities of up to 20 cubic metres (Orlemann 2003). By the mid 1990s the development and introduction of large hydraulic excavators with bucket capacities of up to 40 cubic metres provided an alternative to the walking dragline for overburden removal. The introduction of large hydraulic excavators also enabled the intensification of mining in existing mines and the development of reserves in areas where geological conditions and the depth of the operations previously precluded dragline operation. From 1996/97 to 2013/14 dragline production increase 87 per cent while truck and shovel production increased 260 per cent.

From the commencement of the 2005 mining boom (Battellino 2010) until 2013/14 raw coal production in NSW from open cut coal mines using truck and shovel increased 220 per cent, primarily due to the versatility, availability and capital cost of large diesel-driven hydraulic excavators and associated truck fleets. Over the same period dragline production only increased 11 per cent. A consequence of this intensification of mining activity, however, was an associated increase in operational sound power levels, often in elevated or exposed locations.

The increase in raw coal production through the development of new mines or expansion of existing mines, the intensification of mining to increase production rates from each mining operation and the use of large diesel-driven hydraulic excavators are three of the primary factors that have driven change in the assessment and management of environmental noise from open cut coal mines in NSW. Many of the other factors that have also resulted in changes in the assessment and management of environmental noise are, in part, in direct response to these primary factors.

## 2. KEY REACTIONS TO CHANGING NOISE EXPOSURE

### 2.1 Industry Perspective

From an industry perspective the factors driving change and the industry's response to these factors are interlinked. On this basis, the key drivers that have shaped the changes in environmental noise assessment and management from an industry perspective, which include the availability of new technologies and industry innovation, are as follows:

- the increased demand for metallurgical and thermal coal and the associated increase in production from individual open cut coal mines as well as the increase in the size and number of surrounding mines contributing to the noise environment;
- the dynamic environment of an open cut coal mine where the locations of the mine, and of the equipment within the mine, are continually changing;
- equipment selection to meet production requirements, suited to the geological and geotechnical conditions of the operations including the availability of larger machines, especially hydraulic excavators;
- advancements in sound abatement packages for mining equipment and the increased acceptance of at-source noise mitigation;
- employee awareness of the impact of changes in work practices on noise emissions;
- consultant knowledge and the development of noise assessment methodologies and advancements in monitoring technology;
- the potential for adverse media coverage and reputational damage; and

- an increased focus on the triple bottom line by shareholders and corporate management.

### 2.2 Regulatory Perspective

The key drivers from a regulatory approach can be linked to many factors including issues associated with the implementation of policy due to ambiguities and lack of detail, changes in community expectation, the dissemination of research information and improvements in the science and practice of acoustics (Treagus 2001; Renew and Burgess 2003). Advancements in the NSW Environment Protection Authority (EPA) and the NSW Department of Planning and Environment (DP&E) approach to the assessment and management of industrial noise that the coal industry has responded to include:

- introduction of the NSW *Industrial Noise Policy* (EPA 2000) and the subsequent publishing of application notes on the EPA web site to clarify the EPA's approach to different aspects of the Policy;
- standardisation of the methodology for the assessment of noise impacts and then the acceptance of more rigorous analytical techniques being developed by the industry;
- licensing requirements and the associated compliance monitoring and reporting requirements;
- introduction of noise management plans for mining operations;
- specific consent requirements encouraging mines to investigate the viability of new and emerging noise control and management strategies including predictive meteorological technologies;
- introduction of the *Voluntary Land Acquisition and Mitigation Policy* (DP&E, 2014); and
- release of the of the draft *Industrial Noise Guideline* (EPA 2015).

The release of the NSW *Industrial Noise Policy* (EPA 2000) did not occur in direct response to the increase in open cut coal mining in NSW. The overall objective of the Policy was to provide a comprehensive and effective whole of government approach to noise management (Langgons 2001) that balances the need for industrial activity with the need to protect, restore and enhance the quality of the environment in NSW (Treagus 2001). The Policy did however recognise the significance of mining in the Hunter region, making specific reference to temperature inversions in the region and the effect inversions have on the propagation of noise.

