Russell Vale Colliery

Russel Vale East - Revised Underground Expansion Project

UNDERGROUND EXPANSION PROJECT

NOISE MANAGEMENT PLAN

RVC EC PLN 013

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1 INTRODUCTION

1.1 Overview

This Noise Management Plan (NMP) has been prepared by Wollongong Coal Pty Limited (WCL) to manage noise for the underground expansion of the Russell Vale Colliery (the Colliery) in accordance with relevant conditions of consent.

This report was prepared by RWDI in consultation with WCL, WCC and NSW EPA. RWDI is an acoustic engineering firm member of the Association of Australian Acoustical Consultants (AAAC). More specifically, the NMP, including the monitoring program and the Trigger Action Response Plan (TARP) have been planned and prepared by suitably qualified and experienced persons – RWDI senior acoustic consultant Lee Hudson (member of the Australian Acoustical Society [AAS] with more than 35 years' experience in the acoustic field) and RWDI senior engineer Roman Haverkamp (member of the AAS with almost two decades of experience in environmental acoustics) – in consultation with RWDI technical director John Wassermann (member of the AAS with over 30 years' experience in the public and private sectors). The qualifications of Lee Hudson, Roman Haverkamp and John Wassermann are presented in **Appendix D**.

1.2 Project Background

Wollongong Coal Limited (WCL) operates the Russell Vale Colliery (RVC) in the Southern Coalfield of New South Wales (NSW). The mine is located at Russell Vale approximately 8 km north of Wollongong and 70 km south of Sydney, within the local government areas (LGAs) of Wollongong and Wollondilly in the Illawarra region of NSW. RVC is within the Sydney Catchment Authority (Water NSW) controlled Metropolitan Catchment area, which is used to provide drinking water to Sydney and Wollongong. It also occurs within the Dam Safety Committee (DSC) Notification Area for Cataract Reservoir.

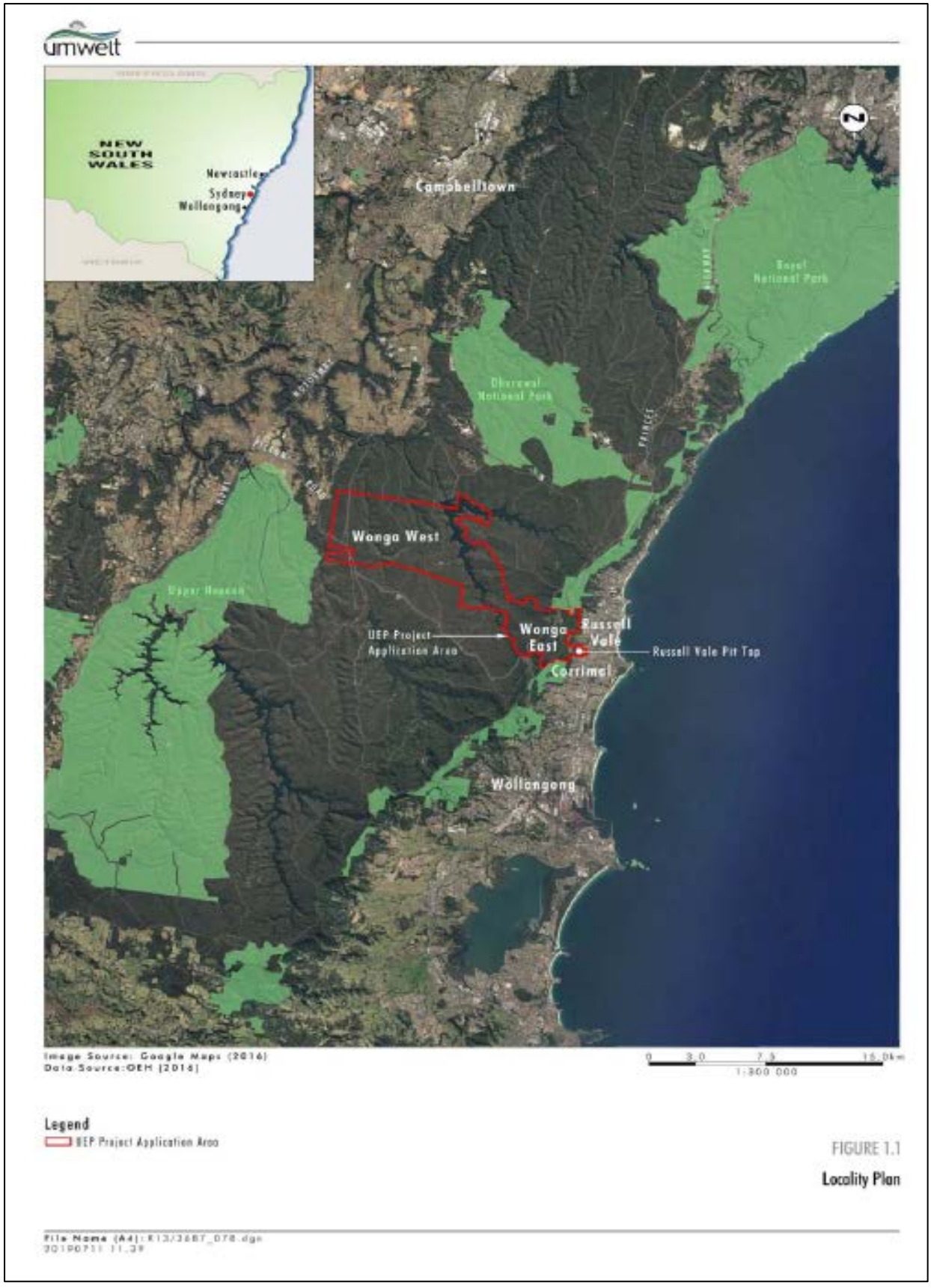
The most recent modification to the project approval for the RVE UEP Revised Underground Expansion Project (UEP) Development Consent (MP09_0013) for the UEP Revised Underground Expansion Project (UEP).

MP09_0013 was granted by the NSW Independent Planning Commission (IPC) on 8 December 2020 to allow:

- Mining using first working mining techniques within the Russell Vale East (RVE UEP) area, with the workings targeting the Wongawilli Seam designed to be long-term stable with imperceptible subsidence impacts. No longwall mining is proposed.
- Extraction of approximately 3.7 Million tonnes (Mt) of run-of-mine (ROM) coal over a period of five years at a rate not exceeding 1.2 Mt of ROM coal per year and a production rate not exceeding 1 Mt of product coal per year.
- Reduced product trucking rates relative to the Preferred Project mine plan.
- Redesign of the Pit Top layout to strategically relocate infrastructure to more shielded locations.
- Additional noise mitigation works at the Russell Vale Pit Top including relocation of infrastructure, new noise barriers, a new berm and extension to the height of existing bunds and acoustic treatment of coal processing infrastructure.

This Noise Management Plan (NMP) has been prepared for the Wollongong Coal Limited (WCL) Underground Expansion Project (UEP) at the Russell Vale Colliery by RWDI Australia Pty Ltd (RWDI). Russell Vale Colliery is located within the Southern Coalfields Region of New South Wales, approximately 8 kilometres north of Wollongong and 70 kilometres south of Sydney. Mining operations at the colliery ceased in 2015 and the mine has been under care and maintenance since that time. Consent (Application number MP09_013) was granted by the Independent Planning Assessment Commission of NSW on 8 December 2020, for the Russell Vale Revised Preferred Underground Expansion Project (the Project). The updated mine plan design addresses the concerns raised by the Planning Assessment Commission (PAC) in its First and Second Assessment Reports on the Russell Vale UEP.

Figure 1 – Project Location



1.3 Environmental Management System (EMS) Overview

WCL has a formalised environmental management system (EMS) for the Colliery (Wollongong Coal 2021a). The EMS provides a framework to ensure that activities at the Colliery are undertaken in an environmentally responsible manner, and are in general accordance with the following:

- Development consent MP09_0013 (the consent').
- ISO14001 Environmental Management Standard; and
- legislative and other requirements.

Figure 2 shows this plans' position within the WCL's Environmental Management Structure. The EMS is implemented, managed and updated as required, most recently in accordance with the Russell Vale Underground Expansion Project major project approval MP09_0013 (').

1.4 Noise Management Plan (NMP)

Condition B3 of the Conditions of Approval (CoA) requires the preparation of a NMP for the Project in consultation with NSW Environment Protection Agency (EPA) and Wollongong City Council (WCC) and submitted to the Secretary of the Department of Planning, Industry & Environment (DPI&E) for approval.

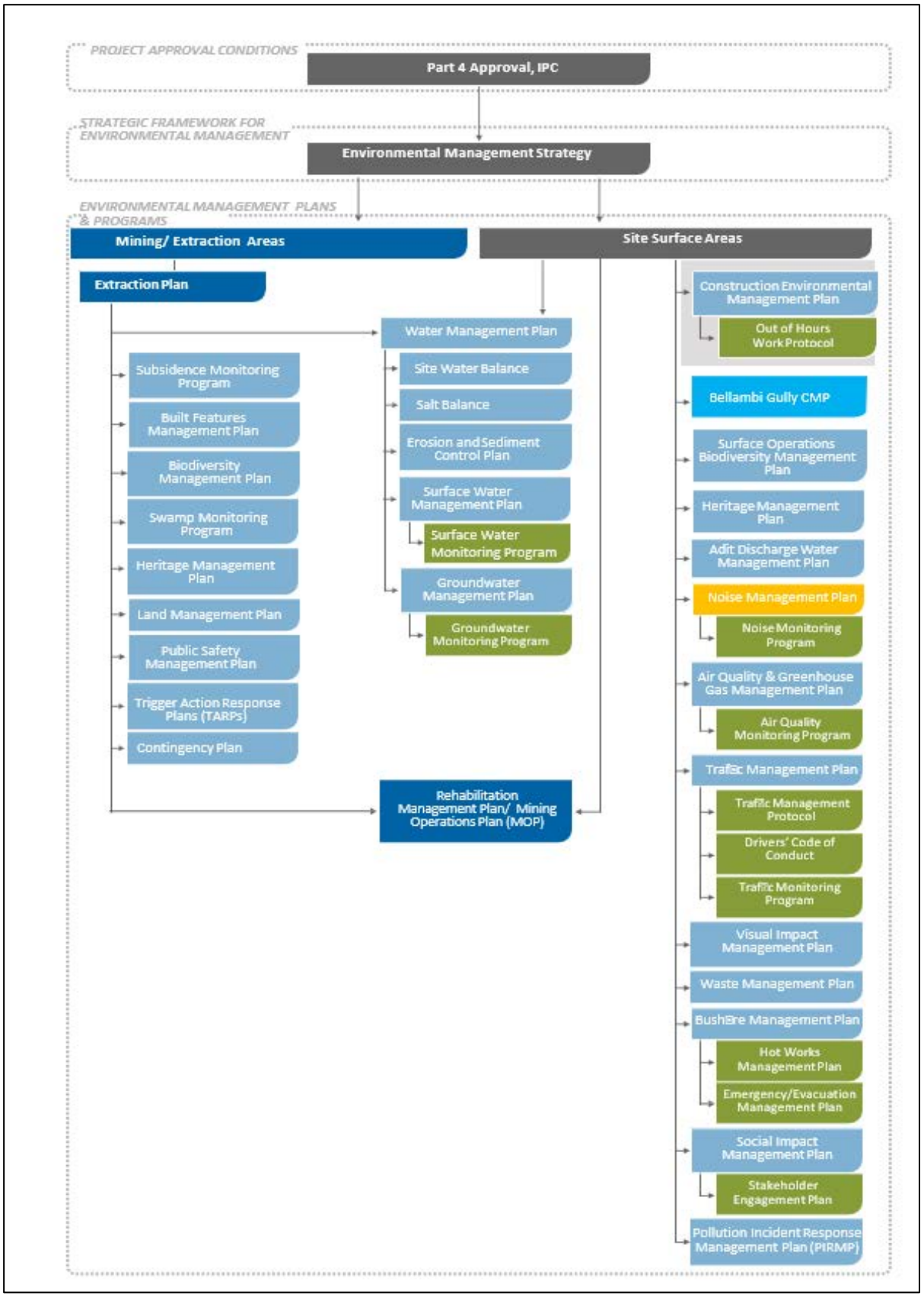
The NMP is to be approved before commencement of any construction and operational activities associated with the Project.

The primary purpose of this NMP is to provide procedures to:

- Manage and control risks associated with noise during construction and operation of the Project;
- Ensure contributed noise emissions from the mine operations are minimised during all meteorological conditions and comply with the noise impact assessment criteria and operating conditions in the Project CoA;
- Seek to minimise road traffic noise generated by employee vehicle movements on public roads and particularly on Bellambi Lane;
- Address the requirements of applicable legislation and any ongoing approvals;
- Address the statement of commitments from the Revised Preferred Project and Response to Second PAC Review (RPPR) (Umwelt, 2019);
- Ensure that relevant stakeholders are involved in the formulation and implementation of this NMP;
- Outline procedures associated with noise management and community consultation;
- Ensure best practice management is being employed; and
- Outline the noise monitoring methodologies to be used, including a combination of real-time and supplementary attended monitoring to evaluate the performance of the development.

These procedures will ensure that the requirements of **Condition B3** are satisfied.

Figure 2 – WCL Environmental Management System (EMS) Overlay



1.5 Document Structure

The remainder of this Management Plan is structured as follows:

- **Section 2:** Outlines the statutory requirements applicable to the Plan.
- **Section 3:** Outlines the baseline data that supports this Plan.
- **Section 4:** Details the performance measures and meteorological conditions will be used.
- **Section 5:** Describes the monitoring program.
- **Section 6:** Describes the management, remediation and mitigation measures that will be implemented to reduce potential impacts.
- **Section 7**: Describes the protocols for the handling of incidents, complaints and non-conformances.
- **Section 8:** Details how the Plan will be implemented, managed, reviewed, updated and managed.

Figure 4 illustrates the approved UEP project Pit Top Layout at Russell Vale Colliery inclusive of the full extent of the noise walls and noise berms.

2 PROJECT DESCRIPTION

2.1 Project Overview

The project involves a revised mine plan that has been designed to have negligible subsidence to address potential subsidence-related mining impacts on groundwater, surface water and biodiversity within the Cataract Reservoir catchment.

The project also involves changes to the Russell Vale Pit Top (the Pit Top), which includes key project components (i.e. surface infrastructure) requiring construction.

The current and proposed surface infrastructure are presented in **Figure 3** and **Figure** 4 to **Figure 6** respectively.

The key elements of the project are:

- mining by bord and pillar mining techniques only with the workings designed to be long-term stable with minimal subsidence impacts.
- extraction of approximately 3.7 million tonnes of Run-of-Mine (ROM) coal at a reduced production rate of up to 1 million tonnes of product coal per year (equivalent to approximately 1.2 million tonnes of ROM coal per year).
- redesign of the Pit Top layout to relocate infrastructure to more shielded locations to reduce amenity impacts.
- operation of surface facilities and product transport, typically limited to daytime hours (7.00am to 6.00pm Mondays to Friday, 8.00am to 6.00pm Saturday, no Sundays and Public Holidays), with provision for occasional operation until 10.00pm Monday to Friday to cater for unexpected port closures or interruptions.
- reduced product trucking rates relative to the previous UEP mine plan with a maximum of 17 trucks permitted per hour.
- extension to the height of existing bunds, construction of new bunds and noise walls within the existing surface infrastructure area for improved noise mitigation.
- construction of a new truck loading facility and associated conveyors.
- construction of a suitable dry coal processing plant to improve the quality of product coal removing reject rock material via use of dry separation methods will also be evaluated at this stage and if required to be installed, will be commissioned to align with the ramp up of production to 1.2Mtpa ROM.

2.2 Project Staging

The project will be implemented in stages as per below with the scope of this Plan covering all stages:

- **Stage 1**

Installation of environmental monitoring controls and mitigation measures, truck access roads, construction of new noise walls, noise bunds and new primary sizer.

Commencement of mining operations ramping up to approximately 0.5 Mtpa with crushed coal transferred to ROM stockpile and coal loading via front-end loader to trucks to be transported to PKCT.

Evaluation of the feasibility of a coal processing plant (CPP) to be installed as part of the new Stage 2 surface infrastructure.

Key elements included in Stage 1 Works include (See **Figure 4**):

- Development and mining by bord and pillar mining
- Up to 500,000 tonnes of product coal per year
- Installation of new primary sizer inline
- Front end loading ROM coal onto trucks
- ROM Stockpile 30,000 tonnes
- Construction of surface infrastructure works, including construction of new noise walls, noise bunds, truck access roads, and commissioning the design and construction of the truck loading bin and associated conveyers.

A copy of the Stage 1 surface infrastructure is provided in **Figure 4**.

- **Stage 2**

Finalise the construction and commissioning of new surface infrastructure, comprising truck loading bins and associated conveyors.

The coal will be transferred from the ROM stockpile through a series of conveyors to the truck loading bin to be loaded onto the trucks for transportation to PKCT or transferred to a new stockpile area for temporary stockpiling.

Coal from temporary stockpile will be loaded onto trucks by front-end loader for transportation to PKCT (Stage 2A – see **Figure 5**).

If the outcome of the evaluation in Stage 1 is to construct a CPP, the coal from the ROM stockpile will transferred by a series of conveyors to the CPP (Stage 2B – see **Figure 6**).

The product from the CPP will transferred to the truck loading bin to be loaded onto the trucks for transportation to PKCT or transferred to a new stockpile area for temporary stockpiling.

Coal from temporary stockpile will be loaded onto trucks by front-end loader for transportation to PKCT. The rejects conveyor will transfer the rejects from the CPP to the rejects stockpile (Stage 2B).

Commencement of full mining operations ramping up to 1.2 Mtpa to align when the new coal handling facilities and associated infrastructure is fully operational.

Key elements included in Stage 2 Works include:

- Mining by bord and pillar mining
- Up to 1 Million tonnes of product coal per year
- Up to 1.2 Million tonnes ROM coal per year
- Loading product coal onto trucks via bins
- Construction of new CPP
- Construction new surge bin
- ROM Stockpile 30,000 tonnes

- Product Stockpile 14,000 tonnes
- Emergency Stockpile
- Rejects stockpile 1,500 tonnes
- Waste rock from CPP used in rehabilitation
- Waste Rock from CPP emplaced underground

2.2.1 Coal Handling and Processing

The proposed coal handling facilities and surface infrastructure upgrades proposed as part of the Revised Preferred Project will be undertaken in accordance with the UEP Project Consent under the NSW EP&A Act to improve the quality of ROM coal in order to meet market demands and to minimise impacts on the environment and local community.

Works associated with the planned upgrade are all located within the existing disturbance footprint of the study area. The planned upgrades to the existing surface infrastructure within the study area (**Figure 3**) are shown on **Figure** 4 to **Figure 6**.

2.2.2 Reject Material Handling

Following commissioning of a suitable CPP, it is anticipated that approximately 0.2 Mtpa of reject material will be produced at full production. Reject material consisting of rock material from the CPP will be transferred via the rejects conveyor to the reject stockpile (see **Figure 6**).

Beneficial reuse would be dependent on further application and or approval, whilst Underground emplacement would only be carried out if testing determines the material to be suitable – see RVC Waste Management Plan.

Reject material that after suitable testing meets the specifications (see Waste Management Plan *RVC ENV PLN 033*) are hauled back to the mine portal via the internal haul road (see **Figure 3**) for emplacement underground.

2.2.3 Coal Stockpiling

Three main coal stockpiles will operate within the Pit Top operational area, these being the main ROM stockpile (30,000 tonne (t) capacity), product stockpile (14,000 t capacity) and proposed temporary rejects stockpile (1,500 t capacity).

2.3 Bellambi Gully Creek

The RPPR describes proposed Bellambi Gully Creek realignment works as being a part of a modification to the previous project consent MP10_0046, i.e., MOD 4. The Modification was subsequently withdrawn, and the project was included in the UEP major project application. Subsequent to the issue of the RPPR in July 2019, and the UEP Additional Information Response Report in June 2020, on 23 July 2020 WCL was issued with an enforcement order by DPIE in relation to the replacement of the underground section of Bellambi Gully pipe. Generally the order requires WCL to engage a suitably qualified independent licensed engineer to develop detailed plans for the replacement of the underground pipe section of Bellambi Gully Creek with a suitably designed and engineered open channel, generally in accordance with the design parameters outlined

in *Cardno 2020 Phase 1 and 2 Bellambi Gully Flood Assessment Proposed Stormwater Diversion Drain*.

As a result of and in compliance with this order the detailed design for Bellambi Gully Diversion and associated site water management system improvements was completed in late 2020 with works commencing onsite post approval of the Construction Management Plan (CMP) by DPIE in April 2021. The construction works associated with the construction of the new diversion channel and associated site water management system improvements are reasonably expected to be completed by November 2021 are addressed in the Bellambi Gully Creek Diversion CMP. The operation of this new channel once completed in accordance with the DPIE order will be detailed in a specific maintenance plan inclusive of an implementation plan which would be included as appropriate in the RV Surface Operations Water Management Plan. This is shown in the context of the site EMS in **Figure 2**.

2.4 Rehabilitation

WCL intends to continue use of the site post the 5-year term of this MP09_0013 Consent. As a result, decommissioning and closure of the Russell Vale Colliery Pit Top facilities are not proposed following the completion of the UEP project.

Rather, if required pending the completion of the 5-year term of the current approval if there are delays to expected future planning assessment process such that mining operations are required to cease the site would be maintained until such time as a planning consent for mining operations is obtained. If consent for continuing use of the site is at the times not anticipated to be forthcoming, WCL will prepare and implement a detailed mine closure and rehabilitation plan in consultation with the Resources Regulator and other relevant government agencies and stakeholders.

For this project term of 5 years from the date of commencement of mining operations, the existing rehabilitation and mine closure strategy outlined in the current Russell Vale Colliery Rehabilitation Management Plan or its equivalent Mine Operations Plan, and generally in accordance with the Rehabilitation Objectives detailed in Table 5 of the Development Consent.

WCL will continue to progressively rehabilitate and decommission non-critical infrastructure as they are phased out of operations or become non-critical to potential future land use options at the Colliery. This will be further detailed in the Rehabilitation Management Plan or combined with the Mining Operations Plan as detailed in the RVC EMS (see **Figure 2**) and in accordance with **Condition B44.**

2.5 Environmental Duty of Care

WCL will implement all reasonable and feasible measures to prevent, and if prevention is not reasonable and feasible, minimise, any material harm to the environment that may result from the construction and operation of the project, and any rehabilitation required under the consent.

Figure 3 – Existing Russell Vale Colliery Pit Top

umwelt

Image Source: Nearmap (Oct 2016)
Data Source: Wollongong Coal (2016)

Legend
- UEP Project Application Area
- Coal Truck Route

FIGURE 1.3

Existing Russell Vale Pit Top Facilities

Figure 4 – Proposed Stage 1 without surface infrastructure

umwelt

Image Source: Nearmap (Dec 2020)
Data Source: Wollongong Coal (2021)

Legend
- UEP Project Application Area
- Bellambi Gully Diversion alignment
- Bund to be raised
- Existing bund
- Water basins
- Coal stockpiles

FIGURE 1

Russell Vale Colliery Pit Top
Stage 1
Without Surface Infrastructure

File Name (A4): 3687_159.dgn
20210607 8.31

Figure 5 – Proposed Stage 2A surface infrastructure components without coal processing plant

umwelt

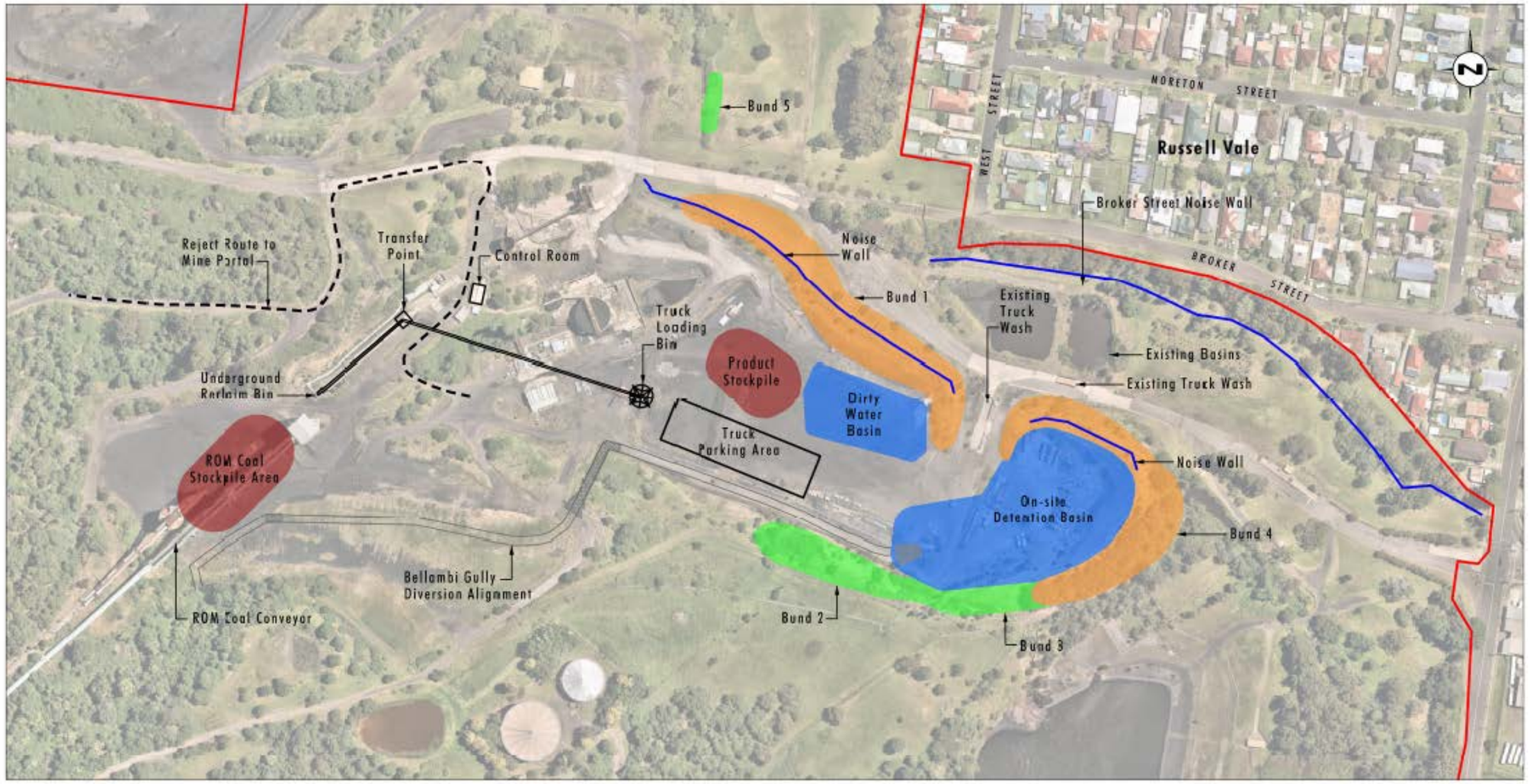


Figure 6 – Proposed Stage 2B surface infrastructure components with coal processing plant

umwelt

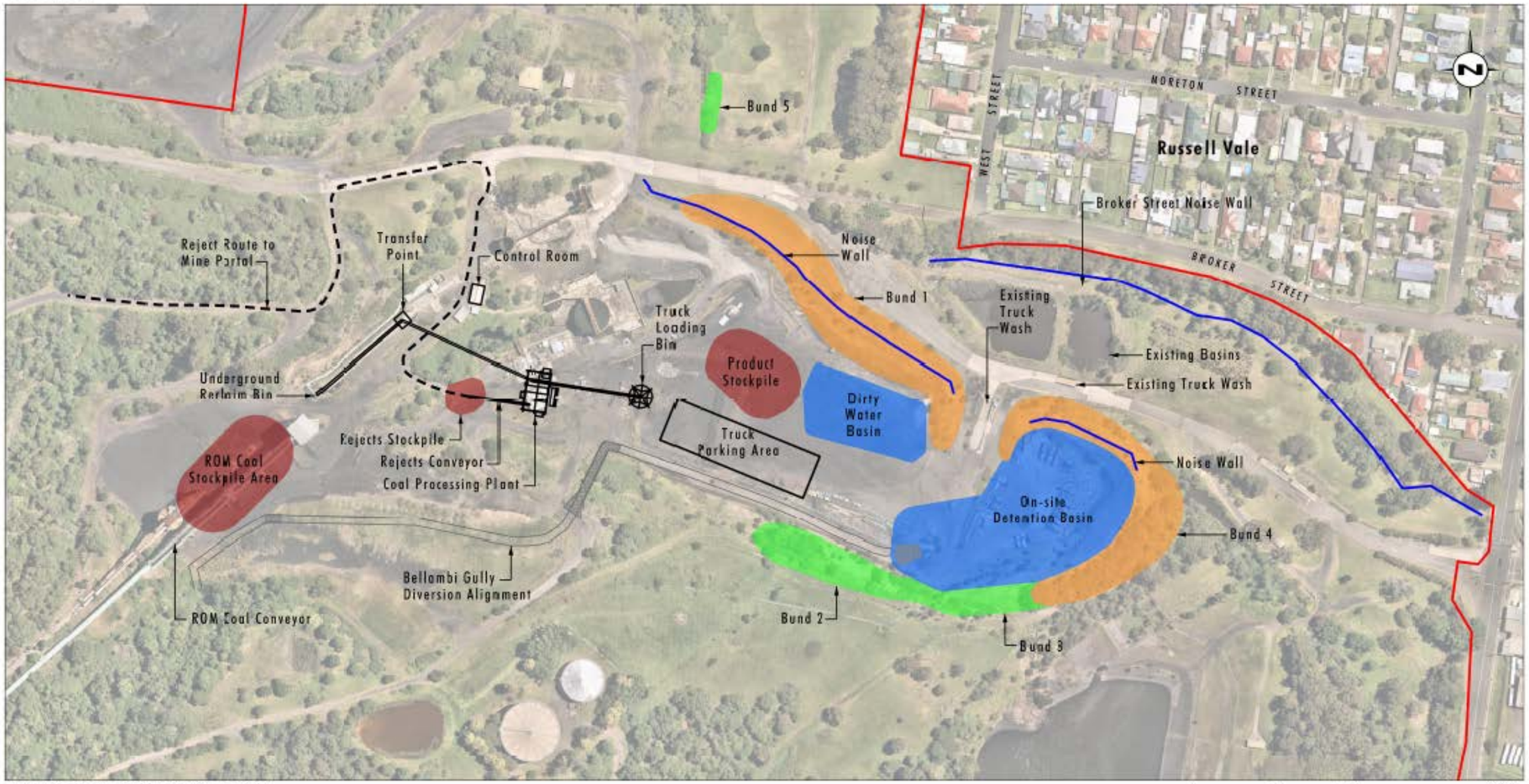


Image Source: Nearmap (Dec 2020)
Data Source: Wollongong Coal (2021)

0 50 100 200m

Legend

- UEP Project Application Area
- Coal Processing Plant and infrastructure
- Bellambi Gully Diversion alignment
- Bund to be raised
- Existing bund
- Water basins
- Coal stockpiles

File Name (A4): 3687_161.dgn
20210607 8.31

FIGURE 3

Russell Vale Colliery Pit Top
Stage 2B
With Coal Processing Plant

3 CONSULTATION

3.1 Consultation During Environmental Assessment Process

Extensive community and government consultation has been carried out prior to and during the preparation of the original environmental assessment, the Revised Project Report, the Submissions Report and other project-related assessment documentation. The primary objective of consultation was to keep the community, government agencies and other stakeholders informed and involved during project development process.

Community engagement was carried out in two phases and is summarised in Section 4.1.2 and Section 4.1.3 of the Revised Project Report.

A complete summary of previous and ongoing government agency and stakeholder consultation is provided in Table 4.5 of the Revised Project Report. Consulted parties of relevance to this WMP included:

- the Department of Planning, Industry and Environment (DPIE);
- NSW Environment Protection Authority (EPA); and
- Wollongong City Council (WCC).

3.2 Consultation During Preparation of Noise Management Plan

In accordance with **Condition B4**, this WMP has been prepared in consultation with the EPA, and WCC. The consultation undertaken as part of the preparation of the Management Plan is included in **Table 1**.

Table 1 – Consultation for this Management Plan

Agency	Issue	Where Addressed in this Plan
DPI&E	• All matters raised from the consultation with DPI&E have been resolved as detailed in the DPI&E feedback provided to the department.	Feedback received.
EPA	• The noise monitoring program appears suitable for determining compliance with noise performance criteria and investigating complaints that may be received during construction and operation. • The EPA would appreciate receiving a copy of the final plan or a link to its location on Wollongong Coal's website after it has been approved by the Planning Secretary.	Noted Section 12.2
WCC	• Acknowledgment of the noise mitigation measures to be constructed including Broker Street noise wall and the earthen bund walls. • Request to advise WCC upon completion of the Noise Wall. • Complete ongoing noise monitoring by an independent expert • Provide a copy of the Annual Environment Management Report to WCC.	Noted Section 12.3 Section 7.1 Section 11.1

4 STATUTORY REQUIREMENTS

4.1 Overview

A number of approvals, licences and consents apply to the project, with associated conditions and requirements. The following sections summarise those that are most relevant in relation to this Management Plan.

WCL will conduct all approved activities consistent with the approval and any other legislation that is applicable.

With regard to noise WCL will ensure that all plant and equipment used at the site is maintained in a proper and efficient condition; and operated in a proper and efficient manner in accordance with **Condition A27**.

In accordance with **Condition B5** WCL will ensure implementation of this Management Plan as is required prior to the commencement of mining operations, once approved by the Secretary.

4.2 Regulatory Requirements

A summary of the legal requirements applicable to the project will be in the Compliance Register, which will be updated and will consider relevant legislation, conditions of consent and licence requirements. The Compliance Register will include both Federal and State legislation, as well as State Environmental Planning Policies (SEPPs) and any Codes of Practice to which the WCL is required to comply.

A copy of the Compliance Register is maintained on the Wollongong Coal Server.

4.3 Project Approval

Condition B4 of the CoA requires the preparation of a Noise Management Plan. It states:

The Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:

(a) be prepared by a suitably qualified and experienced person/s;

(b) be prepared in consultation with EPA and WCC;

(c) be approved by the Secretary prior to the commencement of mining operations under this consent;

(d) describe the measures that would be implemented to ensure:

- *(i) compliance with the noise criteria and operating conditions in this consent;*
- *(ii) best practice management is being employed; and*
- *(iii) the noise impacts of the development are minimised during all meteorological conditions in order to satisfy the noise criteria in Table 1 in conjunction with Appendix 4;*

(e) seek to minimise road traffic noise generated by employee commuter vehicles on public roads, particularly on Bellambi Road;

(f) describe the proposed noise management system in detail;

(g) include a noise monitoring program that:

(i) uses a combination of real-time and supplementary attended monitoring to evaluate the performance of the development;

(ii) includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time;

(iii) monitors noise at the nearest and/or most affected residences;

(iv) adequately supports the noise management system; and

(v) includes a protocol for identifying any noise-related exceedance, incident or non-compliance and for notifying the Department and relevant stakeholders of any such event.

Table 2 indicates where each component of the relevant project approval conditions regarding the administrative conditions described in Part A and specific environmental conditions in Part B are addressed within this Plan.

Table 2 – Relevant Project Approval Conditions

Project Approval Condition	Plan Section
A1 "OBLIGATION TO MINIMISE HARM TO THE ENVIRONMENT *In addition to meeting the specific performance measures and criteria established under this approval, the Applicant must implement all reasonable and feasible measures to prevent, and if prevention is not reasonable and feasible, minimise, any material harm to the environment that may result from the construction and operation of the project, and any rehabilitation required under this consent."*	Section 4.2
Condition A2 *The development may only be carried out:* *(a) in compliance with the conditions of this consent;* *(b) in accordance with all written directions of the Planning Secretary; and* *(c) generally in accordance with the RPPR and the Development Layout.*	Sections 1.2, 3, 4 and 6
A27 "OPERATION OF PLANT AND EQUIPMENT *The Applicant must ensure that all plant and equipment used at the site is:"* *(a) maintained in a proper and efficient condition; and* *(b) operated in a proper and efficient manner.*	Section 4.1
Condition B1 – Operational Noise Criteria *Except for the carrying out of construction, the Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 1[1] at any residence on privately-owned land.* *Noise generated by the development is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions)*	Section 4

Project Approval Condition	Plan Section
of the NPfI. Appendix 4[2] sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria. *However, the noise criteria in Table 1 do not apply if the Applicant has an agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.*	
Condition B2 – Noise Operating Conditions *The Applicant must:* *(a) take all reasonable steps to minimise the construction, operational and road noise of the development, including low frequency noise and other audible characteristics;* *(b) implement reasonable and feasible noise attenuation measures on all plant and equipment that will operate in noise sensitive areas, and monitors and reports on these measures;* *(c) monitor and record all major equipment use and make this data readily available at the request of the Department or the EPA;* *(d) minimise the noise impacts of the development during all meteorological conditions in order to satisfy the noise criteria in Table 1 in conjunction with Appendix 4;* *(e) operate a comprehensive noise management system that uses a combination of meteorological forecasts, predictive noise modelling and real-time monitoring to guide the day to day planning of mining operations and the implementation of adaptive management both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this consent;* *(f) carry out attended noise monitoring (quarterly or as otherwise agreed with the Secretary) to determine whether the development is complying with the relevant conditions of consent; and* *(g) regularly assess noise monitoring data and modify and/or stop operations on site to ensure compliance with the relevant conditions of this consent.*	Section 8 Section 8 Section 8.6 Section 8 Sections 8.8 and 8.10 Sections 7 Section 8.10
Condition B3 - Noise Mitigation *The Applicant must:* *(a) Implement noise mitigation bunds, walls and barriers identified in Appendix 2 prior to the commencement of mining operations;* *(b) consider the use of noise absorptive material as far as practicable in the construction of the noise walls and barriers in condition B3(a); and* *(c) ensure the design of the noise walls and barriers in condition B3(a) are endorsed by a suitably qualified and experienced noise expert.*	See memo as attached in Appendix B
Condition B4 – Noise Management Plan	

Project Approval Condition	Plan Section
The Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:	
(a) be prepared by a suitably qualified and experienced person/s;	Section 1.1
(b) be prepared in consultation with EPA and WCC;	Section 1.1
(c) be approved by the Secretary prior to the commencement of mining operations under this consent;	Section 1.1
(d) describe the measures that would be implemented to ensure:	Sections 7 and 8
(i) compliance with the noise criteria and operating conditions in this consent;	Section 8
(ii) best practice management is being employed; and	Section 8
(iii) the noise impacts of the development are minimised during all meteorological conditions in order to satisfy the noise criteria in Table 1 in conjunction with Appendix 4;	Section 8.7
(e) seek to minimise road traffic noise generated by employee commuter vehicles on public roads, particularly on Bellambi Road;	Section 8
(f) describe the proposed noise management system in detail;	
(g) include a noise monitoring program that:	Sections 7 and 8.8
(i) uses a combination of real-time and supplementary attended monitoring to evaluate the performance of the development;	Section 8.8
(ii) includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time;	Sections 7.1.2 and 8.8.2
(iii) monitors noise at the nearest and/or most affected residences;	Section 7.1
(iv) adequately supports the noise management system; and	Sections 7 and 9
(v) includes a protocol for identifying any noise-related exceedance, incident or non-compliance and for notifying the Department and relevant stakeholders of any such event.	
Condition B5– Noise Management Plan	
The Applicant must implement the Noise Management Plan as approved by the Secretary.	Section 4.1
Condition B11– Meteorological Monitoring	
Prior to commencing construction under this consent and for the remaining life of the development, the Applicant must ensure that there is a suitable meteorological station operating in the vicinity of the site that:	
(a) complies with the requirements in the Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales (DEC, 2007);	Section 6.2.2
(b) is capable of continuous real-time measurement of wind speed, wind direction sigma theta and temperature; and	

Project Approval Condition	Plan Section
(c) is capable of measuring meteorological conditions in accordance with the NPfI; *unless a suitable alternative is approved by the Planning Secretary following consultation with the EPA.*	
Condition D1 - Construction Hours *Construction activities at the surface facilities site must only be undertaken between the hours of 7am to 6pm Monday to Friday, and 8am to 1pm Saturday, with no construction on Sundays or public holidays, unless the Planning Secretary agrees otherwise.*	Section 8.5
Condition D2– Construction Noise *The Applicant must ensure that the noise generated by construction complies with the requirements of the ICNG.*	Sections 6.3, 7.4 and 8.5
Condition E1 – Notification of Exceedances *As soon as practicable, and no longer than 7 days after obtaining monitoring results showing:* *a) an exceedance of any operational noise criteria, WCL must notify affected landowners in writing of the exceedance and provide regular monitoring results to these landowners until the development is again complying with the relevant criteria.*	Section 9.2
Condition E2 – Independent Review *If an owner of privately-owned land considers the development to be exceeding the relevant criteria in PART B or PART C of this consent, then he/she may ask the Secretary in writing for an independent review of the impacts of the development on his/her land.*	Section 9.4
Condition E3 – Independent Review *If the Planning Secretary is not satisfied that an independent review is warranted, the Planning Secretary will notify the landowner in writing of that decision, and the reasons for that decision, within 28 days of the request for a review.*	Section 9.4
Condition E4 – Independent Review *If the Planning Secretary is satisfied that an independent review is warranted, within 3 months, or other timeframe* *agreed by the Planning Secretary and the landowner, of the Planning Secretary's decision, the Applicant must:* *(a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Planning Secretary, to:* *(i) consult with the landowner to determine their concerns;*	Section 9.4

Project Approval Condition	Plan Section
(ii) conduct monitoring to determine whether the development is complying with the relevant criteria in Part B and Part C; and *(iii) if the development is not complying with the relevant criterion, identify measures that could be implemented to ensure compliance with the relevant criterion; and* *b) give the Planning Secretary and landowner a copy of the independent review.*	
Condition E5 – Independent Review *The Applicant must then comply with any written requests made by the Planning Secretary to implement any findings of the review and in accordance with any timeframes specified.*	Section 9.4

4.4 Management Plan Conditions

Table 3 – Management Plan Approval Conditions

Project Approval Condition	Plan Section
Condition F4– Adaptive Management *The Applicant must assess and manage development-related risks to ensure that there are no exceedances of the criteria and/or performance measures in this consent. Any exceedance of these criteria and/or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation, notwithstanding offsetting actionstaken.* *Where any exceedance of these criteria and/or performance measures has occurred, the Applicant must, at the earliest opportunity:* *(a) take all reasonable and feasible steps to ensure that the exceedance ceases and does not reoccur;* *(b) consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action;* *(c) within 14 days of the exceedance occurring, submit a report to the Secretary describing these remediation options and any preferred remediation measures or other course of action; and* *(d) implement remediation measures as directed by the Planning Secretary;* *to the satisfaction of the Secretary.*	Section 8 Section 8.11 Section 8.11 Section 8.11 Section 8.11
Condition F5– Management Plan Requirements *Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:* *(a) a summary of relevant background or baseline data;* *(b) details of:*	a) Section 5

(i) the relevant statutory requirements (including any relevant consent, licence or lease conditions); (ii) any relevant limits or performance measures and criteria; and (iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures; (c) any relevant commitments or recommendations identified in the document/s listed in condition A2; (d) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria; (e) a program to monitor and report on the: (i) impacts and environmental performance of the development; and (ii) effectiveness of the management measures set out pursuant to condition F5(c); (f) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible; (g) a program to investigate and implement ways to improve the environmental performance of the development over time; (h) a protocol for managing and reporting any: (i) incident, non-compliance or exceedance of any impact assessment criterion or performance criterion; (ii) complaint; or (iii) failure to comply with other statutory requirements; (i) public sources of information and data to assist stakeholders in understanding environmental impacts of the development; and (j) a protocol for periodic review of the plan. ***Note**: The Planning Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.*	b) Sections 4 and 6 c) Section 4 d) Section 8 e) Sections 7 and 8 f) Section 8.11 g) Section 11.5 h) Sections 8.11 and 9 i) Sections 12.3 j) Section 11.4
Condition F6 – Management Plan Requirements *The Applicant must ensure that management plans prepared for the development are consistent with the conditions of this consent and any EPL issued for the site.*	Section 4
Condition F7– Revision of Strategies, Plans and Programs *Within three months of:* *(a) the submission of an incident report under condition F9;* *(b) the submission of an Annual Review under condition F11;* *(c) the submission of an Independent Environmental Audit under condition F13; or* *(d) the approval of any modification of the conditions of this consent (unless the conditions require otherwise);* *the suitability of existing strategies, plans and programs required under this consent must be reviewed by the Applicant.*	Section 11.4
Condition F8– Revision of Strategies, Plans and Programs	Section 11.4

If necessary, to either improve the environmental performance of the development, cater for a modification or comply with a direction, the strategies, plans and programs required under this consent must be revised, to the satisfaction of the Planning Secretary. Where revisions are required, the revised document must be submitted to the Planning Secretary for approval within 6 weeks of the review. ***Note**: This is to ensure strategies, plans and programs are updated on a regular basis and to incorporate any recommended measures to improve the environmental performance of the development.*	
Condition F9– Incident Notification *The Applicant must immediately notify the Department and any other relevant agencies immediately after it becomes aware of an incident. The notification must identify the development (including the development application number and name) and set out the location and nature of the incident.*	Section 9.1
Condition F10 – Non-Compliance Notification *Within seven days of becoming aware of a non-compliance, the Applicant must notify the Department of the non-compliance. The notification must set out the condition of this consent that the development is non- compliant with, why it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance.* ***Note**: A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.*	Section 9.2
Condition F11 – Annual Review *By the end of March each year after the commencement of the development under this consent, or other timeframe agreed by the Planning Secretary, a report must be submitted to the Department reviewing the environmental performance of the development, to the satisfaction of the Planning Secretary. This review must:* *(a) describe the development (including any rehabilitation) that was carried out in the previous calendar year and the development that is proposed to be carried out over the current calendar year;* *(b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, including a comparison of these results against the:* *(i) relevant statutory requirements, limits or performance measures/criteria;* *(ii) requirements of any plan or program required under this consent;* *(iii) monitoring results of previous years; and* *(iv) relevant predictions in the document/s listed in condition A2(c);* *(c) Identify any non-compliance or incident which occurred in the previous calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence;* *(d) evaluate and report on:*	Section 11.1

(i) the effectiveness of the noise and air quality management systems; and (ii) compliance with the performance measures, criteria and operating conditions of this consent; (e) identify any trends in the monitoring data over the life of the development; (f) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and (g) describe what measures will be implemented over the next calendar year to improve the environmental performance of the development.	
Condition F12– Annual Review Copies of the Annual Review must be submitted to WCC and made available to the CCC and any interested person upon request.	Section 11.1
Condition F13 – Independent Environmental Audit Within one year of commencement of development under this consent, and every three years after, unless the Planning Secretary directs otherwise, the Applicant must commission and pay the full cost of an Independent Environmental Audit of the development. The audit must: (a) be prepared in accordance with the Independent Audit Post Approval Requirements (Department 2020 or as updated); (b) be led and conducted by a suitably qualified, experienced and independent by a suitably qualified, experienced and independent auditor whose appointment has been endorsed by the Planning Secretary; (c) be conducted by a suitably qualified, experienced and independent team of experts (including any expert in field/s specified by the Planning Secretary) whose appointment has been endorsed by the Planning Secretary; (d) be carried out in consultation with the relevant agencies and the CCC; (e) assess the environmental performance of the development and whether it is complying with the relevant requirements in this consent, water licences and mining leases for the development (including any assessment, strategy, plan or program required under these approvals); (f) review the adequacy of any approved strategy, plan or program required under the abovementioned approvals and this consent; (g) recommend appropriate measures or actions to improve the environmental performance of the development and any assessment, strategy, plan or program required under the abovementioned approvals and this consent; and (h) be conducted and reported to the satisfaction of the Planning Secretary.	Section 11.3
Condition F14 – Independent Environmental Audit Within three months of commencing an Independent Environmental Audit, or other timeframe agreed by the Planning Secretary, the Applicant must submit a copy of the	Section 11.3

audit report to the Planning Secretary, and any other NSW agency that requests it, together with its response to any recommendations contained in the audit report, and a timetable for the implementation of the recommendations. The recommendations must be implemented to the satisfaction of the Planning Secretary.	
Condition F15– Monitoring and Environmental Audits *Any condition of this consent that requires the carrying out of monitoring or an environmental audit, whether directly or by way of a plan, strategy or program, is taken to be a condition requiring monitoring or an environmental audit under Division 9.4 of Part 9 of the EP&A Act. This includes conditions in respect of incident notification, reporting and response, non-compliance notification, compliance report and independent audit.* *For the purposes of this condition, as set out in the EP&A Act, "monitoring" is monitoring of the development to provide data on compliance with the consent or on the environmental impact of the development, and an "environmental audit" is a periodic or particular documented evaluation of the development to provide information on compliance with the consent or the environmental management or impact of the development.*	Section 11
Condition F16– Monitoring and Environmental Audits *Noise and/or air quality monitoring under this consent may be undertaken at suitable representative monitoring locations instead of at privately-owned residences or other locations listed in Part B, providing that these representative monitoring locations are set out in the respective management plan/s.*	Sections 7.1.2and 8.8.2
Condition F17– Access to Information *Before the commencement of construction until the completion of all rehabilitation required under this consent, the Applicant must:* *(a) make the following information and documents (as they are obtained, approved or as otherwise stipulated within the conditions of this consent) publicly available on its website:* *(i) the documents referred to in condition A2(c) of this consent;* *(ii) all current statutory approvals for the development;* *(iii) all approved strategies, plans and programs required under the conditions of this consent;* *(iv) the proposed staging plans for the development if the construction, operation or decommissioning of the development is to be staged;* *(v) minutes of CCC meetings;* *(vi) regular reporting on the environmental performance of the development in accordance with the reporting requirements in any plans or programs approved under the conditions of this consent;* *(vii) a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs;*	Sections 9.3, 12.1 and 12.2

(viii) a summary of the current phase and progress of the development; *(ix) contact details to enquire about the development or to make a complaint;* *(x) a complaints register, updated monthly;* *(xi) the Annual Reviews of the development;* *(xii) audit reports prepared as part of any Independent Environmental Audit of the development and the Applicant's response to the recommendations in any audit report;* *(xiii) any other matter required by the Planning Secretary; and* (b) *keep such information up to date, to the satisfaction of the Planning Secretary.*	

Note 1: Table 1 of the Project Approval is reproduced in Table 13 of this Plan.
Note 2: Appendix 4 of the Project Approval is reproduced in Section 6.2.