### 2.3 Community Perspective

The third driver that has shaped changes in environmental noise assessment and management is the community. Key influences from this group are associated with:

- increase in knowledge within the broader community reflected in well-organised rural industry groups campaigning against the expansion of mining (McManus and Connor 2013);
- evolving expectations of individuals associated with eco-lifestyle, concerns about global warming and potential health impacts from mining;
- exposure to environmental noise from coal mining activities, the cumulative noise impact from multiple mining operations and the aggregation of different environmental impacts from mining on air quality, visual amenity and water quality (Franks, Brereton et al. 2010); and
- increase in land use conflicts and amenity impacts identified as arising from the rapid growth in coal mining activities placing pressure on established agricultural activities (DP&I 2012).

## 3. PROGRESSION OF CHANGE

### 3.1 What Changed

While this paper discusses changes to the coal industry in response to a number of these drivers there is an underlying linkage between the drivers and their responses that has resulted in the progression of change. If we assume the NSW coal industry had a social license to operate in the 1980s based on its ability to meet its statutory obligations, and that there was an acceptable balance between wealth generation and environmental/social impact, then what changed?

Social license generally refers to a local community's acceptance or approval of a company's project or ongoing presence in an area. It is increasingly recognised by various stakeholders and communities as a prerequisite to development (Gunningham, Kagan et al. 2004, Carrington and Pereira 2011).

**Table 1: Raw Coal Production, Mtpa**

| Reporting Period | Open Cut Mining | | | Underground Mining | | | Total |
|---|---|---|---|---|---|---|---|
| | Dragline | Truck and Shovel | Total | Longwall | Bord and Pillar | Total | |
| 1984/85 | - | - | 27.9 | - | - | 42.1 | 70.0 |
| 1994/95 | 31.1 | 27.6 | 58.7 | 38.7 | 10.0 | 48.7 | 107.8 |
| 2004/05 | 60.1 | 44.8 | 104.9 | 45.4 | 6.5 | 51.9 | 156.3 |
| 2013/14 | 66.4 | 120.3 | 186.7 | 66.3 | 8.1 | 74.4 | 261.0 |

Source 1: NSW Department of Mineral Resources, 1996. *1996 New South Wales Coal Industry Profile*
Source 2: NSW Department of Primary Industry, 2006. *2006 New South Wales Coal Industry Profile*
Source 3: NSW Department of Trade and Investment, 2014. *2014 New South Wales Coal Industry Profile*

In the ten year lead up to the 2005 mining boom raw coal production from open cut coal mines in NSW increased 78 per cent, while production from underground mining decreased approximately 4 per cent (refer to Table 1). The 180 per cent increase in the raw coal production from open cut mining from 1994/95 to 2004/05 should have equated to a 2.5 dB increase in total sound power level from open cut mining. However, the change was far more significant due to machine selection and associated changes in mine design and mining methods.

### 3.2 Development of more efficient (but noisier) Mining Equipment

The shift away from draglines and rope shovels to hydraulic excavators in the coal mining industry has facilitated the increase in raw coal production over the last 20 years due to the increased versatility and flexibility, in addition to the availability and lower capital cost, offered by the machinery (Mitra and Saydam, 2012). The use of a dragline requires careful consideration of the geology of the site, and its geotechnical risks. Conversely, a truck and shovel operation can handle steeply dipping deposits or complex geologies with faults, folded strata and multi-seam distribution of the coal, and can be easily relocated to meet operational or environmental constraints. The shift in technology and operational flexibility has come at a cost; an increase in the overall sound power level of coal mining operations.

A dragline has a sound power level of 110 to 113 dB(A) (Envirosciences, 1990; Umwelt, 2010). Each dragline is typically supported by a bulldozer (Cat D10 or D11) and cable tender so the combined operational sound power level of the mining set is approximately 115 dB(A). To achieve the same waste/overburden removal rate as a large dragline a mine could use up to two hydraulic excavators. Each hydraulic excavator is supported by a bulldozer at the working face and a second bulldozer managing the waste emplacement. Depending on the haul distance and ramp grade, a waste excavator could be operating with a small fleet of three trucks running to a close in-pit dump or up to six or seven trucks run to an out-of-pit dump. An unattenuated 600t excavator has a sound power level of between 124 to 127 dB(A) depending on make, model and age (Umwelt, 2004). A fleet of ten unattenuated 240t mine trucks could have a combined operating sound power level of 125 to 127 dB(A) (Umwelt, 2004). When combined, the excavator and truck operation using unattenuated equipment could have an operational sound power level of over 130 dB(A) in comparison to the dragline and ancillary equipment of 115 dB(A).

The introduction of large hydraulic excavators in the mid 1990s resulted in raw coal production using truck and shovel increasing 62 per cent from 1994/95 to 2004/05. However during this period new machines were generally unattenuated except for basic muffler systems. The estimated increase in total sound power level from open cut mining from 1994/95 to 2004/05 was 7 to 8 dB.

### 3.3 The Intensification and Expansion of Mining Fuelled by the Mining Boom

The increase in raw coal production in NSW from the commencement of the mining boom in 2005 to 2013/14 period was approximately 104 Mtpa increasing total raw coal production to 261 MtPa. This resulted in a doubling (114 per cent increase) of raw coal production using truck and shovel operations in the Hunter Valley and a

13-fold increase (1300 per cent) in the Western and Gunnedah mining districts.

In a case study from the Hunter Valley, Moran and Brereton (2013) reported a more or less linear correlation between coal production from mines in the regions surrounding Muswellbrook and the number of complaints. Moran and Brereton (2013) suggested the subsequent decrease in complaints from the year 2000 were most likely attributable to the "remedial actions taken by mines to address the concerns of near neighbours". However, by this time the reputational damage to the mining companies and the statutory authorities had been done. Once near neighbour complaints were filtered out, a different pattern emerged; the number and percentage of complaints coming from the town increased over time. Moreover, the increase in the proportion of complaints attributable to the town was strongly correlated to the amount of land disturbed by mining and, more particularly, to the amount that could be viewed from various locations in the town (Moran and Brereton 2013).

This constitutes evidence that increased mining in the area was having a cumulative effect on the community. However, this impact went largely unrecognised because individual mines were mainly focused on addressing complaints from near neighbours and on reducing the total number of complaints. As a result of growing conflict between mining and rural communities McManus and Connor (2013) argue there has been a weakening of the coal mining industry's social license to operate in many parts of the Upper Hunter Valley. This loss of social standing is linked to an inability for open cut coal mines to co-exist with other land uses.

When faced with reputational damage caused by misreading the terms of their social license Gunningham, Kagan et al. (2004) note that corporations develop risk management strategies that, when and if appropriate, go beyond their legal obligations. That is, the effort required to meet their legal obligations is not necessarily synonymous with and has been outweighed by their perceived social obligations. For the coal mining industry, the cyclic progression of change resulted in advances in machine noise attenuation, mine plan design, monitoring systems and noise management planning. In turn, the evolving statutory/legal requirements sought to mandate the advancements achieved by mines.

## 4. INDUSTRY OPTIONS FOR RESPONDING THROUGH NOISE CONTROL

The coal industry's response to the changes in environmental noise impacts as a result of the growth in the industry, new and evolving statutory requirements, and community expectation falls into the three categories indentified in the NSW *Industrial Noise Policy* (EPA 2000):

- Controlling noise at the source;
- Controlling the transmission of noise; and
- Controlling noise at the receiver.

### 4.1 Controlling Noise at the Source

Some of the initiatives taken by the coal industry to control noise generated at the source, outlined as follows, fall into one or more of the three categories of source elimination, best management practice and best available technology economically achievable:

- The installation of 'silent horn' systems in excavators to communicate with trucks;
- The installation of smart broadband 'Quacker' reversing alarms to replace traditional 1kHz alarms;
- The purchase of less efficient but quieter equipment to replace noisy equipment during night time operations (e.g. using rubber-tyred bulldozers on exposed dumps to replace track bulldozers);
- Investment in the development of machine attenuation including improved muffler systems, attenuated fan casing louvers and engine enclosures;
- The installation of noise attenuation on key items of plant and equipment (i.e. bulldozers, excavators, front-end loaders, graders, drill rigs and water carts);
- Mobile fleet selection (i.e. mine trucks) and use of available attenuated fleets in exposed locations;
- The design of out-of-pit emplacement areas to provide alternate shielded operational locations for the equipment on exposed emplacement areas;

- Oriented benches to enable the mining equipment to maximise topographical shielding or operate with the noisy side of the equipment facing away from sensitive receivers;
- The preparation of operational plans that account for adverse meteorological conditions that include slower equipment speeds, relocating items of equipment, relocating mining and emplacement areas and progressively shutting equipment down; and
- Reduction or shut down of operations during the night time (10pm to 7am). This includes the purchase of additional equipment so that production requirements can be meet during the day and evening.