4.5 Environment Protection Licence

Table 4 lists the Environment Protection Licence (EPL) conditions relevant to the NMP and indicates where each condition is addressed within this Plan.

Table 4 – Relevant EPL Conditions

EPL Condition	Plan Section
Operating Conditions	
Condition O1.1 – Activities must be carried out in a competent manner *Licensed activities must be carried out in a competent manner. This includes:* *a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and* *b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.*	Section 8.9
Condition O2.1 – Maintenance of plant and equipment *All plant and equipment installed at the premises or used in connection with the licensed activity:* *a) must be maintained in a proper and efficient condition; and* *b) must be operated in a proper and efficient manner.*	Sections 8.6 and 8.9
Monitoring and Recording Conditions	
Condition M5.1 – Recording of pollution complaints The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity	Section 9.3

EPL Condition	Plan Section
to which this licence applies.	
Condition M5.2 – Recording of pollution complaints *The record must include details of the following:* *a) the date and time of the complaint;* *b) the method by which the complaint was made;* *c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;* *d) the nature of the complaint;* *e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and* *f) if no action was taken by the licensee, the reasons why no action was taken.*	Section 9.3
Condition M5.3 – Recording of pollution complaints *The record of a complaint must be kept for at least 4 years after the complaint was made.*	Section 9.3
Condition M5.4 – Recording of pollution complaints *The record must be produced to any authorised officer of the EPA who asks to see them.*	Section 9.3
M6.1 - Telephone complaints line *The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.*	Section 9.3
M6.2 - Telephone complaints line *The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complain.*	Section 9.3
M8.1 - Other monitoring and recording conditions *Availability of equipment for continuous monitoring required by this licence.* *All continuous monitoring equipment must be operated and maintained with the aim of achieving 100% availability in each licence year. Where a monitoring device does not achieve 95% availability, the licensee must report reasons and corrective actions to the EPA in the Annual Return.*	Sections 6.2.2 and 8.8.2
Reporting Conditions	

EPL Condition	Plan Section
R1.1 - Annual return documents *The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:* 1. *a Statement of Compliance.* 2. *a Monitoring and Complaints Summary;* 3. *a Statement of Compliance - Licence Conditions;* 4. *a Statement of Compliance - Load based Fee;* 5. *a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan;* 6. *a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and* 7. *a Statement of Compliance - Environmental Management Systems and Practices.* *At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.*	Section 11.2
R1.2 - Annual return documents *An Annual Return must be prepared in respect of each reporting period, except as provided below.*	Section 11.2
R1.4 - Annual return documents *Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:* *a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or* *b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.*	Section 11.2
R1.5 - Annual return documents *The Annual Return for the reporting period must be supplied to the EPA via eConnect EPA or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').*	Section 11.2
R1.6 - Annual return documents *The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.*	Section 11.2
R2.1 Notification of environmental harm *Notifications must be made by telephoning the Environment Line service on 131 555.*	Section 9.3

EPL Condition	Plan Section
R2.2 Notification of environmental harm *The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.* *Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.*	Section 9.3
Incident Management ***R3.1 – Written report*** *Where an authorised officer of the EPA suspects on reasonable grounds that:* *a) where this licence applies to premises, an event has occurred at the premises; or* *b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence, and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.*	Section 11.2
R3.2 – Written report *The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.*	Section 11.2
R3.3 – Written report *The request may require a report which includes any or all of the following information:* *a) the cause, time and duration of the event;* *b) the type, volume and concentration of every pollutant discharged as a result of the event;* *c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;* *d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;* *e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;* *f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and* *g) any other relevant matters.*	Section 11.2
R3.4 – Written report	Section 11.2

EPL Condition	Plan Section
The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.	

4.6 Project Statement of Commitments

This section presents the project Statement of Commitments relevant to hours of operations, environmental management plans, and noise.

The mitigation strategy detailed in the RPPR sets less onerous mitigation measures relating to the implementation of bunds, walls and barriers during the phase-in operations (i.e. according to the RPPR, only the Broker Street noise wall and Bund 1 noise barrier are required during the phase-in operations). In consideration of **Condition B3(a)** of the CoA, it has come to light that all noise mitigation bunds, walls and barriers must be implemented prior to the commencement of mining operations, including the phase-in operations. As such, both phase-in and full operations would be subject to the same bunds, walls and barriers and the RPPR Statement of Commitments relevant to noise and summarised in **Table 5** has been updated accordingly. When no distinction is required between phase-in and full operations, the Statement of Commitments refers to mining operations.

It should be noted that the commitments relating to the establishment of a temporary stockpile of ROM coal and restrictions in dozer movements during the phase-in operations have been removed as they are no longer relevant when considering **Condition B3(a)** of the CoA.

Table 5 – Project Statement of Commitments

Commitment	Timing	Plan Section
Hours of Operation		
Mining operations and the transfer of ROM coal to the surface will be undertaken 24 hours a day, 7 days a week.	*Ongoing during operations*	Section 8.4
Coal beneficiation, truck loading and coal transport will typically be limited to daytime hours only between: • *7.00 am – 6.00 pm Monday to Friday* • *8.00 am – 6.00 pm Saturday* • *No coal beneficiation, truck loading and coal transport will occur on Sundays and Public Holidays* *Coal beneficiation, truck loading and coal transport may occasionally be required until 10.00 pm Monday to Friday in exceptional circumstances such as Port closure or supply interruption, however such circumstances would be rare and as*	*Ongoing during operations*	Section 8.4

Commitment	Timing	Plan Section
a result of unexpected events.		
Haulage of reject material from the reject stockpile to the mine portal will be limited to 7.00 am – 6.00 pm Monday to Friday.	*Ongoing during operations*	Section 8.4
All construction works will be undertaken during standard working hours as defined in the Interim Construction Noise Guideline (ICNG) (DECCW, 2009), being: • *7.00 am – 6.00 pm Monday to Friday* • *8.00 am – 1.00 pm Saturday* • *No construction on Sundays and Public Holidays*	*During construction*	Section 8.5
Environmental Management Plans		
WCL will prepare a Construction Environmental Management Plan, prior to the commencement of construction, that identifies the environmental and social management controls to be implemented during the construction phase.	*Prior to the commencement of construction.*	Sections 1.4, 6.3, 7.4 and 8.5
All existing operational environmental management plans and monitoring networks will be reviewed and revised (where necessary) to reflect the Revised Preferred Project approval requirements, should the project be approved. *Each environmental management plan will include (where relevant):* • *detailed baseline data;* • *a description of:* - *the relevant statutory requirements (including any relevant approval, licence or lease conditions);* - *any relevant limits or performance measures/criteria;* - *the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;* • *a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;* • *a program to monitor and report on the:* - *impacts and environmental performance of the project;*	*Within 3 months of approval*	Section 5 Section 4 Section 6 Sections 6 and 11.5 Section 8 Sections 7 and 8.9

Commitment	Timing	Plan Section
- *effectiveness of any management measures;* • *a contingency plan to manage any unpredicted impacts and their consequences;* • *a program to investigate and implement ways to improve the environmental performance of the project over time;* • *a protocol for managing and reporting any:* - *incidents;* - *complaints;* - *non-compliance with statutory requirements; and* - *exceedances of the impact assessment criteria and/or performance criteria; and* • *a protocol for periodic review of the plan.*		Section 8.11 Section 11.5 Section 9 Section 11
Noise		
WCL will review and update the existing Noise Management Plan for the Russell Cale Colliery and implement the updated plan for the Revised Preferred Project.	*Within 3 months of approval and ongoing*	Section 2
Construction of the access road noise barrier will be completed prior to mining operations commencing.	*Prior to mining operations commencing*	Sections 1.5 and 8.2
The construction of Bund 1 will be completed prior to mining operations commencing.	*Prior to mining operations commencing*	Section 8.2
The proposed extension to Bunds 2 to 5 will be completed prior to mining operations commencing.	*Prior to mining operations commencing*	Section 8.2
WCL will implement the following feasible and reasonable construction noise management measures during construction of bunds around the Pit Top, in accordance with the ICNG. These measures will be identified in the Construction Environmental Management Plan: • *Schedule activities to minimise noise impacts* o *All bund construction works will be undertaken during recommended standard construction hours* o *Minimise the duration of bund construction where feasible and reasonable*	*Ongoing during construction*	Sections 8.2 and 8.5

Commitment	Timing	Plan Section
o *Consult with affected neighbours about scheduling bund construction to minimise noise impacts* • *Use quieter equipment and methods* o *Dump truck access to be provided to bunds on the side further away from the closest receivers to maximise distance to receivers and shielding from bunds* o *Use mobile equipment with less annoying alternatives to the typical 'beeper' alarms where feasible and reasonable* o *Regularly inspect and maintain equipment in good working order* • *Notification before and during bund construction* o *Provide information regarding construction activities to potentially affected neighbours, including the nature and expected duration of construction activities* o *Provide signage at the front of the site providing contact information, construction hours and any updates on construction activities.* • *Implement a complaints handling procedure, maintain a complaints register and implement all feasible and reasonable measures to address the sources of complaints* • *Undertake attended noise monitoring at the nearest and potentially most impacted residence(s) when construction of noise bunds is occurring within 200 m of noise-sensitive receivers to confirm construction noise levels are consistent with predicted levels*		Section 8.5 Section 8.5 Section 9.3 Section 8.5
WCL will implement the following operational noise mitigation measures for the Revised Preferred Project: • *Acoustic treatment of new plant and equipment, including:* o *enclosing the Coal Processing Plant and Secondary Sizer in an acoustically treated building,* o *acoustic treatments to the Surge bin and conveyors and attenuation pack, and* o *grouser treatment of the dozer*	*During phase-in operations*	Section 8.3
• *Operation of the dozer, rejects front-end loader, rejects truck, and underground loader will be restricted to daytime only use*	*Ongoing during mining operations*	Section 8.4

Commitment	Timing	Plan Section
• *The operation of the reclaim conveyor system, Secondary Sizer, Surge Bin, Processing Plant and truck loading bins will generally be to daytime use only*	*Ongoing during mining operations*	Section 8.4
• *Voluntary speed limit of coal trucks of 50 km/hr applied to Bellambi Lane*	*Ongoing during mining operations*	Section 8.4
• *40 km/hr speed limit on site*	*Ongoing during mining operations*	Section 8.4
WCL will continue to operate two continuous noise monitoring stations within the Russell Vale Colliery site.	*Ongoing during mining operations*	Section 8.9

4.7 Relevant Legislation

Legislation applicable to noise management includes but is not limited to:

- Protection of the Environment Operations Act 1997 (POEO Act); and
- Environmental Planning and Assessment Act 1979 (EP&A Act).

This NMP has been developed to be consistent with the principles of the following guidelines and standards for noise management:

- *Noise Policy for Industry (NPfI)* (EPA, 2017);
- *NSW Road Noise Policy (RNP)* (DECCW, 2011);
- *Interim Construction Noise Guidelines (ICNG)* (NSW Department of Environment and Climate Change [DECC], 2009);
- *Voluntary Land Acquisition and Mitigation Policy (VLAMP)* (NSW State Government, 2018);
- Standards Australia AS 1055:2018 *Acoustics - Description and measurement of environmental noise*;
- Standards Australia AS 1055-1997™ (AS1055) - *Description and Measurement of Environmental Noise, Parts 1, 2 and 3*;
- Standards Australia AS IEC 61672.1-2004™ (AS61672) - *Electro Acoustics - Sound Level Meters Specifications*;
- Standards Australia AS 2436-2010™ (AS2436) - *Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites*;
- International Organisation for Standardisation (ISO) 9613-2:1996 (ISO9613:2) - *Acoustics - Attenuation of Sound During Propagation Outdoors - Part 2: General Method of Calculation*;
- Russell Vale Colliery Revised Underground Expansion Project – Submissions Report – Part A, Appendix 3, Updated Noise Assessment, Prepared by Wilkinson Murray. November 2019); and
- Project Approval (MP09_0013).

5 BASELINE DATA

5.1 Background Noise Environment Summary

A summary of the ambient noise level data upon which the operational noise criteria for residential receivers have been based is provided in the following section. The noise monitoring locations are shown on **Figure 7.**

Rating Background Levels (RBLs) determined from the long-term monitoring survey carried out in 2016 at two on-site monitoring stations (NMT1, NMT2) operated by WCL are provided in **Table 6**.

The results at NMT1 are representative of the long-term RBLs at the northern receivers set back from the Princes Highway and shielded from high traffic noise levels, receiver locations R1, R2, R3 and R4. The results at NMT2 reflect the long-term RBLs at the southern receivers shielded from the Princes Highway, namely receiver locations R9, R10, R11, R12, R13 and R14.

The site went into care and maintenance in late 2015 and remains as such until this approval is implemented. As such, this long-term data is representative of the existing background noise environment surrounding the site.

Table 6 – Northern and Southern Receiver RBLs – Shielded from Road Traffic

Monitoring Location ID	Measured RBLs (dBA)		
	Day	Evening	Night
Northern - NMT1	39	38	37
Southern - NMT2	39	38	34

Notes:
Day: the period from 7.00am to 6.00pm.
Evening: the period from 6.00pm to 10.00pm.
Night: the period from 10.00pm to 7.00am

5.2 Relevant RBLs Summary

A summary of all RBLs applicable to the Project are summarised in **Table 7**. Note that these include RBLs determined for the early morning shoulder period (5.00am-7.00am) as developed to account for early morning truck arrivals.

Table 7 – Summary of All Relevant RBLs

Monitoring Location	Representative Receiver ID	Measured RBLs (dBA)			
		Day	Evening	Night	Early Morning Shoulder
NMT1 (2016 Long-Term Survey)	R1, R2, R3, R4	39	38	37	39
M1 (2014 WM)	R5, R6, R7, R8	43	40	37	39
NMT2 (2016 Long-Term Survey)	R9, R10, R11, R12, R13, R14	39	38	34	36

Monitoring to quantify the ambient noise environment at residential receiver locations exposed to noise from road traffic on the Princes Highway was previously conducted by Wilkinson Murray in 2014 at 11 Doncaster Street, Corrimal (M1) (see **Figure 7**). The measured RBLs are presented in **Table 8** and are applicable to receiver locations R5, R6, R7 and R8.

Table 8 – Princes Highway Receiver RBLs – Exposed to Road Traffic

Monitoring Location		Measured RBLs (dBA)		
ID	Address	Day	Evening	Night
M1	11 Doncaster Street	43	40	37

5.3 Summary of Operational Noise Predictions

Operational noise predictions associated with the full operation and phase-in operation are summarised in **Table 9** and **Table 10,** respectively.

Table 9 – Predicted $L_{Aeq,15min}$ Noise Levels from Project – Full Operation

Representative Receiver ID	Address	Predicted $L_{Aeq,15min}$ Noise Levels (dBA)			
		Day	Evening	Night	Early Morning Shoulder
R1	16 West St, Russell Vale	41	38	42	43
R2	30 West St, Russell Vale	42	39	43	43
R3	13 West St, Russell Vale	42	39	42	43
R4	13 Broker St, Russell Vale	40	36	40	40

Representative Receiver ID	Address	Predicted $L_{Aeq,15min}$ Noise Levels (dBA)			
		Day	Evening	Night	Early Morning Shoulder
R5	4 Broker St, Russell Vale	38	35	35	36
R6	659 Princes Hwy, Russell Vale	44	41	41	43
R7	34 Princes Hwy, Corrimal	40	39	41	42
R8	95 Midgley St, Corrimal	40	39	42	43
R9	109 Midgley St, Corrimal	38	36	41	41
R10	6 Lyndon St, Corrimal	37	35	41	41
R11	22 Lyndon St, Corrimal	36	34	38	38
R12	46 Lyndon St, Corrimal	37	35	37	37
R13	6 Taylor Pl, Corrimal	39	37	38	38
R14	15 Taylor Pl, Corrimal	38	36	39	39
R15[1]	652 Princes Highway, Russell Vale	37	-	-	-
R16[1]	4 Wilford Street, Corrimal	37	-	-	-
R17[1]	67 Midgley Street, Corrimal	31	-	-	-

Notes:
Day: the period from 7.00am to 6.00pm.
Evening: the period from 6.00pm to 10.00pm.
Night: the period from 10.00pm to 5.00am.
Early Morning Shoulder: the period from 5.00am to 7.00am.
Note 1: Receiver relates to school therefore only daytime prediction presented.

Table 10 – Predicted $L_{Aeq,15min}$ Noise Levels from Project – Phase-in Operation

Representative Receiver ID	Address	Predicted $L_{Aeq,15min}$ Noise Levels (dBA)			
		Day	Evening	Night	Early Morning Shoulder
R1	16 West St, Russell Vale	41	37	43	43
R2	30 West St, Russell Vale	41	37	43	43
R3	13 West St, Russell Vale	40	36	42	43
R4	13 Broker St, Russell Vale	37	34	40	40
R5	4 Broker St, Russell Vale	36	33	35	36
R6	659 Princes Hwy, Russell Vale	43	41	41	43
R7	34 Princes Hwy, Corrimal	40	38	41	42
R8	95 Midgley St, Corrimal	40	38	42	43
R9	109 Midgley St, Corrimal	37	36	41	41
R10	6 Lyndon St, Corrimal	37	34	41	41
R11	22 Lyndon St, Corrimal	36	33	38	38
R12	46 Lyndon St, Corrimal	37	34	37	37
R13	6 Taylor Pl, Corrimal	38	36	38	38
R14	15 Taylor Pl, Corrimal	37	35	39	39
R15[1]	652 Princes Highway, Russell Vale	36	-	-	-
R16[1]	4 Wilford Street, Corrimal	35	-	-	-
R17[1]	67 Midgley Street, Corrimal	30	-	-	-

Notes:
Day: the period from 7.00am to 6.00pm.
Evening: the period from 6.00pm to 10.00pm.
Night: the period from 10.00pm to 5.00am.
Early Morning Shoulder: the period from 5.00am to 7.00am.
Note 1: Receiver relates to school therefore only daytime prediction presented.

All noise predictions associated with the full operation and phase-in operation scenarios are expected to comply with the relevant Project Approval noise criteria.

It should be noted that predicted noise levels from the phase-in operations are expected to be conservative as noise modelling only assumes the Broker Street noise wall and Bund 1 noise barrier are in place (RPPR). As stipulated by **Condition B3(a)** of the CoA, all noise mitigation bunds, walls and barriers must be implemented prior to the commencement of mining operations, including the phase-in operations.

In accordance with the RPPR, no modifying factor correction for low-frequency noise is warranted for the Revised Project.

Maximum noise level events predicted as part of the RPPR are summarised in **Table 11**. Note that representative receivers only include residential receivers (i.e. not schools) as predictions relate to the night time and early morning shoulder periods.

Table 11 – Predicted L_{AFmax} Noise Levels from Project

Representative Receiver ID	Address	Predicted L_{AFmax} Noise Levels (dBA)	
		Due to Site Infrastructure[1]	Due to Early Morning Trucks Accessing Parking Area[2]
R1	16 West St, Russell Vale	47	43
R2	30 West St, Russell Vale	46	44
R3	13 West St, Russell Vale	48	44
R4	13 Broker St, Russell Vale	43	41
R5	4 Broker St, Russell Vale	39	40
R6	659 Princes Hwy, Russell Vale	44	52
R7	34 Princes Hwy, Corrimal	45	47
R8	95 Midgley St, Corrimal	46	46
R9	109 Midgley St, Corrimal	43	45
R10	6 Lyndon St, Corrimal	43	43
R11	22 Lyndon St, Corrimal	41	39
R12	46 Lyndon St, Corrimal	42	38
R13	6 Taylor Pl, Corrimal	42	39
R14	15 Taylor Pl, Corrimal	43	40

Notes:

1. Predictions applicable to night and early morning shoulder periods (10.00 pm to 7.00 am)
2. Predictions applicable to early morning shoulder period (5.00 am to 7.00 am).

Maximum noise level events predicted as part of the RPPR are expected to comply with the relevant Project Approval noise criteria.

5.4 Summary of Construction Noise Predictions

Noise predictions from construction/extension works associated with the various noise walls/ barriers/bunds are summarised in **Table 12**. Predicted levels exceeding the relevant *ICNG* noise affected levels are shown in bold.

Table 12 – Predicted $L_{Aeq,15min}$ Noise Levels from Noise Wall/Barrier/Bund Construction

Representative Receiver ID	Address	Predicted $L_{Aeq,15min}$ Noise Levels (dBA)
R1	16 West St, Russell Vale	**59**
R2	30 West St, Russell Vale	**65**
R3	13 West St, Russell Vale	**69**
R4	13 Broker St, Russell Vale	**68**
R5	4 Broker St, Russell Vale	**72**
R6	659 Princes Hwy, Russell Vale	**70**
R7	34 Princes Hwy, Corrimal	53
R8	95 Midgley St, Corrimal	**55**
R9	109 Midgley St, Corrimal	**58**
R10	6 Lyndon St, Corrimal	**53**
R11	22 Lyndon St, Corrimal	40
R12	46 Lyndon St, Corrimal	35
R13	6 Taylor Pl, Corrimal	37
R14	15 Taylor Pl, Corrimal	39
R15[1]	652 Princes Highway, Russell Vale	**60**
R16[1]	4 Wilford Street, Corrimal	**57**
R17[1]	67 Midgley Street, Corrimal	45

The results of **Table 12** indicate that construction noise levels would comply with the *ICNG* 'highly noise affected' management level at all representative residential receivers.

At some point in time, the *ICNG* 'noise affected' management level is likely to be exceeded at 11 of the representative receivers. These exceedances would only occur for a very short duration (i.e. during the construction of the closest noise wall/barrier/bund and under adverse weather conditions) and it is expected that noise levels associated with the construction of noise berms would generally comply with the 'noise affected' management level.

5.5 Summary of Offsite Road Traffic Noise Predictions

Noise predictions have indicated that the Project may be expected to result in relative traffic noise level increases of:

- 2.0 dB during the day (7.00 am – 10.00 pm); and
- 0.6 dB at night (10.00 pm – 7.00 am).

These increases are noted to be within the 2 dB increase margin recognised by the *RNP* as acceptable and considered to be barely perceptible to the average person. These relative traffic noise level increases are expected to reduce during the project life as background traffic volumes are expected to grow at a rate of 1.5% per year while project traffic volumes will remain the same.

Figure 7 – Noise Monitoring Locations and Noise Catchment Areas

6 PERFORMANCE CRITERIA & METEOROLOGICAL CONDITIONS

6.1 Operational Noise Criteria

Condition B1 of the Project Approval stipulates that except for the carrying out of construction, the Applicant must ensure that the noise generated by the development does not exceed the criteria in **Table 13** at any residence on privately-owned land.

The relevant Project Approval noise criteria are presented in **Table 13**.

The noise sensitive receivers listed in **Table 13** represent the noise sensitive receivers potentially most impacted by the Project and are consistent with the receivers identified as part of the RPPR. They consist of:

- 14 residential receivers located in Russell Vale along Broker Street and West Street; and in Corrimal along Midgley Street, Wilford Street, Lyndon Street and Taylor Place (R1-R14); and
- three nearby schools (R15-R17).

To identify the locations referred to in **Table 13**, refer to **Table 14** and **Figure 7**.

Table 13 – Project Approval – Operational Noise Criteria

Location	Noise Level (dBA)					
	Day	Evening	Night		Early Morning Shoulder	
	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{AF(max)}$	$L_{Aeq(15min)}$	$L_{AF(max)}$
R1	44	43	43	52	44	54
R2	44	43	43	52	44	54
R3	44	43	42	52	44	54
R4	44	43	43	52	44	54
R5	48	45	42	52	44	54
R6	48	45	42	52	44	54
R7	48	45	42	52	44	54
R8	48	45	42	52	44	54
R9	44	43	41	52	41	52
R10	44	43	41	52	41	52

Location	Noise Level (dBA)					
	Day	Evening	Night		Early Morning Shoulder	
	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{AF(max)}$	$L_{Aeq(15min)}$	$L_{AF(max)}$
R11	44	43	39	52	41	52
R12	44	43	39	52	41	52
R13	44	43	39	52	41	52
R14	44	43	39	52	41	52
R15[1]	45	-	-	-	-	-
R16[1]	45	-	-	-	-	-
R17[1]	45	-	-	-	-	-

Note: • [1] Receivers relate to a school therefore only daytime criteria apply.

Table 14 – Identified Noise Sensitive Receivers

Receiver Type	Receiver ID	Address
Residence	R1	16 West St, Russell Vale
	R2	30 West St, Russell Vale
	R3	13 West St, Russell Vale
	R4	13 Broker St, Russell Vale
	R5	4 Broker St, Russell Vale
	R6	659 Princes Hwy, Russell Vale
	R7	34 Princes Hwy, Corrimal
	R8	95 Midgley St, Corrimal
	R9	109 Midgley St, Corrimal
	R10	6 Lyndon St, Corrimal
	R11	22 Lyndon St, Corrimal
	R12	46 Lyndon St, Corrimal
	R13	6 Taylor Pl, Corrimal

Receiver Type	Receiver ID	Address
	R14	15 Taylor Pl, Corrimal
School	R15	Russell Vale Pre-school (652 Princes Highway, Russell Vale)
	R16	Autism Association NSW Aspect South Coast School (4 Wilford Street, Corrimal)
	R17	Early Learning Corrimal (67 Midgley Street, Corrimal)

Condition B1 additionally states the noise criteria in **Table 13** do not apply if the Applicant has an agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

6.2 Meteorological Conditions

6.2.1 Applicability of Meteorological Conditions

Condition B1 stipulates that the operational noise criteria summarised in **Table 13** will only apply under the following meteorological conditions as per Appendix 4 of the Project Approval:

- Stability Categories A-D combined with wind speeds ranging 0-0.5 m/s at 10 m above ground level; and
- Stability Categories E and F combined with wind speeds ranging 0-2 m/s at 10 m above ground level between the hours of 10.00pm and 7.00am only.

Appendix 4 of the Project Approval states that under all other meteorological conditions relevant to this Plan, the applicable noise criteria would be equivalent to the operational noise criteria nominated in **Table 13** plus 5 dB.

6.2.2 Meteorological Monitoring Requirements

To determine the applicability of meteorological conditions, the existing on-site meteorological station shall continue to operate.

In accordance with **Condition B11** the on-site meteorological station has been checked and noted as compliant with requirements outlined in *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW* (NSW DEC, 2007) and be capable of continuous real-time measurement of meteorological conditions in accordance with the *NPfI*.

Appendix 4 of the Project Approval stipulates that the Stability Category shall be determined using the sigma-theta method outlined in Fact Sheet D of the *NPfI.*

To assist with compliance assessment of the operational noise criteria and the use of the proactive noise management system, the parameters to be measured include those summarised in **Table 15**.

The meteorological station must be operated and maintained with the aim of achieving 100% availability in each licence year. Where the meteorological station does not achieve 95% availability, WCL must report reasons and corrective actions to the EPA in the Annual Return.

Table 15 – Meteorological Monitoring Requirements

Parameter	Units	Frequency	Averaging Period
Rainfall	mm	Continuous	1-hour
Temperature @ 2 m	ºC		15-minute
Temperature @ 10 m	ºC		
Wind Speed @ 2 m	m/s		

Parameter	Units	Frequency	Averaging Period
Wind Speed @ 10 m	m/s		
Wind Direction @ 10 m	Degrees		
Sigma Theta (10 m)	Degrees		

6.3 Construction Noise Criteria

According to the RPPR, noise generated by the construction and extension works associated with the noise wall/barriers/bunds must be assessed against the recommended noise management levels provided by the *Interim Construction Noise Guideline (ICNG).*

Condition D2 regarding the management of construction noise as is described in the project Construction Environmental Management Plan (CEMP) required in accordance with **Condition D5** stipulates that the Applicant must ensure construction noise complies with the requirements of the *ICNG*.

The recommended noise management levels described in the *ICNG* for residences are summarised in **Table 16**, and have been included in the CEMP as approved by Secretary.

Table 16 – Construction Noise Guideline Noise Management Levels - Residences

Time of Day	Management Level $L_{Aeq,15min}$	How to Apply
Recommended standard hours: Monday to Friday 7.00 am to 6.00 pm	Noise affected RBL + 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise: • Where the predicted or measured $L_{Aeq,15\ min}$ 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.
Saturday 8.00 am to 1.00 pm No work on Sundays or public holidays	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).

Time of Day	Management Level $L_{Aeq,15min}$	How to Apply
		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 dBA	• 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.

The recommended noise management level described in the *ICNG* for schools when in use is an external $L_{Aeq,15min}$ noise level of 55 dBA.

6.4 On-Site Plant and Equipment Sound Power Levels

Sound power levels (SWLs) for all permanent plant and equipment operating on site assumed in the RPPR are summarised in **Table 17**.

It is important to note that the table below does not provide an inventory of all sources assumed in the noise modelling conducted as part of the noise assessment or a description of mitigation measures applied to all plant/equipment items (Section 8). Rather, Table 17 presents the SWLs for all different types of plant/equipment item present on site and assumed in the noise assessment (i.e., no further plant/equipment outside that listed in **Table 17** is assumed in the noise assessment).

Table 17 – Plant and Equipment Sound Power Levels

Area	Plant / Equipment Item	Sound Power Level (dBA)
Coal Transport Infrastructure	Conveyors	70/m[1]
	Primary sizer building	104
	RV1 tripper system	100
	Drive tower	94
ROM Coal Reclaim	D8 dozer	112
	Reclaim tunnel fans	108 (combined)
	Conveyors	70/m[1]
	New transfer station	100

Area	Plant / Equipment Item	Sound Power Level (dBA)
	New secondary sizer building	72
	600t surge bin	100
	Coal processing plant	86
	Truck loading bin	105
	Front-End Loader	113
RTV Portal Area	Compressor House	105
	Main Ventilation Fans	104 (combined)
	Hyster116 forklift	84
	Hyster117 forklift	95
	Juggonaut	104
	Men transporter	104
	Eimco underground loader	110

Note: • [1] Sound power level per linear meter.

7 COMPLIANCE MONITORING & REPORTING

7.1 Operational Noise Compliance Monitoring

7.1.1 General

Condition B2(f) stipulates that the Applicant must carry out attended noise monitoring (quarterly or as otherwise agreed with the Secretary) to determine whether the development is complying with the relevant conditions of consent.

Operator-attended short-term noise monitoring as will continue to be carried out by a suitably qualified and experienced independent noise consultant to measure noise levels from ambient noise sources and WCL operations over a 15-minute measurement period. The operator will measure noise emissions and estimate the noise contribution from the Project site operation alone.

The main aim of attended noise monitoring is to determine compliance with the Project Approval noise criteria. Results from attended noise monitoring will also be used to verify data collected from real-time noise monitoring and provide input to set the trigger threshold.

7.1.2 Attended Monitoring Locations

Attended compliance monitoring will be undertaken on a quarterly basis at locations adjacent to the northern, southern and eastern site boundaries, which are representative of the surrounding residential receivers (refer to **Table 14** and **Figure 7**), as follows:

- North – Receiver R2
- East – Receiver R6
- South – Receiver R9

Based on the site layout, noise mitigation measures and local meteorology, the above three receivers represent the residential receivers most likely impacted by the Project and it is expected compliance at the above three receivers would infer compliance at all other noise sensitive receivers surrounding the Project.

Alternative equivalent location(s) may be adopted as practicable in the event of access restrictions. If required, such alternative location(s) should be as follows:

- Receiver R2 – on West St, adjacent to dwelling;
- Receiver R6 – on Princes Highway footpath, adjacent to dwelling; and
- Receiver R9 – on carpark area on Wilford St, adjacent to Aspect South Coast School.

7.1.3 Attended Monitoring Program

Quarterly monitoring should be conducted for two consecutive 15-minute periods at each of the three nominated locations during the night-time period as this represents the most noise-sensitive assessment period. Monitoring should also be conducted for two consecutive 15-minute periods at each of the three locations during all assessment periods on an annual basis to ensure compliance is achieved at all times of the day. All assessment periods include:

- Day (7.00am – 6.00pm);
- Evening (6.00pm – 10.00pm);
- Night time (10.00pm – 5.00am); and
- Early morning shoulder (5.00am – 7.00am).

Table 18 summarises the proposed attended compliance noise monitoring program.

Table 18 – Attended Compliance Noise Monitoring Program

Receiver ID	Address	Monitoring Method	Sampling Frequency
R2	30 West St, Russell Vale	Short-term attended	• Quarterly (night time) • Annually (day, evening, early morning shoulder)
R6	659 Princes Hwy, Russell Vale	Short-term attended	• Quarterly (night time) • Annually (day, evening, early morning shoulder)
R9	109 Midgley St, Corrimal	Short-term attended	• Quarterly (night time) • Annually (day, evening, early morning shoulder)

The monitoring program will be reviewed as required so that noise impacts on privately-owned properties are suitably assessed.

Additional short-term attended monitoring, conducted by suitably trained WCL environmental staff, will also be undertaken within 24 hours, or as soon as practicable, of receiving a noise complaint(s) as required to determine the noise levels and identify the noise source. This will be conducted in conjunction with a detailed review of the recorded real-time data and site-specific activities.

In circumstances where the attended monitoring was affected by adverse weather conditions (i.e. when wind at microphone height exceeds 5 metres per second [m/s] or during rain), an additional set of monitoring will be conducted at the earliest opportunity that will cover the relevant site activities. The operator is to use a hand-held anemometer to determine wind speed at microphone height during attended monitoring.

7.1.4 Attended Monitoring Regulatory Requirements

Attended monitoring shall be carried out in accordance with the regulatory requirements for reviewing performance as documented in the *NSW Noise Policy for Industry*. The requirements relating to the following shall be observed:

- Monitoring locations for collection of representative data;

- Meteorological conditions during which noise monitoring shall be excluded (i.e. when wind at microphone height exceeds 5 m/s, or during rain);
- Instrumentation and conformity to International and Australian Standards; and
- Modifications to data, including penalties for modifying factors such as low-frequency noise.

7.2 Data Analysis and Compliance Evaluation Protocol

During the attended noise measurements, the operator will record any significant Project site related noise sources as well as other extraneous noise sources such as other industrial operations and/or local traffic.

In addition, the operator will obtain copies of the relevant fixed plant and mobile equipment operating shift logs that could be included in the noise monitoring report.

The site noise level contribution ($L_{Aeq,15min}$ and $L_{AFmax,15min}$) for the Project site will be estimated in the absence of any influential, extraneous or erroneous sound that is audibly distinguishable to that of the Project site and compared to the operational noise assessment criteria to determine compliance.

It should be noted that in instances where monitoring may not be conducted at residential receivers due to access limitations, noise levels may be measured at the nearest accessible point and extrapolated via calculation to the nearest residential receiver location for comparison to noise assessment criteria.

Review meteorological conditions to determine which criteria are applicable (i.e. whether or not the applicable noise criteria should be equivalent to the operational noise criteria nominated in **Table 13** plus 5 dB as described in **Section 6.2** of the Plan).

Additional noise measurement or monitoring methods such as near field monitoring or unattended directional noise monitoring may be utilised to investigate noise emissions in relation to noise complaints, within 24 hours or as soon as practicable from receiving the complaint. This process will also be used to determine compliance with the Project Approval conditions where exceedances have been measured or are difficult to quantify from operator-attended or unattended noise measurements. Compliance may be determined by:

- Direct measurement, from the potential source of the complaint, in reference to the Project Approval criteria;
- Operator estimated noise contribution;
- Calculation from near field measurements;
- From post-analysis of audio recordings;
- Measurement at an alternative representative location;
- Predictions from a noise model of the current operating scenario; or
- A combination of any or all the above methods.

7.3 Reporting

Results of the noise monitoring program will be made available in accordance with the requirements of the Consent (**Conditions F12** and **F17**).

A summary of all noise monitoring results will be reported in accordance with **Conditions F10** and **F11** of the Project Approval.

Should monitoring results and investigation (if necessary) show that the contributed noise level exceeds the relevant Project Approval noise criteria, the non-compliance will be reported to DPI&E within seven days of becoming aware of the non-compliance.

All monitoring results will be documented and reported initially on a quarterly basis.

Quarterly reports will consist of the following information:

- Summary of all attended and unattended noise monitoring results;
- Contributed noise levels from the Russell Vale Colliery operation;
- Statement of compliance/ non-compliance;
- Details of any complaints relating to noise and their state of resolution; and
- Meteorological conditions should also be reported in accordance with the *NPfI*.

This information will also be included in the Annual Review, which will also report on any mitigation investigation and the implementation and effectiveness of these measures, to the satisfaction of the Secretary.

7.4 Construction Noise Monitoring

Attended construction noise monitoring will be conducted at the nearest and potentially most impacted residence(s) when construction or extension works associated with the noise wall/barriers/bunds are occurring within 200 m of noise-sensitive receivers with the intent to assess noise against the *ICNG* requirements and confirm construction noise levels are consistent with predicted levels from the RPPR.

Construction noise monitoring is further described in the project Construction Environmental Management Plan (CEMP), and Bellambi Gully CMP.

7.5 Traffic Noise Monitoring

Traffic noise monitoring will be undertaken by a suitably qualified practitioner, or suitably trained WCL environmental staff, if a complaint is received in relation to road noise along Bellambi Lane. Attended noise monitoring will be undertaken in the vicinity of the complainant's residence or other location appropriate to measure road noise, and the influence of road transport associated with colliery operations will be quantified.

7.6 On-Site Testing of Plant and Equipment

All permanent plant and equipment operating on site shall be tested regularly to confirm they are operating at noise levels at or below the SWLs documented in the RPPR.

This should be undertaken annually by a suitably qualified practitioner, and within one month after any new equipment has been introduced to site.

On-site personnel can use an alternative Sound Level Meter to compare results during the annual test and use this as a basis for intervening testing if equipment is considered to be generating higher noise levels.

If a difference greater than 2 dB is identified by the qualified practitioner between the measured SWL of a plant item and the corresponding SWL documented in the RPPR then the item shall also be checked on a quarterly basis until maintenance and/or noise control of the equipment has been implemented such that the measured SWL is no greater than 2 dB above the SWLs documented in the RPPR.

WCL will ensure maintenance and/or noise control of the equipment is implemented successfully to correct any SWL exceedance within 6 months of WCL becoming aware of it, or as agreed with the Secretary of DPI&E.

Measurements should be undertaken at a known distance (typically 7-30 m) where a clear signal-to-noise ratio for the equipment in question can be obtained. This should include the loudest direction from the plant and any other directions deemed necessary. Any reflections of noise in the measurements should be noted.

Calculation of Sound Power Level shall be carried out based on geometric spreading and adjustments for reflections.

All measurements shall be conducted using a Class 1 sound level meter, with current NATA certificate. The sound level meter shall be field calibrated before and after use.

8 NOISE MANAGEMENT

8.1 General

The following noise management system and associated strategies are recommended in accordance with the findings of the RPPR and based on the review of current operational design. They also consider **Condition B3(a)** of the CoA which stipulates that all noise mitigation bunds, walls and barriers must be implemented prior to the commencement of mining operations, including the phase-in operations.

The Project's overall Statement of Commitments provided in Chapter 6, Part A, of the RPPR summarises the numerous physical mitigation and management measures assumed for the Project. These mitigation measures, described in **Section 8** of this plan, are designed to mitigate noise in all meteorological conditions in order to satisfy the noise criteria in **Table 1** of the project approval, in conjunction with **Appendix 4** of the project approval. For those metrological conditions not referred it in **Condition a) of Appendix 4: Noise compliance assessment** of the project approval, the noise criteria that apply are the noise criteria in Table 1 of the approval conditions plus 5 dB.

With regard to **Condition A1** WCL will in addition to meeting the specific performance measures and criteria established under this Consent implement all reasonable and feasible measures to prevent, and if prevention is not reasonable and feasible, minimise, any material harm to the environment that may result from the construction and operation of the project, and any rehabilitation required under this consent.

8.2 Noise Walls/Barriers/Bunds

Consistent with the RPPR, the noise mitigation strategy includes constructing a noise wall along the northern boundary of the site (Broker Street Noise Wall), two bund barriers to the north of the Pit Top (Bunds 1 & 4 Noise Barriers) and raising/extending several of the existing acoustic berms (Bunds 2, 3 and 5) to reduce potential noise impacts on the community (see **Figure 4**).

Table 21 provides a description of the noise walls/barriers/bunds to be constructed, raised or extended as part of the noise mitigation strategy and the relative timing for their construction.

It is important to note that minor changes have been made to the barrier design since the Project Approval and those changes have been incorporated in the noise management strategy as outlined in Table 21. The assessment of the revised barrier design is included in *RWDI Letter Russell Vale Colliery – UEP Revised Barrier Design, RWDI*, dated July 2021 – See **Appendix B**. The revised barrier design is endorsed by suitably qualified and experienced persons, namely RWDI senior engineer Roman Haverkamp (member of the AAS with almost two decades of experience in environmental acoustics) and RWDI technical director John Wassermann (member of the AAS with over 30 years' experience in the public and private sectors). The qualifications of Lee Hudson, Roman Haverkamp and John Wassermann can be found in **Appendix D**.

The changes to the barrier design can be summarised as follows:

- Reduction of length of Bund # 5 (as detailed in Wilkinson Murray Report No. 14141-E) from 100 m to 67 m to accommodate restrictions placed on bund construction under the high voltage powerline running along the internal site access road. The height of the bund would remain unchanged.

- Replacement of Bund 1 and Bund 4 container noise walls (as detailed in Wilkinson Murray Report No. 14141-E) with noise barriers to be constructed directly on top of the existing bunds. The noise barrier design is based on drawings provided by WCL (*Noise Walls at Russell Vale Colliery*, GC Civil Project No. GCCQ#1031 Rev C, dated September 2020). Because of the difference in height between the bottom of the pit top area where the container walls were proposed and the top of the bunds, an equivalent height was achieved with the noise barriers. The approximate length of the noise barriers would also be equivalent to that of the container noise walls.
- The Broker Street Noise Wall was constructed using CSR Hebel Sound Barrier panels and the noise barriers replacing the Bund 1 and Bund 4 container noise walls were built using Wallmark Australia P/L Acoustic Noise Walls. These are deemed suitable for the Russell Vale Revised Preferred UEP as detailed in Appendix B.

Operational noise predictions incorporating the revised noise barrier design for the Full Operation and Phase-in scenarios are presented in **Table 19** and **Table 20**, respectively.

Table 19 – Revised Noise Predictions – Full Operation Scenario

Location	$L_{Aeq(15min)}$ Noise Level (dBA)			
	Day	Evening	Night	Early Morning Shoulder
R1	42	39	43	44
R2	43	39	43	44
R3	42	39	42	43
R4	40	36	41	40
R5	38	35	35	36
R6	44	42	41	43
R7	40	39	41	42
R8	40	39	42	43
R9	38	36	41	41
R10	37	35	41	41
R11	36	34	38	38
R12	37	35	37	37
R13	39	37	38	38
R14	38	36	39	39

Table 20 – Revised Noise Predictions – Phase-in Scenario

Location	$L_{Aeq(15min)}$ Noise Level (dBA)			
	Day	Evening	Night	Early Morning Shoulder
R1	40	37	43	44
R2	42	37	43	44
R3	41	36	42	43
R4	39	34	40	40
R5	37	33	35	36
R6	44	41	41	43
R7	40	38	41	42
R8	40	38	42	43
R9	37	36	41	41
R10	37	34	41	41
R11	36	33	38	38
R12	37	34	37	37
R13	38	36	38	38
R14	37	35	39	39

Noise predictions incorporating the new barrier design indicate that noise levels are generally relatively consistent with those predicted as part of the original assessment. Negligible changes ranging 0-1 dB expected at all identified residential receivers except for receiver R4 where a 2 dB increase is anticipated with the Phase-in scenario.

Noise predictions show that the new barrier design would not result in any additional noise exceedances of the project noise trigger levels identified in the noise assessment prepared for the Russell Vale Revised Preferred UEP (i.e. although some levels are found to increase slightly, they would remain at or below the project noise trigger levels). Neither would the new barrier design generate any increases in approved noise exceedances. As such, it is considered that no additional residual noise impacts are expected as a result of the new barrier design.

Preliminary analysis indicates the revised design is generally not expected to result in material changes of outcome relating to construction noise, low frequency noise and maximum noise levels.

It should be noted that some small reduction in noise levels ranging up to 2 dB are found at receivers R1 and R6.

As required by **Condition B3(a)**, all barrier mitigation measures would be implemented prior to commencement of the mining operations. **Table 21** presents the required timeframe for the construction/extension works associated with the various noise walls/barriers/bunds.

Table 21 – New, Raised, Extended Noise Walls/Barriers/Bunds – Description and Timing

Control Measure	Description	Timeframe for Construction
Broker Street Noise Wall1	5 m high noise wall along the northern boundary of the site starting from the Princes Highway entrance to the old Broker Street site gates.	Construction works to be completed prior to mining operations commencing.
Bund 1 Noise Barrier[1]	Noise barrier along entire length of Bund 1, with height of 5 m along western section of bund (approx. 217 m long) and 3 m along eastern section of bund (approx. 34 m).	
Bund 4 Noise Barrier[1]	Noise barrier along entire length of Bund 4 (approx. 160m), with height of 2.1 m throughout whole length.	
Bund 2	Bund raised to reach RL of 56 m throughout whole length.	
Bund 3	Bund raised to reach RL of 47 m throughout whole length.	
Bund 5	Bund extended north such that total length equates 67 m and raised to reach RL of 58 m throughout whole length.	

Note 1: Wall/Barrier incorporates revised design.

8.3 Physical Noise Controls

In accordance with the RPPR Statement of Commitments, the Applicant must implement the site-specific noise control summarised in **Table 22**. A more detailed assessment of the noise reduction strategy for key equipment on site, leading to the physical noise controls outlined in **Table 22,** is outlined in **Appendix C**. It should be noted that WCL will continue to investigate opportunities to reduce noise impacts from its operations, including consideration of evolving technologies and associated modifications to equipment.

Table 22 – Physical Noise Controls

Control Measure	Detail	Timing
New infrastructure layout maximising shielding from site topography	Positioning of secondary sizer near bottom of nearby batter and surge bin at toe of nearby batter to maximise shielding to northern receivers.	Prior to operation of plant
Acoustic treatment of primary sizer building	Side sheeting lined with absorption material installed around all facades of the building (except for the northern façade where an opening had to be left for ventilation purposes).	
Acoustic treatment of existing tripper system	Internal lining and vibration isolation of tripper impact plates and hangers as well as internal lining and top covering of trouser leg chutes completed.	
Conveyors	Decline conveyor semi-enclosed.	
	Poly rollers provided to all conveyors.	
	Vulcanised Joints applied to all conveyors.	
Coal processing plant to be enclosed in acoustically treated building according to recommendations made by Hatch[1] and as detailed in **Appendix C**		
Secondary sizer plant to be enclosed in acoustically treated building according to recommendations made by Hatch[1] and as detailed in **Appendix C**.		
Surge bin to be acoustically treated building according to recommendations made by Hatch[1] and as detailed in **Appendix C**.		
D8 dozer provided with attenuation pack and grouser treatment.		Prior to operation of Dozer
Internal access road maintained such as to avoid potholes and other road defects.		Ongoing during mining operations

Note 1: Russell Vale - Coal reclaim, screening sizing and separation plant, Hatch, February 2015.

8.4 Operational Noise Management Measures

Mining operations and the transfer of ROM coal to the surface will be undertaken 24 hours a day, 7 days a week.

In accordance with the RPPR Statement of Commitments, operational noise mitigation measures as documented in **Table 23** will be included as procedure for the noise management system. Those operational noise mitigation measures would be applicable to the phase-in and full operations.

Table 23 – Operational Noise Management Measures (Phase-in and Full Operations)

Operational Noise Management Measures
Operation of the CAT D8 dozer, rejects front-end loader, rejects truck, and underground loader will be restricted to daytime only use.
The operation of the reclaim conveyor system, secondary sizer, surge bin, processing plant and truck loading bins will generally be to daytime use only, with provision for occasional operation in the evening period to cater for unexpected Port closures or interruptions.
Coal loading and laden truck movements typically restricted to daytime period only, with provision for occasional operation in the evening period to cater for unexpected Port closures or interruptions.
Coal beneficiation, truck loading and coal transport will typically be limited to daytime hours only between: • 7.00 am – 6.00 pm Monday to Friday • 8.00 am – 6.00 pm Saturday • No coal beneficiation, truck loading and coal transport will occur on Sundays and Public Holidays Coal beneficiation, truck loading and coal transport may occasionally be required until 10.00 pm Monday to Friday in exceptional circumstances such as Port closure or supply interruption; however, such circumstances would be rare and as a result of unexpected events.
Haulage of reject material from the reject stockpile to the mine portal will be limited to 7.00 am – 6.00 pm Monday to Friday.
Early morning truck movements to designated truck parking area prior to 7.00 am would be restricted to a maximum of six arrivals per 15-minute period.
Voluntary speed limit of coal trucks of 50 kilometres per hour (km/hr) applies to Bellambi Lane.
40 km/hr speed limit on site.

8.5 Construction Noise Management Measures

Consistent with the RPPR Statement of Commitments, the Applicant will implement the construction noise management measures summarised in **Table 24** during construction of bunds around the Pit Top, in accordance with the *ICNG*.

Construction noise management measures are consistent with those described in the project Construction Environmental Management Plan (CEMP).

Table 24 – Construction Noise Management Measures

Construction Noise Management Measures	
Schedule activities to minimise noise impacts	• All bunds construction works to be undertaken during *ICNG* recommended standard construction hours[1]. • Construction of Bunds 2, 3 and 5 to be scheduled as early as possible within the phase-in period so that they can be used as noise barriers. • Minimise the duration of bund construction where feasible and reasonable. • Consult with affected neighbours about scheduling bund construction to minimise noise impacts.
Use quieter equipment and methods	• Dump truck access to be provided to bunds on the side further away from the closest receivers to maximise distance to receivers and shielding from bunds. • Use mobile equipment with less annoying alternatives to the typical 'beeper' alarms where feasible and reasonable. • Regularly inspect and maintain equipment in good working order.
Notification before and during bund construction	• Provide information regarding construction activities to potentially affected neighbours, including the nature and expected duration of construction activities. • Provide signage at the front of the site providing contact information, construction hours and any updates on construction activities.
Construction activities must only be undertaken between the hours of 7.00 am to 6.00 pm Monday to Friday, and 8.00 am to 1.00 pm Saturday, with no construction on Sundays or public holidays, unless the Planning Secretary agrees otherwise.	
Implement a complaints handling procedure, maintain a complaints register and implement all feasible and reasonable measures to address the source of complaints.	
Undertake attended noise monitoring at the nearest and potentially most impacted residence(s) when construction of noise bunds is occurring within 200 m of noise-sensitive receivers to confirm construction noise levels are consistent with predicted levels.	

Note 1: *ICNG* recommended standard construction hours = Monday-Friday 7.00 am-6.00 pm; Saturday 8.00 am-1.00 pm; no work on Sundays or public holidays.

8.6 Plant and Equipment Sound Power Levels

8.6.1 New Equipment and Maintenance

WCL recognise the importance of equipment sound power level (SWL) as a source of variability in noise impacts and understand the importance of consistent SWLs in order to maintain the noise footprint of the Project. As such, WCL have committed to implementing and managing proper

care and maintenance of the equipment to avoid any deterioration that nay lead to increased noise levels or damage of noise attenuation components.

All equipment owned by the operator shall be selected to minimise noise where feasible and reasonable and be consistent with the equipment SWLs assumed as part of the RPPR (Section 6.4).

All permanent plant and equipment operating on site will be tested regularly to confirm they are operating at noise levels at or below the SWLs documented in the **Table 17**, Section 6.4 of this plan. This should be undertaken annually by a suitably qualified practitioner, and within one month after any new equipment has been introduced to site. Testing of existing and new plant or equipment is detailed in Section 0.

In accordance with **Condition B2(c)** the Applicant must monitor and record all major equipment use and make this data readily available at the request of the Department or the EPA. Records should include what plant and equipment items were in operation in each shift and the times during which they were operating.

8.6.2 Plant and Equipment

The following measures apply to the

- Select the most effective mufflers, enclosures and low-noise tool bits and blades;
- Use less annoying alternatives to audible reversing alarms (such as broadband noise emitting models i.e. 'quacker alarm' or 'squashed duck') that provide a safe system of work;
- Use alternatives to diesel and petrol engines and pneumatic units, such as hydraulic or electric-controlled units, where feasible and reasonable;
- Reduce throttle settings and turn off equipment and plant when not being used;
- Regularly inspect and maintain equipment to ensure it is in good working order, also check the condition of mufflers. Equipment must not be operated until it is maintained or repaired, where maintenance or repair would address the annoying character of noise identified;
- For machines with fitted enclosures, check that doors and door seals are in good working order and that the doors close properly against the seals; and
- Utilise site topographic detail or structures to shield noise emission sources from the affected receivers, where practicable.

8.7 Product Transport Operational Noise Controls

The following are the description of the relevant measures that have been implemented at WCL Russell Vale to safely and efficiently manage coal loading and transport operations to safely and efficiently manage coal loading and transport operations so as to ensure compliance with the statutory requirements, limits, and performance criteria defined within the TMP (RVC EC PLN 015). The RV TMP has been developed in consultation with WCC, RMS, PKCT.

8.7.1 Code of Conduct for Truck Drivers

Truck drivers must be instructed to maintain best operational practices at all times and made aware of potential adverse traffic noise impacts on the local community. All drivers accessing

the site on a regular basis will be required to undertake a specific site induction regarding truck noise on the nearby roads.

Truck drivers shall be specifically advised of the following requirements:

- Operate vehicle to minimise noise emissions when approaching and departing the site;
- Limit extended periods of engine idling;
- Do not queue outside the site with engines running;
- Limit engine revving, exhaust brakes and heavy braking when entering and exiting or whilst on site;
- Respect designated heavy vehicle routes in the coal loading area and elsewhere onsite parking locations, acceptable delivery hours or other relevant site practices (e.g. minimising the use of engine brakes); and
- Ensure the road haulage fleet attains and maintains best practice in both equipment and operation.

Any drivers accessing the site in vehicles considered by site personnel to be excessively noisy or who drive in an unacceptable manner shall be refused future entry.

8.7.2 Vehicle Movement and Scheduling

The following measures will be implemented with regard to scheduling and vehicle movements in addition to the measures outlined in the Code of Conduct,

- Manage truck delivery times to reduce impact on community amenity where feasible and reasonable; and
- Encourage car-pooling for site personnel to reduce number of vehicle movements during shift changes.

8.7.3 Road Conditions

Relevant local government authorities and the Roads and Maritime Services (RMS) will be promptly notified as required regarding noticeable deterioration in road pavement that may increase noise generation.

8.8 Proactive Noise Management System

8.8.1 General

A comprehensive proactive noise management system will be used to guide the day-to-day planning of mining operations and the implementation of both practical and responsive noise mitigation measures to ensure compliance with the relevant conditions of the Project Approval and minimise noise impacts on surrounding noise-sensitive receivers.

WCL is to implement a real-time monitoring and forecasting system to assist with the management of noise levels during periods of noise-enhancing meteorological conditions. In the event the real-time monitoring and forecasting system predicts elevated noise levels at some receivers, the Applicant should prepare and possibly adjust operations to minimise noise impacts during predicted noise-enhancing meteorological conditions.

WCL will endeavour to implement the proactive noise management system during all noise-enhancing meteorological conditions where no noise levels are above the Project Approval

operational noise criteria and noise impacts are expected, including those during which noise criteria plus 5 dB are applicable and no adjustment in operation would be required to achieve compliance (e.g. meteorological conditions featuring temperature inversions during the evening period [6.00pm-10.00pm]). As such, WCL would minimise noise impacts during all meteorological conditions, even when compliance is already achieved.

Noise-enhancing meteorological conditions would be identified by a combination of real-time noise and meteorological monitoring and meteorological forecasting, where noise monitoring indicates the trend in actual noise levels at a location and meteorological monitoring and forecasting indicates the likelihood that the current trend would continue or intensify over the ensuing period.

Continued use of the proactive noise management system should be implemented for all stages of the Project life (i.e. phase-in and full operations) but exclude construction and extension works associated with the various noise walls/barriers/bunds.

8.8.2 Real-Time Noise Monitoring

WCL is to implement real-time noise monitoring to ensure site responsiveness to noise-enhancing meteorological conditions and support the proactive and reactive noise management system.

Continuous, real-time monitoring will be conducted at two locations as follows:

- along the site perimeter directly adjacent to Receivers R2 (north); and
- along the site perimeter directly adjacent to Receivers R9 (south).

These are considered suitable monitoring locations representative of receivers R2 and R9.

The exact monitor locations are described in **Table 25**, including georeferenced coordinates (in Geocentric Datum of Australia [GDA] 2020, Map Grid of Australia [MGA] Zone 56).

Table 25 – Monitor Locations

Monitor ID	Monitoring Location		
	Description	Easting	Northing
North Monitor	Aligned with the receiver R2 dwelling, approximately 4 m south of the southern property boundary fence.	306464	6196076
South Monitor	Aligned with the receiver R9 dwelling, approximately 4 m west of the western property boundary fence.	306501	6195605

Note: Monitors should be installed at least 3.5 m from the property timber fence to ensure free-field conditions.

The real-time noise monitoring system shall be used to assist with proactively managing noise levels during upcoming periods of noise-enhancing meteorological conditions to minimise noise impacts.

However, it may also be used to:

- identify and quantify variations in noise levels at receivers which can be related to operational conditions;
- evaluate the effectiveness of noise mitigation measures;
- assist in demonstrating compliance with the CoA; and/or
- assist in the review of noise complaints.

WCL will implement a program to validate the real-time noise monitoring results against attended quarterly compliance monitoring results and monitoring resulting from complaints, if any, at the same locations (i.e. R2 and R9). The validation program would be implemented for the duration of the project, and reported upon within the quarterly monitoring report.

The noise monitoring system would be deemed validated and calibrated if noise levels typically remain within 1 dB of the attended monitoring results. If differences in noise levels are observed to exceed 1 dB across two quarterly monitoring surveys, WCL would commission a suitably qualified and experienced independent noise consultant to calibrate the real-time noise monitoring system.

The real-time noise monitoring system is non-directional and unattended; as such, it is not intended to be directly used to assess compliance with the noise criteria.

The real-time noise monitoring system must be operated and maintained with the aim of achieving 100% availability in each licence year. Where the noise monitoring system does not achieve 95% availability, WCL must report reasons and corrective actions to the EPA in the Annual Return and the DPIE in the Annual Review.

8.8.3 Noise Trigger Levels

The triggers used as part of the real-time noise monitoring are based on the Project Approval operational noise criteria and are shown in **Table 26.**

The trigger levels have been established to provide two real-time response alarms:

- **Level 1 Alarm** (equivalent to operational noise criteria): Continue to monitor operational noise level in accordance with the Trigger Action Response Plan (**Table 26** and **Table 27**).
- **Level 2 Alarm** (equivalent to operational noise criteria minus 2 dB): Review noise and meteorological data, confirm validity of alarm, and prepare to implement mitigation measures as per Trigger Action Response Plan (**Table 26** and **Table 27**).
- **Level 3 Alarm** (equivalent to operational noise criteria): Review noise and meteorological data, confirm validity of alarm, and implement mitigation measures as per Trigger Action Response Plan (**Table 26** and **Table 27**).

Table 26 – Noise Trigger Levels

Loc	Noise Trigger Levels, $L_{Aeq(15min)}$ (dBA)			
	Day	Evening	Night	Early Morning Shoulder
R2	Level 1 Alarm: <42 dBA Level 2 Alarm: 42-44 dBA	Level 1 Alarm: <41 dBA Level 2 Alarm: 41-43 dBA	Level 1 Alarm: <41 dBA Level 2 Alarm: 41-43 dBA	Level 1 Alarm: <42 dBA Level 2 Alarm: 42-44 dBA

Loc	Noise Trigger Levels, $L_{Aeq(15min)}$ (dBA)			
	Day	Evening	Night	Early Morning Shoulder
	Level 3 Alarm: >44 dBA	Level 3 Alarm: >43 dBA	Level 3 Alarm: >43 dBA	Level 3 Alarm: >44 dBA
R9	Level 1 Alarm: <42 dBA Level 2 Alarm: 42-44 dBA Level 3 Alarm: >44 dBA	Level 1 Alarm: <41 dBA Level 2 Alarm: 41-43 dBA Level 3 Alarm: >43 dBA	Level 1 Alarm: <39 dBA Level 2 Alarm: 39-41 dBA Level 3 Alarm: >41 dBA	Level 1 Alarm: <39 dBA Level 2 Alarm: 39-41 dBA Level 3 Alarm: >41 dBA

It is recommended that if the trigger levels are not appropriate to site operations (i.e. too many or too few investigation or action responses) they would be reviewed and updated. Any exceedances measured under those circumstances would not warrant implementation of the Contingency Plan described in **Section 8.11** of this Plan. Additionally, the adequacy of the trigger levels and monitoring data will be reviewed on a 6-monthly basis, with any changes reported in the Annual Review and subsequent revisions of this Plan. Criteria for appropriateness of noise trigger levels during 6-monthly review will be based on the following:

- Noise levels measured by both monitors should be consistent with attended quarterly compliance monitoring results and monitoring resulting from complaints, if any, at the same locations (i.e. R2 and R9).
- In the event of Level 2 alarm being triggered, the implementation of noise mitigation measures in accordance with the Trigger Action Response Plan would result in satisfactory reduction of noise levels to achieve compliance for no less than 100 % of triggered events in each season and for each assessment period (i.e. day [7.00am-6.00pm]; evening [6.00pm-10.00pm]; and night time [10.00pm-7.00am]).

8.8.4 Meteorological Monitoring

Real-time meteorological monitoring used for the proactive noise management system would be conducted via the on-site meteorological station (**Section 6.2**).

In the event the real-time noise monitoring system triggers an alarm that is due to site noise, review of the meteorological monitoring data for the time of the alarm would be required to determine if and what operational noise criteria are applicable.

In accordance with AS 1055:2018 and the *NPfI*, operational noise criteria are not applicable under the following meteorological conditions as environmental noise measurements would be deemed invalid:

- rain/hail; and/or
- average wind speeds exceeding 5 m/s at microphone height (assumed to be equivalent to 2 m above ground level for the purpose of the proactive management system).

Condition B1 stipulates that the operational noise criteria summarised in **Table 13** will only apply under the following meteorological conditions as per Appendix 4 of the Project Approval:

- Stability Categories A-D combined with wind speeds ranging 0-0.5 m/s at 10 m above ground level; and
- Stability Categories E and F combined with wind speeds ranging 0-2 m/s at 10 m above ground level between the hours of 10.00pm and 7.00am only.

Under all other meteorological conditions (except those deemed invalid), the applicable noise criteria would be equivalent to the operational noise criteria nominated in **Table 13** plus 5 dB.

However, as mentioned above, WCL will endeavour to implement the proactive noise management system during all noise-enhancing meteorological conditions where no noise levels are above the Project Approval operational noise criteria and noise impacts are expected, including those during which **Table 13** criteria plus 5 dB are applicable.

8.8.5 Meteorological Forecasting

In accordance with **Condition B2(e)**, the proactive noise management system would include meteorological forecasting. Real-time meteorological forecasting used for the proactive noise management system will be based on data obtained from the on-site meteorological station (Section 6.2).

Real-time meteorological forecasting would be used to indicate the likelihood that the current noise trend would continue or intensify over the ensuing period due to noise enhancing conditions.

Noise-enhancing conditions generally consist of meteorological conditions featuring:

- temperature inversions (represented by Stability Categories E [weak temperature inversion strength], F [moderate temperature inversion strength] or G [strong temperature inversion strength]);
- source-to-receivers light winds (ranging 0.5-3 m/s); or
- a combination of the above.

Temperature inversions are only present during the evening, night-time and early morning shoulder periods and are typically more prevalent in cold weather months. Source-to-receivers light winds can occur at any time of the day.

Depending on the receiver, compliance would generally be expected during milder noise-enhancing conditions such as meteorological conditions featuring:

- lower source-to-receivers wind speeds (e.g. 0.5 m/s); or
- weak-to-moderate temperature inversion strengths (Stability Categories E and F).

Depending on the receiver, exceedances of the operational noise criteria would generally be expected during more adverse noise-enhancing conditions such as meteorological conditions featuring:

- greater source-to-receivers wind speeds (e.g. 3 m/s);
- moderate-to-strong temperature inversion strengths (Stability Categories F and G); or
- a combination of source-to-receivers winds and temperature inversions.

8.9 Generic Noise Mitigation and Management Measures

While the measures contained within this section will not necessarily satisfy the Project Approval noise criteria, they will serve as feasible, practical means to reduce impacts to residents in accordance with the intent outlined in the *NPfI*. Through the review of the feasible practices identified below, WCL will identify what work practices are reasonable, practicable and enforceable.

- Implement best practice noise management, including all reasonable and feasible noise mitigation measures to minimise the construction and operational noise generated by the Project site;
- Encourage general environmental awareness for employees and contractors;
- Carry out activities in a competent manner (including processing, handling, movement and storage of materials);
- Maintain all plant and equipment installed at the premises or used in connection with the site in a proper and efficient condition;
- Operate all plant and equipment installed at the premises or used in connection with the site in a proper and efficient manner;
- During site inductions for all operators (e.g. truck drivers, mobile plant operators), identify the closest and potentially most affected noise sensitive receivers in the vicinity of current works, present the applicable noise criteria for the site and identify the site culture of best operational practice and provide incentives for good behaviour/compliance with these practices;
- Erect permanent signage on site that is visible to all personnel and identifies the need to limit noise, (e.g. 'Respect our neighbours and keep noise to a minimum ' sign at site entrance for truck movements during early morning shoulder; 'No engine brakes' sign at site office up the escarpment for truck deliveries, etc.)
- Avoid dropping materials from height, where practicable;
- Avoid metal-to-metal contact on equipment near residences;
- Avoid mobile plant clustering near residences;
- Close openings where appropriate on process plant;
- Ensure all covers are in place and closed when fixed and mobile plant is in operation; and
- Inform all potentially impacted residents of the nature of potentially high noise generating works to be carried out, the expected noise levels and duration, as well as contact details.

8.10 Trigger Action Response Plan

The Trigger Action Response Plan (TARP) provides a framework where various monitoring components, performance measures and responsibilities are structured to achieve compliance with the relevant statutory requirements via implementation of management and control actions.

In the event that a noise trigger level is exceeded, alarms will be directed to key staff/operational personnel who would implement the site-specific TARP as presented in **Table 27.**

The shift Site Supervisor, Production Manager, Environment Monitoring Coordinator and Group Environment Manager would be responsible for implementing the TARP on site.

Details regarding measured noise levels (i.e. range in measured levels, noise level trends, and triggered alarms) and meteorological forecasts would be presented in the shift changeover report provided to the shift Site Supervisor, Production Manager, Environment Monitoring Coordinator and Group Environment Manager for the upcoming shift. The shift changeover report will help understanding potential noise risks at surrounding noise-sensitive receivers and assist with operational planning to minimise noise.

Table 27 – Trigger Action Response Plan

Level	Management/Control Action	Role & Responsibility
Level 1 Normal operation	1. Review of measured audio data to assess whether the noise is related to site operations. 2. Review of meteorological data to confirm that environmental noise measurements are valid. Measurements are deemed valid under the following meteorological conditions: • No rain/hail; • Average wind speeds (over 15-minute period) less or equal to 5 m/s at 2 m above ground level; • Review predicted meteorological conditions to identify if noise enhancing conditions are forecast or likely to occur for the rest of the shift/assessment period of the day. 3. Review predicted noise impacts for the shift against observations to ensure compliance.	• Shift Site Supervisor • Shift Production Manager, • Environment Monitoring Coordinator, • Group Environment Manager
Level 2 Alarm	4. Review of measured audio data to assess whether the noise is related to site operations. 5. Review of meteorological data to confirm that environmental noise measurements are valid. Measurements are deemed valid under the following meteorological conditions: • No rain/hail; • Average wind speeds (over 15-minute period) less or equal to 5 m/s at 2 m above ground level; 6. If UEP noise is audible and a significant contributor to total noise levels (Item 1), and measurements are deemed valid (Item 2): • Review predicted meteorological conditions to identify if noise enhancing conditions are forecast or likely to occur for the rest of the shift/assessment period of the day. • Review predicted noise impacts for the shift against observations. 7. Prepare a priority list all plant and equipment operating on site. 8. Modify operations on site and consider relocating or shutting down 'high priority' and then 'lower priority' operating equipment, as per the priority list, as necessary to reduce noise levels back to level 1. 9. Record management strategies. This includes details of investigation, type of response (if any required), real-time monitoring results and actions taken.	• Shift Site Supervisor • Shift Production Manager, • Environment Monitoring Coordinator, • Group Environment Manager
Level 3 Alarm	1. Review of measured audio data to assess whether the noise is related to site operations.	• Shift Site Supervisor

Level	Management/Control Action	Role & Responsibility
	2. Review of meteorological data to confirm that environmental noise measurements are valid. Measurements are deemed valid under the following meteorological conditions: • No rain/hail; • Average wind speeds (over 15-minute period) less or equal to 5 m/s at 2 m above ground level; 3. If UEP noise is audible and a significant contributor to total noise levels (Item 1), and measurements are deemed valid (Item 2): • Prepare a priority list all plant and equipment operating on site. • Where possible, progressively relocate or shutdown 'high priority' and then 'lower priority' operating equipment as per the priority list. • Review predicted meteorological conditions to identify if noise enhancing conditions are forecast or likely to occur for the rest of the shift/assessment period of the day. • Review predicted noise impacts for the shift against observations. 4. Monitor changes in noise levels against operational changes. 5. Monitor the changes in noise levels until noise levels drop below the alarm trigger. 6. Monitor changes in meteorological conditions and noise levels and progressively reinstate equipment once noise levels have dropped below the alarm trigger. 7. Record management strategies. This includes details of investigation, type of response (if any required), real-time monitoring results and actions taken.	• Shift Production Manager, • Environment Monitoring Coordinator, • Group Environment Manager

8.11 Contingency Plan

Notwithstanding the TARP management and control actions summarised in Table 27 of this Plan, in the event that noise results from attended compliance noise monitoring or the proactive noise management system (once it has been calibrated appropriately for the site) indicate an exceedance of the performance criteria detailed in **Section 6** of this Plan and under the applicable meteorological conditions (Appendix 4 of Project Approval), WCL will implement the following Contingency Plan:

- The observation will be reported to WCL's Group Environmental Manager within 24 hours;
- The observation will be recorded;
- WCL will implement all reasonable and feasible measures to ensure the exceedance ceases and does not re-occur and for remediation;
- WCL will assess the exceedances and where appropriate, implement safety measures in accordance with the appropriate Management Plan(s);
- The Group Environmental Manager will investigate any potential contributing factors and identify an appropriate action plan to manage the identified impact(s), in consultation with specialists and/or relevant agencies if necessary;
- WCL will identify an appropriate action plan to manage the identified impact(s), in consultation with other specialists and/or key stakeholders;
- WCL will report any exceedances of the performance measure including description of remediation options and any preferred remediation measures or other proposed course of action to the Secretary of DPI&E and other relevant stakeholders within 14 days of the exceedance occurring;
- WCL will implement the approved course of action to the satisfaction of DPI&E; and
- WCL will continue to monitor performance with the new action plan in place and, if successful will formalise these actions as part of the Management Plan

Contingency measures will be developed in consideration of the specific circumstances of the issue and the assessment of consequences.

If either, it is not reasonable or feasible to remediate the impact or remediation measures implemented by WCL have failed to satisfactorily remediate the impact, WCL will provide a suitable offset to compensate for the impact, to the satisfaction of the Secretary of DPI&E.

9 INCIDENTS, NON-CONFORMANCE, INDEPENDENT REVIEWS & COMPLAINTS

The Development Consent defines:

- an **'incident'**to be "an occurrence or a set of circumstances that causes or threatens to cause material harm and which may or nor cause a non-compliance".
- **'Non-compliance'** as "an occurrence, set of circumstances or development that is a breach of this consent.

Any incidents, exceedance or non-compliance will be managed through established WCL procedures as detailed in the EMS (Wollongong Coal 2021a).

9.1 Incidents

The Project Approval defines an 'incident' to be "an occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance".

In accordance with **Condition R2.1** of the site EPL, WCL must provide notification of environmental harm by telephoning the Environment Line services on 131 555.

In accordance with **Condition R2.2** of the site EPL, WCL must provide written details of the complaint to the EPA within 7 days of the date on which the incident occurred.

In accordance with **Condition R2.2** of the site EPL, WCL or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

Incidents will be managed through established WCL procedures as detailed the Environmental Management Strategy (EMS), and or as detailed with regard to **Condition F15** for audits and or monitoring data.

In accordance with **Condition F9** WCL will immediately notify the Department and any other relevant agencies immediately after it becomes aware of an incident. The notification must identify the development (including the development application number and name) and set out the location and nature of the incident.

WCL would in addition to the information above make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request in relation to an incident or potential incident.

The request may require a report which includes any or all of the following information:

a) the cause, time and duration of the event;

b) the type, volume and concentration of every pollutant discharged as a result of the event;

c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;

d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;

e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;

f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and

any other relevant matters.

The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

9.2 Non-Conformance Protocol

WCL will manage and report non-compliances relevant against statutory requirements in accordance with an established protocol developed as a component of the site EMS.

Condition F10 stipulates that within seven days of becoming aware of a non-compliance, the Applicant must notify the Department of the non-compliance. The notification must set out the condition of this consent that the development is non- compliant with, why it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. In addition, **Condition B4 (v)** notes that a protocol for notification to the Department and relevant stakeholders of any noise related exceedance, incident or non-compliance is required to be included in this NMP.

As soon as practicable, and no longer than 7 days after obtaining monitoring results showing an exceedance of any operational noise criteria, WCL must notify affected landowners in writing of the exceedance and provide regular monitoring results to these landowners until the development is again complying with the relevant criteria.

Compliance with all approvals, plans and procedures will be the responsibility of all personnel (staff and contractors) employed on or in association with WCL Russell Vale Colliery, and will be promoted through direct consultation and direction of the mine's Operations Manager.

Regular inspections and/or internal audits will be undertaken as required by suitably qualified personnel under the direction of the Group Environment Manager, to identify any remediation/rectification work required, and areas of actual or potential non-compliance.

A Compliance Register will be established to monitor compliance against project approval conditions, mining leases, etc. Non-compliances identified through the Compliance Register are to be reported, with corrective actions implemented.

A review of WCL's compliance with all conditions of the Project Approval, mining leases and all other approvals and licences will be undertaken prior to (and included within) each Annual Review. The Annual Review will be made publicly available on WCL's website.

9.3 Complaints Handling

Complaints will be managed through established WCL procedures as detailed in the EMS. Noise complaints will be investigated by WCL staff as soon as possible, and within 24 hours, from the time of receiving the complaint.

Investigation by WCL into the source of the noise disturbance will include a review of the operations being conducted on site at the time of the complaint, short-term attended noise monitoring by WCL staff as outlined in **Section 7.1.3** (if required to determine the noise levels and identify the noise source), and a detailed review of the recorded real-time data from real time noise monitors. If further investigation is required following the initial investigation WCL will engage a suitably qualified noise consultant to conduct independent noise monitoring. This will inform whether further corrective actions are required to minimise potential noise disturbance and complaints.

As part of the complaints handling procedure WCL will:

- Implement a system for recording complaints with respect. A publicly advertised telephone number and email address will be utilised to receive complaints during operating hours and record complaints at other times;
- Notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint;
- Ensure all complaints are entered into a logbook; and
- Ensure an initial response is provided within 24 hours of receipt of the complaint except in the event of complaints recorded when the mine is not operational.

The complaints record will include the following details for noise complaints:

- The date and time of complaint;
- The method through which the complaint was communicated e.g. Telephone, Email;
- Any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
- The nature of the complaint;
- Any action taken by WCL in relation to the complaint, including any follow up contact with the complainant; and
- If no follow up action is taken by WCL, the reason why no action was taken.

In accordance with **Condition F17(a)(x)** of the Consent, the Complaints Register will be made publicly available on the website and updated on a monthly basis. The register will include a summary of complaints received, and actions taken. This report will be summarised and presented to the CCC as part of the operational performance review.

A summary of complaints received, and actions taken will also be included in the Annual Review in accordance with **Condition F11** and the EPL Annual Return. This will be submitted to WCC, WSC, and made available to CCC and any interested person upon request and provided in the Annual Environmental Management Reports (AEMRs).

In accordance with **Condition M5.3** of the site EPL, the record of a noise complaint must be kept for at least 4 years after the complaint was made and must be produced to any authorised officer of the EPA who asks to see it.

9.4 Independent Review

If an owner of privately-owned land considers the development to be exceeding the operational noise criteria, then he/she may ask the Secretary in writing for an independent review of the impacts of the development on his/her land.

If the Planning Secretary is not satisfied that an independent review is warranted, the Planning Secretary will notify the landowner in writing of that decision, and the reasons for that decision, within 28 days of the request for a review.

If the Planning Secretary is satisfied that an independent review is warranted, within 3 months, or other timeframe agreed by the Planning Secretary and the landowner, of the Planning Secretary's decision, the Applicant must:

(a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Planning Secretary, to:

(i) consult with the landowner to determine their concerns;

(ii) conduct monitoring to determine whether the development is complying with the relevant operational noise criteria; and

(iii) if the development is not complying with the relevant criterion, identify measures that could be implemented to ensure compliance with the relevant criterion; and

(b) give the Planning Secretary and landowner a copy of the independent review

The Applicant must then comply with any written requests made by the Planning Secretary to implement any findings of the review and in accordance with any timeframes specified.

10 PLAN ADMINISTRATION

10.1 Roles and Responsibilities

Environment and community management is regarded as part of the responsibilities of all Colliery personnel. The roles and function of the main personnel responsible for the implementation of environmental and community management including the plans, procedures and action plans contained in this Plan are outlined in WCL's Management Operating System.

10.2 Resources Required

Management shall ensure that the appropriate resources are made available to achieve the implementation of this Plan.

It is the role of the Group Environment Manager to ensure that these requirements are communicated to WCL Management.

10.3 Training

All training and inductions conducted are to be undertaken as per the WCL training procedures. A record of all environment inductions will be maintained and kept on site. The SER may authorise amendments to the induction where required to address project modifications, legislative changes or amendments to this Management Plan or related documentation.

The EM/SER will review and endorse the induction program as below and monitor its implementation via reporting as per WLC training procedures.

Additional training is also undertaken with specific people involved in noise waste management via the following forums:

- delivery of Toolbox Talks highlighting waste minimisation and management issues;
- incorporation of noise management update into site personnel training days; and
- refresher training where required.

Notices may also be posted on the notice boards in crib rooms and elsewhere around the site to advise of noise minimisation and management measures.

10.4 Inductions

All new personnel, contractors and associated subcontractors will be required to participate in site induction prior to the commencement of work. As a minimum, the induction is to include.

Staff training will be undertaken as detailed in the EMS. This consists of three levels of training applicable to different types of staff:

- Level 1 - High level training on environmental requirement – Management. This training would include the key compliance elements of this plan and their implementation.
- Level 2 - Operational level training - Project Managers, Supervisors, Surface Personnel – detailed training on the implementation of the key compliance elements of this plan and their implementation

- Level 3 - Basic environmental awareness – All Underground and other site personnel Staff – induction level awareness

11 AUDIT AND REVIEW

11.1 Annual Review

In accordance with Condition F11, WCL will prepare an annual review of the environmental performance of the project. The timeframe and scope of the annual review are defined in Section 5.1 of the EMS.

Copies of this review would be provided to WCC, WSC, the CCC, and interested persons upon request.

By the end of March each year after the commencement of the development under this consent, or other timeframe agreed by the Planning Secretary, a report must be submitted to the Department reviewing the environmental performance of the development, to the satisfaction of the Planning Secretary. This review must:

(a) describe the development (including any rehabilitation) that was carried out in the previous calendar year and the development that is proposed to be carried out over the current calendar year;

(b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, including a comparison of these results against the:

  (i) relevant statutory requirements, limits or performance measures/criteria;

  (ii) requirements of any plan or program required under this consent;

  (iii) monitoring results of previous years; and

  (iv) relevant predictions in the document/s listed in condition A2(c);

(c) Identify any non-compliance or incident which occurred in the previous calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence;

(d) evaluate and report on:

  (i) the effectiveness of the noise and air quality management systems; and

  (ii) compliance with the performance measures, criteria and operating conditions of this consent;

(e) identify any trends in the monitoring data over the life of the development;

(f) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and

(g) describe what measures will be implemented over the next calendar year to improve the environmental performance of the development.

11.2 Annual Return Documents

WCL must complete and supply to the EPA an Annual Return in the approved form comprising:

1. a Statement of Compliance;

2. a Monitoring and Complaints Summary;
3. a Statement of Compliance - Licence Conditions;
4. a Statement of Compliance - Load based Fee;
5. a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan;
6. a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and
7. a Statement of Compliance - Environmental Management Systems and Practices.

At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.

An Annual Return must be prepared in respect of each reporting period, except as provided below.

The Annual Return for the reporting period must be supplied to the EPA via eConnect EPA or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.

Within the Annual Return, the Statements of Compliance must be certified, and the Monitoring and Complaints Summary must be signed by:

a) the licence holder; or

b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

Where an authorised officer of the EPA suspects on reasonable grounds that:

a) where this licence applies to premises, an event has occurred at the premises; or

b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence, and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

11.3 Auditing

In accordance with Condition F13, an Independent Environmental Audit will be undertaken by a suitably qualified auditor and include experts in any field specified by the Secretary. The timeframe and scope of the audit are defined in Section 5.2 of the EMS.

Any condition of this consent that requires the carrying out of monitoring or an environmental audit, whether directly or by way of a plan, strategy or program, it is taken to be monitoring or an environmental audit under Division 9.4 of Part 9 of the EP&A Act.

11.4 Plan Revision

In accordance with **Condition F7**, this NMP will be reviewed within three months of:

- the submission of an incident report under **Condition F9,**
- the submission of an annual review under **Condition F11**
- the submission of an independent environmental audit under **Condition F13,** or
- the approval of any modification of the conditions of the consent (unless the conditions require otherwise).

The suitability of existing strategies, plans and programs required under the consent will be reviewed by WCL.

In accordance with **Condition F8,** if necessary, to either improve the environmental performance of the project, cater for a modification or comply with a direction, the strategies, plans and programs required under the Consent will be revised, to the satisfaction of the Planning Secretary. Where revisions are required, the revised document will be submitted to the Planning Secretary for approval within 6 weeks of the review.

11.5 Noise Management - Key Performance Indicators (KPI's)

The operational noise criteria listed in Section 6.1 are for compliance. WCL commits to the following key performance indicators (KPIs) to demonstrate the performance of ongoing noise management practices at Russell Vale Colliery:

- Maintenance of an effective on-site noise monitoring network (Section 8.8).
- Continued successful implementation of the noise control measures outlined in Section 8.
- Continued successful implementation of the noise compliance and reporting program (Section 7).
- Maintaining records of the reactive measures and action taken in response to a potential breach of noise trigger levels.
- No exceedance of the operational noise criteria (Section 6.1) that can be attributed to Russell Vale Colliery operations, based on measurements from the real-time noise monitoring network (Section 8.8) and the compliance noise monitoring program (Section 7).
- No confirmed noise-related complaints from the operation of the Russell Vale Colliery (Section 9.3)

In the event that these KPIs are not met, noise mitigation measures and maintenance practices will be reviewed and amended, as necessary.

Monitoring of performance measures will be the responsibility of the Environment Manager/Site Environment Representative or delegate.

WCL will continually monitor performance indicators to identify opportunities to improve operations and will report on as part of the annual review.

12 RECORDS AND DOCUMENT CONTROL

12.1 Record Keeping and Control

Environmental records are to be managed in accordance with the (WCL SYS PRO 001) Wollongong Coal Document and Data control procedure.

All records of the EMS and this plan will be stored so that they are readily retrievable and suitably protected from deterioration or loss. Archiving will be managed in accordance with the data control procedure.

A current master copy of each EMS document including all appendices and supporting information is to be held in the office of the E&C Department and kept on the WCL Document management system.

Specifically, in accordance with **Condition F17 (iv) and (vi),** the records of the monitoring associated with the environmental performance measures will be placed on the WCL website as available.

12.2 Distribution

This Plan will be distributed to DPE for comment prior to update and distribution to:

The Environmental Manager will coordinate the preparation, review and distribution, as appropriate, of the environmental documents including to the NSW EPA.

During construction and operation, the environmental documents will be stored at the main site compound.

The NMP will be developed, approved, implemented and maintained in accordance with the Document Control Procedure (WCL SYS PRO 001).

In accordance with **Condition F17, (a) (iii),** of the Project Approval, WCL will make this Plan publicly available on the WCL website and will be responsible for its maintenance. A hard copy will also be kept at the Russell Vale Colliery, 7 Princes Highway, Corrimal, NSW 2518.

Any revisions undertaken will be the responsibility of WCL and any notifications will be sent accordingly. WCL will not be responsible for maintaining uncontrolled copies beyond ensuring the most recent version is maintained on WCL's computer system, website, and hard copy at the Russell Vale Colliery, 7 Princes Highway, Corrimal, NSW 2518.

12.3 Public sources of information

To assist the public and other stakeholders understand the impacts from the development, including monitoring results, newsletters and updates, and in accordance with **Condition F5(i)**, WCL will:

- publish information on the company website;
- notify the local community through the Russell Vale CCC;
- contact individuals by direct notification (email subject to registration of interest) where relevant.

This information will be updated as required.

12.4 Notification

Upon completion of the acoustic measures including the noise wall and acoustic noise berms WCL will advise DPIE and WCC via provision of a completion certificate or similar documentation advising on the completion as per the design

13 REFERENCES

- AS 1055:2018 *Acoustics - Description and measurement of environmental noise*
- Department of Environment and Climate Change (2009) *Interim Construction Noise Guideline*
- Department of Environment, Climate Change and Water (2011) NSW *Road Noise Policy*
- Department of Planning and Environment (2018) *Voluntary Land Acquisition and Mitigation Policy*
- Department of Planning and Environment (2020) MP09_0013 Project Approval
- Hatch (2014) Russell Vale Tripper Conveyor and Surface Noise Source Management (Rev B)
- Hatch (2015) Russell Vale Coal Deshaling Plant
- Hatch (2015) Russell Vale Coal Reclaim, Screening, Sizing and Separation Plant
- NSW Environment Protection Authority (2017) Noise Policy for Industry
- RWDI (2021) Russell Vale Colliery – Underground Expansion Project - Revised Barrier Design
- Umwelt (Australia) (2019) Russell Vale Revised Underground Expansion Project – Revised Preferred Project Report and Response to Second PAC Review
- Wilkinson Murray (2019) Russell Vale Colliery – Underground Expansion Project – Revised Project Noise Assessment.

14 GLOSSARY OF TERMS AND ABBREVIATIONS

Abbreviations	
AAAC	Association of Australian Acoustical Consultants
AAS	Australian Acoustical Society
AEMR	Annual Environmental Management Report
AS	Australian Standard
AWS	Automatic Weather Station
CCC	Community consultative committee
CoA	Conditions of Approval
DECCW	Department of Environment, Climate Change & Water
DPI&E	Department of Planning, Industry & Environment
EA	Environmental Assessment Report prepared for NRE No. 1 Colliery Preliminary Works Project
EPL	Environment Protection Licence
EMS	Environmental Management Strategy
EP&A Act	Environmental Planning & Assessment Act 1979
EPA	NSW Environmental Protection Agency
EPL	Environment Protection Licence
ERM	Environmental Resources Management Australia Pty Ltd
IPC	Independent Planning Commission
ICNG	Interim Construction Noise Guideline
KPI	Key Performance Indicator
LGA	Local Government Area
Mtpa	Million tonnes per annum
NMP	Noise Management Plan
NPfI	Noise Policy for Industry
PNTL	Project Noise Trigger Level
RBL	Rating Background Level
RL	Reduced Level
RMS	Roads and Maritime Services
RPPR	Revised Preferred Project and Response to Second PAC Review
ROM	Run of Mine
RNP	NSW Road Noise Policy
RWDI	RWDI Australia Pty Ltd
TARP	Trigger Action Response Plan

Abbreviations	
VLAMP	Voluntary Land Acquisition and Mitigation Policy
WCC	Wollongong City Council
WCL	Wollongong Coal Limited

Terms	
Annual Review	The review as required by condition F11 of the approval.
Construction	The construction works for the project as described in the RPPR. Construction work does not include surveys, acquisitions, fencing, investigative drilling or excavation, minor clearing, minor access roads, minor adjustments to services/utilities, works which allow isolation of the site so that access for construction can be provided (including service relocations) and establishing temporary facilities for construction (including for example an office and amenities compounds, temporary water and communications, construction compounds, materials storage compounds, maintenance workshops, testing laboratory or material stockpile areas).
CCC	The Russell Vale Community consultative committee
Conditions of this consent	Conditions contained in Schedule 2
Construction	The construction works for the project as described in the RPPR. Construction work does not include surveys, acquisitions, fencing, investigative drilling or excavation, minor clearing, minor access roads, minor adjustments to services/utilities, works which allow isolation of the site so that access for construction can be provided (including service relocations) and establishing temporary facilities for construction (including for example an office and amenities compounds, temporary water and communications, construction compounds, materials storage compounds, maintenance workshops, testing laboratory or material stockpile areas).
Day	7.00am - 6.00pm
dB(A)	A-weighted decibel
Department	Department of Planning, Industry & Environment
Early Morning Shoulder	5.00am - 7.00am
Evening	6.00pm – 10.00pm
Feasible	Means what is feasible and practical in the circumstances
Incident	A set of circumstances that causes or threatens to cause material harm to the environment, and/or breaches or exceeds the limits or performance measures/criteria in the Project Approval and which may or may not be a non-conformance.

Terms	
	See "Unintended Event" – the Russell Vale Colliery Logistics Manager and the Group Environmental Manager are responsible for determining if a report of an "unintended event" represents an "incident" as defined.
L_{Aeq}	A-weighted equivalent continuous noise level – represents Ambient Noise
L_{A90}	A-weighted sound pressure level which is exceeded for 90 % of the measurement period represents Background Noise.
L_{A1}	A-weighted sound pressure level which is exceeded for 1 % of the measurement period – used to assess sleep disturbance impact.
Material Harm	Material harm is harm to the environment that: • involves actual or potential harm to the health or safety of human beings or to the environment that is not trivial, or • results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000 (such loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment). This definition excludes "harm" that is authorised under either this approval or any other statutory approval'.
Mining operations	The carrying out of mining, including the extraction, processing, stockpiling and transportation of coal on the site and the associated removal storage and/or emplacement of vegetation, topsoil, overburden and reject material. Mining operations include both phase-in and full operations.
Mine closure	Decommissioning and final rehabilitation of the site following the cessation of mining activities.
Mitigation	Activities associated with reducing the impacts of the development
Negligible	Small or unimportant, not worth considering.
Night	The period from 10pm to 5am on Monday to Saturday, and 10 pm to 8 am on Sundays and Public Holidays.
Noise Sensitive areas	Areas where mining operations are being carried out that have the potential to lead to increased noise at privately owned residences, such as elevated areas or areas near the boundary of the site.
Non-Compliance	An occurrence or set of circumstances or development that is a breach of the project consent.
Reasonable	Means applying judgement in arriving at a decision, taking into account mitigation benefits, cost of mitigation versus benefits provided, community views, and the nature and extent of potential improvements.
Secretary	The Secretary of the Department of Planning, Industry & Environment
Second Workings	The extraction of coal from board and pillar workings
Surface Facilities Site	Russell Vale Pit Top site, coal conveyor, truck load out facilities, ventilation shaft sites, and any other site subject to proposed surface disturbance (excluding subsidence impacts) associated with the development.

15 CONTROL AND REVISION HISTORY

Control

PROPERTY	VALUE
Approved by	Group Environment and Approvals Manager
Document Owner	Richard Sheehan
Effective Date	10/08/2021

Revision History

VERSION	DATE REVIEWED	REVIEW TEAM (CONSULTATION)	NATURE OF THE AMENDMENT
A	25/01/2021	• Roman Haverkamp, RWDI Senior Engineer • Richard Sheehan – WCL Group Environmental & Approvals Manager • Lee Hudson, RWDI Senior Acoustic Consultant | Associate	Development of draft RV EUP Noise Plan
B	13/03/2021	• Roman Haverkamp, RWDI Senior Engineer • Richard Sheehan – WCL Group Environmental & Approvals Manager	Development of revised draft RV EUP Noise Plan
C	14/03/2021	• Richard Sheehan – WCL Group Environmental & Approvals Manager	Minor formatting to address Final Issued for DPI&E approval
D	01/06/2021	• Roman Haverkamp, RWDI Senior Engineer • John Wassermann, RWDI Technical Director • Richard Sheehan – WCL Group Environmental & Approvals Manager	Address DPI&E comments
E	13/07/2021	• Robert Faddy-Vrouwe – WCL Environmental Coordinator • Warwick Lidbury – WCL CEO	Update Project Description to be consistent with all other management plans and incorporate DPIE review feedback dated 29 June 2021
F	11/08/2021	• Robert Faddy-Vrouwe – WCL Environmental Coordinator • Warwick Lidbury – WCL CEO	Incorporate DPIE review feedback dated 3 June 2021

APPENDIX A – AGENCY CONSULTATION

DOC21/115370-1

Mr Richard Sheehan
Wollongong Coal Limited
PO Box 281
FAIRY MEADOW NSW 2519

Email: Richard.sheehan@wcl.net.au

Dear Mr Sheehan

EPA Comments on draft Russell Vale Colliery Noise Management Plan

The EPA refer to your request for comments on the above plan as required to be prepared by condition B4 of Schedule 2 of Development Consent MP09_0013 issued for the Russel Vale Revised Preferred Underground Coal Project.

The EPA has reviewed the plan and revised noise barrier design and has no comments to make.

The noise monitoring program appears suitable for determining compliance with noise performance criteria and investigating complaints that may be received during construction and operation.

The EPA would appreciate receiving a copy of the final plan or a link to its location on Wollongong Coal's website after it has been approved by the Planning Secretary.

If you have questions regarding the above, please phone Andrew Couldridge on (02) 4224 4100.

Yours sincerely

William Dove 24.02.2021

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Unit Head Regulation

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013

Mr Richard Sheehan
Group Environmental & Approvals Manager
Wollongong Coal
PO Box 281
FAIRY MEADOW NSW 2519

Our Ref: Z21/49786
File: MP-2009/13
Date: 10 March 2021

Dear Mr Sheehan

RUSSEL VALE COLLIERY NOISE MANAGEMENT PLAN

Thank you for the opportunity to comment on the Russell Vale Colliery Underground Expansion Project Noise Management Plan dated 5 February 2021.

Council has reviewed the Russell Vale Colliery Underground Expansion Project Noise Management Plan and acknowledges the proposed noise mitigation measures and commitments made by Wollongong Coal in the plan, in order to minimise noise emissions emanating from the colliery. In particular, the construction of the access road noise barrier along the northern boundary of the site (Broker Street Noise Wall) and the earthen bund walls are supported to reduce operational noise impacts upon the surrounding residential community.

It would be greatly appreciated if your company could formally advise Council when the construction of the noise barrier and the bund walls are completed. Additionally, Council anticipates that ongoing noise monitoring be undertaken by a suitably qualified and experienced noise consultancy to ascertain how the colliery is performing with regards to the predicted noise levels in the plan. The results of this ongoing noise monitoring should be provided at the quarterly Russell Vale Colliery CCC meetings and also contained within the Annual Environmental Management Report (AMER) with a copy furnished to Council annually.

Should you have any enquiries regarding this matter, please contact Mr Ron Zwicker, Special Projects and Planning Support Manager on telephone (02) 4227 7111 or via email *rzwicker@wollongong.nsw.gov.au*.

This letter is authorised by

Mark Riordan
Manager Development Assessment + Certification
Wollongong City Council
Telephone (02) 4227 7111

APPENDIX B – NOISE MITIGATION STRUCTURE DESIGN REVIEW (DECEMBER 2020)

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Level 4, 272 Pacific Highway
Crows Nest, NSW, 2065, Australia

Tel: +61.2.9437.4611
E-mail: solutions@rwdi.com
ABN: 86 641 303 871

July 13, 2021

Devendra Vyas
Wollongong Coal Limited
Russell Vale Colliery
7 Princes Highway
CORRIMAL NSW 2518
Dvyas2@wcl.net.au

Dear Devendra

Re: Russell Vale Colliery - Underground Expansion Project – Revised Barrier Design

Introduction

Wollongong Coal Limited (WCL) propose to make minor changes to the barrier design associated with the Russell Vale Revised Preferred Underground Expansion Project (UEP), recently approved by the Independent Planning Commission of NSW on 8 December 2020 (Development Consent MP09_013).

RWDI Australia Pty Ltd (RWDI), which have prepared the noise assessment associated with the above project under the name of Wilkinson Murray (*Russell Vale Colliery – Underground Expansion Project - Revised Project Noise Assessment*, Wilkinson Murray Report No. 14141-E, dated November 2019), have been commissioned by WCL to revise the noise model and discuss potential noise implications associated with the revised barrier design.

This letter report would accompany the Noise Management Plan prepared for the Russell Vale Revised Preferred Underground Expansion Project.

Revised Barrier Design

The changes to the barrier design can be summarised as follows:

- Reduction of length of Bund # 5 (as detailed in Wilkinson Murray Report No. 14141-E) from 100 m to 67 m to accommodate restrictions placed on bund construction under the high voltage powerline running along the internal site access road. The height of the bund would remain unchanged.

- Replacement of Bund 1 and Bund 4 container wall (as detailed in Wilkinson Murray Report No. 14141-E) with noise walls to be constructed directly on top of the existing bunds. The noise wall design is based on drawings provided by WCL (*Noise Walls at Russell Vale Colliery*, GC Civil Project No. GCCQ#1031 Rev C, dated September 2020). Because of the difference in height between the bottom of the pit top area where the container walls were proposed and the top of the bunds, an equivalent height was achieved with the new noise walls. The approximate length of the noise walls would also be equivalent to that of the container walls.

Operational Noise Criteria

Operational noise criteria for residential receivers as documented in the Development Consent are summarised in **Table 1**.

Table 1: Development Consent Operational Noise Criteria

Location	Noise Level (dBA)					
	Day	Evening	Night		Early Morning Shoulder	
	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{AF(max)}$	$L_{Aeq(15min)}$	$L_{AF(max)}$
R1	44	43	43	52	44	54
R2	44	43	43	52	44	54
R3	44	43	42	52	44	54
R4	44	43	43	52	44	54
R5	48	45	42	52	44	54
R6	48	45	42	52	44	54
R7	48	45	42	52	44	54
R8	48	45	42	52	44	54
R9	44	43	41	52	41	52
R10	44	43	41	52	41	52
R11	44	43	39	52	41	52
R12	44	43	39	52	41	52
R13	44	43	39	52	41	52
R14	44	43	39	52	41	52

Noise Predictions

Operational noise predictions incorporating the revised noise barrier design for the Full Operation and Phase-in scenarios are presented in **Tables 3** and **5**, respectively. For ease of reference, noise levels predicted as part of the noise assessment associated with the

Russell Vale Revised Preferred UEP (Wilkinson Murray Report No. 14141-E, dated November 2019) are reproduced in **Tables 2** and **4** for the Full Operation and Phase-in scenarios, respectively.

All predictions are expressed as $L_{Aeq,15min}$ noise levels based on the same assumptions and methodology used for the original noise assessment.

Table 2: Original Noise Predictions – Full Operation Scenario

Location	$L_{Aeq(15min)}$ Noise Level (dBA)			
	Day	Evening	Night	Early Morning Shoulder
R1	41	38	42	43
R2	42	39	43	43
R3	42	39	42	43
R4	40	36	40	40
R5	38	35	35	36
R6	44	41	41	43
R7	40	39	41	42
R8	40	39	42	43
R9	38	36	41	41
R10	37	35	41	41
R11	36	34	38	38
R12	37	35	37	37
R13	39	37	38	38
R14	38	36	39	39

Table 3: Revised Noise Predictions – Full Operation Scenario

Location	$L_{Aeq(15min)}$ Noise Level (dBA)			
	Day	Evening	Night	Early Morning Shoulder
R1	42	39	43	44
R2	43	39	43	44
R3	42	39	42	43
R4	40	36	40	40
R5	38	35	35	36
R6	44	42	41	43
R7	40	39	41	42
R8	40	39	42	43
R9	38	36	41	41
R10	37	35	41	41
R11	36	34	38	38
R12	37	35	37	37
R13	39	37	38	38
R14	38	36	39	39

Table 4: Original Noise Predictions – Phase-in Scenario

Location	$L_{Aeq(15min)}$ Noise Level (dBA)			
	Day	Evening	Night	Early Morning Shoulder
R1	41	37	43	43
R2	41	37	43	43
R3	40	36	42	43
R4	37	34	40	40
R5	36	33	35	36
R6	43	41	41	43
R7	40	38	41	42
R8	40	38	42	43
R9	37	36	41	41

Location	$L_{Aeq(15min)}$ Noise Level (dBA)			
	Day	Evening	Night	Early Morning Shoulder
R10	37	34	41	41
R11	36	33	38	38
R12	37	34	37	37
R13	38	36	38	38
R14	37	35	39	39

Table 5: Revised Noise Predictions – Phase-in Scenario

Location	$L_{Aeq(15min)}$ Noise Level (dBA)			
	Day	Evening	Night	Early Morning Shoulder
R1	40	37	43	44
R2	42	37	43	44
R3	41	36	42	43
R4	39	34	40	40
R5	37	33	35	36
R6	44	41	41	43
R7	40	38	41	42
R8	40	38	42	43
R9	37	36	41	41
R10	37	34	41	41
R11	36	33	38	38
R12	37	34	37	37
R13	38	36	38	38
R14	37	35	39	39

Discussion

Noise predictions incorporating the new barrier design indicate that noise levels are generally consistent with those predicted as part of the original assessment. Negligible changes ranging 0-1 dB are expected at all identified residential receivers except for receiver R4 where a 2 dB increase is anticipated with the Phase-in scenario.