For many of the open cut mines in the Hunter Valley the key to managing noise impacts is the installation of continuous noise monitoring and meteorological systems (Parnell, 2015).

### 4.2 Controlling the Transmission of Noise

The two broad approaches to controlling the noise transmission path from source to sensitive receiver include the use of barriers and land-use. To control noise the transmission path from source to sensitive receiver the coal industry has:

- Designed open cut pits and out-of-pit emplacement areas to shield sensitive receivers by using or augmenting natural topographical features;
- Located and oriented haul roads below ground surface level and constructed strategically located bunds along exposed sections of haul roads to maximise topographical shielding;
- Developed mine plans and operational scenarios that allow for alternate levels of machine utilisation and alternative work locations; and
- Implemented landuse controls by establishing buffer zones around the mining operation which attenuate noise by increasing the distance between source and receiver.

### 4.3 Controlling Noise at the Receiver

The implementation of mitigation measures at sensitive receivers is typically undertaken as a final option. When required, controlling noise at the receiver typically includes one or more of the following:

- Negotiating an agreement with the landholder that could include financial or 'works in kind'; and/or
- Acoustic treatment of dwellings to mitigate the noise impacts; and/or
- Property acquisition where owners have rights to request acquisition in accordance with development consent conditions.

## 5. CASE STUDIES

There are many examples of the initiatives taken by the NSW coal industry in response to the changes in environmental noise impacts as a result of the growth in the industry, to new and evolving statutory requirements, and to community expectation. The following section provides details on how various operations have responded to the key factors driving change discussed above.

### 5.1 Ravensworth Operations: A Case Study of changing Mining Intensification

Mudd (2010) reports on the major shift from underground to open cut mining in the mid-twentieth century for a range of commodities including coal. One of the issues identified resulting from the change in mining format is the significant increase in the excavation of waste rock to expose the coal resource.

As mining operations increased their production capacity to meet domestic and export demands the change in mining format reported by Mudd (2010) became an operational constraint to open cut mines due to air, noise, water and visual impacts. With respect to the assessment and management of environmental noise the intensification of mining resulted in an increase in operational sound power levels often in elevated or exposed locations. By the late 2000s the coal mining industry had recognised this as a significant issue and started investigating and implementing engineering noise controls to reduce sound power levels and modify mine plans to control the propagation of noise.

In the late 1980s seven coal mines operating in the central Hunter Valley were contracted to supply thermal coal to the then Electricity Commission of NSW's (ECNSW) Liddell and Bayswater power stations. The ECNSW's Ravensworth South mine supplied 3.4 Mtpa of coal to the power stations. Over the next 25 years through a series of new developments, joint ventures and expansions, mining in and around the Ravensworth locality gradually changed and grew in order to meet the domestic demand for electricity generation due the expiry of contracts at other mines and for the growing export market. Operations changed over that period from dragline based operations to a combination of dragline and truck and shovel operations to truck and shovel operations. The increase in raw coal production and estimated increase in sound power level of the Ravensworth Mining Operations over this period are outlined in Table 2.

The sound power levels presented in Table 2 are representative of:

- At least 90 to 95 per cent of the all acoustically significant plant and mobile equipment used by the mining operation operating simultaneously; and
- Mobile noise sources, such as front-end loaders, excavators and haul trucks were modelled at typical locations and assumed operating in repetitive cycles

**Table 2: Increase in Production Capacity at Ravensworth Operations**

| Period | Mining Operations | Approved Raw Coal Production, Mtpa | Estimated SWL, dB(A) |
|---|---|---|---|
| Pre 1990 | Ravensworth South | 3.4 | 122 |
| Mid 1990s | Ravensworth South plus Narama | 6.2 | 136 |
| Mid 2000s | Narama | 3.5 | 131 |
| Late 2000s | Narama plus Ravensworth West | 6.5 | 136 |
| 2013/14 | Narama Extended plus Ravensworth North | 16.6 | 137 |