Noise predictions show that the new barrier design would not result in any additional noise exceedances of the project noise trigger levels identified in the noise assessment prepared for the Russell Vale Revised Preferred UEP (i.e. although some levels are found to increase slightly, they would remain at or below the project noise trigger levels). Neither would the new barrier design generate any increases in approved noise exceedances. As such, it is considered that no additional residual noise impacts are expected as a result of the new barrier design.

Preliminary analysis indicates the revised design is generally not expected to result in material changes of outcome relating to construction noise, low frequency noise and maximum noise levels.

Yours faithfully

Roman Haverkamp
Senior Engineer
RWDI

APPENDIX C – HATCH NOISE MITIGATION OPTIONS REPORT (2014)

HATCH™

Wollongong Coal Limited
Russell Vale NSW

Operational noise measurements and draft strategy for noise control

For

Russell Vale tripper conveyor and surface noise source management

H346292-0000-07-220-0003
Rev. C
21 october 2014

Project Report

21 October 2014

Wollongong Coal Limited

Russell Vale Tripper conveyor and Surface Noise Source Management

Distribution
P Bawden, D Clarkson, K Prajapati

Operational noise measurements and Draft Strategy for noise control

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Safety ● Quality ● Sustainability ● Innovation

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This report contains the expression of the professional opinion of Hatch, based upon information available at the time of preparation. The quality of the information, conclusions and estimates contained herein is consistent with the intended level of accuracy as set out in this report, as well as the circumstances and constraints under which this report was prepared. However, this report is a review of an existing facility and, accordingly, all estimates and projections contained herein are based on limited and incomplete data. Therefore, while the work, results, estimates and projections herein may be considered to be generally indicative of the nature and quality of the Project, they are not definitive. No representations or predictions are intended as to the results of future work, nor can there be any promises that the estimates and projections in this report will be sustained in future work.

1. Executive Summary

1.1 Background

Wollongong Coal Limited (WCL) operates coal stockpiling and transport activities at its Russell Vale site. The site has environmental approval for upgrades to surface works, including the relatively new tripper conveyor and primary sizer building. Future works include a primary stockpile reclaim system (underneath assumed) to feed a truck loading facility.

The current environmental approval conditions for noise are contribution sound levels of 36 to 40 dBA at the nearest residences (depending on receiver location); however this may be currently exceeded, with 44 dBA being measured at some receiver locations at times. The main sources of noise are advised to be the tripper head chute impacts, from unsized coal and rocks. Figure 1.1 shows an aerial view of the site and surrounds with major noise sources and receiver locations identified.

WCL has requested assistance from Hatch to identify opportunities for reducing noise emissions and achieving compliance. Work undertaken to achieve this has included:

1.2 Source sound levels

Measurement of conveyor noise source sound levels during operations with limited coal supply in the period April to June 2014. Noise emissions were limited from the production conveyor system because development work only was occurring. Coal would typically flow at low to medium levels for periods of approximately 1-minute at a time.

Measurements of emissions from the northern mine ventilation fan, main compressor house, workshop fork-lift and administration block substation were also obtained.

Sound power levels from each source were calculated based on the measured sound pressure levels. The directivity of the source to each receiver was also included.

The sound power levels calculated ranged from 74 dBA (88 dBC) for part of the conveyor drive building, to 105 dBA for both the stockpile excavator loading coal trucks (116 dBC) and the compressor house northern wall vents (109 dBC).

The tripper conveyor components had the highest source sound power levels for the southern side opening had a source sound power level of 103 dBA, and the Sizer Building/Transfer House eastern wall had a source sound power level of 101 dBA.

The calculated sound power levels for the sources are given in Table 1.1 below.

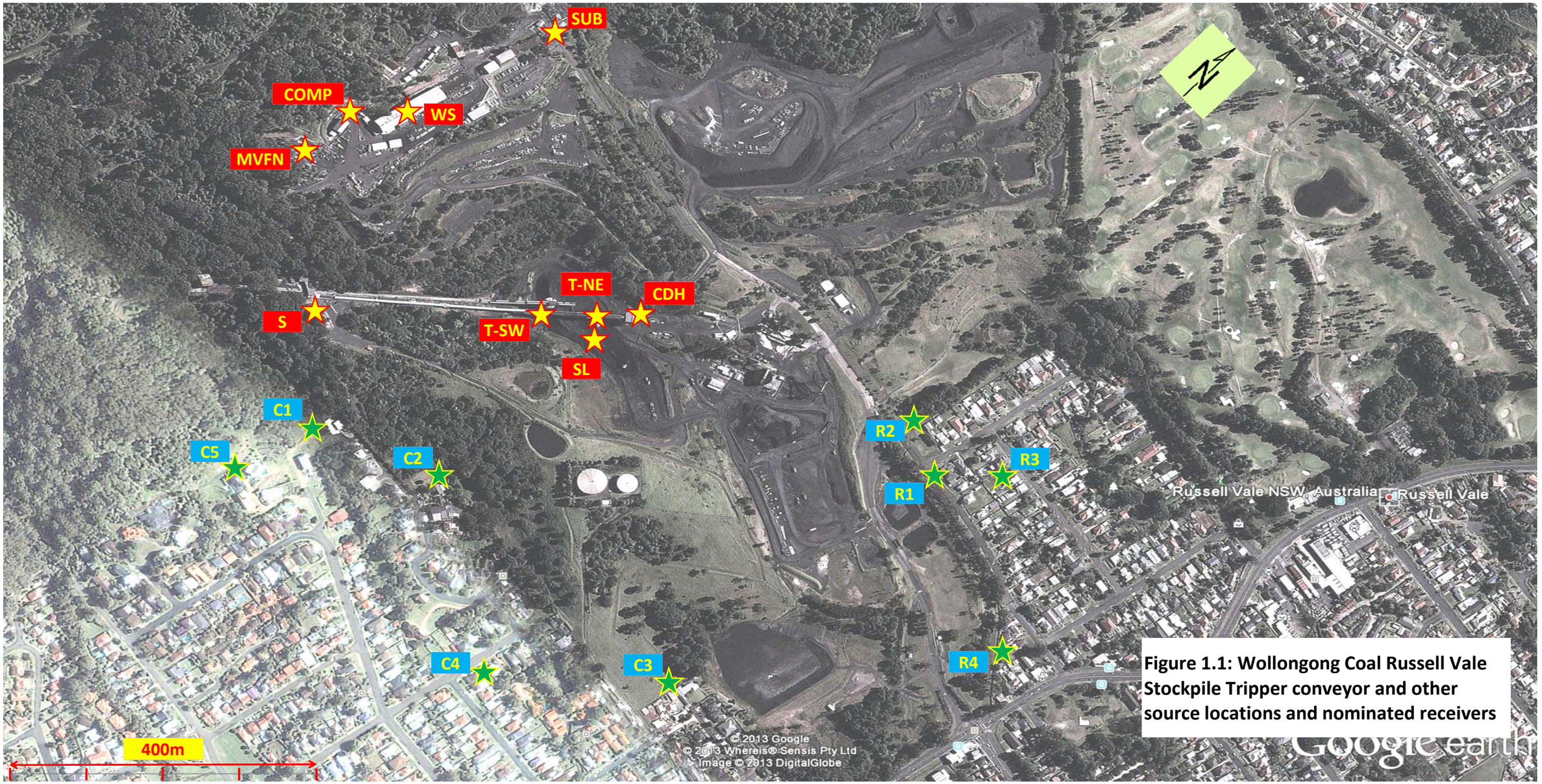

Figure 1.1: Wollongong Coal Russell Vale Stockpile Tripper conveyor and other source locations and nominated receivers

R1 ★ Indicates Boundary Receiver location

S ☆ Indicates noise source location

S = Sizer - Transfer House
CDH = Conveyor Drive House
T-SW = Tripper South-west limit
T-NE - Tripper North-east limit
SL = Stockpile loader
WS = Workshop
MVFN = Northern Mine Vent Fan
SUB = Substation
COMP = Compressor House

Table 1.1: Wollongong Coal Surface noise source sound levels (not including directivity loss)

Source No.	Location	PWL-A	PWL-C
S1	S1 Conveyor Drive Building Top level N side	82	95
S2	S2 Conveyor Drive Building Top level E side	82	95
S3	S3 Conveyor Drive Building Top level S side	92	101
S4 (& S8)	S4 Tripper N side N end	92	95
S5 (& S6, S9, S10)	S5 E Trouser Leg Open N end	103	105
S7 (& S11)	S7 Tripper S wall N end Coal On	101	106
S12	S12 Transfer Stn E wall @ 18m	101	110
S13	S13 Stockpile Excavator operating East side centre	105	115
S14	S14 Conveyor Drive Building 1 level down from top N side	79	93
S15	S15 Conveyor Drive Building 1 level down from top E side	79	93
S16	S16 Conveyor Drive Building 1 level down from top S side	79	92
S17	S17 Conveyor Drive Building 2 levels down from top N side	75	90
S18	S18 Conveyor Drive Building 2 levels down from top E side	74	88
S19	S19 Conveyor Drive Building 2 levels down from top S side	78	93
S20	S20 Conveyor Drive Building Stair opening	82	91
S21	S21 Transfer Stn N wall opening	100	107
S22	S22 Tripper Belt alone	79	89
S23 (&S24)	S23 Tripper S entry no coal	98	116
S25 (&S26)	S25 Workshop Door 1 South	99	101
S27	S27 MVF North	102	113
S28	S28 MVF North casing	99	100
S29	S29 Compressor House N Wall vents	105	109
S30	S30 Substation N of Admin	83	94

1.3 Calculation of received sound levels

Quantification of received source sound levels were made by calculations of contribution sound levels at the nominated receivers using the computer noise model ENM. This model used calculated sound power levels and ground cross-sections between each of the sources and receivers, which were taken from Google-Earth Pro. A total of 30 source locations and 8 receivers were used.

Calculations were made for a range of weather conditions typical for enhanced sound propagation conditions in the locality. These were:

A. calm neutral conditions,
B. low to medium speed winds from the source to the receivers with neutral lapse and
C. low to medium speed winds from the source to the receivers with medium to strong inversion conditions,

all typical of winter. The condition of wind speed 3m/s with a neutral lapse rate (no increase or decrease in temperature with increasing elevation) gave a slightly higher result than the NSW Industrial Noise Policy recommended default conditions of 2m/s with 3^{o}C lapse rate.

Use of this condition (wind 3m/s, Lapse 0^{o}C/100m) as the basis for assessment of potential impact is recommended by Hatch because it allows for increased sound levels for conditions typically occurring at the site. These increases can be up to 24 dB for some sources and receivers over that occurring for calm and neutral.

Two tripper locations were used – one for the northern limit and one for the southern limit of its travel. The calculations included losses for directivity between the source and receivers. This means that if a source is for example facing towards the south, but the path towards the receiver is towards the northeast, then a directivity loss for the angle 135^{o} is applied. The directivity was dependent upon the relative angle between the source and the receiver. The calculations provided ranked contribution sound levels from each source from highest to lowest, at each receiver.

1.4 Received source sound levels

For the recommended assessment conditions, results are summarised in Table 1.2. The results show that different receivers had highest sound levels from different sources, depending on their locations. The highest received sound levels were up to 48 dBA at Receivers R1 and R2 for the stockpile excavator, and this was also the highest source for the other northern receivers R3 and R4. However, the southern (C1, C2 and C5) eastern (C3 and C4) had different major sources. For C1 and C5, the Sizer Building Eastern wall was the major source at up to 41 dBA at C1. For C2 it was the tripper southern side entry source with 46 dBA and for C3 and C4 it was the trouser leg discharge/coal impact on the stockpile which was the major source at 42 dBA. These differences show that topography and directivity have an influence.

The total calculated sound levels for each of the tripper locations are also shown. The highest received sound levels are at Receivers C2 and R1/R2, with 50 and 51 dBA respectively. For C2 this is 12 dB above the long-term night-time objective and 14 dB for R1/R2. These results include the stockpile loader. If this is not included, night-time levels are unchanged at C2 (0.1 dB difference), and reduce 3 dB at R1 and R2.

Table 1.3 shows a similar set of results for the calm, neutral condition. In this case the highest received sources have changed – it is the trouser leg discharges for R1 to R4, tripper trouser leg discharge/stockpile impacts for C2 and C4, the Sizer Building Eastern wall for C1 and C5, and the Sizer Building Northern opening (to the portal) for C3. The increase in contribution levels from some sources caused by the wind can be significant – up to 21 dB for trouser leg discharges towards C3, and the increase in the total sound level was calculated to be up to 14 dB for C3, as shown at the bottom of Table 1.3.

The next stage of the analysis was to assess the effects of reduction of the higher sources on total received sound levels. The effects of subsequently reducing the contribution sound level of the top 5 sources at each receiver in 5dB steps were then calculated. This approach is to determine what level of reduction is achieved by treating the top 5 sources with 5, 10 then 15 dB reduction. For some receivers this caused the total to be less than the long-term objective, but for others even 15 dB reduction on the top 5 sources was not enough to achieve a total less than the objective – this was because there were many sources with relatively high received sound levels. Table 1.4 shows an example result of this calculation for receiver C2. Despite reducing the top 5 sources by up to 15 dB, the total remained at 5 dB above the objective.

Table 1.2: Wollongong Coal Russell Vale - Tripper Conveyor and Surface Noise Assessment
Ranked contribution sound levels at receivers for typical worst case conditions Wind 3m/s towards receivers, Neutral Atmosphere

Source No.	Source Description Condition W3 L0	Received dBA both tripper locations								
		C1	C2	C3	C4	C5	R1	R2	R3	R4
1	S1 Conveyor Drive Building North Wall Top	-17	-2	8	-3	-11	25	25	24	23
2	S2 Conveyor Drive building E side Top	1	21	23	19	7	13	12	11	22
3	S3 Conveyor Drive building S side top inc. opening	15	24	-5	14	24	4	4	3	3
4	S4 Tripper N end N side	5	25	29	24	13	34	34	34	32
5	S5 Tripper N end E side Trouser Leg	24	42	42	39	32	44	44	43	41
6	S6 Tripper N end W side trouser leg	24	42	42	39	32	44	44	43	41
7	S7 Tripper N end S side entry	24	44	32	38	35	29	30	28	28
8	S8 Tripper S end N side	4	27	29	25	13	34	34	33	31
9	S9 Tripper S end E side Trouser Leg	24	42	42	42	32	43	44	43	41
10	S10 Tripper S end W side trouser leg	24	42	42	42	32	43	44	43	41
11	S11 Tripper S end S side entry	25	46	32	38	33	29	29	28	27
12	S12 Sizer Building E wall	41	38	36	21	38	24	23	24	26
13	S13 Loader on stockpile	27	30	31	28	27	48	48	47	45
14	S14 Conveyor Building N side 1L down from top	-19	-5	2	-8	-14	21	22	20	18
15	S15 Conveyor Building E side 1L down from top	0	16	16	14	5	9	11	8	18
16	S16 Conveyor Building S side 1L down from top	4	15	-7	0	10	-7	-6	-9	-9
17	S17 Conveyor Building N side 2L down from top	-22	-11	-1	-12	-18	16	17	15	13
18	S18 Conveyor Building E side 2L down from top	-5	8	10	6	-1	3	4	1	13
19	S19 Conveyor Building S side 2L down from top	6	12	-6	-11	10	-8	-5	-10	-11
20	S20 Conveyor Building Stair opening	-8	-1	2	-2	-2	11	11	10	10
21	Sizer Building N wall opening	30	39	37	12	19	38	38	37	35
22	Tripper conveyor belt	-1	17	14	11	9	15	16	15	13
23	Tripper S side opening No Coal Northern End	24	41	31	35	34	29	30	28	27
24	Tripper S side opening No Coal Southern End	24	43	31	36	32	28	29	28	27
25	Door 1 South	27	24	28		25		28		
26	Door 2 Centre	33	30	29		27		28		
27	MVF North	26	29	28	26	17		16		
28	MVF North casing	18	20	28	18	10		21		
29	Compressor House N Wall vents	11	13	14	10	4		17		
30	Substation N of Admin	13	7	13	13	6		17		
	Max	41	46	42	42	38	48	48	47	45
	Total for Northern Tripper	43	50	47	45	43	51	51	50	48
	Total for Southern Tripper	43	51	47	47	42	50	51	50	48
	Long-term night-time objective dBA	38	38	36	36	40	37	37	37	37

Table 1.3: Wollongong Coal Russell Vale - Tripper Conveyor and Surface Noise Assessment
Ranked contribution sound levels at receivers for typical worst case conditions Wind 3m/s towards receivers, Neutral Atmosphere

Source No.	Source Description Condition – W0 L0	Received dBA for both Tripper locations								
		C1	C2	C3	C4	C5	R1	R2	R3	R4
1	S1 Conveyor Drive Building North Wall Top to R4	-20	-6	-2	-10	-18	19	19	18	14
2	S2 Conveyor Drive building E side Top to R4	-2	15	9	9	1	9	8	7	15
3	S3 Conveyor Drive building S side Top including opening to R4	10	17	-13	3	13	-1	-2	-2	-4
4	S4 Tripper N end N side to R4	0	15	11	10	4	26	27	24	22
5	S5 Tripper N end E side Trouser Leg to R4	18	32	22	24	21	36	36	35	32
6	S6 Tripper N end W side trouser leg to R4	18	32	22	24	21	36	36	35	32
7	S7 Tripper N end S side entry to R4	19	34	20	25	24	23	25	22	21
8	S8 Tripper S end N side to R4	0	18	10	12	5	24	26	24	21
9	S9 Tripper S end E side Trouser Leg to R4	19	35	21	28	22	35	36	34	32
10	S10 Tripper S end W side trouser leg to R4	19	35	21	28	22	35	36	34	32
11	S11 Tripper S end S side entry to R4	21	40	18	28	25	22	23	21	20
12	S12 Sizer Building E wall R4	38	31	27	16	34	21	20	21	22
13	S13 Loader on stockpile R4	21	24	18	20	19	34	34	33	30
14	S14 Conveyor Building N side 1L down from top R4	-21	-9	-6	-16	-20	15	15	13	9
15	S15 Conveyor Building E side 1L down from top R4	-3	11	6	5	-1	6	5	4	10
16	S16 Conveyor Building S side 1L down from top R4	0	9	-15	-8	2	-11	-12	-13	-15
17	S17 Conveyor Building N side 2L down from top R4	-25	-15	-10	-19	-24	10	10	8	4
18	S18 Conveyor Building E side 2L down from top R4	-9	3	-1	-2	-8	-2	-2	-4	4
19	S19 Conveyor Building S side 2L down from top R4	2	8	-14	-18	3	-12	-11	-14	-17
20	S20 Conveyor Building Stair opening R4	-12	-6	-9	-11	-8	4	1	3	-1
21	Sizer Building N wall opening R4	26	29	29	8	16	29	30	29	27
22	Tripper conveyor belt to R4	-6	8	0	1	-1	8	9	7	5
23	Tripper S side opening No Coal Northern End to R4	19	32	20	24	24	24	24	23	21
24	Tripper S side opening No Coal Southern End to R4	21	36	19	26	25	23	22	22	20
25	Door 1 South	19	17	15		17		16		
26	Door 2 Centre	24	22	15		18		16		
27	MVF North	21	23	19	16	13		8		
28	MVF North casing	14	15	16	8	6		9		
29	Compressor House N Wall vents	5	6	4	2	-1		7		
30	Substation N of Admin	7	4	3	5	0		12		
	Maximum	38	40	29	28	34	36	36	35	32
	Total for Northern Tripper	39	41	33	32	36	41	41	40	37
	Total for Southern Tripper	39	44	33	35	36	40	41	39	37
	Long-term Night-time objective	38	38	36	36	40	37	37	37	37
	Difference with wind 3m/s Northern Tripper Location	4	9	14	12	7	10	9	10	11
	Southern Tripper Location	4	7	14	12	6	10	10	11	11

Table 1.4: Wollongong Coal Noise - Effect of reducing top 5 sources to C2 subsequently by 5, then 10 then 15dB

Source	Source Description	Receiver			Total Subsequent 5dB reduction of first 5 sources in order					Total Subsequent 10dB reduction of first 5 sources in order					Total Subsequent 15dB reduction of first 5 sources in order				
No.	Condition W3 l0	C2	C2	C2	C2 Tripper Southern Location					C2 Tripper Southern Location					C2 Tripper Southern Location				
11	S11 Tripper S end S side entry	46		46	41	41	41	41	41	36	36	36	36	36	31	31	31	31	31
7	S7 Tripper N end S side entry	44	44		0					0					0				
24	Tripper S side opening No Coal Southern End	43	43	43	43	38	38	38	38	38	33	33	33	33	33	28	28	28	28
9	S9 Tripper S end E side Trouser Leg	42		42	42	42	37	37	37	37	37	32	32	32	32	32	27	27	27
10	S10 Tripper S end W side trouser leg	42		42	42	42	42	37	32	32	32	32	27	22	22	22	22	17	12
5	S5 Tripper N end E side Trouser Leg	42	42																
6	S6 Tripper N end W side trouser leg	42	42																
23	Tripper S side opening No Coal Northern End	41	41	41	41	41	41	41	36	36	36	36	36	31	31	31	31	31	26
21	Sizer Building N wall opening	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39
12	S12 Sizer Building E wall	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
26	Door 2 Centre	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
13	S13 Loader on stockpile	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
27	MVF North	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
8	S8 Tripper S end N side	27		27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
4	S4 Tripper N end N side	25	25		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	Door 1 South	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
3	S3 Conveyor Drive building S side Top including opening	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
2	S2 Conveyor Drive building E side Top	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
28	MVF North casing	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
22	Tripper conveyor belt	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
15	S15 Conveyor Building E side 1L down from top	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
16	S16 Conveyor Building S side 1L down from top	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
29	Compressor House N Wall vents	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
19	S19 Conveyor Building S side 2L down from top	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
18	S18 Conveyor Building E side 2L down from top	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
30	Substation N of Admin	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
20	S20 Conveyor Building Stair opening	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
1	S1 Conveyor Drive Building North Wall Top	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
14	S14 Conveyor Building N side 1L down from top	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
17	S17 Conveyor Building N side 2L down from top	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
	Max	46	44	46															
	Total Northern Tripper Location	52	50																
	Total southern Tripper Location			51	50	49	48	48	47	46	45	45	45	44	44	43	43	43	43
	Long-term Objective Night	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38

NOTES

Yellow highlighted cells indicate highest received source sound level

Pink highlighted cells indicate exceed night-time levels without loader by more than 2 dB

Green highlighted cells indicate exceed evening levels with loader by more than 2 dB

The next step was to calculate the required equivalent objective for each source such that the total at each receiver would be not greater than the objective. In other words, what maximum equal sound level for each of the 26 sources would be required to achieve the objective? Having this “equivalent objective sound level” value allows an assessment to be made of the reduction in contribution sound level likely to be required for each source. Normally this would be calculated by dividing the objective (logarithmically) by 26, which would give a maximum individual contribution of the total less 14 dB. However that would be too conservative as many of the sources have a calculated contribution sound level of more than 20 dB below the objective and would not contribute to the total. The value determined to be required for equivalent contribution was 13 dB below the objective.

For example, if the long-term night-time objective at Receiver C2 is 38 dBA, then to ensure that objective was not exceeded, each of the sources would be required to have a contribution level of 38 – 13 = 25 dBA. When these values were used for each receiver, with the sound levels of sources less than the equivalent value, the resulting total sound levels at most receivers were less than or equal to the total objective.

The reduction required in the emission from each source was then calculated for each receiver. Because of the different distances from and topographical cross-sections between sources and receivers, one source might have a high reduction requirement for one receiver but a low or no reduction for another. These reduction requirement values were then collated such that the maximum reduction required for each sources was calculated. These are shown in Table 1.5.

Table 1.5: Wollongong Coal Russell Vale - surface noise sources reduction assessment Calculation of maximum required reduction for sources to achieve all receiver objectives

Source No	Source Description	Maximum Reduction dB
1	S1 Conveyor Drive Building North Wall Top	1
4	S4 Tripper N end N side	10
5	S5 Tripper N end E side Trouser Leg	20
6	S6 Tripper N end W side trouser leg	20
7	S7 Tripper N end S side entry	19
8	S8 Tripper S end N side	10
9	S9 Tripper S end E side Trouser Leg	20
10	S10 Tripper S end W side trouser leg	20
11	S11 Tripper S end S side entry	21
12	S12 Sizer Building E wall	16
13	S13 Loader on stockpile daytime, evening, night-time	18, 22, 24
21	Sizer Building N wall opening	14
23	Tripper S side opening No Coal Northern End	16
24	Tripper S side opening No Coal Southern End	18
25	Door 1 South	5
26	Door 2 Centre	8
27	MVF North	5
28	MVF North casing	5

The maximum reduction required was up to 24 dB, for the loader/excavator operating on the stockpile loading coal at night-time. If it operates in the evening the reduction required is 22 dB. Other high reductions required were 20 to 21 dB for the Tripper Trouser Leg discharges and the Tripper southern side opening and entry emissions. Reductions of these magnitudes (20 dB and above) will be difficult to achieve, especially for the Trouser Leg discharges as these sound levels included the impact of coal onto the stockpile.

1.5 Sensitivity of results to variations in measured sound levels

The calculated sound levels were based on measured sound pressure level results converted to sound power levels for use in the model. For most sources these were based on the distance of the measurement location from the source or the area of the source and these were reasonably accurate. Inaccuracy in distance is relevant for calculation of the sound power level of Source S13, the stockpile excavator loading coal. A distance of 50m was assumed. If the distance was 40m, the calculated sound power level would be 2 dB lower, meaning the calculated receiver sound levels would be 2 dB lower. This difference is not significant for the receivers (R1 to R4) with Source 13 as their major contributor – this has calculated received sound levels of up to 48 dBA compared to the 40 dBA objective.

Impact sources are discussed in the next section (section 1.6). Sizer building sound levels included some of its Northern wall opening, so closing that opening will reduce the total.

1.6 Effects of impact noise

The calculations and measurements described above were made for equivalent continuous L_{AEq} sound levels. Impacts of lumps and rocks will cause higher sound levels to be emitted. There are limits in the approval conditions for each site for the 1-percent exceedance sound level $L_{A01.1\text{-minute}}$. These were between 9 and 11 dB above the $L_{AEq.15\text{-minute}}$ long-term night-time objectives for the receivers.

Measurements of source noise included periods with impacts and L_{A01} measurements were obtained – how typical these were of operating conditions is difficult to assess. For some sources the differences were relatively low but for others around the tripper the differences were significant. Values for increases used in the assessment are noted in Table 1.6 below:

Table 1.6 Wollongong Coal Russell Vale - surface noise sources reduction assessment – L_{A01} additions to L_{AEq} values for impacted sources

Source No.	Source No.'s and Descriptions	L_{A01} Addition dB
4 & 8	S4 & 8 Tripper N side	6
5,6, 9 & 10	S5,6,9 & 11 Tripper N end E side Trouser Leg	5
7 & 11	S 7 & 11 Tripper S side entry	10
12	S12 Sizer Building E wall	3
23 & 24	S23 & 24 Tripper S side opening No Coal	5

These values mean that received sound levels could be up to 10 dB above the calculated results for L_{AEq} values shown in Table 1.4. These L_{A01} results have been compared with the L_{A01} objectives and are shown in Table 1.7. The results in Table 1.7 show that the L_{A01} objectives are exceeded for 6 of the 8 receiver sites, however for 5 of these the exceedance is less than 2 dB. Only Receiver C2 has a significant exceedance of the objective of 9dB, caused by the Tripper southern side entry emissions.

Table 1.7: Wollongong Coal Russell Vale - Tripper Conveyor and Surface Noise Assessment Ranked contribution sound levels at receivers for typical worst case conditions Wind 3m/s towards receivers, Neutral Atmosphere. Calculated values with L01 increase for relevant sources

Source No.	Source Description	Received dBA for both Tripper Location								
		C1	C2	C3	C4	C5	R1	R2	R3	R4
1	S1 Conveyor Drive Building North Wall Top	-17	-2	8	-3	-11	25	25	24	23
2	S2 Conveyor Drive building E side Top	1	21	23	19	7	13	12	11	22
3	S3 Conveyor Drive building S side Top including opening	15	24	-5	14	24	4	4	3	3
4	S4 Tripper N end N side	11	31	35	30	19	40	40	40	38
5	S5 Tripper N end E side Trouser Leg	29	47	47	44	37	49	49	48	46
6	S6 Tripper N end W side trouser leg	29	47	47	44	37	49	49	48	46
7	S7 Tripper N end S side entry	34	54	42	48	45	39	40	38	38
8	S8 Tripper S end N side	10	33	35	31	19	40	40	39	37
9	S9 Tripper S end E side Trouser Leg	29	47	47	47	37	48	49	48	46
10	S10 Tripper S end W side trouser leg	29	47	47	47	37	48	49	48	46
11	S11 Tripper S end S side entry	35	56	42	48	43	39	39	38	37
12	S12 Sizer Building E wall	44	41	39	24	41	27	26	27	29
13	S13 Loader on stockpile at night-time	27	30	31	28	27	48	48	47	45
14	S14 Conveyor Building N side 1L down	-19	-5	2	-8	-14	21	22	20	18
15	S15 Conveyor Building E side 1L down	0	16	16	14	5	9	11	8	18
16	S16 Conveyor Building S side 1L down	4	15	-7	0	10	-7	-6	-9	-9
17	S17 Conveyor Building N side 2L down	-22	-11	-1	-12	-18	16	17	15	13
18	S18 Conveyor Building E side 2L down	-5	8	10	6	-1	3	4	1	13
19	S19 Conveyor Building S side 2L down	6	12	-6	-11	10	-8	-5	-10	-11
20	S20 Conveyor Building Stair opening	-8	-1	2	-2	-2	11	11	10	10
21	Sizer Building N wall opening	30	39	37	12	19	38	38	37	35
22	Tripper conveyor belt	-1	17	14	11	9	15	16	15	13
23	Tripper S side opening No Coal Nth End	29	46	36	40	39	34	35	33	32
24	Tripper S side opening No Coal Sth End	29	48	36	41	37	33	34	33	32
25	Door 1 South	27	24	28		25		28		
26	Door 2 Centre	33	30	29		27		28		
27	MVF North	26	29	28	26	17		16		
28	MVF North casing	18	20	28	18	10		21		
29	Compressor House N Wall vents	11	13	14	10	4		17		
30	Substation N of Admin	13	7	13	13	6		17		
	Maximum received source level	44	56	47	48	45	49	49	48	46
	Total for Northern Tripper	45	57	52	51	49	54	54	53	46
	Total for Southern Tripper	45	58	52	53	47	53	54	53	51
	Long-term Objective Night L_{AEq}	38	38	36	36	40	37	37	37	37
	Long-term objective $L_{01.1min}$	47	47	47	47	50	47	47	47	47
	If L_{01} objective exceeded and maximum		**11**	**5**	**6**		**7**	**7**	**6**	

Cells higlighted pink with red text indicate the contribution level exceeds the total $L_{01.1-min}$ objective for the receiver

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1.7 Options for noise control engineering

The sound level measurements and calculation of received sound levels has allowed a ranking of sources at each location and the reduction required in sound levels to achieve objectives and the maximum reduction required for each source was given in Table 1.5.

Methods of treatment have been discussed and provided in the report. Table 1.8 below provides an initial priority, based on exceedance of the contribution objective, how difficult it may be to achieve this level of reduction, and a brief description of the treatment method.

Table 1.8: Wollongong Coal Russell Vale - surface noise sources reduction assessment
Draft priority, maximum reduction and treatment for sources to achieve all receiver objectives

Source	Source Description	Reduction	Comments – Priority & method
1	S1 Conveyor Drive Building North Wall Top	1	Low priority for the moment. Line internally if required with absorption.
4 & 8	Tripper N end N side	10	Medium to High priority. Line internally, vibration isolate impact plate & hangers.
5, 6, 9 & 10	Tripper Trouser Leg discharges	20	High priority. 20 dB reduction is difficult. Source noise includes stockpile impacts. Line chutes internally & cover top.
7 & 11	Tripper N end S side entry	19 - 21	High priority. 21 dB reduction is difficult. Internal impact plate treatment as per S4; Close off or cover opening on South side where possible, consider a lined-tunnel entry, and provide a lined barrier on the Eastern side for the full height of the tripper and from the northern side back about 4m.
12	S12 Sizer Building E wall	16	High priority. 16 dB reduction is difficult for an already lined building, although the lining may be thicker on the chute level than the conveyor drive level. The result includes some N wall opening. Line drive level internally with absorption.
13	S13 Loader on stockpile	24 night 22 evening 18 day	Highest priority. 24 or 22 dB reduction is difficult. Minimise night/evening use. Specify quiet equipment. Include high attenuation exhaust silencers, engine bay covers, air inlet/radiator covers, quiet radiator fan
21	Sizer Building N wall opening	14	High priority. This attenuation is achievable because the wall is open. Close opening with attenuation panels and seal edges.
23	Tripper S side opening No Coal Northern End	16	High priority. 16 dB reduction is difficult. Treatment is the same as for S7.
25 & 26	Workshop Doors	5 to 8	Medium priority. Reduction is easily achievable. Close doors during high noise activities, repair wall holes and/or install 3m barrier along E side of yard to also cover yard activities.
27	MVF North	5	Low priority. 5dB reduction is difficult for an existing silenced fan. Some contribution from fan drive is included. Clad ductwork.
28	MVF North casing	5	Medium priority. Consider absorptive cover for drive pulley, cladding for ductwork.

Application of the above treatment will significantly assist Wollongong Coal to achieve its approval objectives and minimise potential noise annoyance at residential receivers.

2. Introduction and background

Wollongong Coal Limited (formerly Gujarat NRE) operates coal stockpiling and transport activities at its Russell Vale site. The site has environmental approval for upgrades to surface works, including the relatively new tripper conveyor and primary sizer building. Future works include a primary stockpile reclaim system (underneath assumed) to feed a truck loading facility.

Wollongong Coal (formerly Gujarat NRE) has requested assistance from Hatch to identify opportunities for reducing noise emissions and achieving compliance.

The current environmental approval condition for noise is a contribution sound level of 36 to 40 dBA at the nearest residences (depending on receiver location); however this may be currently exceeded, with 44 dBA being measured at some receiver locations at times.

During an initial site visit in mid-August 2013, Hatch provided an outline of a recommended approach to identify the major sources of noise on the tripper conveyor system and determine alternatives to reduce their emissions. This approach has been used by Hatch on similar tasks for materials handling and industrial plants.

The main sources of noise were advised by WCL to be the tripper head chute impacts from unsized coal and rocks. Other sources of potential concern identified during site visits were stockpile mobile equipment, mine ventilation fans, the compressor house and yard mobile equipment. WCL requested that these be included in the discussion and assessment of noise control engineering opportunities.

Hatch assisted with an options design workshop at the site on 1 April 2014 to consider options potentially available for developing control measures for the tripper conveyor head chute. Attendees at the workshop included representatives from Wollongong Coal, EDC (tripper structure design consultants), Department of Planning and Hatch (Refer to the minutes of that workshop).

Measurement of sound levels from the noise sources at the site were obtained during operations with development coal being produced, from April to June 2014. These measurements have enabled quantification of the source sound levels, as available during the type of development production occurring at the time.

This document provides the following:

- results of the source sound level measurements. ,
- a ranking of the contributed sound levels calculated for the receivers,
- calculation of required reduction for each source to achieve the receiver noise objectives, and
- a recommended draft strategy to assess noise reduction options for noise emissions from the tripper system.

The measurements of source sound levels around the tripper and sizer-transfer station were obtained for brief periods of around 60 seconds during transport of development coal. As such the load, volumes and capacities were well below typical operations with a longwall

operating. This needs to be kept in mind while considering the report and allowances made for potentially higher sound levels from some sources during full operation.

This report should be considered as part of a staged strategy as further information becomes available when different treatments may be implemented.

Some terms which will be used and may be helpful in use of the strategy are given in an Appendix A at the rear of the document. The initial scope of work for the study is provided in Appendix B.

3. Sound level measurements – quantification of sources

Measurement of sound levels at normal operating conditions was difficult to achieve at the time of the site visits as the mine was in development phase between longwalls. During this period peak flow-rates of coal from the conveyor were advised to be perhaps a maximum of 1000 tph, compared to 4000 tph during normal production, and many periods without flow occurred in-between peak flow periods.

The approach taken was to measure whenever a reasonable flow rate of coal was expected – there is a likelihood that noise emission levels will be higher with full flow, but the relative contributions from individual source points will be in a similar ranking to that which might be measured.

3.1 Source sound levels

3.1.1 Measurement locations and dates

Measurement of conveyor noise source sound levels during operations with limited coal supply in the period April to June 2014. Noise emissions were limited from the production conveyor system because development work only was occurring. Coal would typically flow at low to medium levels for periods of approximately 1-minute at a time.

Measurements of stockpile mobile equipment coal loading coal trucks was obtained on 1 April 2014 while there was no coal production but the tripper conveyor belt was operating.

On 10 April 2014, sound levels were obtained on the tripper conveyor and at different locations inside the conveyor drive house during operation of the conveyor without coal production. Measurements were also obtained on this day of the Workshop Forklift at stationary high-idle with the reversing alarm operating.

On 27 May, sound levels were obtained of the background sound levels around the Sizer Building/Transfer station with the belt not running, and at locations near the northern mine ventilation fan and around the main compressor building. The electrical substation located just to the north of the Administration Building was also noted at this time to have a tonal noise and this was also measured.

Operating sound levels on the tripper conveyor and around the Sizer Building/ Transfer Station were obtained on the afternoon of 12 June 2014. Coal produced during this period was noted to be of relatively low lump size with few, if any rocks.

Locations of the sources are shown in Figure 1.1. Locations of the sources where measurements were taken are also shown in Figures 3.1 to 3.8.

Results of measurements of sound levels are summarised in Table 3.1. Full one-third octave band spectral data are given in Appendix C.

Measurements of emissions from the northern mine ventilation fan, main compressor house, workshop fork-lift and administration block substation were also obtained.

Sound power levels from each source were calculated based on the measured sound pressure levels. These were provided in Table 1.1.

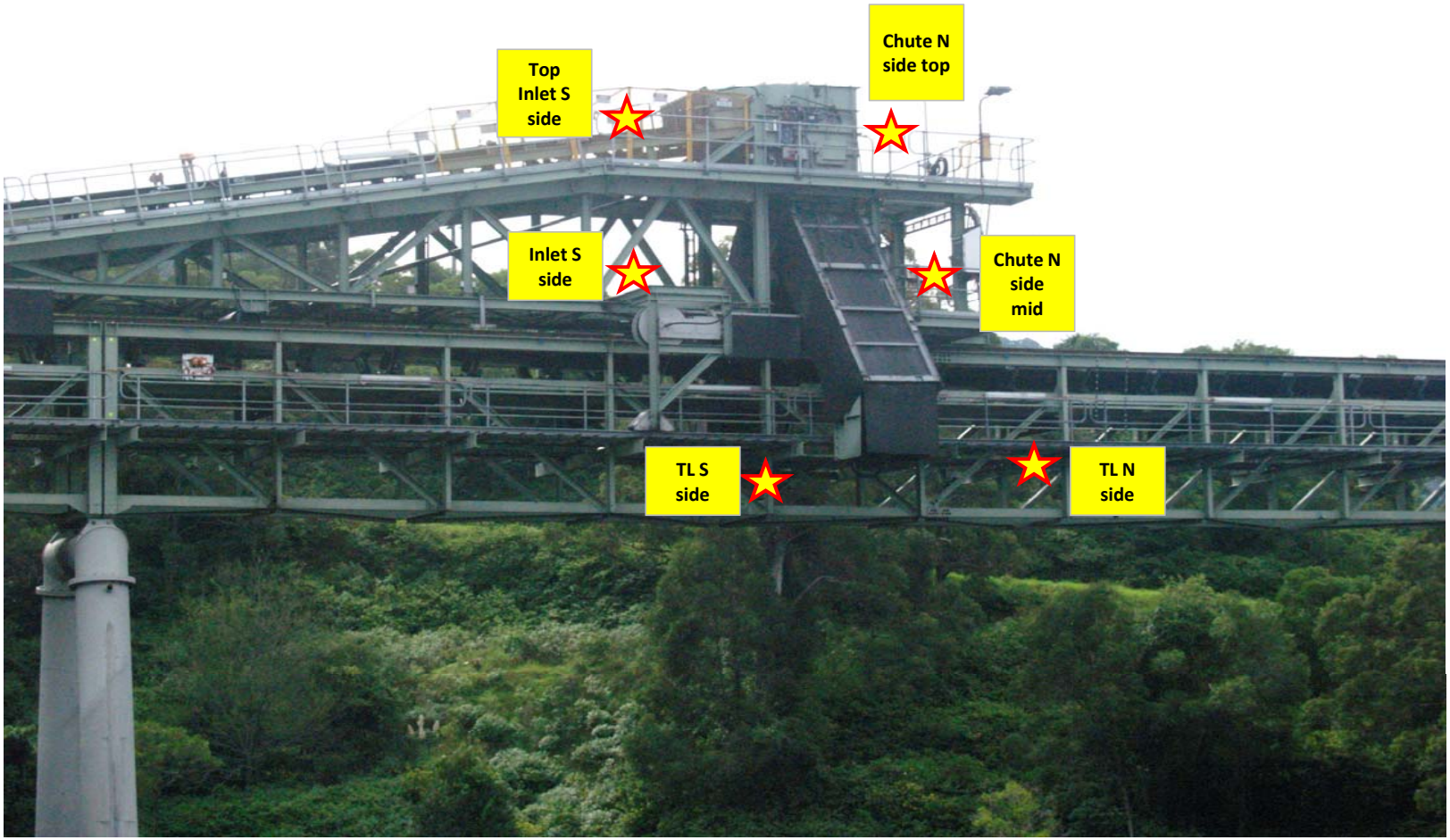


Figure 3.1: View of Tripper and measurement locations for Trouser Leg discharges (TL), Inlet side openings and Northern side

Figure 3.2: View of stockpile conveyor, tripper and conveyor drive house

Figure 3.3: View of the sizer - Transfer Station from the 18m measurement location

Figure 3.4: View of the sizer - Transfer Station from the join to the conveyor gantry

Figure 3.5: View of Mine Ventilation Fans and measurement locations

Figure 3.6: View of Comprerssor House and Northern Wall vents measurement location

Figure 3.7: View of Excavator Coal loader on stockpile on 1 April 2014 from measurment location

Figure 3.8: Stockpile Noise Monitoring Location – Distance is 65 m from tripper

Table 3.1: Wollongong Coal Ltd - Russell Vale Site: Tripper Conveyor and some surface equipment sound level measurements April, May and June 2014

Table 3.1 A: Results of measurements on 1 and 10 April 2014 (Yellow highlighted cells are Z-weighted measurements)

Location	File No.	Time	Period dd:hh:mm:ss	Measured Sound Levels - dB					Comments
				LAEq	LA01	LA10	LA90	LCEq	
Measurements 1 April 2014									
Stockpile excavator loading coal to truck ~50m	3	3:10 PM	00d 00:04:00	65	68	67	61	75	
Measurements 10 April 2014									
Drive house Top Level									
Doorway E side	5	11:03 AM	00d 00:00:30	84	85	85	84	95	
2m inside SE corner	6	11:04 AM	00d 00:00:30	84	85	85	84	92	
2m inside E wall centre	7	11:05 AM	00d 00:00:33	84	86	85	84	92	
2m inside NE corner	8	11:06 AM	00d 00:00:30	84	85	85	84	93	
2m inside N wall centre	9	11:07 AM	00d 00:00:44	85	86	86	85	93	
2m inside NW corner	10	11:08 AM	00d 00:00:30	86	87	87	86	93	
2m inside W wall centre opp motor @ 3m	11	11:09 AM	00d 00:00:31	87	88	87	86	94	
2m inside SW corner	12	11:10 AM	00d 00:00:39	87	88	87	86	93	
Gearbox @ 1m W side	13	11:11 AM	00d 00:00:32	89	90	90	88	98	
Gearbox S end @ 0.8m	14	11:12 AM	00d 00:00:31	88	88	88	88	94	
Motor W side @ 1m	15	11:13 AM	00d 00:00:34	89	90	90	89	95	
Motor N end @ 1m	16	11:13 AM	00d 00:00:32	88	88	88	87	97	
Doorway W side	17	11:14 AM	00d 00:00:31	86	87	86	85	94	
Drive house 1 level below top									
2m inside E wall centre by stairs	18	11:16 AM	00d 00:00:32	83	84	83	82	93	
2m inside N wall centre	19	11:17 AM	00d 00:00:34	82	83	83	82	91	
2m inside W wall centre opp motor @ 3m	20	11:17 AM	00d 00:00:31	83	83	83	82	90	
2m inside S wall centre by belt E side	21	11:18 AM	00d 00:00:31	83	84	84	83	91	
Drive house 2 levels below top									
Floor area SE corner by stair	22	11:19 AM	00d 00:00:43	78	79	78	77	88	
Inside NW corner @ 2m	23	11:20 AM	00d 00:00:31	77	78	77	76	88	
2m to W side centre by opening in wall	24	11:21 AM	00d 00:00:30	77	78	77	76	87	
S side centre by E side belt	25	11:22 AM	00d 00:00:36	79	81	80	78	92	
2 flights down on stair by bottom of wall sheeting									
On stairway	26	11:23 AM	00d 00:00:42	72	74	73	72	82	

Table 3.1: Wollongong Coal Ltd - Russell Vale Site: Tripper Conveyor and some surface equipment sound level measurements April, May and June 2014

Table 3.1 A: Results of measurements on 1 and 10 April 2014 (Yellow highlighted cells are Z-weighted measurements)

Location	File No.	Time	Period dd:hh:mm:ss	Measured Sound Levels - dB					Comments
				LAEq	LA01	LA10	LA90	LCEq	
On Tripper No coal									
On E walkway under TL chute @ 1m	27	11:27 AM	00d 00:00:49	70	71	71	70	88	
S end tripper stairs access	28	11:28 AM	00d 00:00:33	66	67	66	65	79	
At portal to covered conveyor @ 2m, 1m to belt	29	11:29 AM	00d 00:00:30	71	72	72	71	80	
Top Level of Tripper No Coal									
E side Entry to hood @ 1m, 0.5m to belt	30	11:35 AM	00d 00:00:31	76	77	76	75	93	
E side by Inspection hatch @ 0.8m	31	11:36 AM	00d 00:00:30	71	72	71	70	84	
N side @ 1m	32	11:36 AM	00d 00:00:32	67	68	67	66	84	
W side inspection hatch @ 0.8m	33	11:37 AM	00d 00:00:41	70	71	71	69	84	
W side Entry to hood @ 1m, 0.5m to belt	34	11:38 AM	00d 00:00:30	77	77	77	76	95	
W side @ 3m to entry, 0.5m to belt	35	11:39 AM	00d 00:00:30	75	76	75	75	91	
W side @ 6m to entry, 0.5m to belt	36	11:40 AM	00d 00:00:30	73	74	73	72	86	
Tripper Mid level No coal									
N side @ 1m	37	11:41 AM	00d 00:00:30	69	70	69	68	85	
1m N of E TL	38	11:42 AM	00d 00:00:33	68	69	68	67	80	
Logger location 1-min No coal or loading									
	39	12:50 PM	00d 00:01:01	56	57	56	55	70	
Forklift Reverse Alarm									
Rear @ 7m	40	1:19 PM	00d 00:00:35	74					
45^{o} rear @ 7m	41	1:19 PM	00d 00:00:30	69					

Table 3.1: Wollongong Coal Ltd - Russell Vale Site: Tripper Conveyor and some surface equipment sound level measurements April, May and June 2014

Table 3.1 B: Results of measurements on 27 May 2014 (Yellow highlighted cells are Z-weighted measurements)

Location	File No.	Time	Period dd:hh:mm:ss	Measured Sound Levels - dB					Comments
Measurements 27 May 2014				**LAEq**	**LA01**	**LA10**	**LA90**	**LCEq**	
Transfer Point @ 16m Background	44	2:55 PM	00d 00:00:34	47	55	51	40	55	Background, belt off, birds, people, stockpile area vehicles
Transfer Point @ 16m Background	45	3:05 PM	00d 00:02:01	43	53	44	38	54	-----
Transfer Point @ pole 50m Background	46	3:10 PM	00d 00:02:00	45	53	47	41	56	-----
Substation N of Admin @ 12.4m	47	3:35 PM	00d 00:00:24	52	53	53	52	66	Tone @ 100 Hz
Comp House S doorway Open	48	3:48 PM	00d 00:01:00	80	82	81	80	86	S doorway half open
Comp house S wall @ 1m	49	3:49 PM	00d 00:00:27	68	70	69	68	78	Some leakage through small hole and out of S doorway
Comp House N doorway closed @ 2m	50	3:50 PM	00d 00:00:30	71	73	72	71	81	S doorway half open
Comp house N man doorway open	51	3:51 PM	00d 00:00:28	84	85	84	83	91	Comp noise & vent fan noise
Comp House between N comps	52	3:52 PM	00d 00:00:30	89	91	90	88	96	Both on
Comp House N wall by wall vents @ 2m, exhaust vents 3.2m above	53	3:54 PM	00d 00:00:35	82	83	82	82	88	Vents & door open
Comp House N wall @ 8m	54	3:55 PM	00d 00:00:29	80	81	80	79	84	Vents & door open
Comp House S door closed @ 2m	55	3:57 PM	00d 00:00:34	69	70	70	68	78	All doors closed
Comp House E wall centre @ 8m	56	3:58 PM	00d 00:00:27	63	64	64	62	75	All doors closed
MVF North @ 12m to discharge, 8.2m to side S fan	57	4:05 PM	00d 00:00:40	73	74	74	73	85	No tones apparent. Minor wind buffeting
MVF North @ 12m to discharge, 8.2m to side S fan, out of wind	58	4:06 PM	00d 00:01:00	72	73	73	72	84	Out of wind, no buffeting
MVF North @ 12m to discharge, 8.2m to side S fan, out of wind	59	4:08 PM	00d 00:00:30	72	73	73	72	84	Record A wt
MVF North @ 12m to discharge, 8.2m to side S fan, out of wind Zwt	60	4:08 PM	00d 00:00:31	90	96	93	87	84	Record Z wt
MVF South Drive Belt side @ 2m	61	4:12 PM	00d 00:00:34	80	81	81	80	87	3m to drive stand
MVF South fan casing @ 1.5m	62	4:13 PM	00d 00:00:20	79	80	79	78	88	-----
MVF South fan 2m to scroll @ 1.5m	63	4:14 PM	00d 00:00:21	74	75	75	74	86	-----
MVF South fan 2m to inlet scroll & exp joint	64	4:14 PM	00d 00:00:27	74	75	74	74	85	-----