Source 1: Envirosciences Pty Limited, 1990. *Environmental Impact Statement for Narama Coal Mine*
Source 2: Mitchell McCotter, 1997. *Environmental Impact Statement - Extension of Mining Operations and Ravensworth Mine*
Source 3: Umwelt (Australia) Pty Limited, 2008. *Environmental Assessment for Proposed Increase in Production – Narama Coal Mine*
Source 4: Umwelt (Australia) Pty Limited, 2010. *Ravensworth Operations Project Environmental Assessment*
Source 5: NSW Department of Mineral Resources, 1993. *1993 New South Wales Coal Industry Profile*
Source 6: NSW Department of Trade and Investment, 2014. *2014 New South Wales Coal Industry Profile*

Without investing in noise attenuated equipment as part of the proposed Ravensworth North mine the cumulative operational sound power of the mine could have exceeded 142 dB(A) by the 2013/14 period.

## 5.2 Mount Owen Operations: A Case Study of a changing Mine Footprint

The operating noise environment of a modern open cut coal mine in characterised by a large mobile fleet of equipment in a dynamic environment where both the location of the mine and the equipment within it are continually changing. As a mine advances the changing footprint of the mine can either exacerbate or abate the noise impacts in the region surrounding the mine. The change in the noise environment can occur because the mine is encroaching on land held in private ownership or towards residential communities, or due to changes in the topography, design aspects of the mine plan such as haul road location, exposure and grade, equipment orientation, and the location of the waste emplacement areas.

To offset the increase in noise associated with the changing footprint of an open cut coal mine the strategies employed by the industry include:

- Progressive noise attenuation of the mining equipment;
- Equipment relocation or shut down during adverse weather conditions;
- Mine plan design to: change the orientation of the pit area, shield or hide equipment; use day/night waste emplacement options; and use earth bunds along exposed haul roads or augment the natural topography;
- Scheduling the activities to specifically control the timing of surface or close to surface activities; and

- Mitigation treatment of affected properties or property acquisition to increase the size of the buffer zone around the mine.

Mount Owen open cut coal mine was approved in the early 1990s as a truck and excavator operation producing 8 Mtpa of coal. In 2003 a proposal was submitted to extend the life of the mine by an additional 17 to 21 years and increase production to 10 Mtpa (Umwelt, 2004). This was to be achieved by increasing the approved width of the mine by approximately 500 metres and by progressing the mine an additional 1,000 metres to the south-east. The noise impact assessment for the project was based on four conceptual mine plan stages. It was reported in the Environmental Impact Statement (EIS) for the expansion of the mine that the preliminary noise modelling included an assessment of noise impacts from the project based on the continued use of the existing unattenuated mining fleet already in use at Mount Owen (Umwelt, 2004). The EIS reported that an Equipment Replacement Program would be implemented with the objective of minimising noise emissions from the project through the modification of existing equipment and the scheduled replacement of older equipment with new noise attenuated equipment. It was reported that the Equipment Replacement Program represented a compromise between leading edge best practice noise attenuation, economic practicality and equipment maintainability.

Based on the schedule of equipment presented in the EIS the existing unattenuated mining fleet already in use at Mount Owen had a combined operating sound power level of 135 dB(A). By year 3 of the new mine plan it was proposed the production rate would increase to 10 Mtpa and the combined operating sound power level of the Mount Owen mine would be 134 dB(A). Through the progressive attenuation of the mining equipment the combined operating sound power level would be further reduced to 132 dB(A) by year 6, 131 dB(A) by year 10 and 130 dB(A) by year 17.

Through the progressive sound attenuation of the mining equipment and implementation of the strategies out lined above, the mine could maintain the same area of affection to the south east of the mine during year 17 of the mine life as in year 3, even though the mine would progress a total of 2,700 m to the south-east.