Table 3.1: Wollongong Coal Ltd - Russell Vale Site: Tripper Conveyor and some surface equipment sound level measurements April, May and June 2014

Table 3.1 B: Results of measurements on 27 May 2014 (Yellow highlighted cells are Z-weighted measurements)

Location	File No.	Time	Period dd:hh:mm:ss	Measured Sound Levels - dB					Comments
Measurements 27 May 2014				**LAEq**	**LA01**	**LA10**	**LA90**	**LCEq**	
MVF North fan 2m to inlet scroll & exp joint S side & 4m to drive motor end	65	4:15 PM	00d 00:00:28	79	80	80	78	86	-----
MVF North fan 1m to fan casing and drive motor end	66	4:16 PM	00d 00:00:19	83	84	84	83	90	-----
MVF North fan 1m to side drive motor end	67	4:16 PM	00d 00:00:25	84	85	85	84	88	-----
MVF North fan 2m to side drive belt	68	4:17 PM	00d 00:00:23	85	85	85	84	86	Belt is a bit squeaky
MVF North fan 1m to side fan casing scroll	69	4:17 PM	00d 00:00:21	76	77	77	75	85	-----
MVF North fan 2m to side fan inlet casing & inlet exp joint	70	4:18 PM	00d 00:00:23	73	73	73	72	84	-----
Small substation 110m from fans towards washery site	71	4:29 PM	00d 00:00:31	47	49	48	46	61	-----
Small substation 110m from fans towards washery site	72	4:30 PM	00d 00:00:20	47	49	48	46	62	-----
Small substation 110m from fans towards washery site Zwt	73	4:30 PM	00d 00:00:21	67	69	68	65	62	Record Z wt
Small substation 110m from fans towards washery site	74	4:31 PM	00d 00:00:25	47	48	47	46	62	-----

Table 3.1: Wollongong Coal Ltd - Russell Vale Site: Tripper Conveyor and some surface equipment sound level measurements April, May and June 2014

Table 3.1 C: Results of measurements on 12 June 2014

Measurement results adjusted for extension microphone calibration difference Yellow highlighted cells are Z-weighted measurements

Location	File No.	Time	Period dd:hh:mm:ss	Measured Sound Levels - dB					Comments
Measurements 12 June 2014				**LAEq**	**LA01**	**LA10**	**LA90**	**LCEq**	
Transfer Point Power Pole, 51m to join, 67m to Transfer Bld	75	2:37 PM	00d 00:03:01	55	57	56	53	66	Belt on, occasional coal not significant
Post opposite join 18m	76	2:41 PM	00d 00:02:01	60	61	61	59	72	Belt on, occasional coal not significant
Post opposite join 18m	77	2:44 PM	00d 00:01:03	68	69	68	66	77	Belt on, occasional coal not significant, Drive house higher than transfer
Post opposite join 18m	78	2:45 PM	00d 00:01:00	68	72	69	67	78	Belt on, occasional coal not significant up to 72
E side Transfer Bld @ 5m	79	2:48 PM	00d 00:01:01	72	73	73	71	82	Strong tone from drive 200Hz
E side Transfer Bld @ 5m	80	2:54 PM	00d 00:03:55	74	75	74	73	83	Some coal at times
Inside Transfer, 1m E side of chute	81	3:00 PM	00d 00:00:44	83	84	84	82	93	No coal - drive noise from above
Drive level NE corner, 2.4m to E Gearbox	82	3:02 PM	00d 00:01:00	94	96	95	93	98	Drive noise only
Drive level 1m side E Gearbox	83	3:04 PM	00d 00:00:18	103	104	103	103	110	Drive noise only
Drive level 0.6m side E Fluid Coupling	84	3:05 PM	00d 00:00:22	98	99	99	98	104	Drive noise only
Drive level 1.5m end E motor	85	3:05 PM	00d 00:00:21	93	95	94	93	99	Drive noise only
Drive level 1m End W Gearbox	86	3:06 PM	00d 00:00:21	93	94	94	93	98	Drive noise only
Drive level 1m side W Gearbox	87	3:07 PM	00d 00:00:20	97	98	98	96	101	Drive noise only
Drive level 0.6m side W Fluid Coupling	88	3:07 PM	00d 00:00:25	98	100	99	96	105	Drive noise only
Drive level 1m end W motor	89	3:08 PM	00d 00:00:30	90	91	90	89	96	Drive noise only
At N side opening in N wall	90	3:10 PM	00d 00:00:36	85	86	86	84	92	Opening ~ 6mwide & 5m high. Drive noise
E side Transfer Bld @ 5m	91	3:12 PM	00d 00:00:37	81	83	82	80	80	Record Z wt
Transfer Point Power Pole, 51m to join, 67m to Transfer Bld	92	3:14 PM	00d 00:01:00	54	56	55	54	66	Record A wt
Stockpile Logger Location	93	3:29 PM	00d 00:00:41	71	73	72	69	70	No coal - belt & drive house noise, record

Table 3.1: Wollongong Coal Ltd - Russell Vale Site: Tripper Conveyor and some surface equipment sound level measurements April, May and June 2014

Table 3.1 C: Results of measurements on 12 June 2014

Measurement results adjusted for extension microphone calibration difference Yellow highlighted cells are Z-weighted measurements

Location	File No.	Time	Period dd:hh:mm:ss	Measured Sound Levels - dB					Comments
Measurements 12 June 2014				**LAEq**	**LA01**	**LA10**	**LA90**	**LCEq**	
Stockpile Logger Location	94	3:31 PM	00d 00:01:01	56	56	56	55	70	No coal - belt & drive house noise
Stockpile Logger Location	95	3:34 PM	00d 00:01:00	60	64	62	59	69	Coal out at high rate
Tripper Gantry - top 1.5m to belt entry	96	3:52 PM	00d 00:00:39	77	78	78	77	96	No coal
Tripper Gantry - top 1m to E side of chute	97	3:52 PM	00d 00:00:30	69	70	70	69	80	No coal
Tripper Gantry - top 1m to N side of chute	98	3:53 PM	00d 00:00:43	66	67	67	66	80	No coal, belt noise impact on rolls
Tripper Gantry - top 1m to W side of chute	99	3:54 PM	00d 00:00:29	69	70	69	68	83	No coal
Tripper Gantry - top 1.5m to belt entry	100	3:57 PM	00d 00:00:30	80	82	81	79	92	Coal on, not many lumps, belt ~ 1/3rd to half full
Tripper Gantry - top 1m to E side chute & above impact point	101	3:58 PM	00d 00:00:25	83	87	86	80	88	Coal on, not many lumps, belt ~ 1/3rd to half full
Tripper Gantry - top 1.5m to belt entry	102	3:59 PM	00d 00:00:31	96	98	97	96	95	No coal, record Z, tone 63 Hz
Tripper Gantry - top 1m to E side of chute	103	4:00 PM	00d 00:00:30	86	87	87	85	85	No coal, record Z, tone 63 Hz
E Trouser Leg discharge @ 1m N	106	4:45 PM	00d 00:00:29	71	72	72	71	92	Level with discharge, no coal, water fall noise
E Trouser Leg - under @ 1m centre	107	4:47 PM	00d 00:00:33	73	74	73	72	86	Under chute - belt roller impact noise
E side 2m S of Chute box	108	4:48 PM	00d 00:00:40	75	78	75	74	88	Belt noise
E Trouser Leg Top surface @ 400mm from N side walkway	109	4:51 PM	00d 00:00:25	67	68	68	67	85	~1/2 up leg from bottom
Noisy idler N of chute @ 1m	110	4:53 PM	00d 00:00:33	72	74	73	71	81	From walkway
Compare Fixed & Extension mic at same loc 3m E of belt inside drive house	111	5:18 PM	00d 00:00:30	86	89	87	85	99	-
Compare Fixed & Extension mic at same loc 3m E of belt inside drive house	112	5:21 PM	00d 00:00:38	85	87	86	85	96	-

Table 3.1: Wollongong Coal Ltd - Russell Vale Site: Tripper Conveyor and some surface equipment sound level measurements April, May and June 2014

Table 3.1 C: Results of measurements on 12 June 2014

Measurement results adjusted for extension microphone calibration difference Yellow highlighted cells are Z-weighted measurements

Location	File No.	Time	Period dd:hh:mm:ss	Measured Sound Levels - dB					Comments
Measurements 12 June 2014				**LAEq**	**LA01**	**LA10**	**LA90**	**LCEq**	
E doorway by belt on walkway	113	5:22 PM	00d 00:00:41	84	86	85	83	97	Drive noise
E Trouser Leg discharge @ 1m N	114	6:35 PM	00d 00:00:20	86	91	88	84	93	Coal on, 2m to impact zone
E Trouser Leg Top surface @ 400mm from N side walkway	115	6:36 PM	00d 00:00:21	79	82	81	77	83	Coal on
E Trouser Leg - under @ 1m centre	116	6:36 PM	00d 00:00:21	88	92	90	82	92	Coal on - most noise from drop impact at stockpile
E side 2m S of Chute box	117	6:43 PM	00d 00:00:24	84	94	85	80	91	Coal on
E Trouser Leg Top surface @ 400mm from S side walkway	118	6:44 PM	00d 00:00:19	81	84	82	80	84	Coal on
E Trouser Leg discharge @ 1m S	119	6:45 PM	00d 00:00:09	85	91	88	78	93	Coal on, 2-3m to impact zone
Mid-level of N side Chute 1m to wall	120	6:51 PM	00d 00:00:31	69	70	70	69	85	No coal
Mid-level of N side Chute 1m to wall	121	6:52 PM	00d 00:01:08	75	83	78	71	86	Some coal
E Trouser Leg Top surface @ 500mm from N side Mid level	122	6:54 PM	00d 00:00:30	70	71	70	69	91	No coal
E Trouser Leg Top surface @ 500mm from N side Mid level	123	6:55 PM	00d 00:00:38	71	75	73	70	89	Some coal
Mid-level of N side Chute 1m to wall	124	6:57 PM	00d 00:01:20	73	81	75	69	89	Some coal
Mid-level of N side Chute 1m to wall	125	7:00 PM	00d 00:00:52	81	86	83	78	87	High flow coal
Tripper Gantry - top 1m to N side of chute	126	7:03 PM	00d 00:00:21	66	67	67	66	84	No coal
Tripper Gantry - top walkway level E side of belt level with top of inlet	127	7:10 PM	00d 00:00:28	82	83	83	82	96	No coal - gets belt opening area noise
Tripper Gantry - top 1m to N side of chute	128	7:31 PM	00d 00:00:32	77	81	78	75	82	Coal
Tripper Gantry - top walkway level E side of belt level with top of inlet	129	7:32 PM	00d 00:00:19	87	91	89	85	93	Coal on gets belt opening noise

The sound power levels calculated ranged from 74 dBA (88 dBC) for part of the conveyor drive building, to 105 dBA for both the stockpile excavator loading coal trucks (116 dBC) and the compressor house northern wall vents (109 dBC).

3.1.2 Frequency Spectra

One-third octave band spectra were also obtained for each measurement. These are relevant in considering the tonality of the sources and the differences between coal and no coal production through the system.

Sizer Building - Transfer Station sound level spectra are shown in Figure 3.9 and 3.10. The legend shows whether coal was flowing, the location, file number and L_{AEq} sound level. External sound levels show a strong tone at 250 Hz, both inside and outside the building. This tone exceeds the tonality limits of the Industrial Noise Policy – the tonality difference is up to 16 dB outside the building, compared to the limit of 8 dB. The tonality appears to be caused by drive gearbox noise emissions and close to the building this noise tends to mask the impact noise of coal in the transfer chute. There is a large opening on the northern side of the building at its connection to the conveyor portal. This opening is approximately 5m high and 6m wide and provides a major leakage point for noise from the conveyor drives to escape from the building.

Tripper area sound level spectra are shown in Figures 311 to 3.14. There are tones evident in the 63 Hz and 125 Hz bands but these do not exceed tonality limits. There is a difference between coal flowing and not flowing and this has been compared for similar locations in Figures 3.15 to 3.22. For most locations around the Tripper, the differences in Coal on to Coal off were not significant at frequencies below around 150 Hz – this similar level region is considered to be caused by belt travel noise which would not change significantly. The differences also depended on the location, but for most there was typically a 15 dB difference at middle parts of the spectrum between sound levels with coal on and those without coal.

Tripper Conveyor Drive House internal sound level spectra are shown in Figures 3.23 to 3.26. Spectra are relatively smooth with some minor tonality at 125 Hz from the drive.

The **Electrical substation** spectrum is shown in Figure 3.27. Tones are seen at 100 Hz and harmonics of that.

Compressor House wall vent spectra are shown in Figure 3.28. Highest levels and tonality occur at 8m from the Northern wall vents.

Spectra for the **Northern Mine Ventilation Fan** discharge and casing are shown in Figure 3.29 and 3.30. The spectra appear to be relatively smooth and broad-band with no tonality apparent. Casing and drive-belt noise spectra are shown in Figure 3.31. Figure 3.32 provides a tonality assessment of the mine vent fan, compressor house and substation sources in terms of sound power level. This shows that only the substation is considered to be tonal. If the received sound levels are less than the contribution objective then the tonality will not be an issue.

The spectra for the workshop Fork-lift truck operating at high idle are shown in Figure 3.33. This shows a relatively smooth spectrum with a tone from the alarm at 1000 Hz.

Figure 3.9: Wollongong Coal Noise 12 June 2014 - Transfer House Area - outside

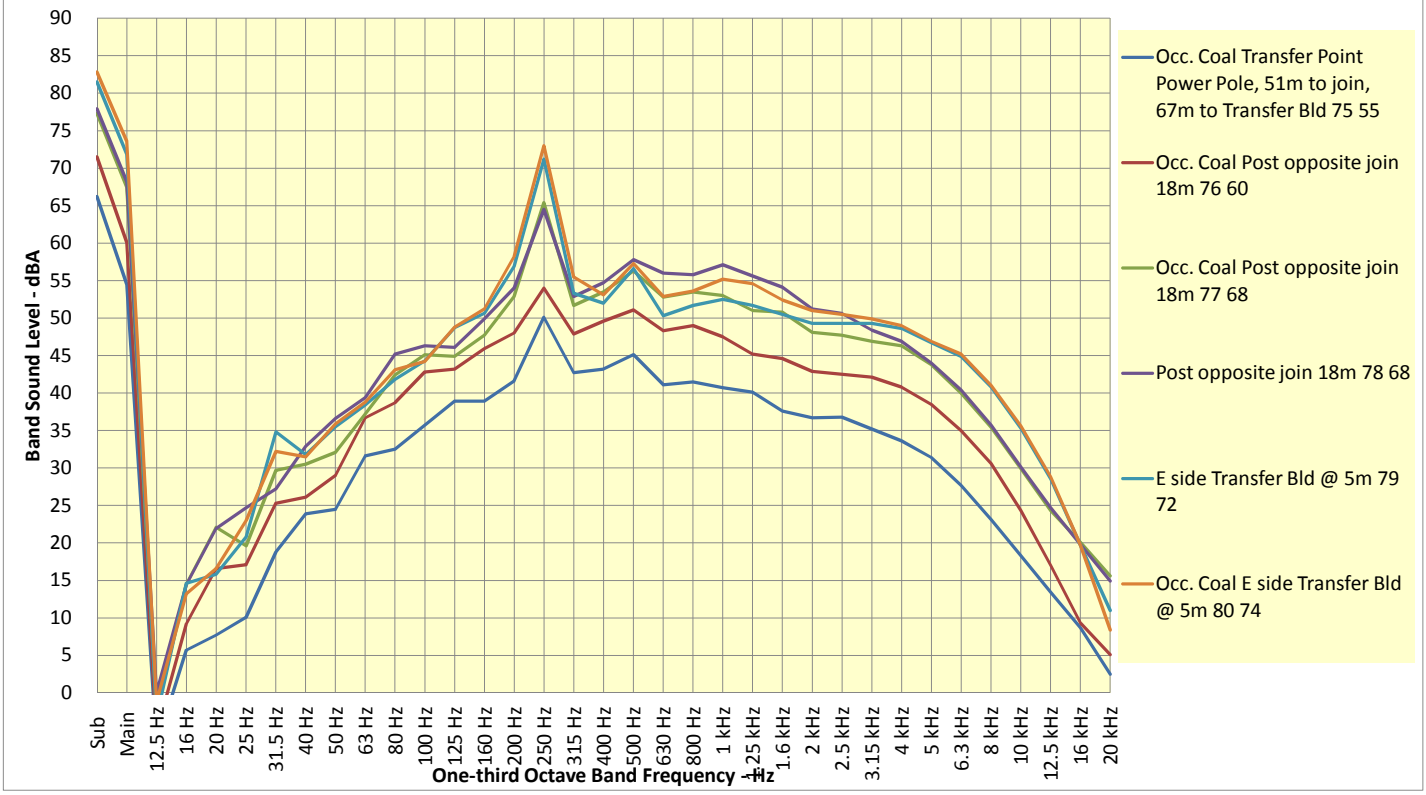
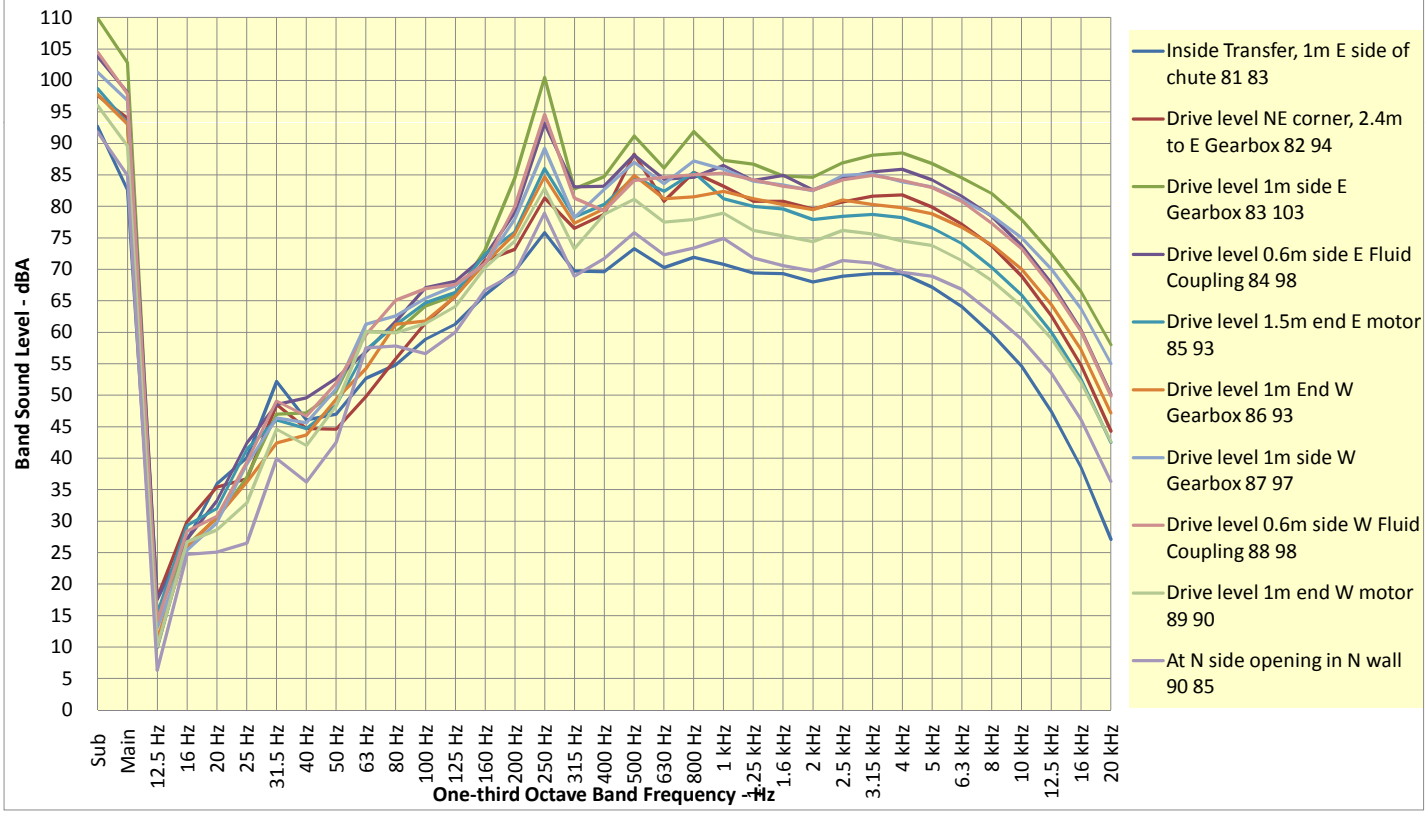


Figure 3.10: Wollongong Coal Noise 12 June 2014 - Transfer House Area - inside



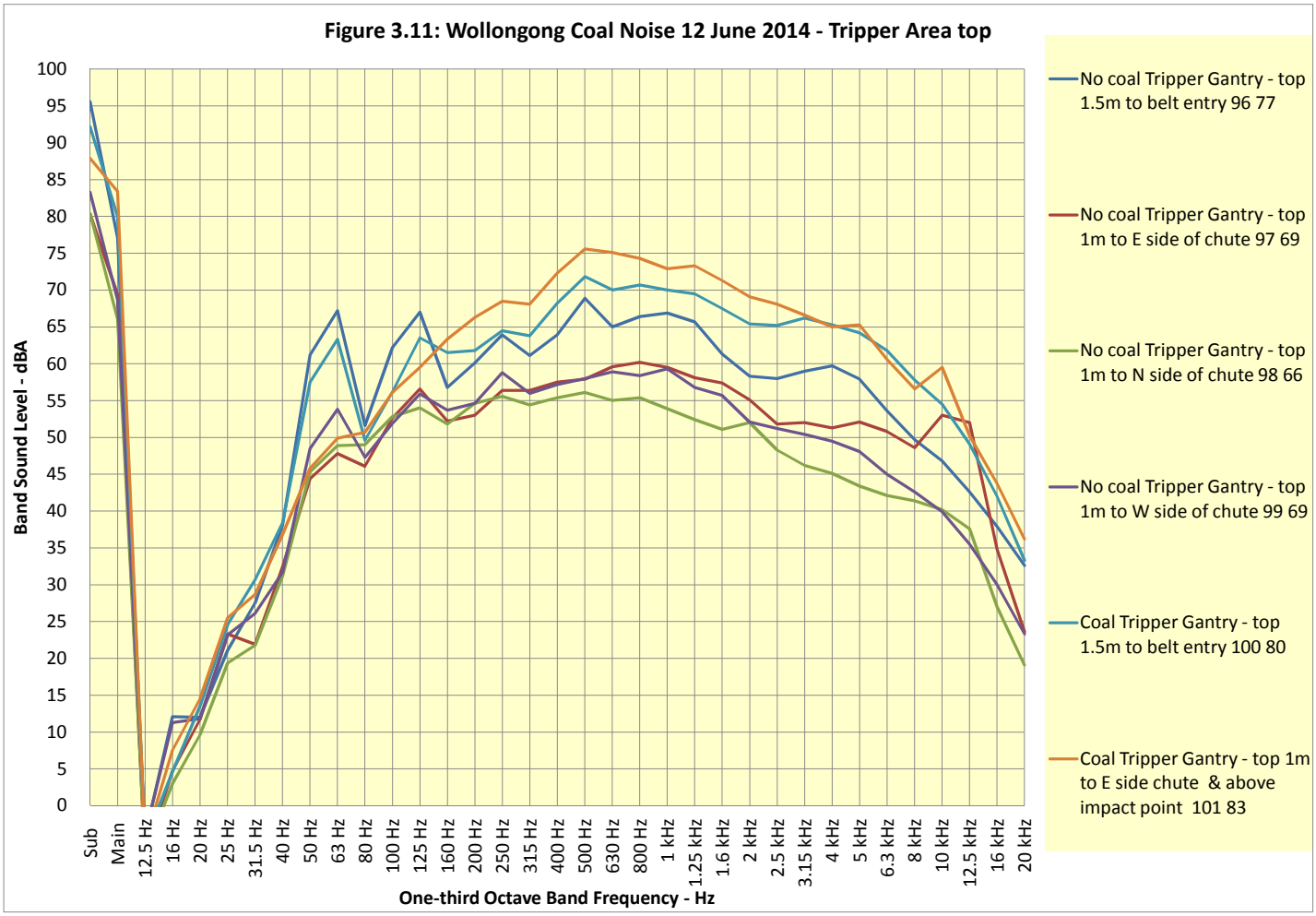


Figure 3.11: Wollongong Coal Noise 12 June 2014 - Tripper Area top
Band Sound Level - dBA
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
Sub
Main
12.5 Hz
16 Hz
20 Hz
25 Hz
31.5 Hz
40 Hz
50 Hz
63 Hz
80 Hz
100 Hz
125 Hz
160 Hz
200 Hz
250 Hz
315 Hz
400 Hz
500 Hz
630 Hz
800 Hz
1 kHz
1.25 kHz
1.6 kHz
2 kHz
2.5 kHz
3.15 kHz
4 kHz
5 kHz
6.3 kHz
8 kHz
10 kHz
12.5 kHz
16 kHz
20 kHz
One-third Octave Band Frequency - Hz
No coal Tripper Gantry - top 1.5m to belt entry 96 77
No coal Tripper Gantry - top 1m to E side of chute 97 69
No coal Tripper Gantry - top 1m to N side of chute 98 66
No coal Tripper Gantry - top 1m to W side of chute 99 69
Coal Tripper Gantry - top 1.5m to belt entry 100 80
Coal Tripper Gantry - top 1m to E side chute & above impact point 101 83

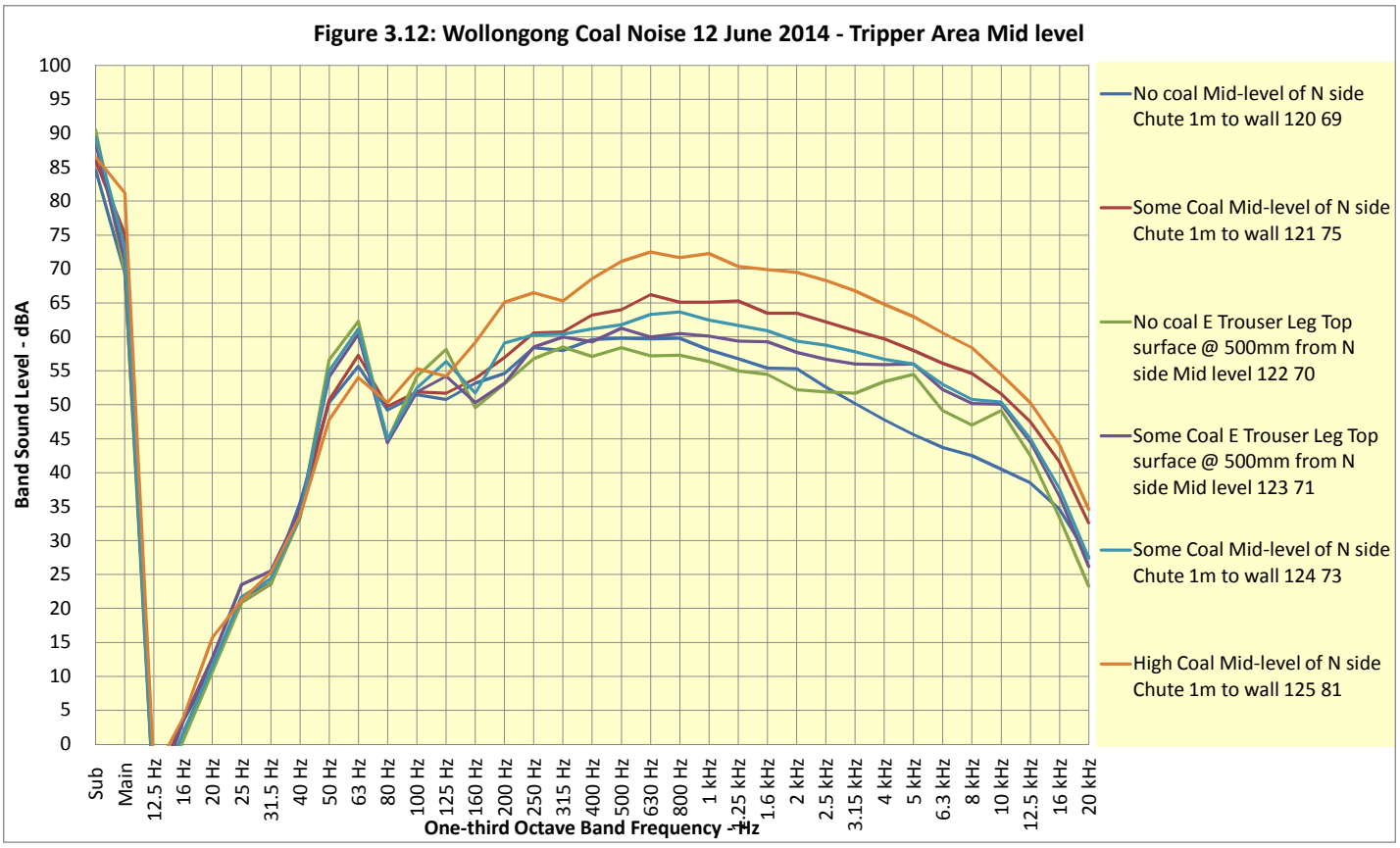


Figure 3.12: Wollongong Coal Noise 12 June 2014 - Tripper Area Mid level
Band Sound Level - dBA
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
Sub
Main
12.5 Hz
16 Hz
20 Hz
25 Hz
31.5 Hz
40 Hz
50 Hz
63 Hz
80 Hz
100 Hz
125 Hz
160 Hz
200 Hz
250 Hz
315 Hz
400 Hz
500 Hz
630 Hz
800 Hz
1 kHz
1.25 kHz
1.6 kHz
2 kHz
2.5 kHz
3.15 kHz
4 kHz
5 kHz
6.3 kHz
8 kHz
10 kHz
12.5 kHz
16 kHz
20 kHz
One-third Octave Band Frequency - Hz
No coal Mid-level of N side Chute 1m to wall 120 69
Some Coal Mid-level of N side Chute 1m to wall 121 75
No coal E Trouser Leg Top surface @ 500mm from N side Mid level 122 70
Some Coal E Trouser Leg Top surface @ 500mm from N side Mid level 123 71
Some Coal Mid-level of N side Chute 1m to wall 124 73
High Coal Mid-level of N side Chute 1m to wall 125 81

Figure 3.13: Wollongong Coal Noise 12 June 2014 - Tripper Area Trouser Leg - No coal

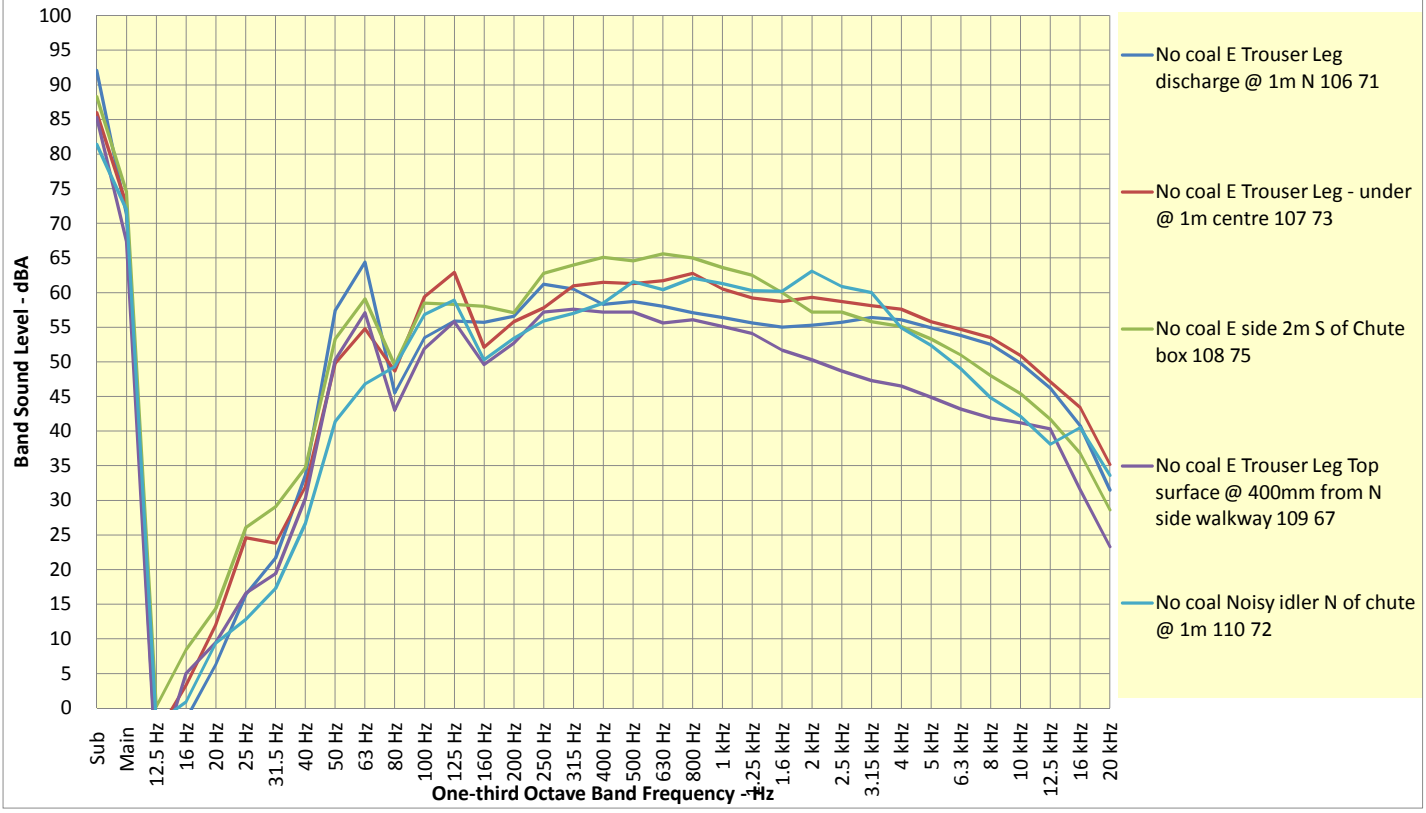


Figure 3.14: Wollongong coal Noise 12 June 2014 - Tripper Area trouser leg - Coal

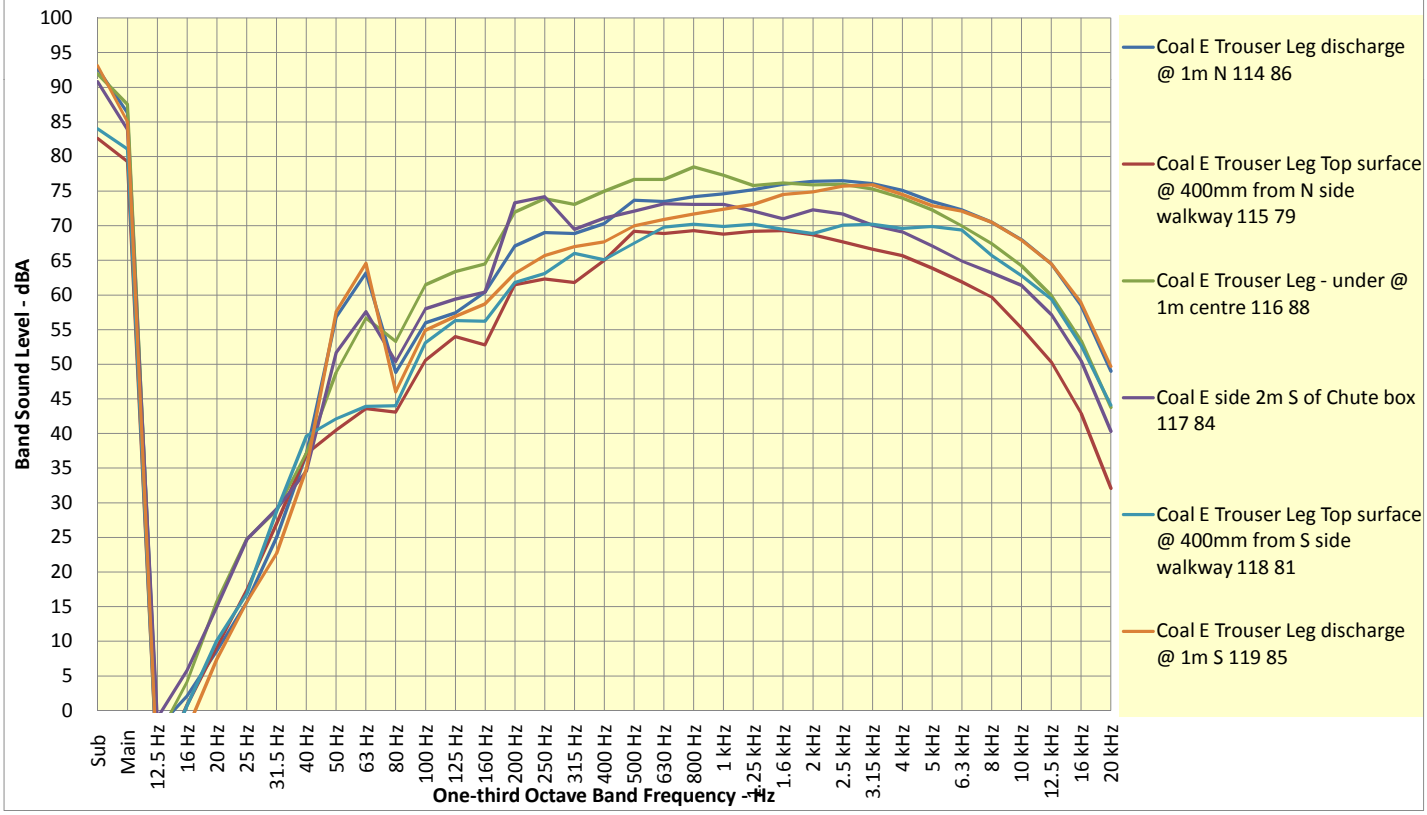


Figure 3.15: Wollongong Coal - Tripper Conveyor Comparing Sound Levels at Locations with Coal and without Gantry top 1.5m to belt entry

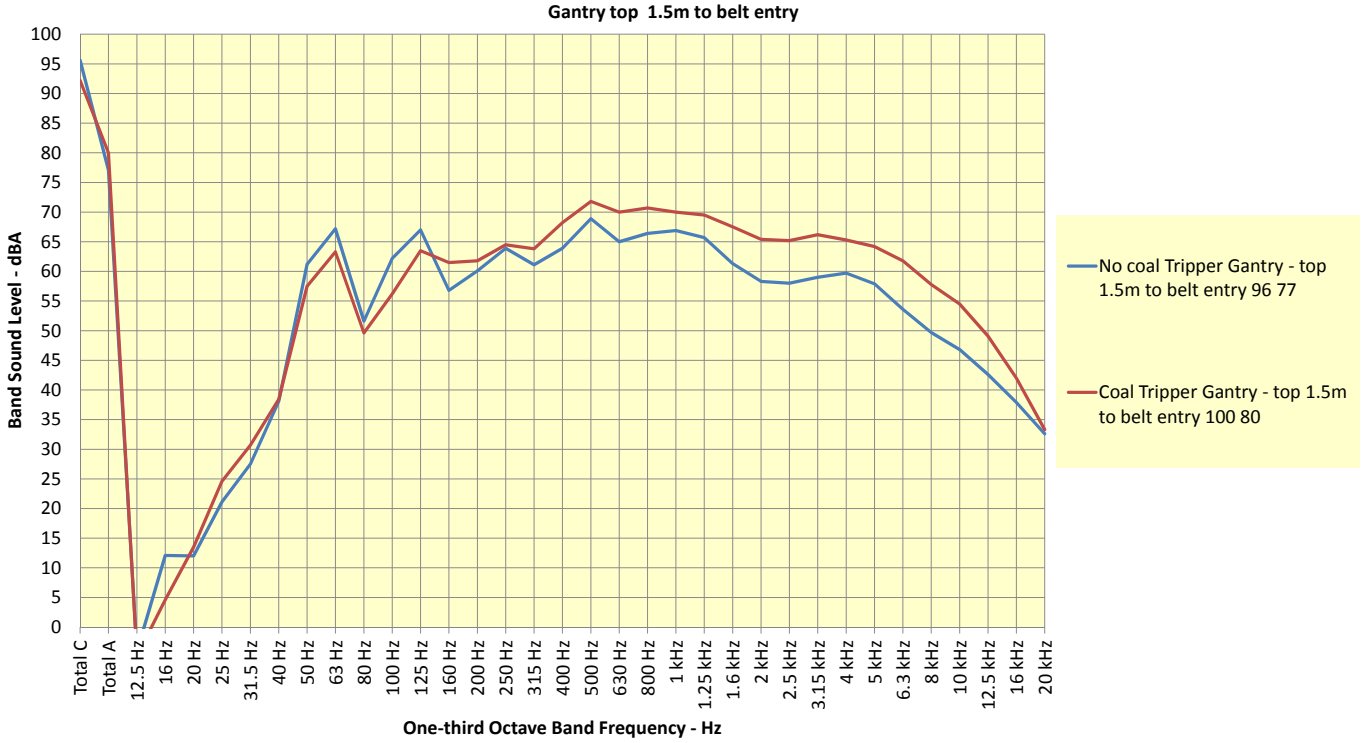


Figure 3.16: Wollongong Coal - Tripper Conveyor Comparing Sound Levels at Locations with Coal and without Gantry top E side of chute

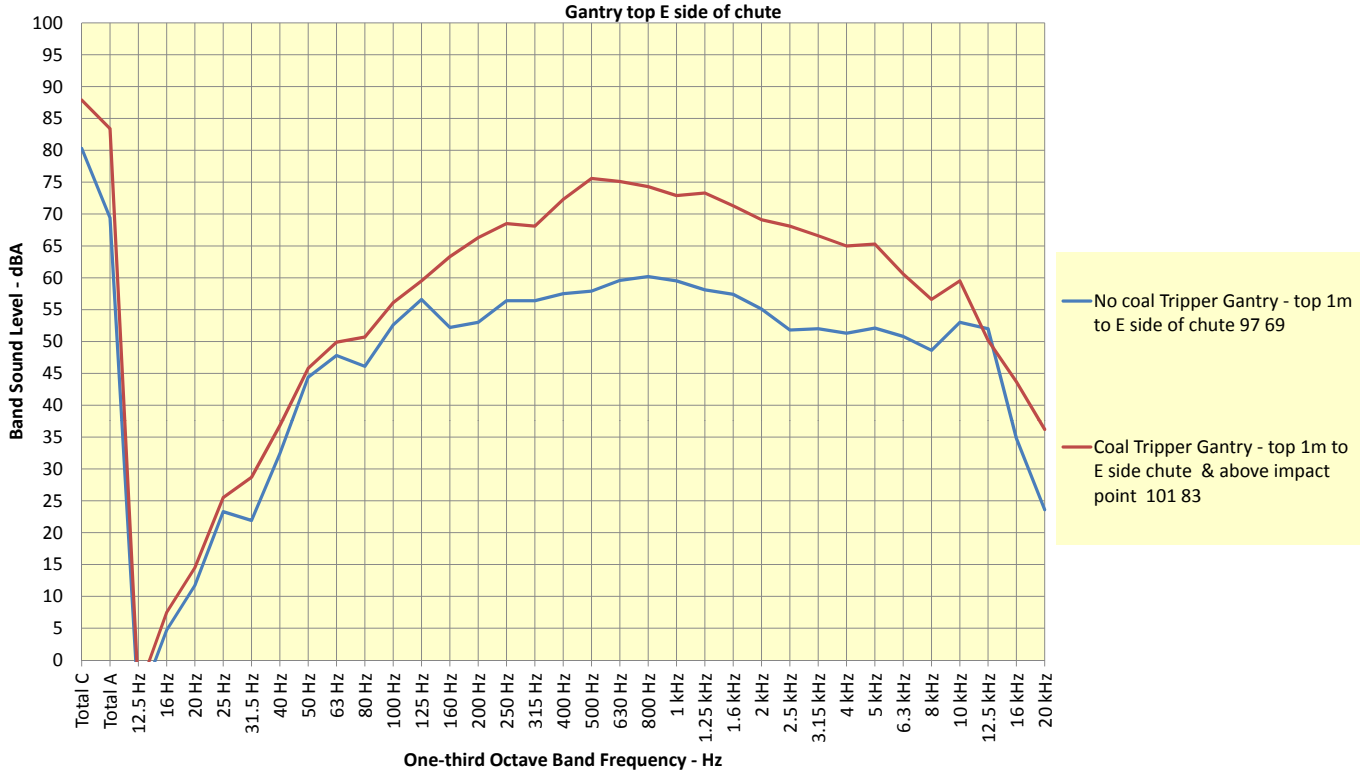


Figure 3.17: Wollongong Coal - Tripper Conveyor Comparing Sound Levels at Locations with Coal and without Gantry Top N side of chute

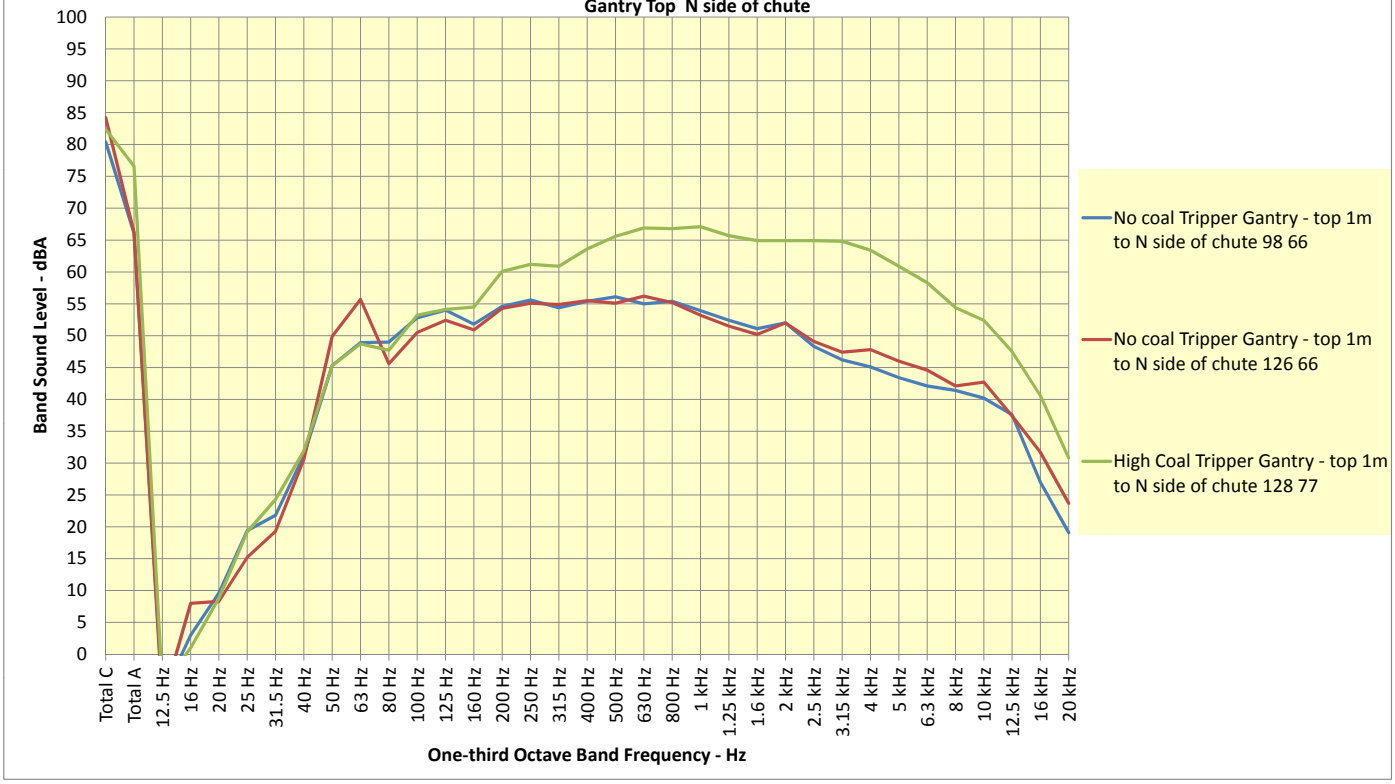


Figure 3.18: Wollongong Coal - Tripper Conveyor Comparing Sound Levels at Locations with Coal and without Main walkway level - at sides of trouser leg discharges

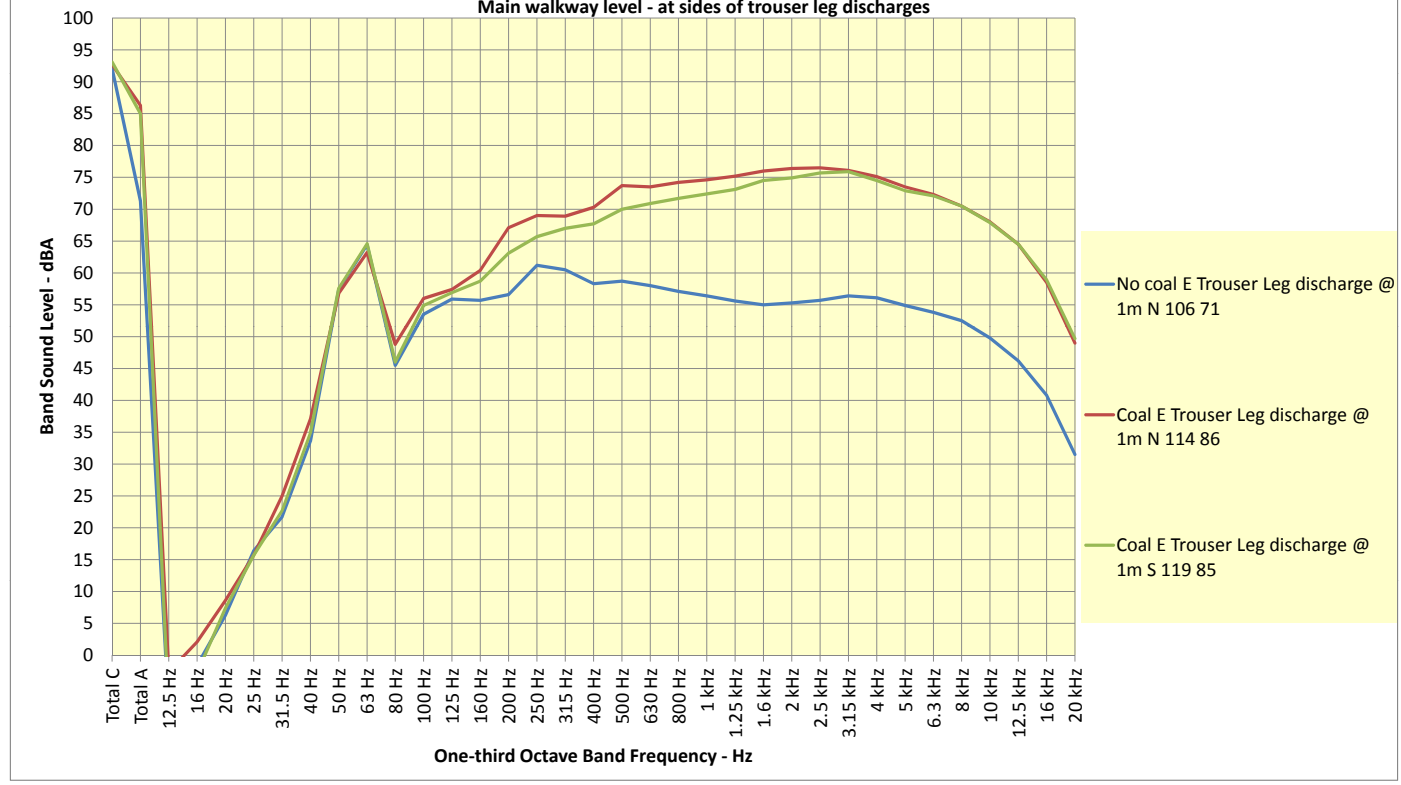


Figure 3.19: Wollongong Coal - Tripper Conveyor Comparing Sound Levels at Locations with Coal and without
Main walkway under trouser leg

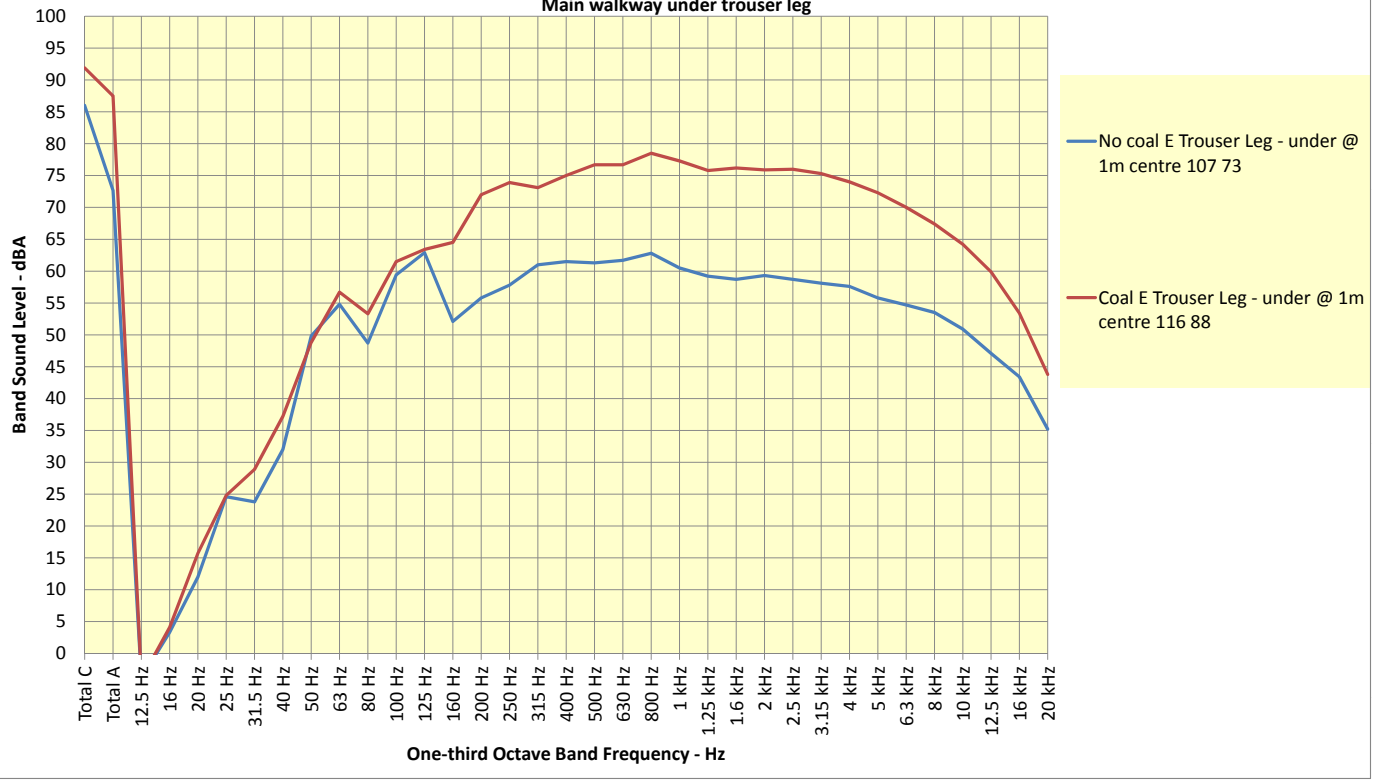


Figure 3.20: Wollongong Coal - Tripper Conveyor Comparing Sound Levels at Locations with Coal and without
Main walkway 2m S of inlet chute box belt opening

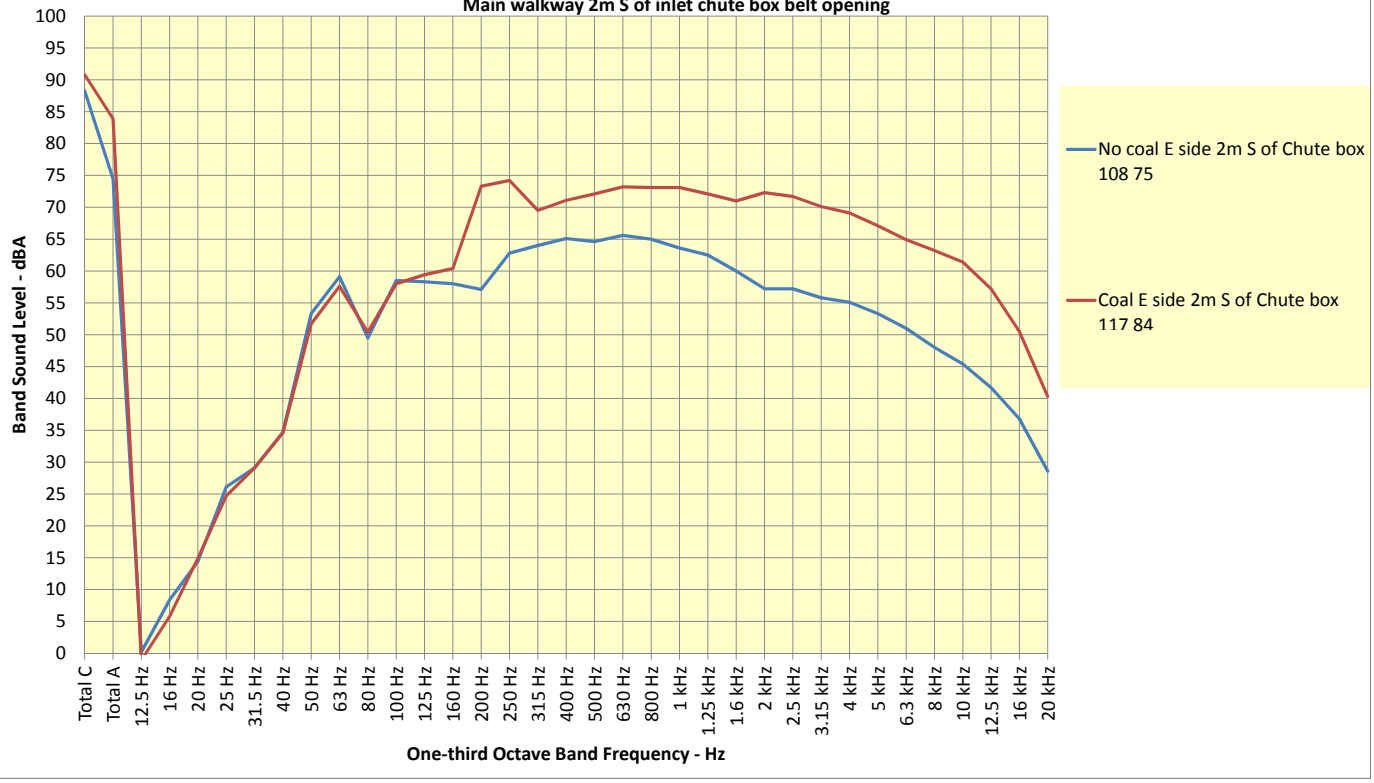


Figure 3.21: Wollongong Coal - Tripper Conveyor Comparing Sound Levels at Locations with Coal and without
Mid level - above trouser leg top

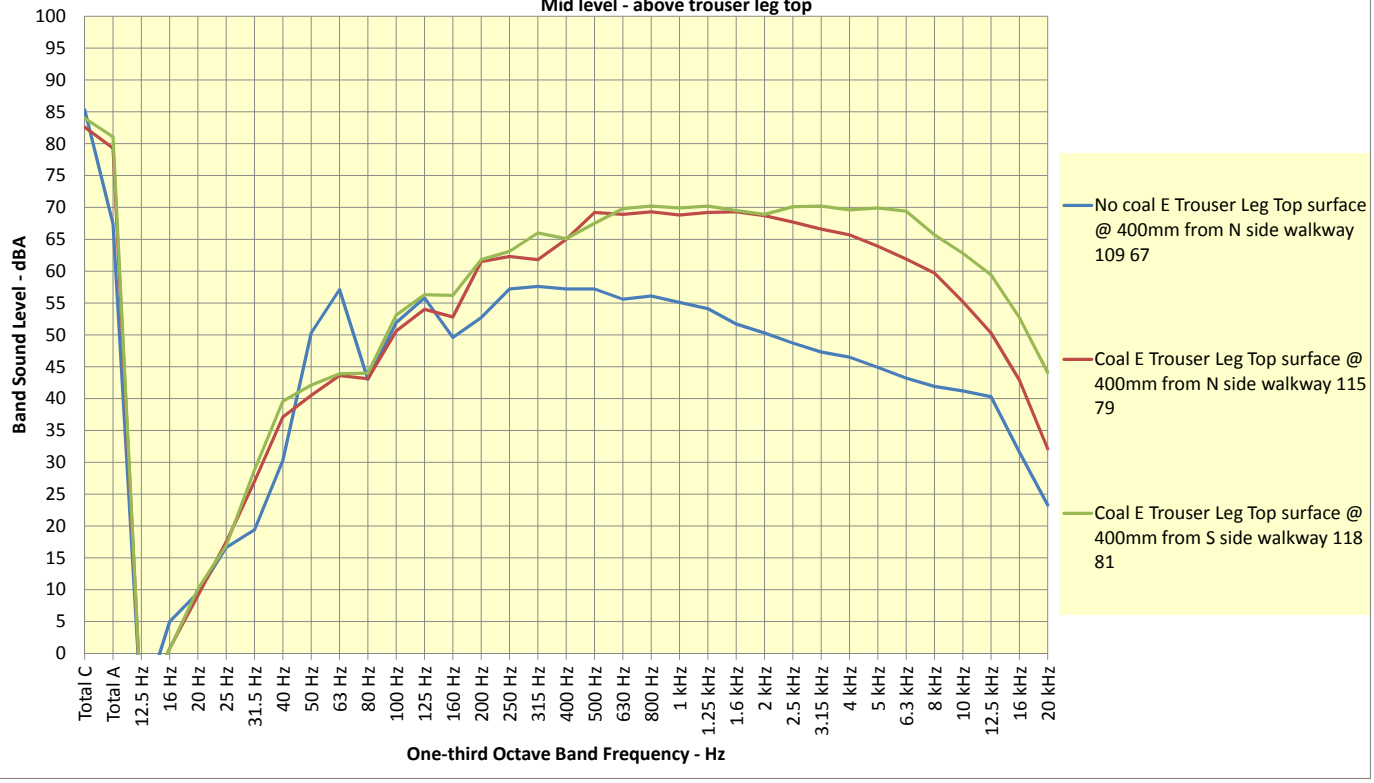


Figure 3.22: Wollongong Coal - Tripper Conveyor Comparing Sound Levels at Locations with Coal and without
Mid level N side of chute @ 1m

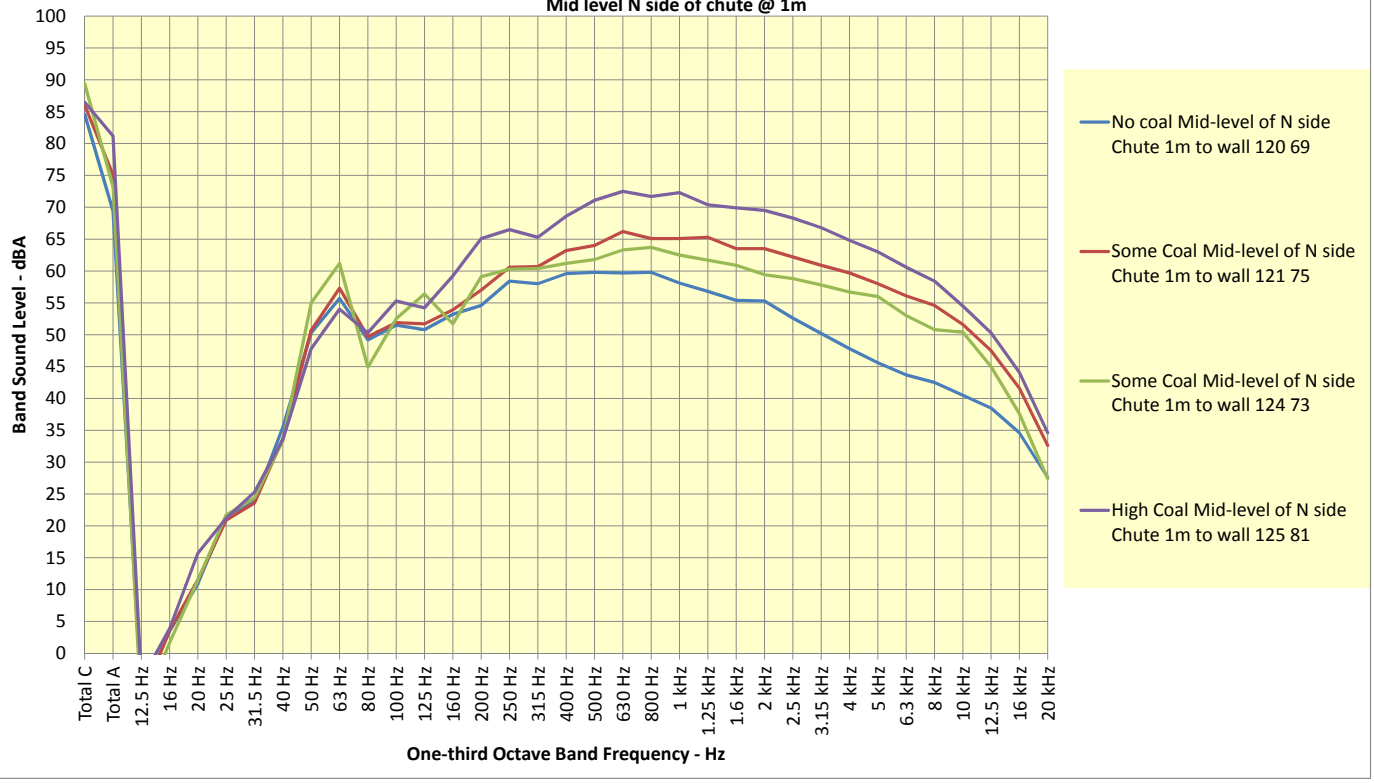


Figure 3:23: Wollongong Coal Russell Vale - surface Noise - Conveyor Drive Building - Top Level sound levels

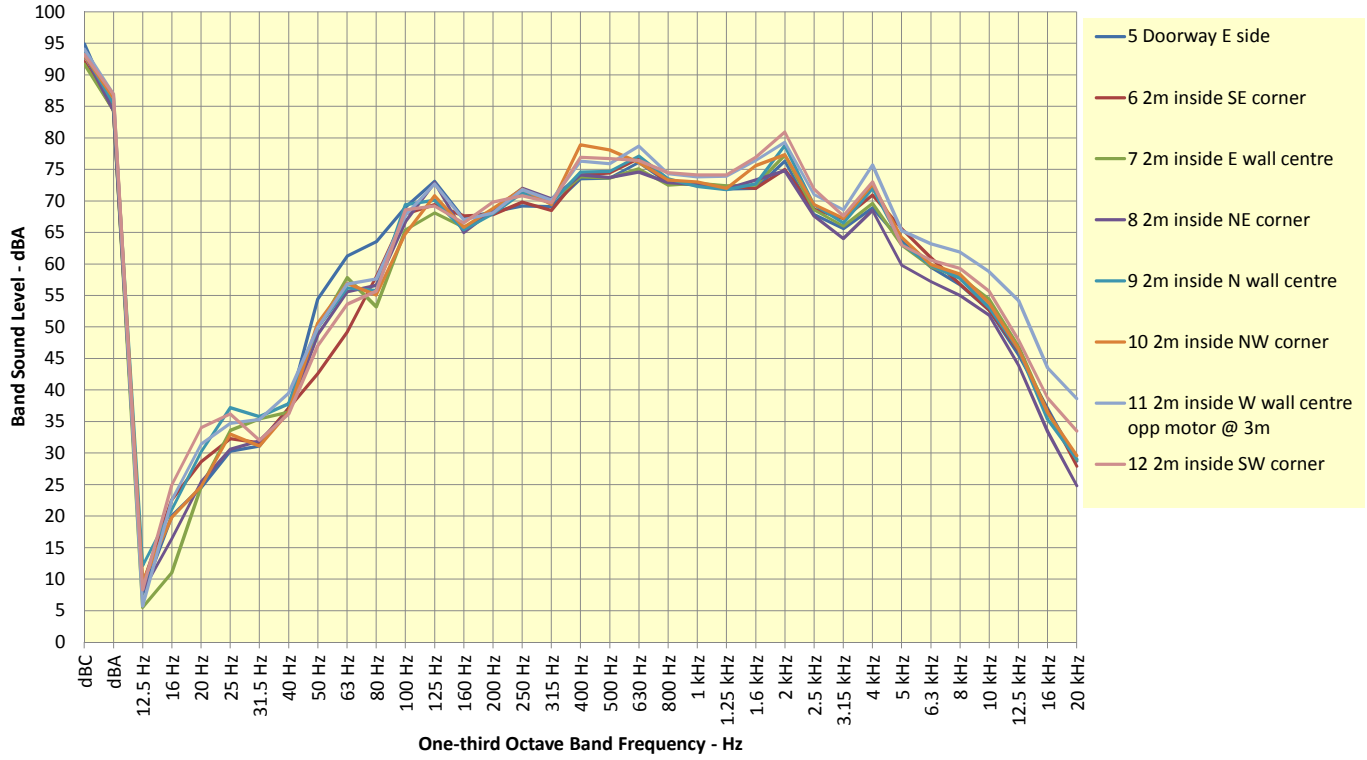


Figure 3:24: Wollongong Coal Russell Vale - surface Noise - Conveyor Drive Building - Top Level sound levels by drive

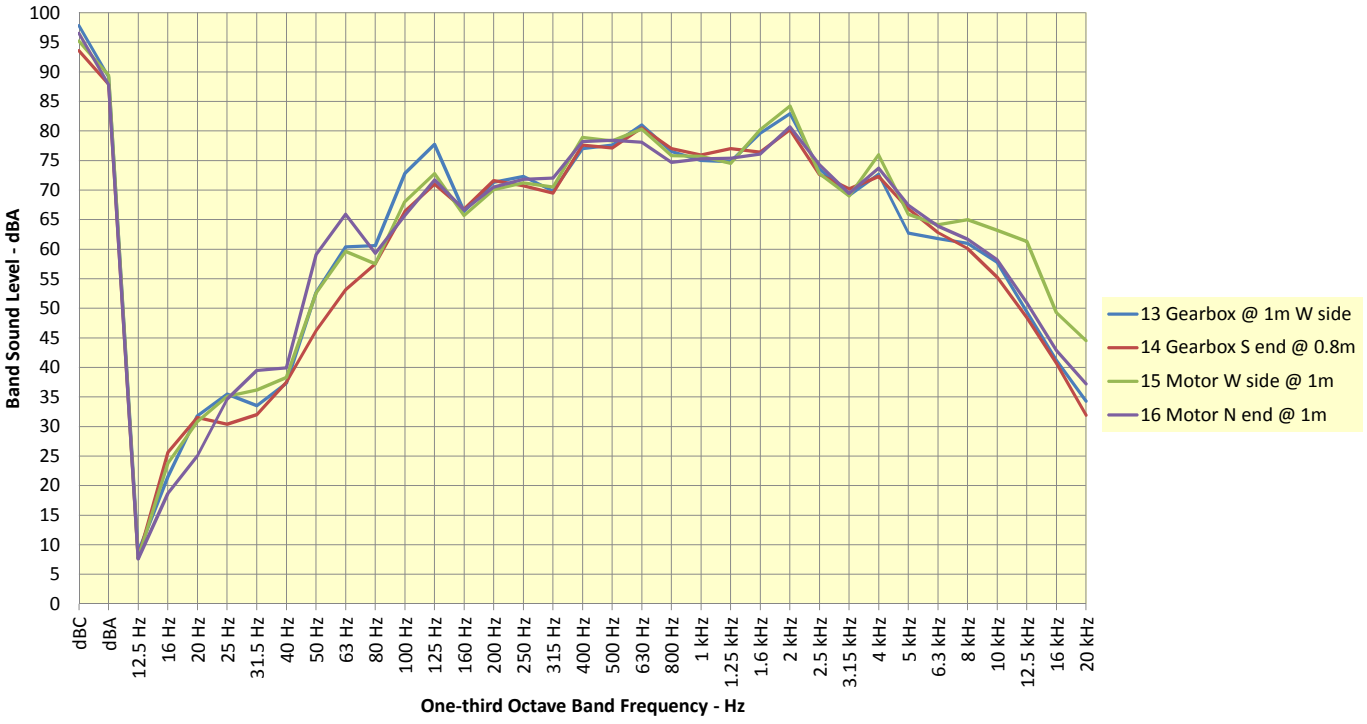


Figure 3:25: Wollongong Coal Russell Vale - surface Noise - Conveyor Drive Building - 1 Level down from top

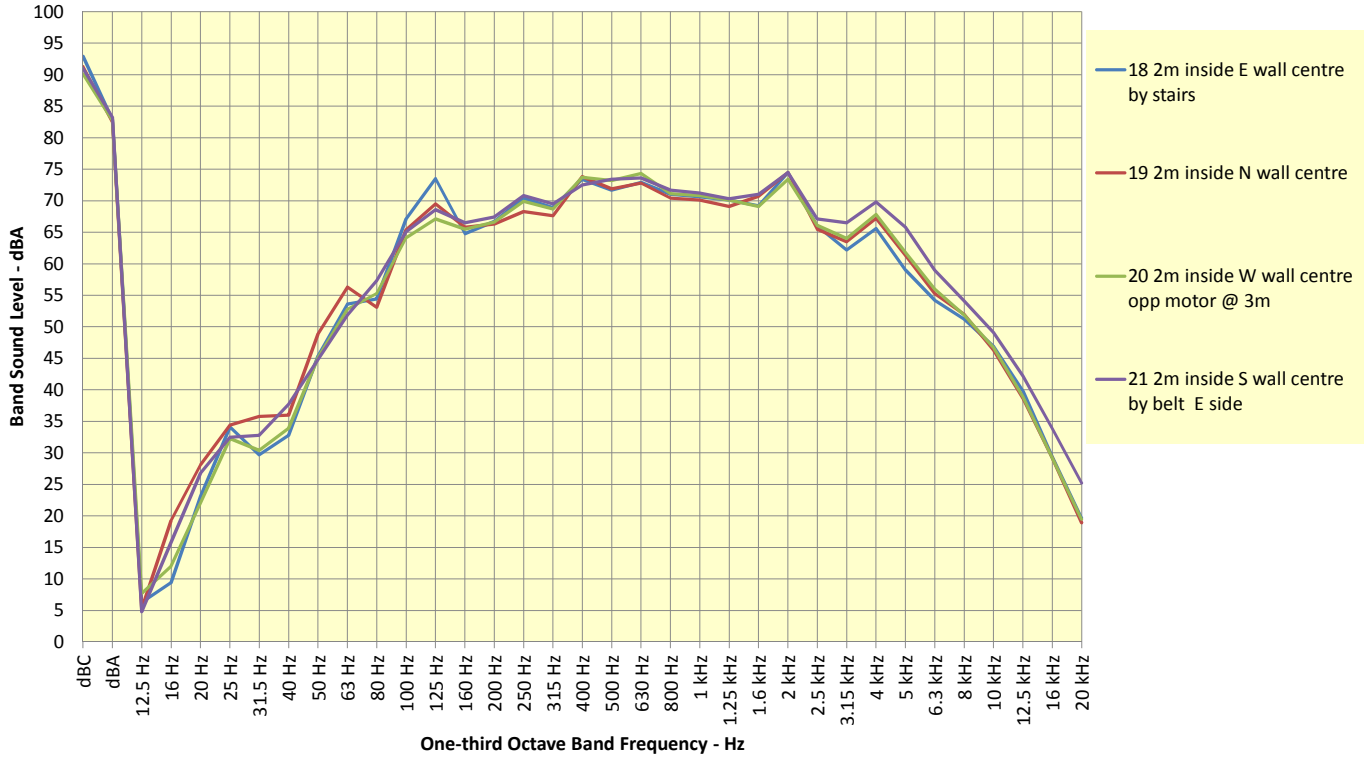


Figure 3:26: Wollongong Coal Russell Vale - surface Noise - Conveyor Drive Building - 2 Levels down from top

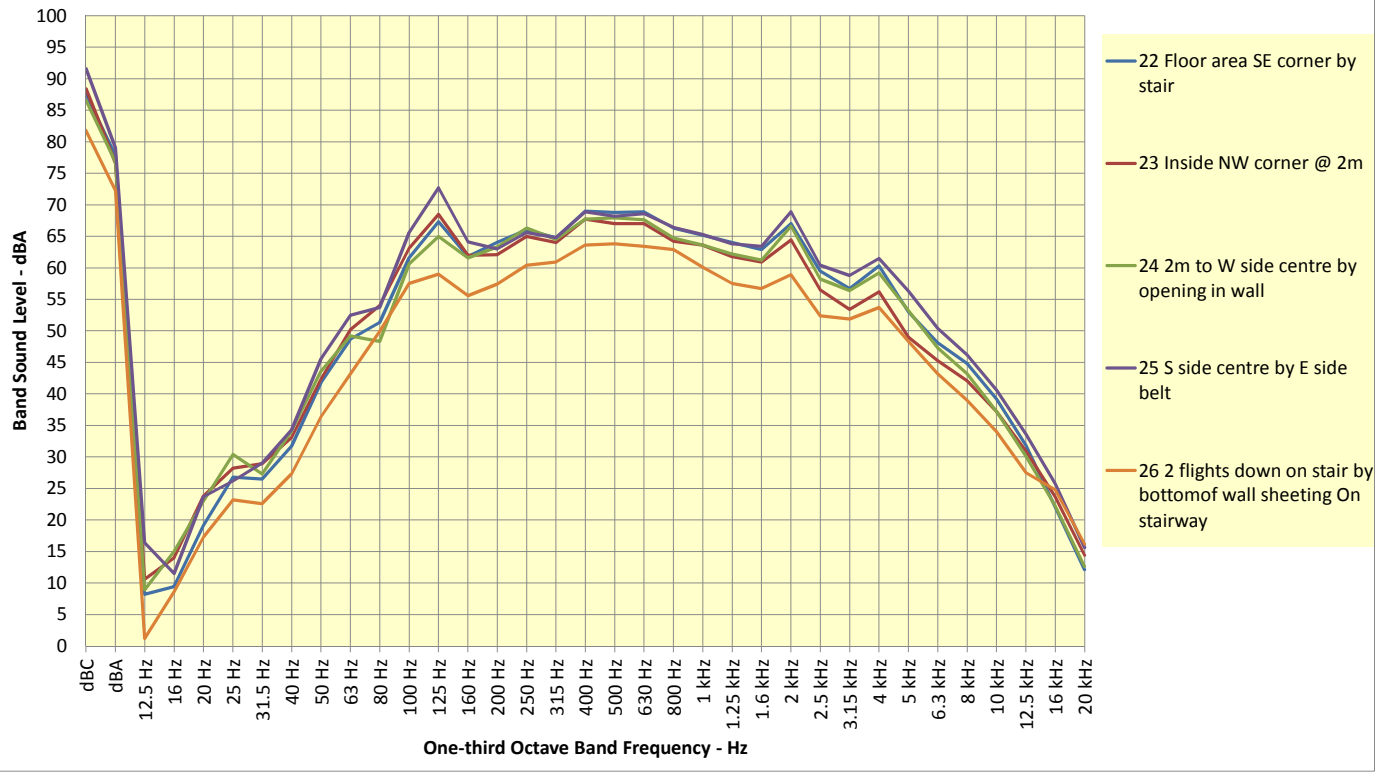


Figure 3.27: Wollongong Coal Russell Vale Noise Levels 27 May - Belt off: Substation N of Admin Building

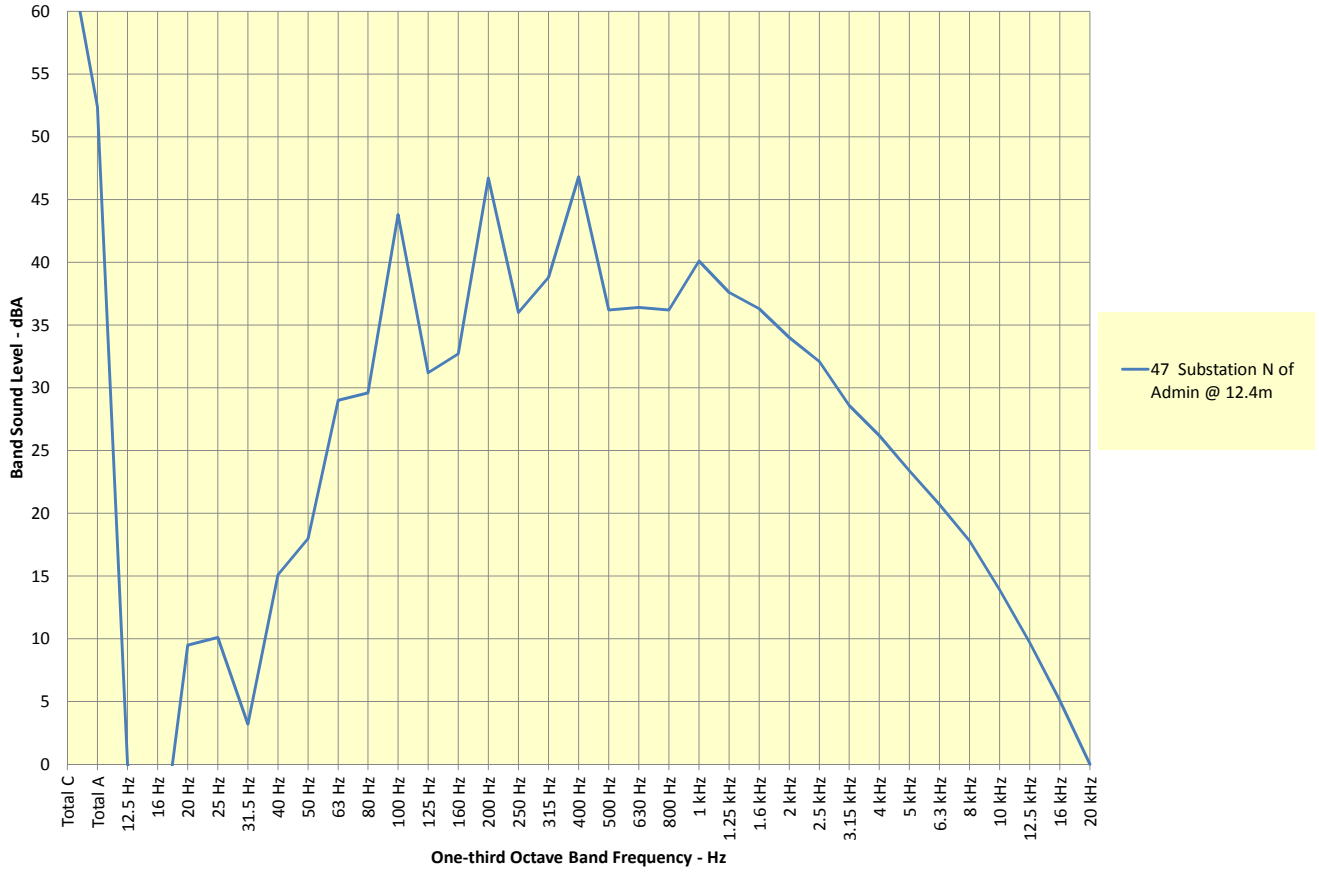


Figure 3:28: Wollongong Coal Russell Vale Noise Levels 27 May - Belt off: Compressor House

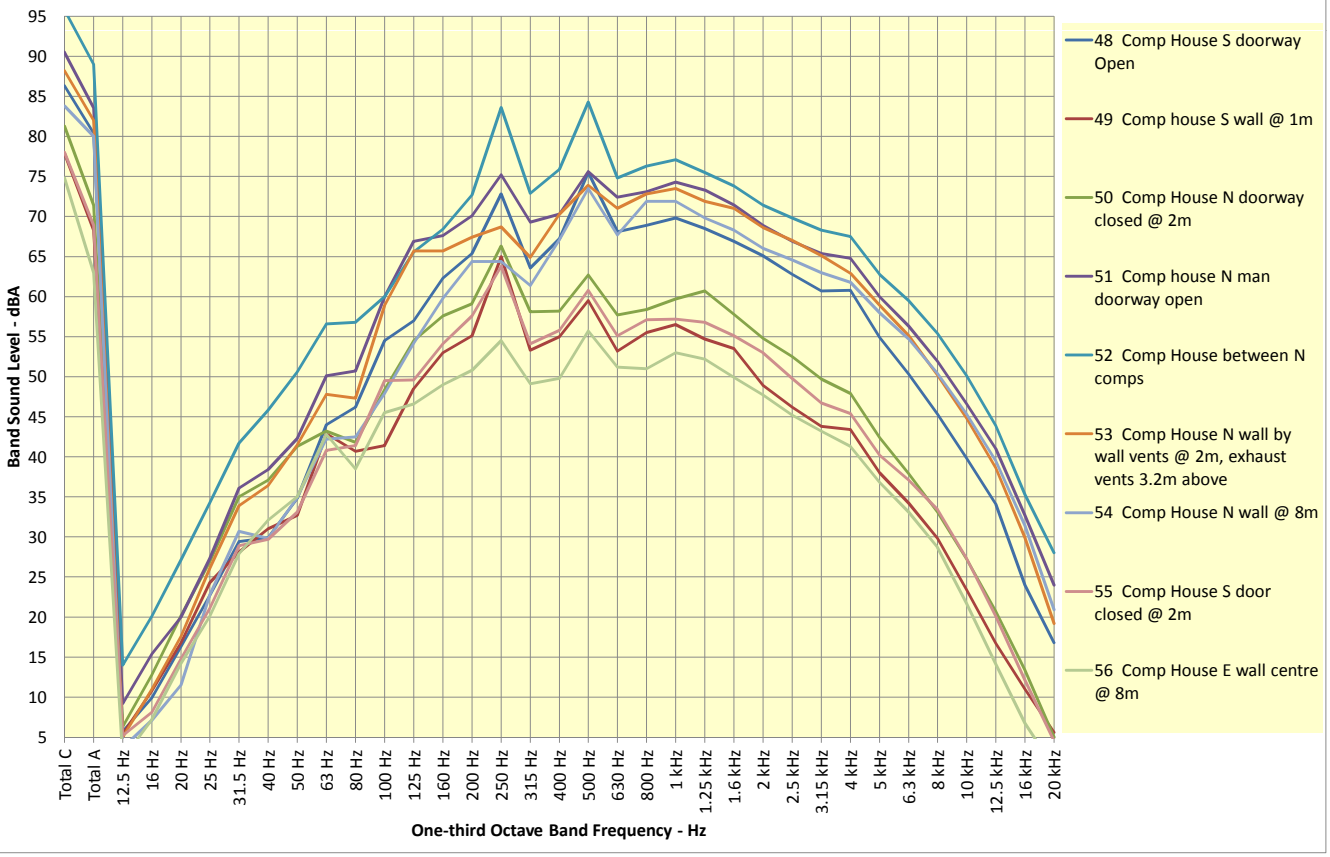


Figure 3.29: Wollongong Coal Russell Vale Noise Levels 27 May - Belt off: Mine Vent Fan North evase emission @ 12m

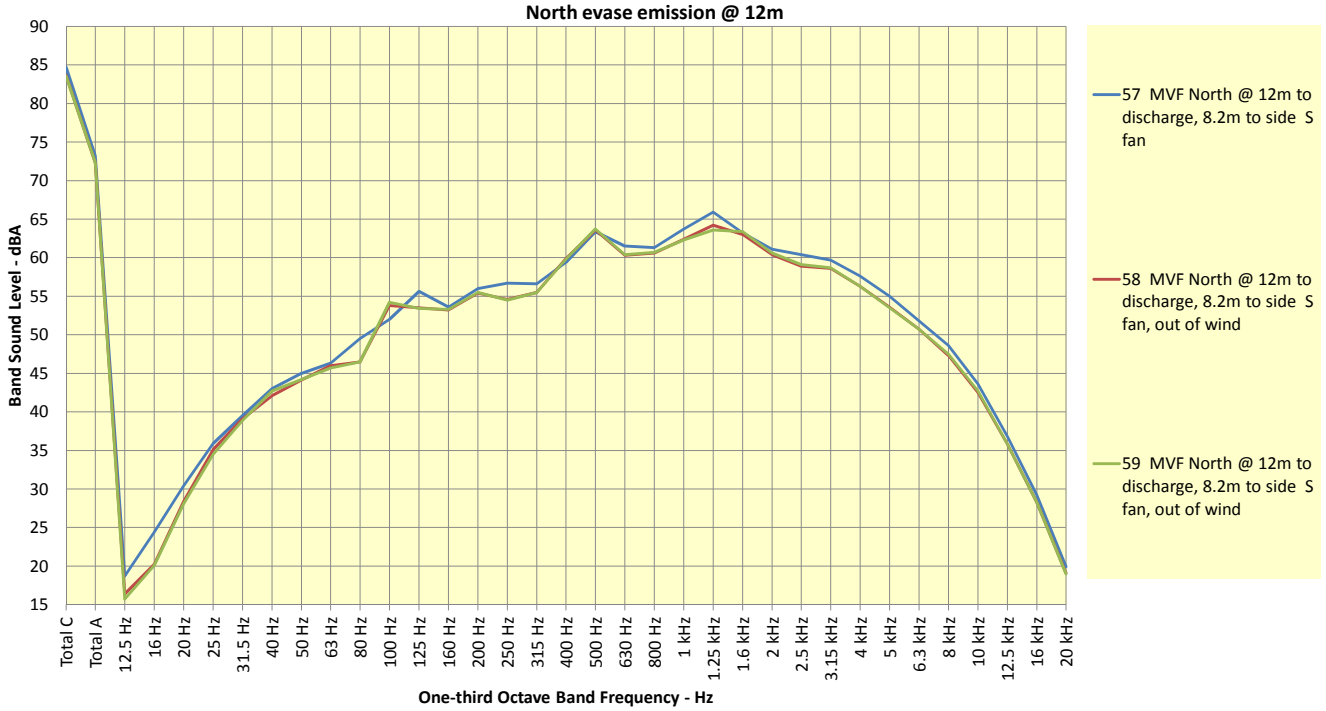


Figure 3.30: Wollongong Coal Russell Vale Noise Levels 27 May - Belt off: Mine Vent Fan South casing at 1.5 to 2m

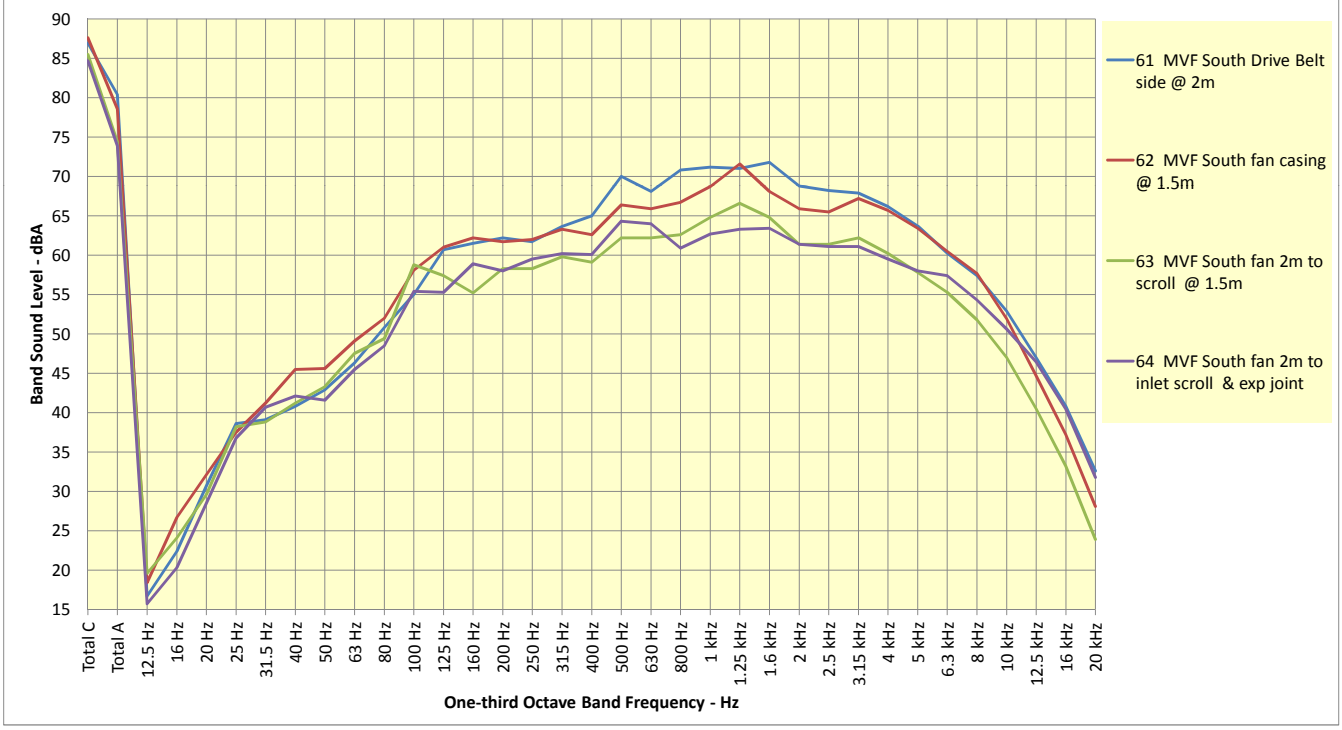


Figure 3.31: Wollongong Coal Russell Vale Noise Levels 27 May - Belt off: Mine Vent Fan North casing at 1.5 to 2m

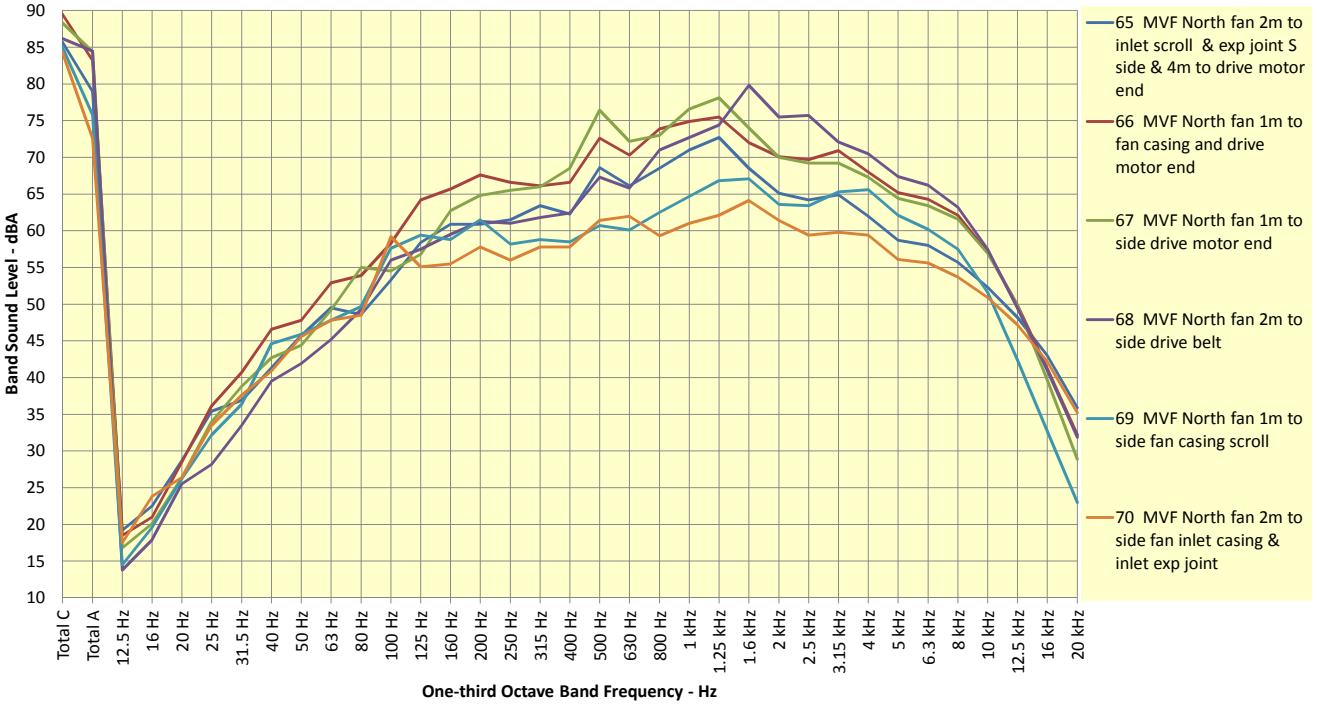


Figure 3.32: Wollongong Coal - Noise Source PWL
Tonality Mine Vent Fan exhaust, MVF casing, Compressor House N wall vents, Substation

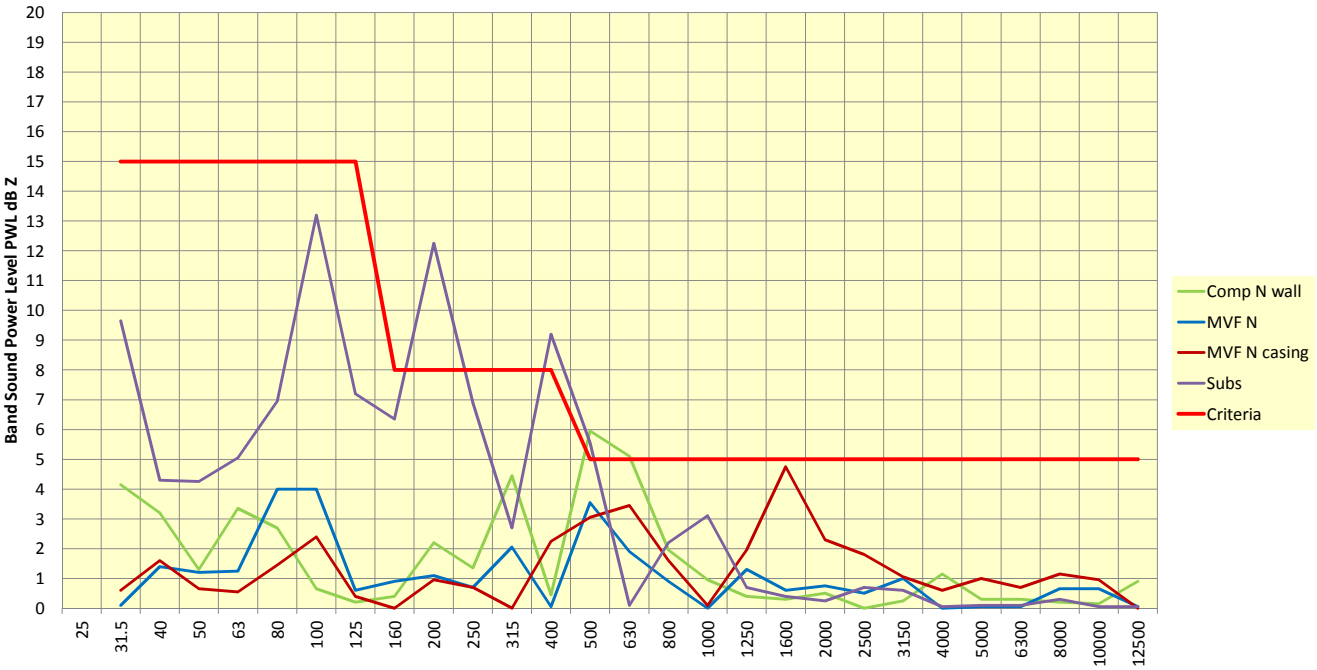
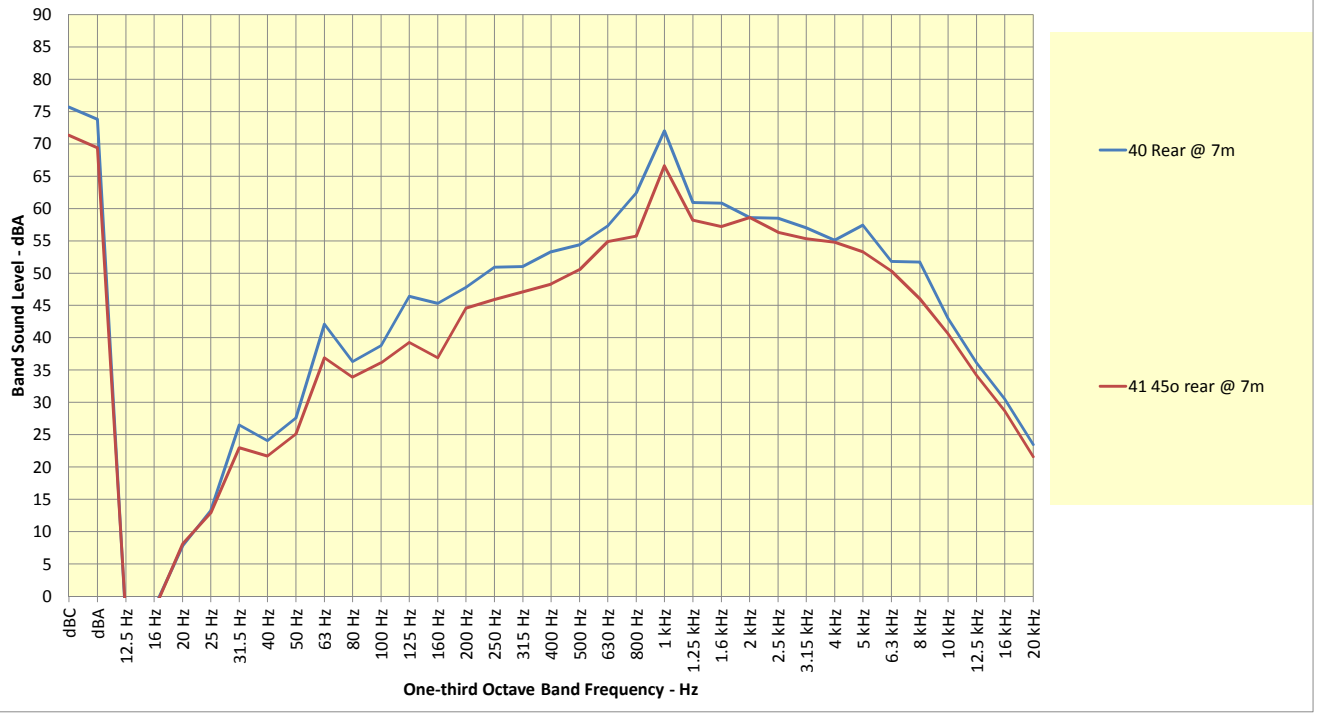


Figure 3:33: Wollongong Coal Russell Vale - surface Noise - Workshop Forklift Full Revs with reverse alarm on



3.2 Effects of impacts and higher flow

For some locations around the tripper and transfer station, occasional impacts of lumps causes a higher sound level, which is recorded by the L_{A01} sound level and shown in Table 3.1. It is also expected that higher flow may cause higher L_{Eq} sound levels.