### 5.3 Moolarben Coal Mine: A Case Study of changing Noise Management and Mitigation

The evolution of the modern noise management plan for the mining industry commenced in the mid 2000s, as mines provided specific details in order to meet their statutory obligations. The first noise monitoring programs outlined when and where noise monitoring would take place and protocols in place to address any reported exceedance of statutory noise criteria. Contemporary noise management plans are prepared to satisfy specific requirements of project approvals and provide detailed information of all aspects of noise management implemented by a site. While the noise management plan provides assurance to the community that a mine will operate according to its statutory requirements, as a public document, it also provides commentary on issues relevant to the individual and to the local community.

In addition to meeting specific noise criteria, statutory obligations typically include:

- Implementing noise monitoring programs that incorporat attended and 'real-time' noise monitoring;
- The day to day planning of mining operations, incorporating meteorological forecasting of adverse conditions and real-time noise monitoring; and
- Ongoing investigation into best practice noise mitigation technologies and alternate operating methodologies in order to further reduce noise impacts.

In order to meet specific noise criteria a range of noise management and mitigation measures, often not discussed in noise management plans, are implemented by mines to reduce their operational noise levels. These include, but are not limited to:

- Long range mine planning to strategically manage potentially noisy activities. This could include the reorientation of haul roads so that equipment can be oriented to reduce noise propagation towards sensitive receivers; designing dumps specifically for winter nights when temperature inversions affect noise propagation; and scheduling activities to match temporal conditions;
- Strategic alliances with suppliers to investigate leading edge technologies or new noise attenuation and mitigation opportunities;

- The purchase of task-specific equipment to reduce noise impacts such as rubber-tyred bulldozers to replace tracked bulldozers in exposed areas during adverse weather conditions;
- Short term operational changes to manage potentially adverse noise impacts such as reducing bulldozer speed, especially in reverse, to minimise track clatter; reducing the speed of mine trucks on exposed ramps; relocating equipment; and hot seating equipment so that major items of equipment are not shut down during crib breaks;
- Selective shut down of equipment to reduce adverse noise impacts
- Prediction of likely noise levels supplementary to the meteorological forecasting; and
- Employment of staff specifically tasked with monitoring noise system alarms and implementing response protocols including the physical verification of noise by mine staff.

The noise generated by the first-pass loading of rock into the dump body of a mine truck was recognised by Moolarben Coal as being intrusive in the surrounding community (Duratray 2013, Komatsu 2013). At the time, the mine was operating below their noise criteria (Moolarben, 2012, 2013) and there was no specific requirement to address the intrusive noise being generated by the first load of rock into the dump bodies of the mine trucks.

Through a collaborative partnership between Duratray, Komatsu and Moolarben, a suspended dump body was developed for the 830E Komatsu mine trucks. The suspended dump body consists of a one-piece flexible rubber floor liner supported by elastomeric ropes connected to the framework of the dump body. The liner dampens the noise when rock is dropped in the dump body significantly reducing peak instantaneous noise levels.

Moolarben coal mine installed an initial four Duratray suspended dump bodies into its fleet of 830E Komatsu mine trucks as a part of the noise mitigation package for the site. A press release from Duratray (Duratray, 2013) reported reductions in peak instantaneous noise levels of up to 8 dB (Moolarben, 2012). As a result of the noise reduction achieved using the suspended dump bodies Moolarben coal mine purchased additional units to augment the existing Duratray fleet working in exposed areas of the mine site.

## 6. CONCLUSION

The NSW *Industrial Noise Policy* (EPA 2000) was introduced with the objective of setting noise criteria for industrial developments that would protect the community from excessive intrusive noise and preserve amenity for specific land uses in NSW. The Policy also provided a framework for a consistent approach to the assessment and management of environmental noise and the quantification of noise impact from industrial noise sources; and guidance on what mitigation and management measures might be appropriate for particular types of development.

At the time the NSW *Industrial Noise Policy* (EPA 2000) was introduced the NSW Coal Industry was ramping up to meet the demand for coal in the domestic and international markets. This paper describes how, at the time of the Policy's introduction, the NSW Coal Industry was starting to implement new initiatives to control and manage their noise impacts in response to community expectations. Treagus (2011) indicates the Policy was introduced at a time when industry required certainty regarding noise standards that would, as described in the introduction of the Policy, balance the needs of industry with the desire for quiet by the community.

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