The measurements described above were made for equivalent continuous L_{AEq} sound levels. Impacts of lumps and rocks will cause higher sound levels to be emitted. There are limits in the approval conditions for each site for the 1-percent exceedance sound level $L_{A01.1\text{-minute}}$. These were between 9 and 11 dB above the $L_{AEq.15\text{-minute}}$ long-term night-time objectives for the receivers.

Figures 3.34 to 3.41 compare the spectra of L_{AMax}, L_{A01} and L_{AEq} sound levels of sources at locations where effects of impacts and lump noise occurred. The top graph of each page (e.g. Figure 3.34A) shows the spectra; the bottom graph (e.g. Figure 3.34B) shows the spectral differences between the L_{AMax} and the L_{A01} to the L_{AEq}. How typical these were of operating conditions is difficult to assess. It will be important to consider these differences in the calculation of received sound levels

Values for increases of L_{A01} above L_{AEq} used in the assessment were noted in Table 1.6 and are repeated in Table 3.2 below.

Table 3.2 Wollongong Coal Russell Vale - surface noise sources reduction assessment – L_{A01} additions to L_{AEq} values for impacted sources

Source No.	Source No.'s and Descriptions	L_{A01} Addition dB
4 & 8	S4 & 8 Tripper N side	6
5,6, 9 & 10	S5,6,9 & 11 Tripper N end E side Trouser Leg	5
7 & 11	S 7 & 11 Tripper S side entry	10
12	S12 Sizer Building E wall	3
23 & 24	S23 & 24 Tripper S side opening No Coal	5

Figure 3.34A: Wollongong Coal Surface Noise - Tripper Sources Leq, Lmax & L01 - Transfer Station E wall @ 18m

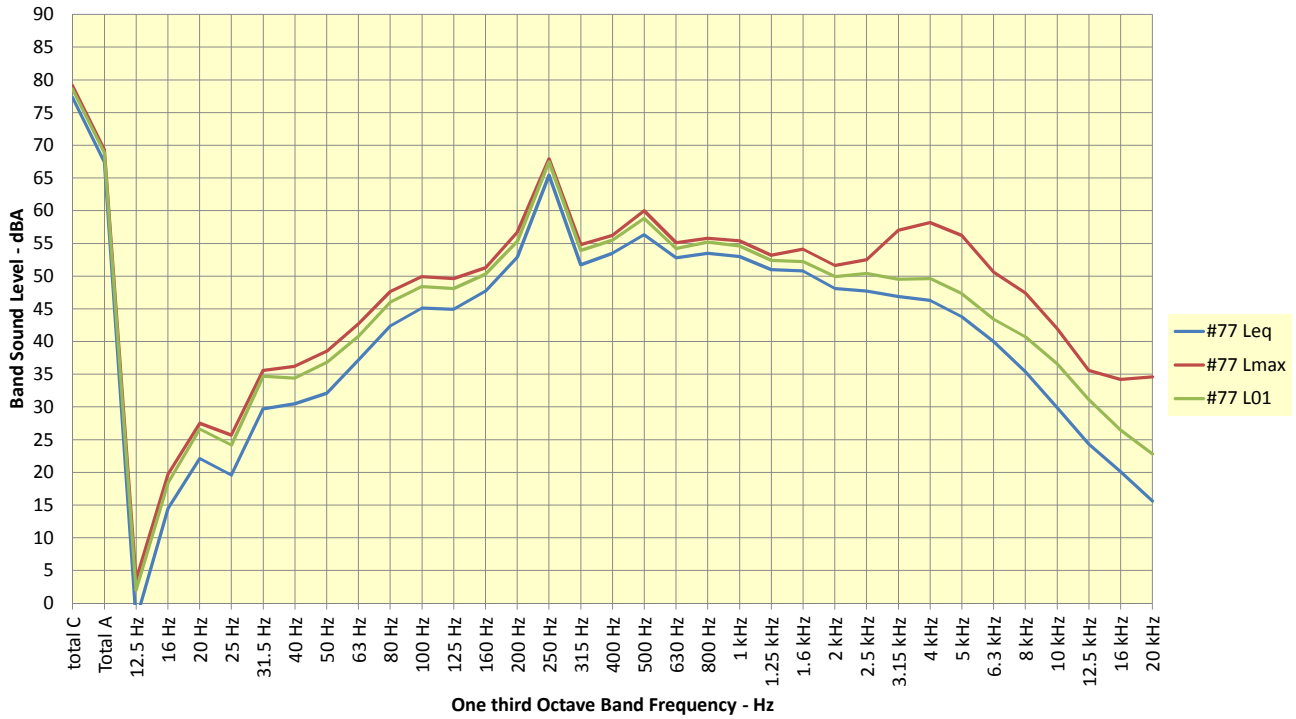


Figure 3.34B: Wollongong Coal Surface Noise - Tripper Sources Leq, Lmax & L01 - Transfer Station E wall @ 18m
File 77 Differences LMax & L01 to LEq

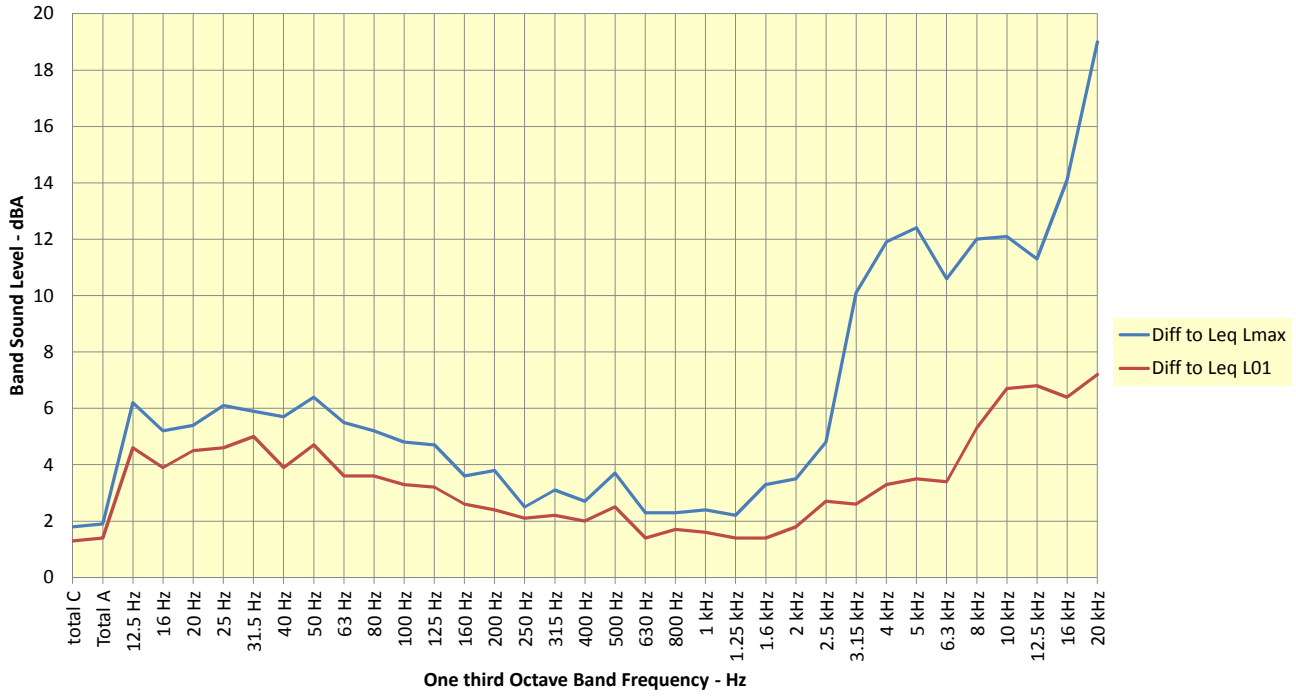


Figure 3.35A: Wollongong Coal Surface Noise - Tripper Sources Leq, Lmax & L01 - Stockpile Logger Location 65m to Tripper

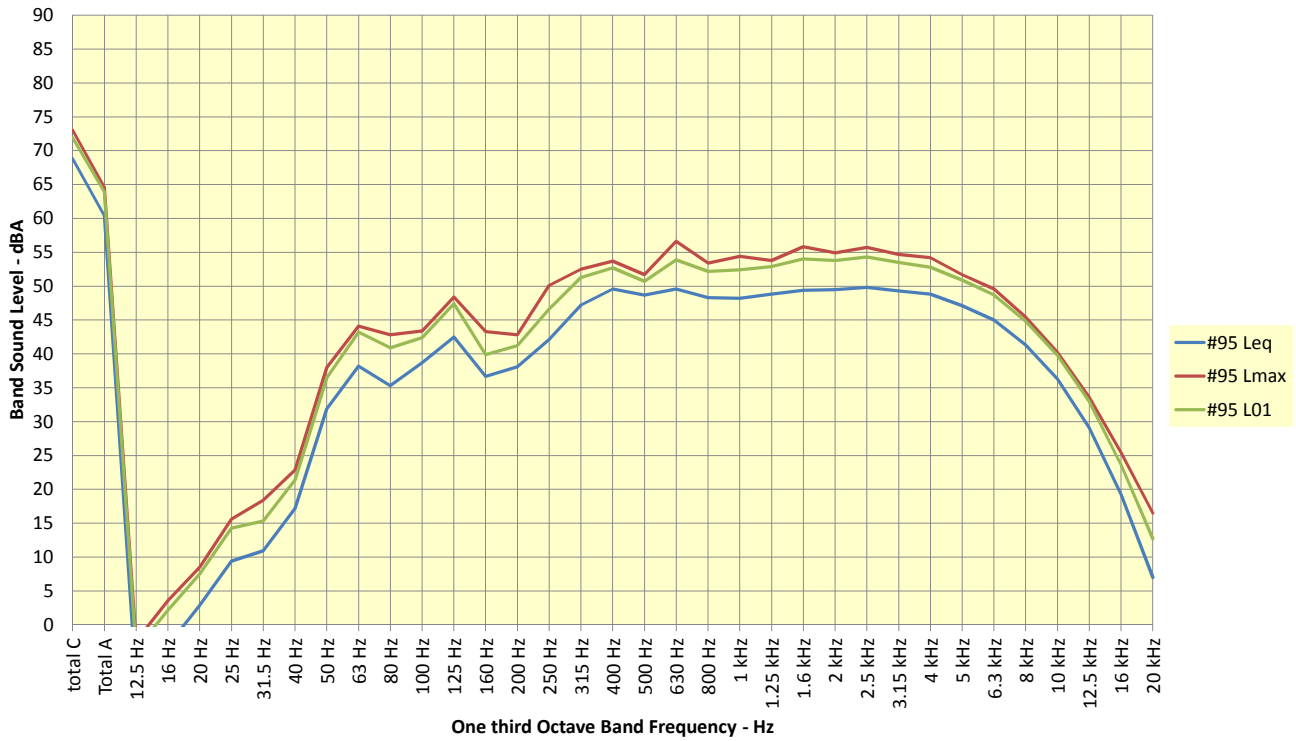


Figure 3.35B: Wollongong Coal Surface Noise - Tripper Sources Leq, Lmax & L01 - Stockpile Logger Location 65m to Tripper
File 95 Differences LMax & L01 to LEq

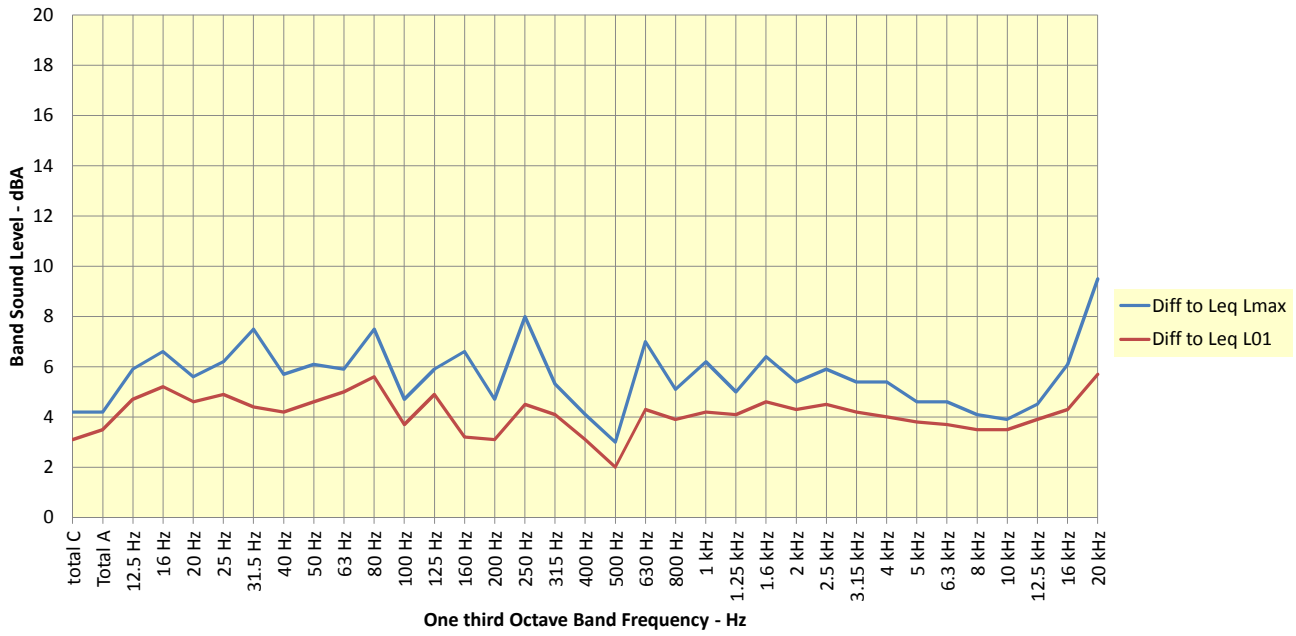


Figure 3.36A: Wollongong Coal Surface Noise - Tripper Sources Leq, Lmax & L01 - Tripper S side opening from top walkway

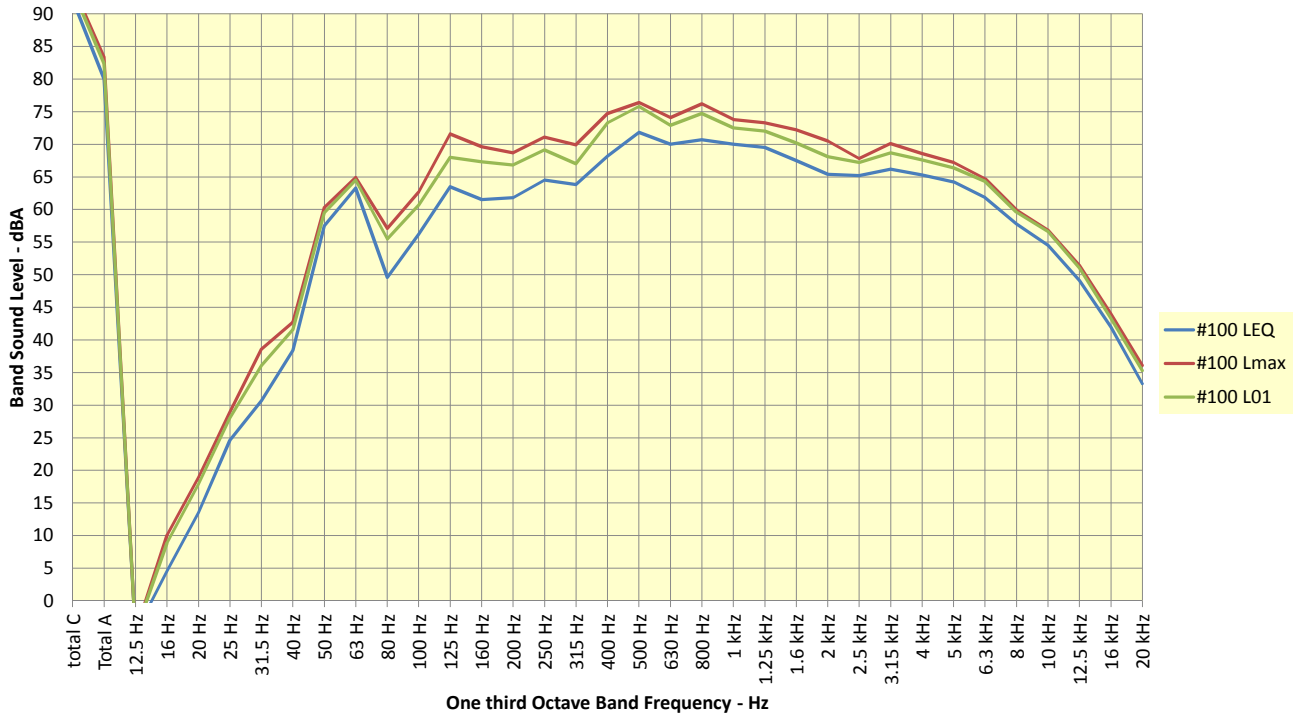


Figure 3.36B: Wollongong Coal Surface Noise - Tripper Sources Leq, Lmax & L01 Tripper S side opening from top walkway
File 100 Differences LMax & L01 to LEq

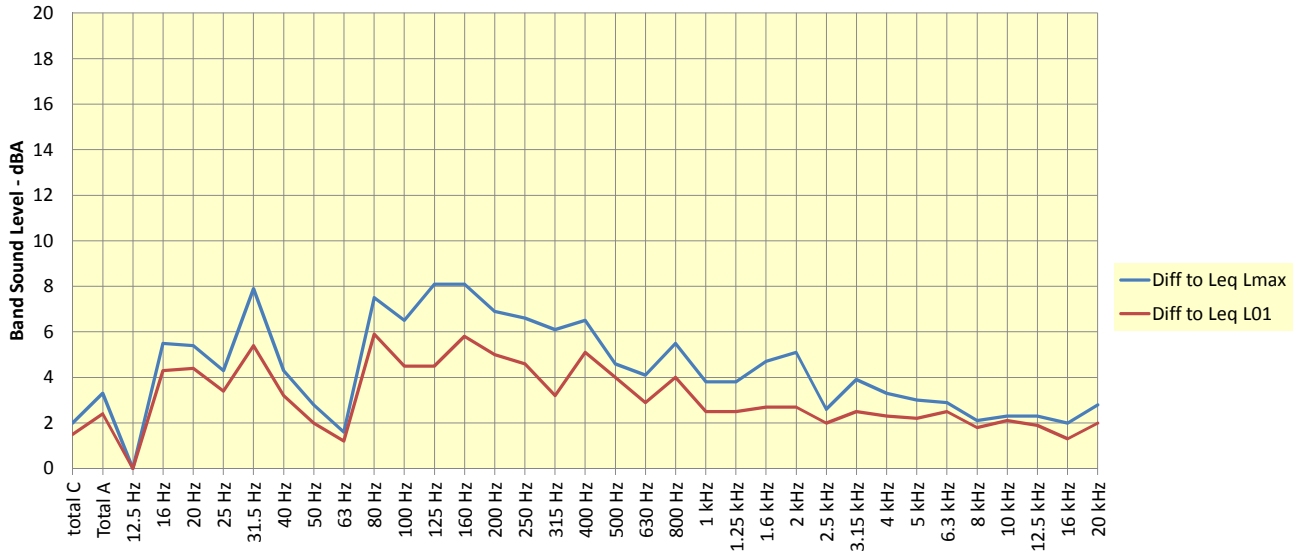


Figure 3.37A: Wollongong Coal Surface Noise - Tripper Sources Leq, Lmax & L01 - Tripper S side opening from lower walkway

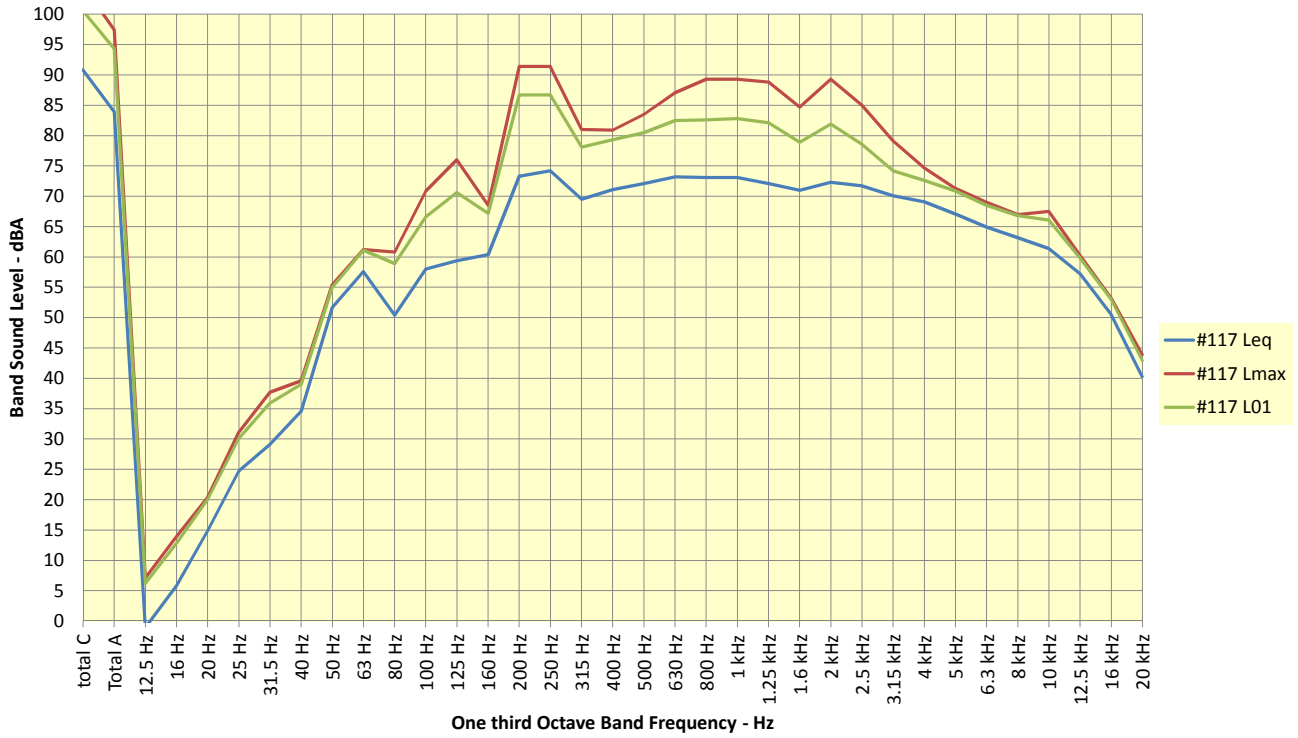


Figure 3.37B : Wollongong Coal Surface Noise - Tripper Sources Leq, Lmax & L01 Tripper S side opening from lower walkway
File 117 Differences LMax & L01 to LEq

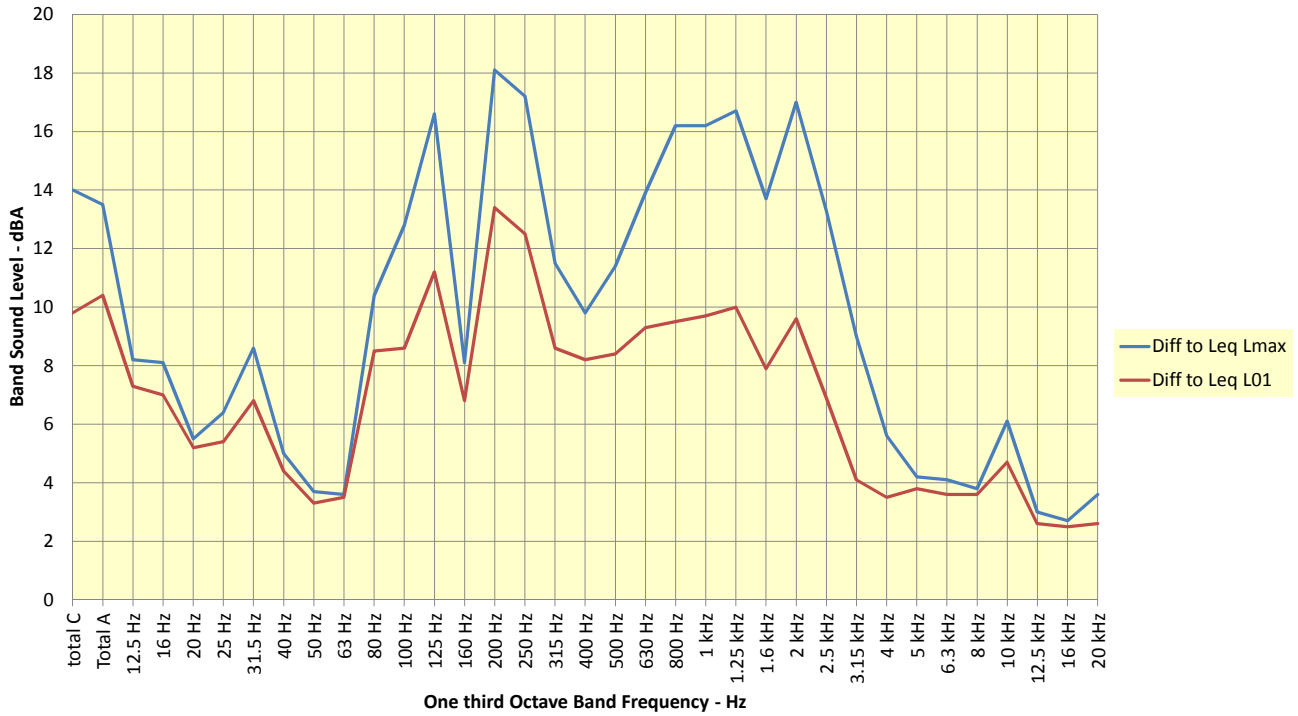


Figure 3.38A: Wollongong Coal Surface Noise - Tripper Sources Leq, Lmax & L01 - Trouser Leg Discharge N side 1m

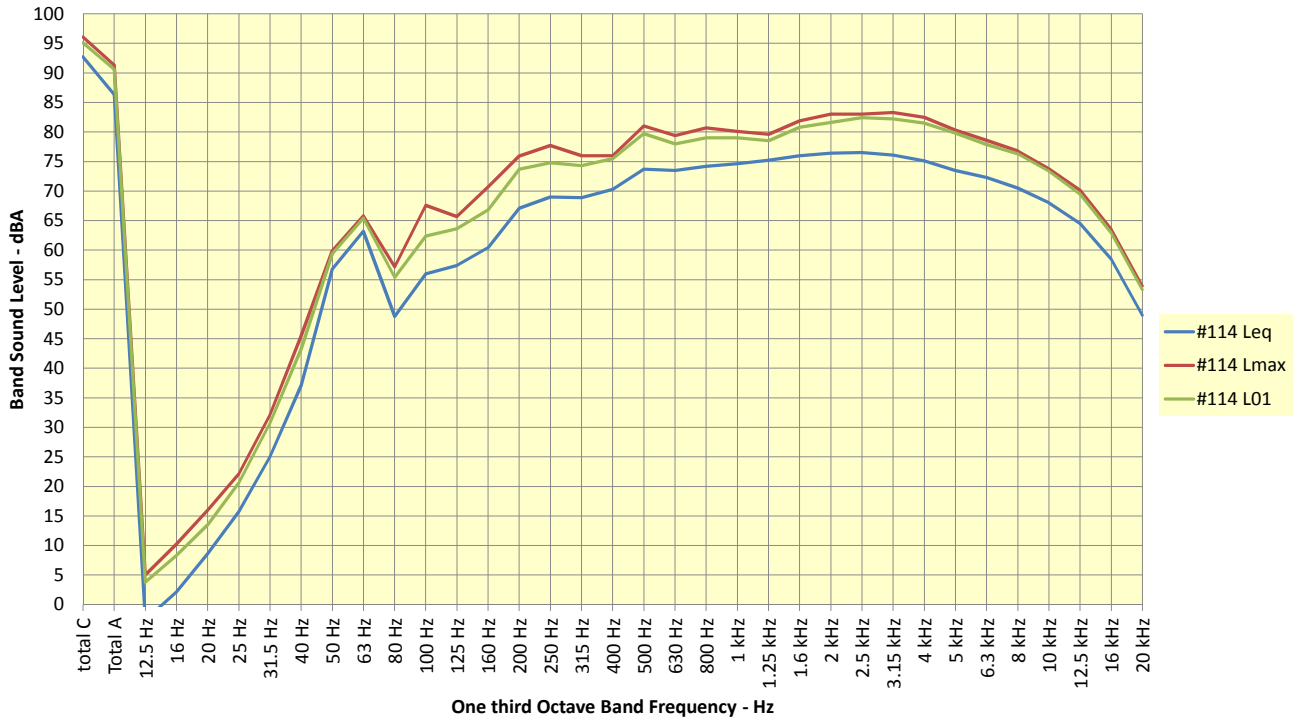


Figure 3.38B: Wollongong Coal Surface Noise - Tripper Sources Leq, Lmax & L01 Trouser Leg Discharge N side 1m
File 114 Differences LMax & L01 to LEq

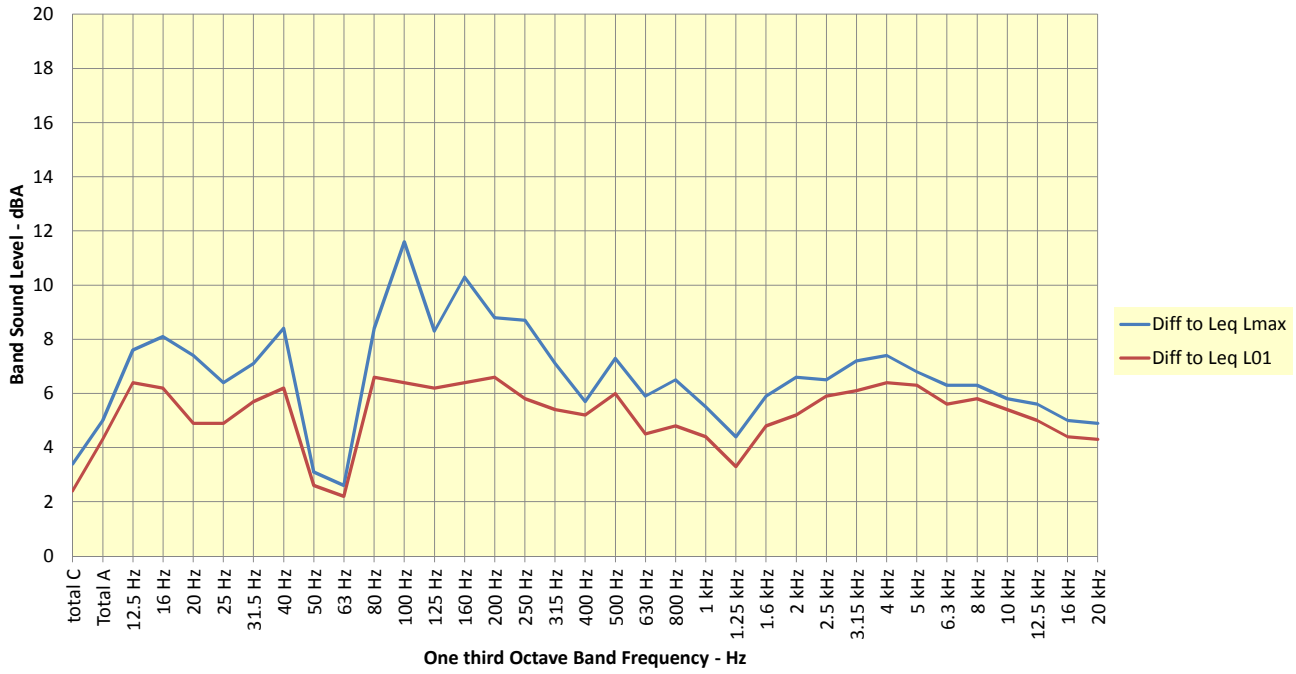


Figure 3.39A: Wollongong Coal Surface Noise - Tripper Sources Leq, Lmax & L01 - Trouser Leg Discharge S side 1m

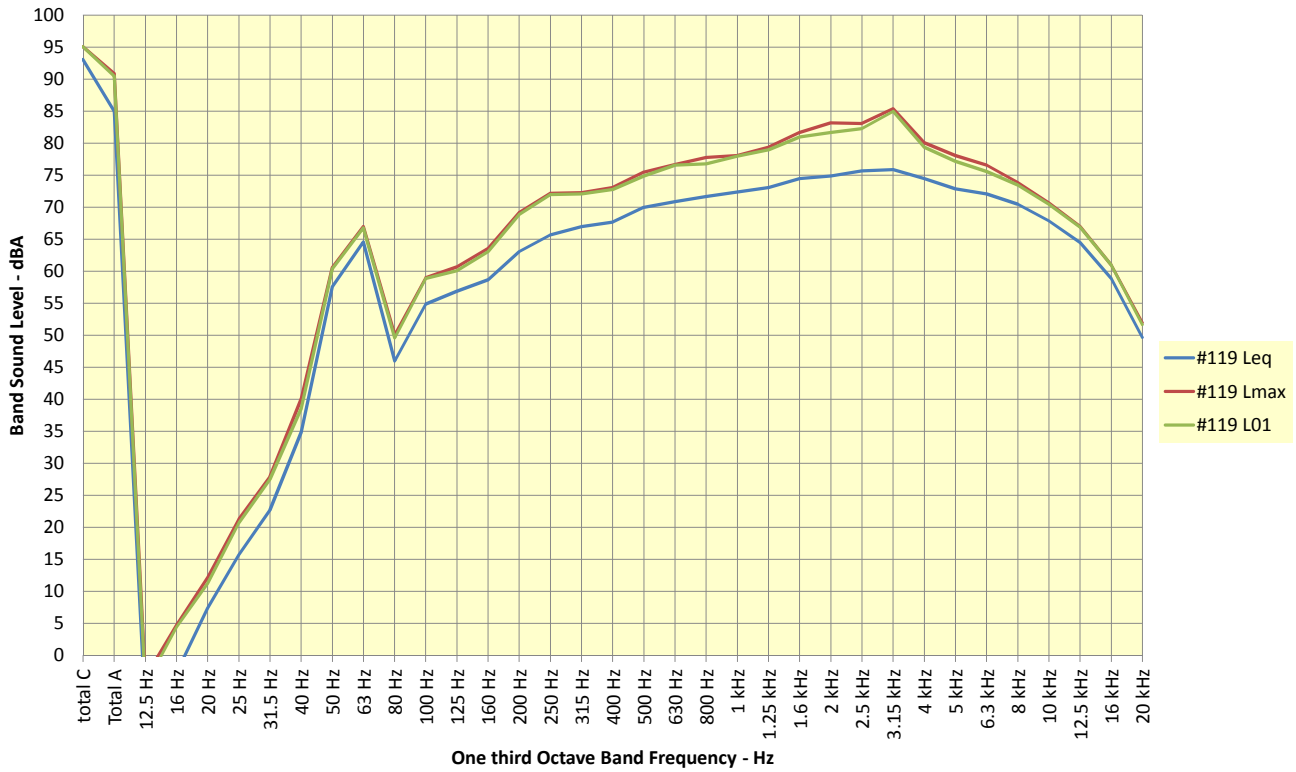


Figure 3.39B: Wollongong Coal Surface Noise - Tripper Sources Leq, Lmax & L01 Trouser Leg Discharge S side 1m
File 119 Differences LMax & L01 to LEq

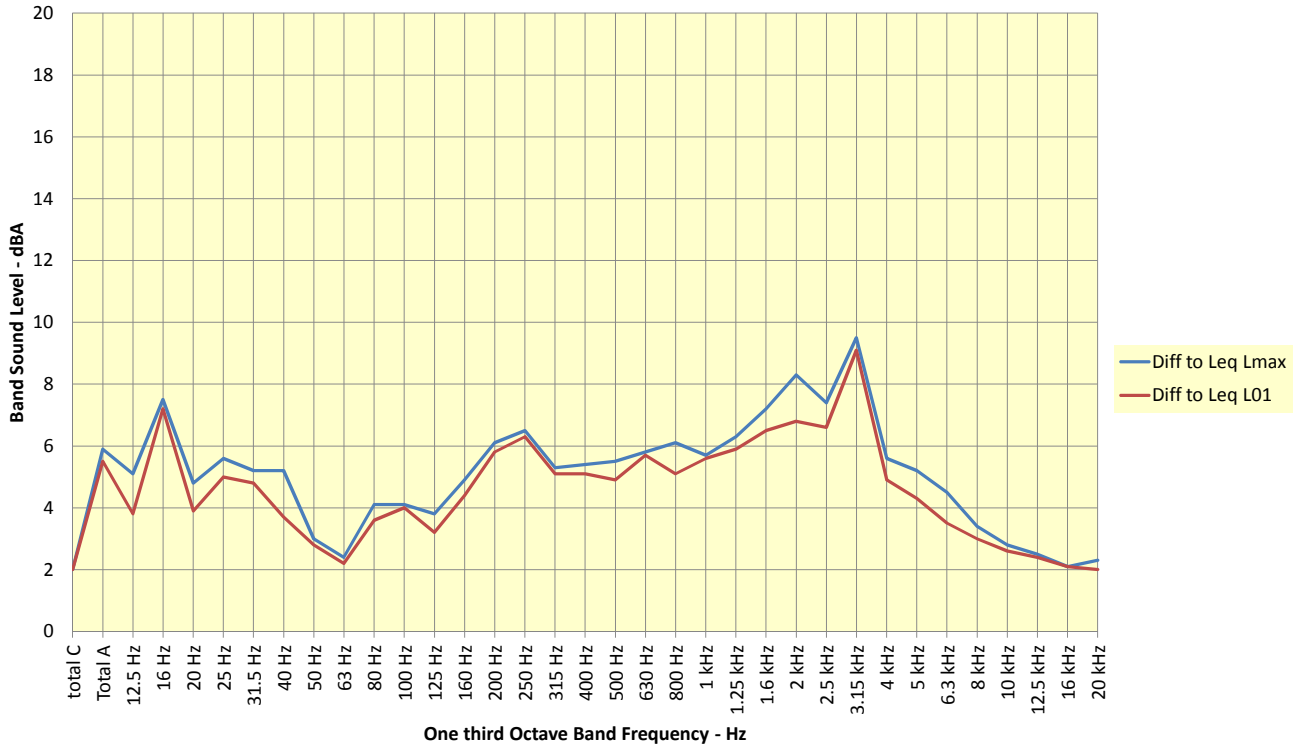


Figure 3.40A: Wollongong Coal Surface Noise - Tripper Sources Leq, Lmax & L01 - Tripper N wall at 1m

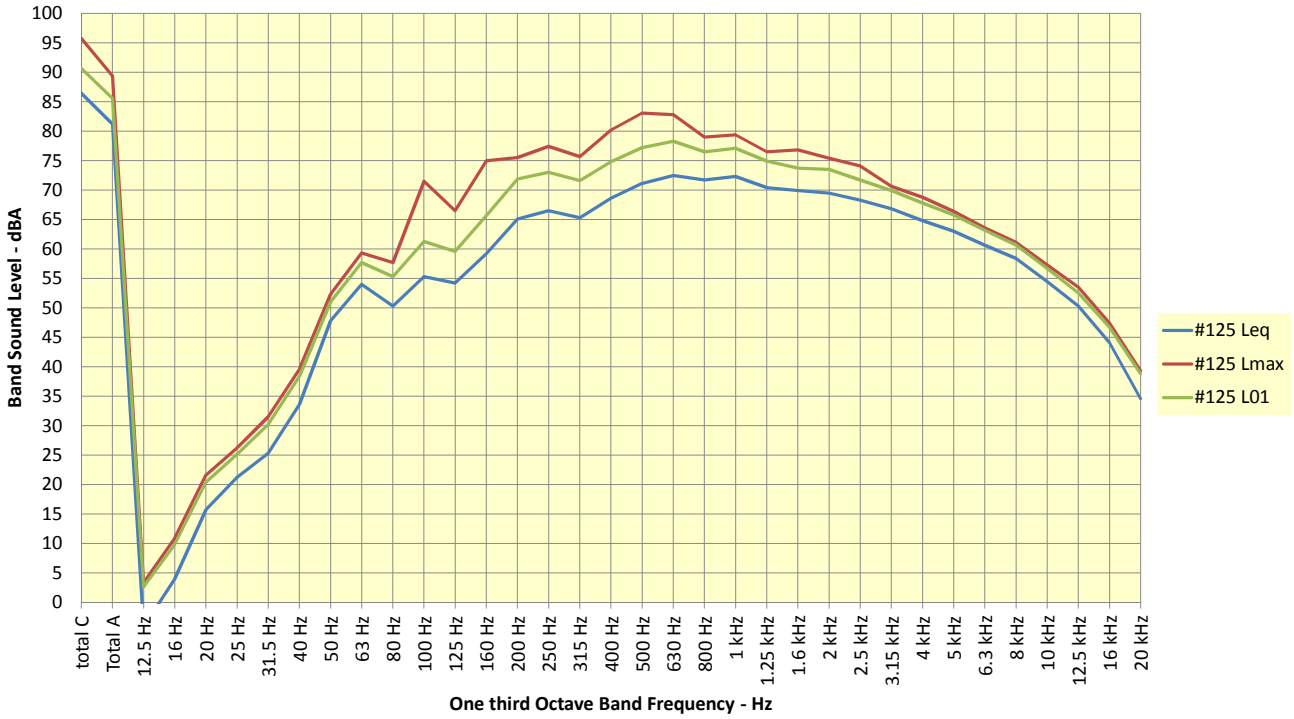


Figure 3.40B: Wollongong Coal Surface Noise - Tripper Sources Leq, Lmax & L01 Tripper N wall at 1m
File 125 Differences LMax & L01 to LEq

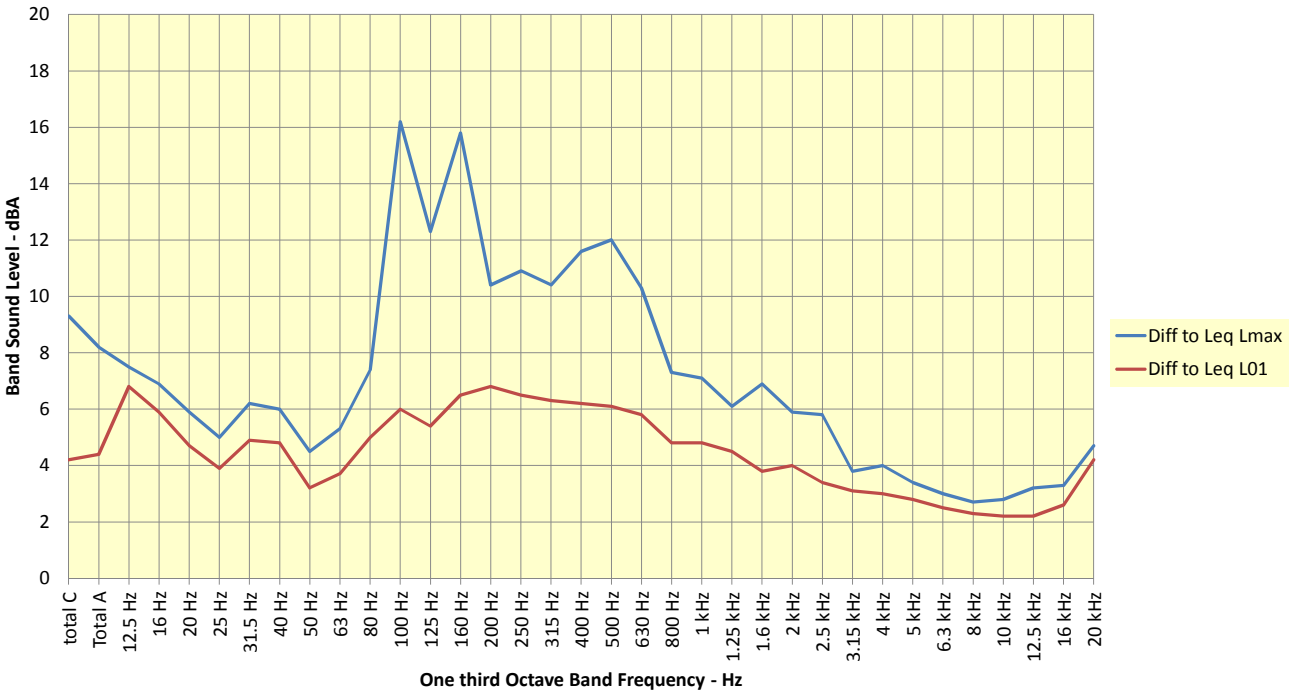


Figure 3.41A: Wollongong Coal Surface Noise - Tripper Sources Leq, Lmax & L01 - Tripper N wall at 1m

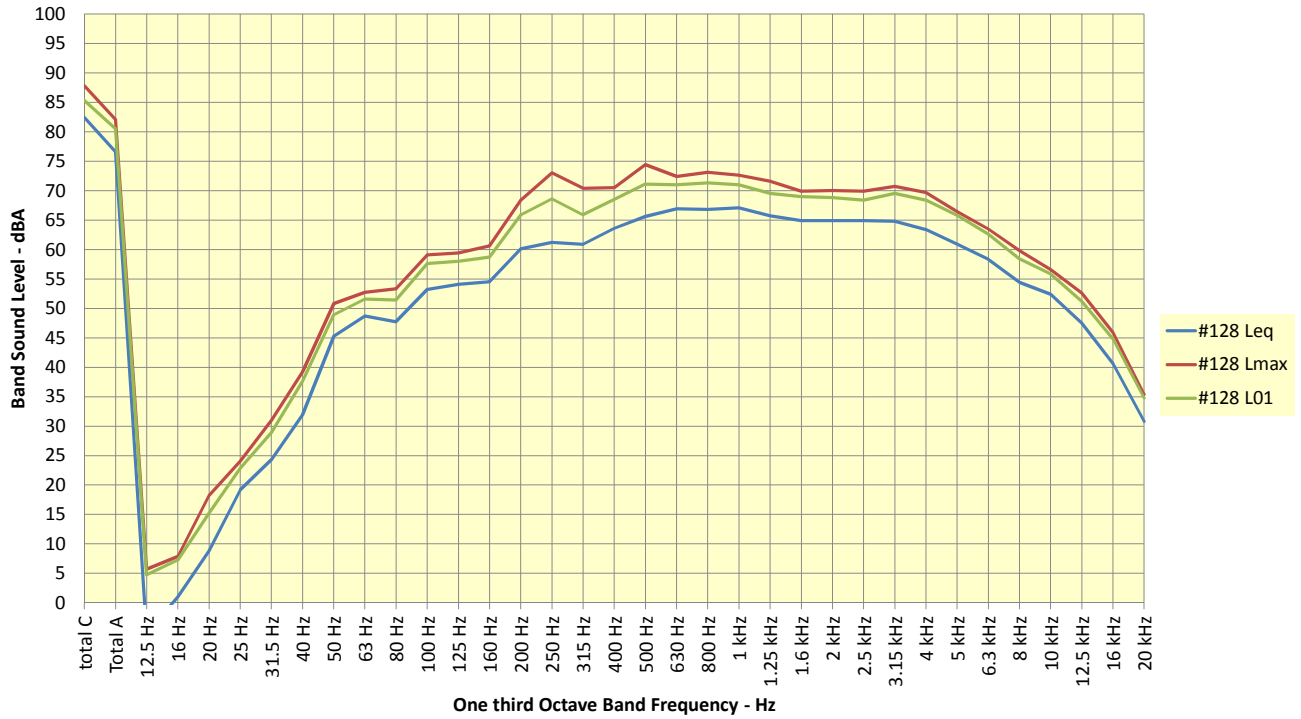
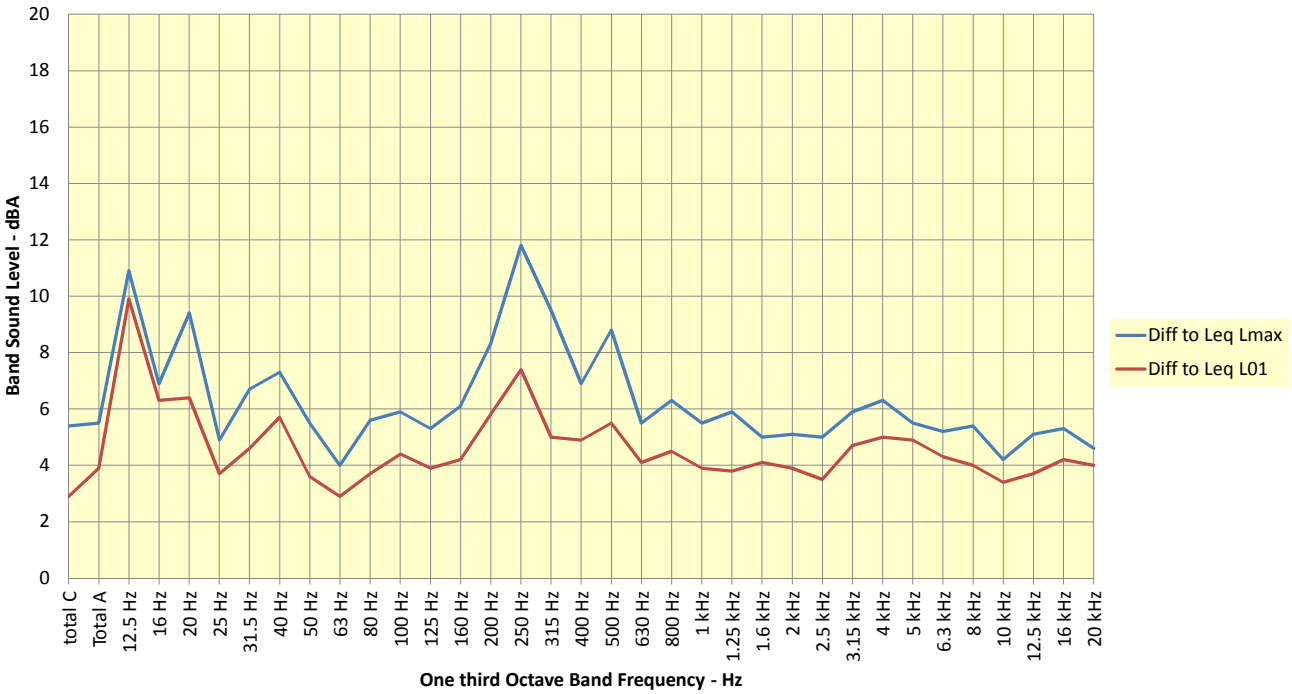


Figure 3.41B: Wollongong Coal Surface Noise - Tripper Sources Leq, Lmax & L01 Tripper N wall at 1m
File 128 Differences LMax & L01 to LEq



4. Prediction of received sound levels

4.1 Noise model inputs

The next stage of the work is to quantify the contribution sound levels of the noise sources at each receiver. To do this, a computer noise model, ENM provided by RTA Technology, is used. This model has been used by Hatch since 1988 and is well recognised for use with industrial noise predictions in NSW. Inputs to the model are:

- ground surface topography between the sources and receiver locations;
- sound power levels for each source;
- meteorological conditions relevant to the area.

Ground surface topography was taken from Google Earth Pro for each Source and Section combination. Source elevations were taken from supplied drawings or known locations.

Source sound power levels are calculated from the sound pressure level measurements using either the distances from the sources or areas of the source if the measurement was in a doorway.

Meteorological conditions used in the model were intended to be for enhanced propagation typical of cold winter nights and mornings. These were air temperature 10^{o}C, relative humidity 95% for each case of wind calm or towards receivers at 2 or 3m/s and atmospheric lapse rates (inversion) of neutral or +3^{o}C/100m (typical of a strong inversion). These conditions are as recommended for predictions in the Industrial Noise Policy.

4.2 Directivity

For sources facing a particular direction, directivity loss will be involved for angles of propagation greater than 60^{o} towards the receiver. For example, the emissions from the southern side of the Tripper have a relatively low angle of propagation towards Receivers C1, C2 and C5, but are close to 90^{o} for C3 and greater than 90^{o} for R1 to R4. As the sound bends around through these angles, some of the sound power is lost. A recognised method to calculate the directivity loss was used, shown in Figure 4.1. This is taken from a 2009 Acoustics Australia Journal article by Day Hansen and Bennett. For this calculation, the equivalent diameter of a duct was used for the emitting area.

Directivity was different for several sources to different receivers because of the wide spread of receivers and locations of sources. The angles used are given in Table 4.1.

4.3 Source sound power levels

The source sound power levels to specific to each receiver including directivity loss are collated and provided in Table 4.2 in Appendix D.

For some tripper sources there was little difference between sound level spectra for operating coal flow and no coal flow. For these sources the difference only occurred at frequencies above 160 Hz. Sources used included belt only sound levels for these locations, so the coal flow source spectra only included values at frequencies above 160 Hz. These sources were S4 to S11.

For all other continuous sources, no difference in sound power level was expected between coal flowing and no coal flowing.

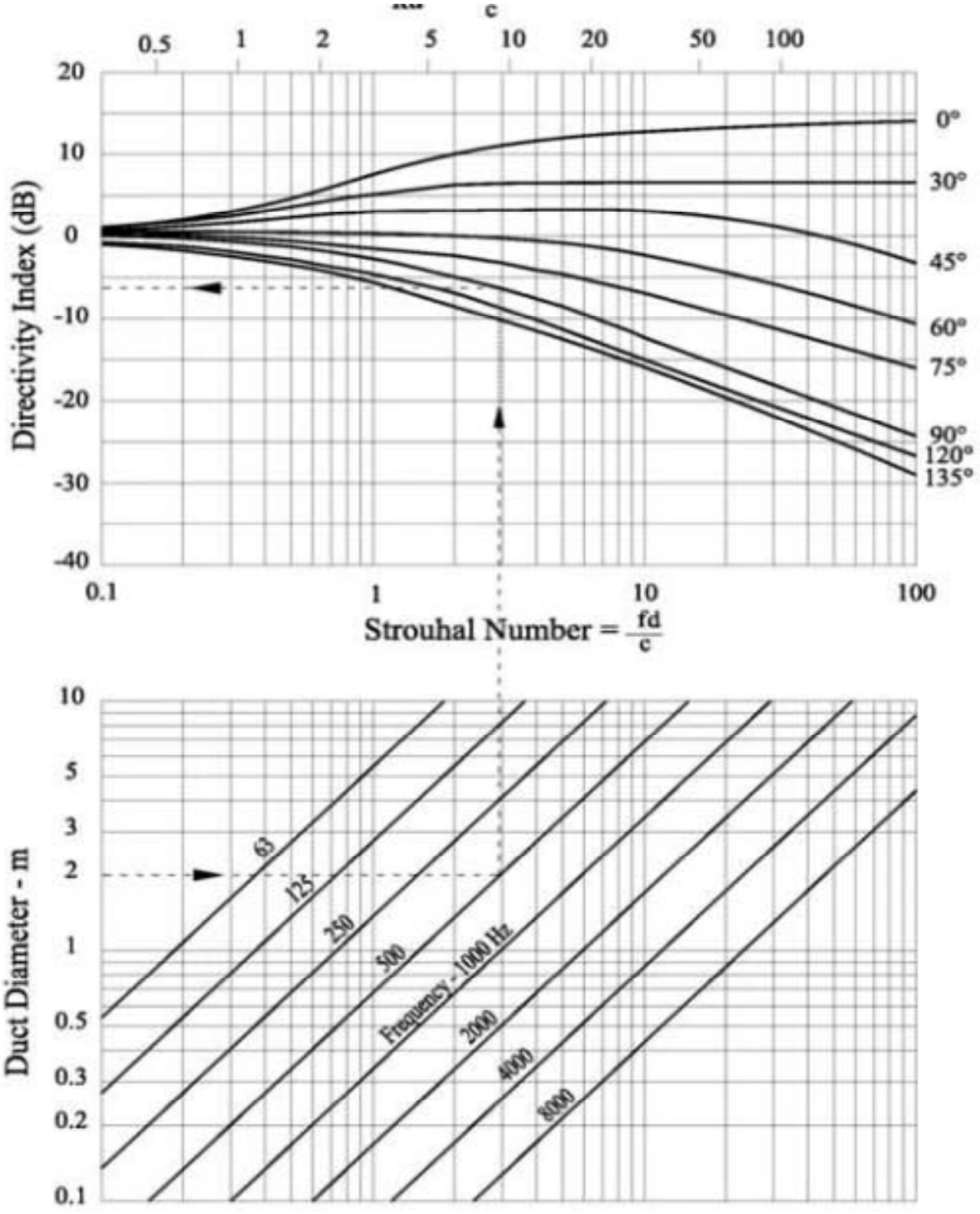


Figure 4.1: Duct directivity loss -

from Day, Hansen & Bennett, Acoustics Australia 37 (3) December 2009

Table 4.1: Wollongong Coal Russell Vale Noise Assessment - Angles from Sources to Receivers to be included in source file directivity

Source	Area	Angles to Receiver from Source								
	m2	RC1	RC2	RC3	RC4	RC5	RR1	RR2	RR3	RR4
S1, S14, S17: Drive Building N wall	61	160	130	75	115	160	30	30	30	40
S2, 15, S16: Drive Building E wall	71	60	40	20	15	60	70	70	70	50
S3, S16, S19: Drive Building S wall	61	20	55	110	75	20	160	165	160	140
S4 Tripper N side chute wall N end	5	160	130	75	115	160	30	30	30	40
S5 Trouser Leg discharge E side N end	1	60	35	20	15	60	75	80	75	50
S6 Trouser Leg discharge W side N end	1	110	135	160	170	110	110	105	110	130
S7 & 23 Tripper S side openings	4	20	55	110	75	20	160	165	160	140
S8 Tripper N side chute wall S end	5	160	130	75	115	160	30	30	30	40
S9 Trouser Leg discharge E side S end	1	60	35	20	15	60	75	80	75	50
S10 Trouser Leg discharge W side S end	1	110	135	160	170	110	110	105	110	130
S11 & 24 Tripper S side openings	4	20	55	110	75	20	160	165	160	140
S12 Sizer E wall	30	10	30	45	25	10	75	80	75	65
S13 Stockpile excavator loader	Point									
S20 Stairway door opening	10	90	90	90	90	90	90	90	90	90
S21 Transfer Station N wall opening	30	75	55	45	65	105	15	10	15	25
S22 Tripper conveyor belt	Line									
S25 Workshop Door South	Point									
S26 Workshop Door Centre	Point									
S27 Mine Vent Fan N discharge	8	35	45	60	40	25	90	90	90	
S28 Mine Vent fan N casing/belt	Point									
S29 Compressor House N wall	8	155	135	120	135	160	90			
S30 Substation	Point									

4.4 Topographical cross-sections between sources and receivers

The noise model requires ground topography between the sources and receivers. This can be done with a digital map of the ground and sources placed upon it. It can also be done by preparing specific cross-sections between the sources and receivers – this second method was used to allow for the different directivity that occurs.

Figures 4.2 and 4.3 show the cross-sections between the tripper and receivers C1 and C5, and C3.

Cross-sections for all source to receiver combinations are shown in Appendix C Table 4.3.

Cross-sections were not done for some sources (mine ventilation fan, compressor house and workshop) to Receiver R4 as this was more distant than other sources on the northern side of the site. Sound levels received at R1 to R3 will be greater than those at R4, meaning if reduction in noise emission is required for these sources at R1 to R3 to achieve the objectives, the reduction will apply at R4.

4.5 Computer noise model results

Predictions of sound level were made for the four meteorological conditions advised in section 4.1. A typical result is shown for tripper conveyor and transfer station noise sources for the condition wind 2m/s and lapse rate 3^{o}C/100m to Receiver C2 is shown in Table 4.4 below.

The results show The highest received contribution is from the southern side of the tripper opening. Tripper sources are the top four contributions at 40 to 45 dBA depending on tripper location, followed by the Sizer-Transfer Station northern wall opening and eastern wall and 38 and 37 dBA respectively. The next source below these is the stockpile loader at 30 dBA. If the loader doesn't operate the sound level does not change.

The difference between the results for this receiver for different weather conditions is shown in Table 4.5 and Figure 4.4. The highest results occur for a wind of 3m/s and neutral lapse rate, which has sound levels about 0.5 to 1 dB higher than for the 2m/s wind speed and inversion condition.

When assessing noise impacts likely at a location, typical meteorological conditions should be used to ensure their effects on propagation are included. It is considered and recommended by Hatch that a wind speed of 3m/s (11km/hr) towards the receivers with a neutral lapse rate be used because it is typical for this type of location with coastal winds and drainage flow. At higher wind speeds there will be a higher received sound level but the ambient or background sound level will increase from wind in vegetation noise, meaning the difference to background will be less. Using these conditions also provides a conservative approach to assessing impacts. This approach has been used in this report with the discussion of comparing received sound levels with objectives based on wind speed of 3m/s.

Tables 1.2 and 1.3 presented the collated and sorted sound levels for all sources and receivers for wind at 3m/s and calm respectively. Table 4.6 shows the results for wind 3m/s again, also showing the exceedance of the night-time objective. The exceedance is up to 14 dB for receivers R1 and R2 and 12 dB for Receiver C2. Table 4.7 shows the results for calm neutral conditions. Exceedances are lower, up to 6 dB at C3 and 4 dB at R1 and R2.

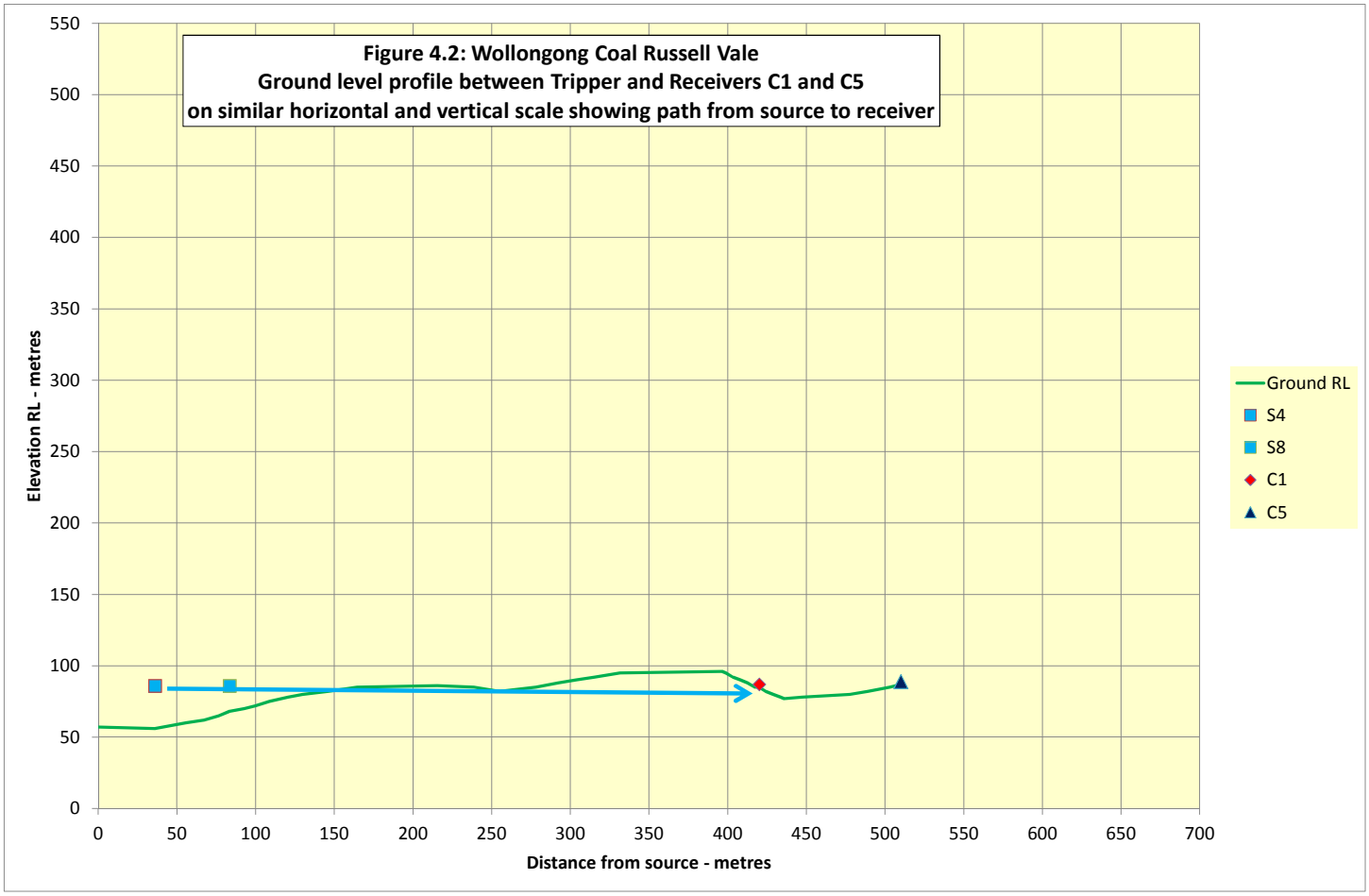


Figure 4.2: Wollongong Coal Russell Vale
Ground level profile between Tripper and Receivers C1 and C5
on similar horizontal and vertical scale showing path from source to receiver
Elevation RL - metres
Distance from source - metres
Ground RL
S4
S8
C1
C5

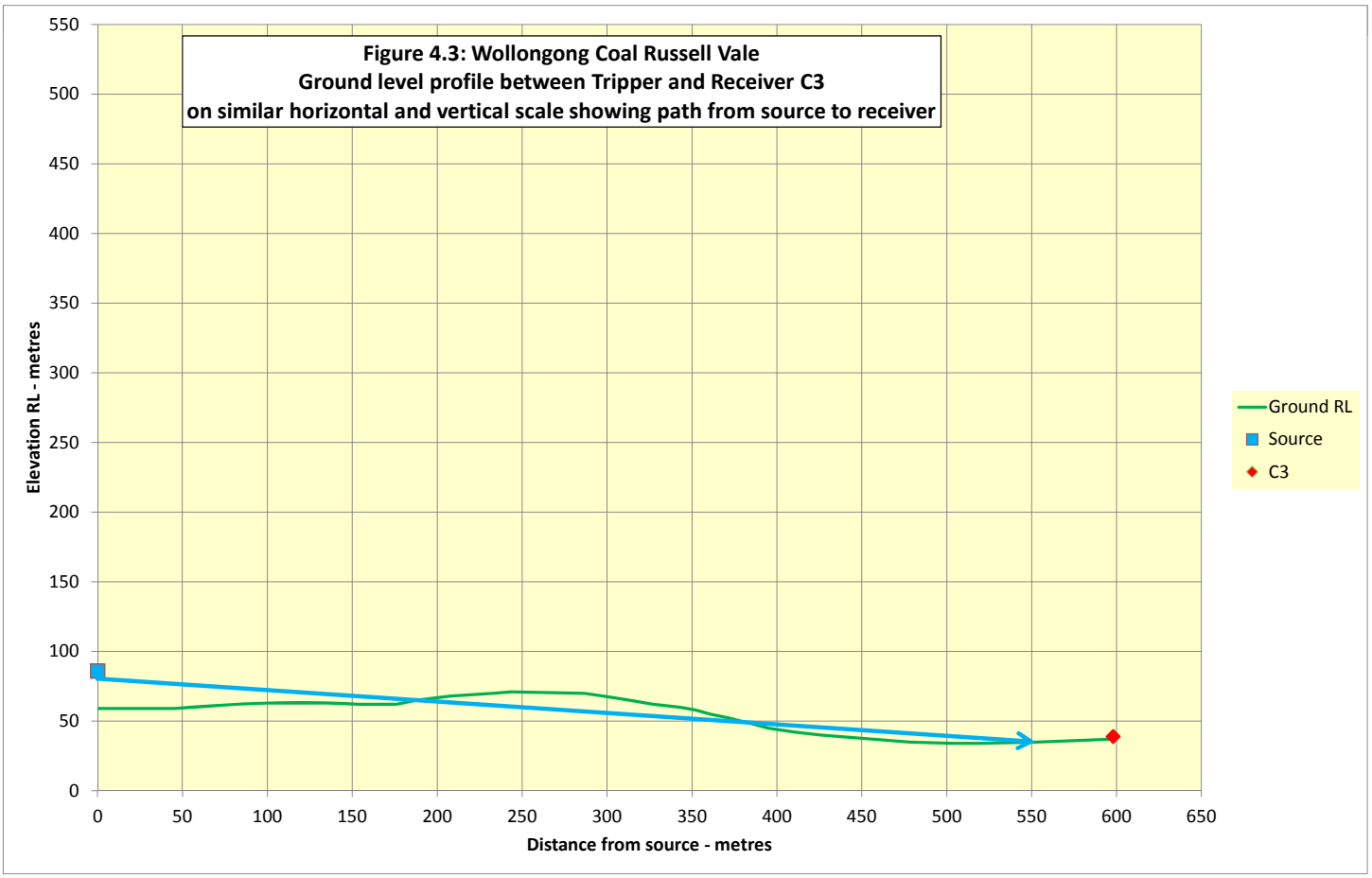


Figure 4.3: Wollongong Coal Russell Vale
Ground level profile between Tripper and Receiver C3
on similar horizontal and vertical scale showing path from source to receiver
Elevation RL - metres
Distance from source - metres
Ground RL
Source
C3

Table 4.4: Results of computer noise model to C2 for wind 2m/s, Lapse +3°C/100m

Source	Source Name	Contribution dB(A)		
No.			Nth End	Sth End
11	S11 Tripper S end S side entry to C2	45		45
7	S7 Tripper N end S side entry to C2	43	43	
24	Tripper S side opening No Coal Southern End to C2	42		42
9	S9 Tripper S end E side Trouser Leg to C2	42		42
10	S10 Tripper S end W side trouser leg to C2	42		42
6	S6 Tripper N end W side trouser leg to C2	41	41	
5	S5 Tripper N end E side Trouser Leg to C2	41	41	
23	S23 Tripper N end S side entry No Coal to C2	40	40	
21	Sizer Building N wall opening to C2	38	38	38
12	S12 Sizer Building E wall to C2	37	37	37
13	S13 Loader on stockpile to C2 (daytime and evening)	30	30	30
8	S8 Tripper S end N side to C2	26		26
4	S4 Tripper N end N side to C2	24	24	
3	S3 Conveyor Drive building S side Top including opening to C2	23	23	23
2	S2 Conveyor Drive building E side Top to C2	21	21	21
22	Tripper Belt to C2	16	16	16
15	S15 Conveyor Building E side 1L down from top C2	16	16	16
16	S16 Conveyor Building S side 1L down from top C2	15	15	15
19	S19 Conveyor Building S side 2L down from top C2	12	12	12
18	S18 Conveyor Building E side 2L down from top C2	8	8	8
20	S20 Conveyor Building Stair opening to C2	-2	-2	-2
1	S1 Conveyor Drive Building North Wall Top to C2	-2	-2	-2
14	S14 Conveyor Building N side 1L down from top C2	-6	-6	-6
17	S17 Conveyor Building N side 2L down from top C2	-12	-12	-12
	Total		**48**	**49**
	Total No loader		**48**	**49**

Tables 1.2 and 1.3 presented the collated and sorted sound levels for all sources and receivers for wind at 3m/s and calm respectively. Table 4.6 shows the results for wind 3m/s again, also showing the exceedance of the night-time objective. The exceedance is up to 14 dB for receivers R1 and R2 and 12 dB for Receiver C2. Table 4.7 shows the results for calm neutral conditions. Exceedances are lower, up to 6 dB at C2 and 2 dB at R1 and R2.

It is noted that there are significant increases in sound level caused by wind at some locations for some sources. Table 4.8 shows the differences for each source at each receiver. Increases of up to 21 are noted for C3. A check of the effect of wind speed changes was made for C3 and C4. These are shown in Tables 4.9 and 4.10, with figures 4.5 to 4.8 showing the results graphically indicating the higher received sources. Increases of the order of 20 dB or more for the sources is high but are indicative of the refractive effect of a following wind on sound propagating in a downhill direction.

Table 4.5: Results of computer noise model to C2 for each condition and the differences to calm and neutral.

Source	Source Name	Contribution dBA				Increase over W0 L0		
No.		W0 L0	W2 L3	W3 L0	W0 L3	W2 L3	W3 L0	W0 L3
1	S1 Conveyor Drive Building North Wall Top to C2	-6	-2	-2	-5	3.2	3.5	0.9
2	S2 Conveyor Drive building E side Top to C2	15	21	21	16	6	6.5	1.5
3	S3 Conveyor Drive building S side Top including opening to C2	17	23	24	19	6.2	6.7	1.5
4	S4 Tripper N end N side to C2	15	24	25	16	8.8	9.8	1.3
5	S5 Tripper N end E side Trouser Leg to C2	32	41	42	35	8.8	9.4	2.5
6	S6 Tripper N end W side trouser leg to C2	32	41	42	35	8.8	9.4	2.5
7	S7 Tripper N end S side entry to C2	34	43	44	36	9	9.7	1.6
8	S8 Tripper S end N side to C2	18	26	27	21	8	8.6	2.4
9	S9 Tripper S end E side Trouser Leg to C2	35	42	42	37	6.2	6.9	2
10	S10 Tripper S end W side trouser leg to C2	35	42	42	37	6.2	6.9	2
11	S11 Tripper S end S side entry to C2	40	45	46	41	5.7	6.2	1.7
12	S12 Sizer Building E wall to C2	31	37	38	33	5.8	6.4	1.4
13	S13 Loader on stockpile to C2 (Daytime and evening)	24	30	30	26	5.1	5.6	1.2
14	S14 Conveyor Building N side 1L down from top C2	-9	-6	-5	-8	3.7	4.1	1
15	S15 Conveyor Building E side 1L down from top C2	11	16	16	12	4.4	4.9	1.1
16	S16 Conveyor Building S side 1L down from top C2	9	15	15	10	5.4	6	1.2
17	S17 Conveyor Building N side 2L down from top C2	-15	-12	-11	-14	3.5	3.9	0.9
18	S18 Conveyor Building E side 2L down from top C2	3	8	8	4	4.9	5.4	1.2
19	S19 Conveyor Building S side 2L down from top C2	8	12	12	9	4	4.4	1
20	S20 Conveyor Building Stair opening to C2	-6	-2	-1	-5	4.1	4.7	1
21	Sizer Building N wall opening to C2	29	38	39	31	8.8	9.7	2
22	Tripper Belt to C2	8	16	17	9	8.1	8.9	1.2
23	S23 Tripper N end S side entry No Coal to C2	32	40	41	33	8.5	9.3	1.4
24	Tripper S side opening No Coal Southern End to C2	36	42	43	38	6.6	7.1	2

Figure 4.4: Wollongong Coal Russell Vale Noise - Comparison of difference predicted sound levels from calm neutral with higher wind speed and lapse rate

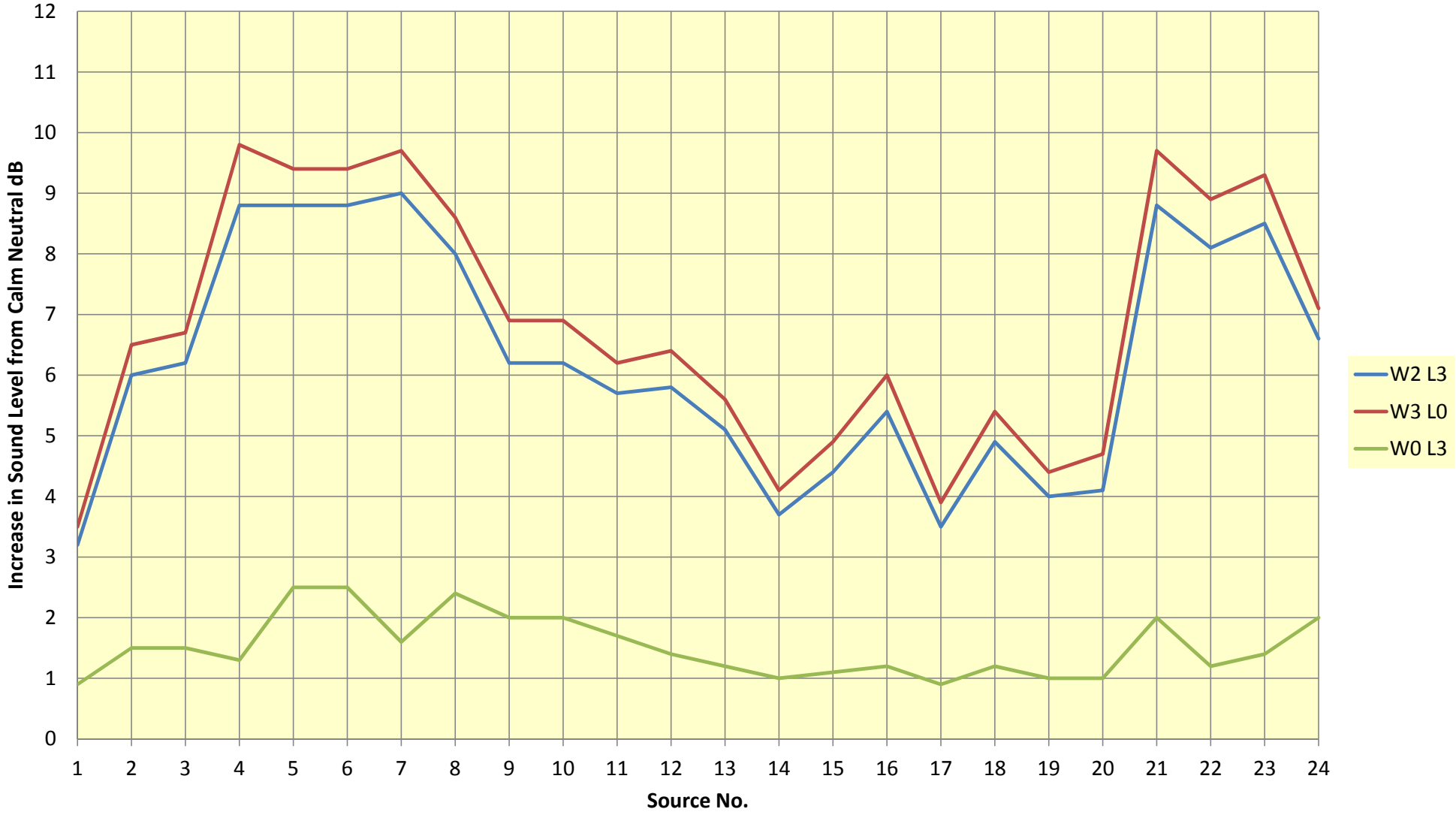


Table 4.6: Wollongong Coal Russell Vale - Tripper Conveyor and Surface Noise Assessment
Contribution sound levels at receivers for typical worst case conditions Wind 3m/s towards receivers, Neutral Atmosphere

Source	Source Description	Received dBA for both tripper locations									Received dBA for Northern tripper location									Received dBA for Southern Tripper location									Received dBA for Northern tripper location with No Loader									Received dBA for Southern tripper location with No Loader								
No.	Condition W3L0	C1	C2	C3	C4	C5	R1	R2	R3	R4	C1	C2	C3	C4	C5	R1	R2	R3	R4	C1	C2	C3	C4	C5	R1	R2	R3	R4	C1	C2	C3	C4	C5	R1	R2	R3	R4	C1	C2	C3	C4	C5	R1	R2	R3	R4
1	S1 Conveyor Drive Building North Wall Top	-17	-2	8	-3	-11	25	25	24	23	-17	-2	8	-3	-11	25	25	24	23	-17	-2	8	-3	-11	25	25	24	23	-17	-2	8	-3	-11	25	25	24	23	-17	-2	8	-3	-11	25	25	24	23
2	S2 Conveyor Drive building E side Top	1	21	23	19	7	13	12	11	22	1	21	23	19	7	13	12	11	22	1	21	23	19	7	13	12	11	22	1	21	23	19	7	13	12	11	22	1	21	23	19	7	13	12	11	22
3	S3 Conveyor Drive building S side Top including opening	15	24	-5	14	24	4	4	3	3	15	24	-5	14	24	4	4	3	3	15	24	-5	14	24	4	4	3	3	15	24	-5	14	24	4	4	3	3	15	24	-5	14	24	4	4	3	3
4	S4 Tripper N end N side	5	25	29	24	13	34	34	34	32	5	25	29	24	13	34	34	34	32										5	25	29	24	13	34	34	34	32									
5	S5 Tripper N end E side Trouser Leg	24	42	42	39	32	44	44	43	41	24	42	42	39	32	44	44	43	41										24	42	42	39	32	44	44	43	41									
6	S6 Tripper N end W side trouser leg	24	42	42	39	32	44	44	43	41	24	42	42	39	32	44	44	43	41										24	42	42	39	32	44	44	43	41									
7	S7 Tripper N end S side entry	24	44	32	38	35	29	30	28	28	24	44	32	38	35	29	30	28	28										24	44	32	38	35	29	30	28	28									
8	S8 Tripper S end N side	4	27	29	25	13	34	34	33	31										4	27	29	25	13	34	34	33	31										4	27	29	25	13	34	34	33	31
9	S9 Tripper S end E side Trouser Leg	24	42	42	42	32	43	44	43	41										24	42	42	42	32	43	44	43	41										24	42	42	42	32	43	44	43	41
10	S10 Tripper S end W side trouser leg	24	42	42	42	32	43	44	43	41										24	42	42	42	32	43	44	43	41										24	42	42	42	32	43	44	43	41
11	S11 Tripper S end S side entry	25	46	32	38	33	29	29	28	27										25	46	32	38	33	29	29	28	27										25	46	32	38	33	29	29	28	27
12	S12 Sizer Building E wall	41	38	36	21	38	24	23	24	26	41	38	36	21	38	24	23	24	26	41	38	36	21	38	24	23	24	26	41	38	36	21	38	24	23	24	26	41	38	36	21	38	24	23	24	26
13	S13 Loader on stockpile	27	30	31	28	27	48	48	47	45	27	30	31	28	27	48	48	47	45	27	30	31	28	27	48	48	47	45																		
14	S14 Conveyor Building N side 1L down from top	-19	-5	2	-8	-14	21	22	20	18	-19	-5	2	-8	-14	21	22	20	18	-19	-5	2	-8	-14	21	22	20	18	-19	-5	2	-8	-14	21	22	20	18	-19	-5	2	-8	-14	21	22	20	18
15	S15 Conveyor Building E side 1L down from top	0	16	16	14	5	9	11	8	18	0	16	16	14	5	9	11	8	18	0	16	16	14	5	9	11	8	18	0	16	16	14	5	9	11	8	18	0	16	16	14	5	9	11	8	18
16	S16 Conveyor Building S side 1L down from top	4	15	-7	0	10	-7	-6	-9	-9	4	15	-7	0	10	-7	-6	-9	-9	4	15	-7	0	10	-7	-6	-9	-9	4	15	-7	0	10	-7	-6	-9	-9	4	15	-7	0	10	-7	-6	-9	-9
17	S17 Conveyor Building N side 2L down from top	-22	-11	-1	-12	-18	16	17	15	13	-22	-11	-1	-12	-18	16	17	15	13	-22	-11	-1	-12	-18	16	17	15	13	-22	-11	-1	-12	-18	16	17	15	13	-22	-11	-1	-12	-18	16	17	15	13
18	S18 Conveyor Building E side 2L down from top	-5	8	10	6	-1	3	4	1	13	-5	8	10	6	-1	3	4	1	13	-5	8	10	6	-1	3	4	1	13	-5	8	10	6	-1	3	4	1	13	-5	8	10	6	-1	3	4	1	13
19	S19 Conveyor Building S side 2L down from top	6	12	-6	-11	10	-8	-5	-10	-11	6	12	-6	-11	10	-8	-5	-10	-11	6	12	-6	-11	10	-8	-5	-10	-11	6	12	-6	-11	10	-8	-5	-10	-11	6	12	-6	-11	10	-8	-5	-10	-11
20	S20 Conveyor Building Stair opening	-8	-1	2	-2	-2	11	11	10	10	-8	-1	2	-2	-2	11	11	10	10	-8	-1	2	-2	-2	11	11	10	10	-8	-1	2	-2	-2	11	11	10	10	-8	-1	2	-2	-2	11	11	10	10
21	Sizer Building N wall opening	30	39	37	12	19	38	38	37	35	30	39	37	12	19	38	38	37	35	30	39	37	12	19	38	38	37	35	30	39	37	12	19	38	38	37	35	30	39	37	12	19	38	38	37	35
22	Tripper conveyor belt	-1	17	14	11	9	15	16	15	13	-1	17	14	11	9	15	16	15	13	-1	17	14	11	9	15	16	15	13	-1	17	14	11	9	15	16	15	13	-1	17	14	11	9	15	16	15	13
23	Tripper S side opening No Coal Northern End	24	41	31	35	34	29	30	28	27	24	41	31	35	34	29	30	28	27										24	41	31	35	34	29	30	28	27									
24	Tripper S side opening No Coal Southern End	24	43	31	36	32	28	29	28	27										24	43	31	36	32	28	29	28	27										24	43	31	36	32	28	29	28	27
25	Door 1 South	27	24	28		25		28			27	24	28		25		28			27	24	28		25		28			27	24	28		25		28			27	24	28		25		28		
26	Door 2 Centre	33	30	29		27		28			33	30	29		27		28			33	30	29		27		28			33	30	29		27		28			33	30	29		27		28		
27	MVF North	26	29	28	26	17		16			26	29	28	26	17		16			26	29	28	26	17		16			26	29	28	26	17		16			26	29	28	26	17		16		
28	MVF North casing	18	20	28	18	10		21			18	20	28	18	10		21			18	20	28	18	10		21			18	20	28	18	10		21			18	20	28	18	10		21		
29	Compressor House N Wall vents	11	13	14	10	4		17			11	13	14	10	4		17			11	13	14	10	4		17			11	13	14	10	4		17			11	13	14	10	4		17		
30	Substation N of Admin	13	7	13	13	6		17			13	7	13	13	6		17			13	7	13	13	6		17			13	7	13	13	6		17			13	7	13	13	6		17		
	Max	41	46	42	42	38	48	48	47	45	41	44	42	39	38	48	48	47	45	41	46	42	42	38	48	48	47	45	41	44	42	39	38	44	44	43	41	41	46	42	42	38	43	44	43	41
	Total Northern Tripper location	43	49	47	44	42	51	51	50	48	43	49	47	44	42	51	51	50	48																											
	Total Northern Tripper location No stockpile loader	42	49	47	44	42	47	48	47	45																			42	49	47	44	42	47	48	47	45									
	Total Southern Tripper location	43	50	47	46	42	50	51	50	48										43	50	47	46	42	50	51	50	48																		
	Total Southern Tripper location No stockpile loader	42	50	47	46	41	47	48	47	45																												42	50	47	46	41	47	48	47	45
	Long-term Objective Night $L_{Aeq,15min}$	38	38	36	36	40	37	37	37	37	38	38	36	36	40	37	37	37	37	38	38	36	36	40	37	37	37	37	38	38	36	36	40	37	37	37	37	38	38	36	36	40	37	37	37	37
	Long-term Objective Evening $L_{Aeq,15min}$	38	38	37	37	40	39	39	39	39	38	38	37	37	40	39	39	39	39	38	38	37	37	40	39	39	39	39	38	38	37	37	40	39	39	39	39	38	38	37	37	40	39	39	39	39
	Long-term Objective Day $L_{Aeq,15min}$	39	39	38	37	40	43	43	43	43	39	39	38	37	40	43	43	43	43	39	39	38	37	40	43	43	43	43	39	39	38	37	40	43	43	43	43	39	39	38	37	40	43	43	43	43
	Night-time $L_{A01,1min}$	47	47	47	47	50	47	47	47	47	47	47	47	47	50	47	47	47	47	47	47	47	47	50	47	47	47	47	47	47	47	47	50	47	47	47	47	47	47	47	47	50	47	47	47	47
	Difference Loader and no loader Northern Tripper	0.1	0.1	0.1	0.1	0.1	3.1	3.0	3.1	2.8																																			
	Southern Tripper	0.1	0.0	0.1	0.1	0.2	3.2	2.9	3.2	3.0																																			

NOTES Yellow highlighted cells indicate highest received source sound level

Pink highlighted cells indicate exceed night-time levels without loader by more than 2 dB

Green highlighted cells indicate exceed evening levels with loader by more than 2 dB

Exceedance of Objectives:

Total Northern Tripper location Daytime	4	10	9	7	2	8	8	7	5	4	10	9	7	2	8	8	7	5																											
Total Northern Tripper location Evening	5	11	10	7	2	12	12	11	9	5	11	10	7	2	12	12	11	9																											
Total Northern Tripper No stockpile loader Night-time	4	11	11	8	2	10	11	10	8																			4	11	11	8	2	10	11	10	8									
Total Southern Tripper location Daytime	4	11	9	9	2	7	8	7	5										4	11	9	9	2	7	8	7	5																	
Total Southern Tripper location Evening	5	12	10	9	2	11	12	11	9										5	12	10	9	2	11	12	11	9																	
Total Southern Tripper No stockpile loader Night-time	4	12	11	10	1	10	11	10	8																												4	12	11	10	1	10	11	10	8

Table 4.7: Wollongong Coal Russell Vale - Tripper Conveyor and Surface Noise Assessment

Contribution sound levels at receivers for typical worst case conditions Wind calm, Neutral Atmosphere

Source	Source Description	Received dBA for both Tripper locations									Received dBA for Northern tripper location									Received dBA for Southern Tripper location									eceived dBA for Northern tripper location with No Load									eceived dBA for Southern tripper location with No Load								
No.	Condition W0L0 Calm Neutral	C1	C2	C3	C4	C5	R1	R2	R3	R4	C1	C2	C3	C4	C5	R1	R2	R3	R4	C1	C2	C3	C4	C5	R1	R2	R3	R4	C1	C2	C3	C4	C5	R1	R2	R3	R4	C1	C2	C3	C4	C5	R1	R2	R3	R4
1	S1 Conveyor Drive Building North Wall Top to R4	-20	-6	-2	-10	-18	19	19	18	14	-20	-6	-2	-10	-18	19	19	18	14	-20	-6	-2	-10	-18	19	19	18	14	-20	-6	-2	-10	-18	19	19	18	14	-20	-6	-2	-10	-18	19	19	18	14
2	S2 Conveyor Drive building E side Top to R4	-2	15	9	9	1	9	8	7	15	-2	15	9	9	1	9	8	7	15	-2	15	9	9	1	9	8	7	15	-2	15	9	9	1	9	8	7	15	-2	15	9	9	1	9	8	7	15
3	S3 Conveyor Drive building S side Top including opening to R4	10	17	-13	3	13	-1	-2	-2	-4	10	17	-13	3	13	-1	-2	-2	-4	10	17	-13	3	13	-1	-2	-2	-4	10	17	-13	3	13	-1	-2	-2	-4	10	17	-13	3	13	-1	-2	-2	-4
4	S4 Tripper N end N side to R4	0	15	11	10	4	26	27	24	22	0	15	11	10	4	26	27	24	22										0	15	11	10	4	26	27	24	22									
5	S5 Tripper N end E side Trouser Leg to R4	18	32	22	24	21	36	36	35	32	18	32	22	24	21	36	36	35	32										18	32	22	24	21	36	36	35	32									
6	S6 Tripper N end W side trouser leg to R4	18	32	22	24	21	36	36	35	32	18	32	22	24	21	36	36	35	32										18	32	22	24	21	36	36	35	32									
7	S7 Tripper N end S side entry to R4	19	34	20	25	24	23	25	22	21	19	34	20	25	24	23	25	22	21										19	34	20	25	24	23	25	22	21									
8	S8 Tripper S end N side to R4	0	18	10	12	5	24	26	24	21										0	18	10	12	5	24	26	24	21										0	18	10	12	5	24	26	24	21
9	S9 Tripper S end E side Trouser Leg to R4	19	35	21	28	22	35	36	34	32										19	35	21	28	22	35	36	34	32										19	35	21	28	22	35	36	34	32
10	S10 Tripper S end W side trouser leg to R4	19	35	21	28	22	35	36	34	32										19	35	21	28	22	35	36	34	32										19	35	21	28	22	35	36	34	32
11	S11 Tripper S end S side entry to R4	21	40	18	28	25	22	23	21	20										21	40	18	28	25	22	23	21	20										21	40	18	28	25	22	23	21	20
12	S12 Sizer Building E wall R4	38	31	27	16	34	21	20	21	22	38	31	27	16	34	21	20	21	22	38	31	27	16	34	21	20	21	22	38	31	27	16	34	21	20	21	22	38	31	27	16	34	21	20	21	22
13	S13 Loader on stockpile R4	21	24	18	20	19	34	34	33	30	21	24	18	20	19	34	34	33	30	21	24	18	20	19	34	34	33	30																		
14	S14 Conveyor Building N side 1L down from top R4	-21	-9	-6	-16	-20	15	15	13	9	-21	-9	-6	-16	-20	15	15	13	9	-21	-9	-6	-16	-20	15	15	13	9	-21	-9	-6	-16	-20	15	15	13	9	-21	-9	-6	-16	-20	15	15	13	9
15	S15 Conveyor Building E side 1L down from top R4	-3	11	6	5	-1	6	5	4	10	-3	11	6	5	-1	6	5	4	10	-3	11	6	5	-1	6	5	4	10	-3	11	6	5	-1	6	5	4	10	-3	11	6	5	-1	6	5	4	10
16	S16 Conveyor Building S side 1L down from top R4	0	9	-15	-8	2	-11	-12	-13	-15	0	9	-15	-8	2	-11	-12	-13	-15	0	9	-15	-8	2	-11	-12	-13	-15	0	9	-15	-8	2	-11	-12	-13	-15	0	9	-15	-8	2	-11	-12	-13	-15
17	S17 Conveyor Building N side 2L down from top R4	-25	-15	-10	-19	-24	10	10	8	4	-25	-15	-10	-19	-24	10	10	8	4	-25	-15	-10	-19	-24	10	10	8	4	-25	-15	-10	-19	-24	10	10	8	4	-25	-15	-10	-19	-24	10	10	8	4
18	S18 Conveyor Building E side 2L down from top R4	-9	3	-1	-2	-8	-2	-2	-4	4	-9	3	-1	-2	-8	-2	-2	-4	4	-9	3	-1	-2	-8	-2	-2	-4	4	-9	3	-1	-2	-8	-2	-2	-4	4	-9	3	-1	-2	-8	-2	-2	-4	4
19	S19 Conveyor Building S side 2L down from top R4	2	8	-14	-18	3	-12	-11	-14	-17	2	8	-14	-18	3	-12	-11	-14	-17	2	8	-14	-18	3	-12	-11	-14	-17	2	8	-14	-18	3	-12	-11	-14	-17	2	8	-14	-18	3	-12	-11	-14	-17
20	S20 Conveyor Building Stair opening R4	-12	-6	-9	-11	-8	4	1	3	-1	-12	-6	-9	-11	-8	4	1	3	-1	-12	-6	-9	-11	-8	4	1	3	-1	-12	-6	-9	-11	-8	4	1	3	-1	-12	-6	-9	-11	-8	4	1	3	-1
21	Sizer Building N wall opening R4	26	29	29	8	16	29	30	29	27	26	29	29	8	16	29	30	29	27	26	29	29	8	16	29	30	29	27	26	29	29	8	16	29	30	29	27	26	29	29	8	16	29	30	29	27
22	Tripper conveyor belt to R4	-6	8	0	1	-1	8	9	7	5	-6	8	0	1	-1	8	9	7	5	-6	8	0	1	-1	8	9	7	5	-6	8	0	1	-1	8	9	7	5	-6	8	0	1	-1	8	9	7	5
23	Tripper S side opening No Coal Northern End to R4	19	32	20	24	24	24	24	23	21	19	32	20	24	24	24	24	23	21										19	32	20	24	24	24	24	23	21									
24	Tripper S side opening No Coal Southern End to R4	21	36	19	26	25	23	22	22	20										21	36	19	26	25	23	22	22	20										21	36	19	26	25	23	22	22	20
25	Door 1 South	19	17	15		17		16			19	17	15		17		16			19	17	15		17		16			19	17	15		17		16			19	17	15		17		16		
26	Door 2 Centre	24	22	15		18		16			24	22	15		18		16			24	22	15		18		16			24	22	15		18		16			24	22	15		18		16		
27	MVF North	21	23	19	16	13		8			21	23	19	16	13		8			21	23	19	16	13		8			21	23	19	16	13		8			21	23	19	16	13		8		
28	MVF North casing	14	15	16	8	6		9			14	15	16	8	6		9			14	15	16	8	6		9			14	15	16	8	6		9			14	15	16	8	6		9		
29	Compressor House N Wall vents	5	6	4	2	-1		7			5	6	4	2	-1		7			5	6	4	2	-1		7			5	6	4	2	-1		7			5	6	4	2	-1		7		
30	Substation N of Admin	7	4	3	5	0		12			7	4	3	5	0		12			7	4	3	5	0		12			7	4	3	5	0		12			7	4	3	5	0		12		
	Max	38	40	29	28	34	36	36	35	32	38	34	29	25	34	36	36	35	32	38	40	29	28	34	35	36	34	32	38	34	29	25	34	36	36	35	32	38	40	29	28	34	35	36	34	32
	Total Northern Tripper location	39	40	33	31	36	41	41	40	37	39	40	33	31	36	41	41	40	37																												
	Total Northern Tripper location No stockpile loader	39	40	33	31	35	40	40	39	36																			39	40	33	31	35	40	40	39	36									
	Total Southern Tripper location	39	44	33	34	36	40	41	39	37										39	44	33	34	36	40	41	39	37																		
	Total Southern Tripper location No stockpile loader	39	43	33	34	36	39	40	38	36																												39	43	33	34	36	39	40	38	36
	Long-term Objective Night $L_{Aeq,15min}$	38	38	36	36	40	37	37	37	37	38	38	36	36	40	37	37	37	37	38	38	36	36	40	37	37	37	37	38	38	36	36	40	37	37	37	37	38	38	36	36	40	37	37	37	37
	Long-term Objective Evening $L_{Aeq,15min}$	38	38	37	37	40	39	39	39	39	38	38	37	37	40	39	39	39	39	38	38	37	37	40	39	39	39	39	38	38	37	37	40	39	39	39	39	38	38	37	37	40	39	39	39	39
	Long-term Objective Day $L_{Aeq,15min}$	39	39	38	37	40	43	43	43	43	39	39	38	37	40	43	43	43	43	39	39	38	37	40	43	43	43	43	39	39	38	37	40	43	43	43	43	39	39	38	37	40	43	43	43	43
	Night-time $L_{A01,1min}$	47	47	47	47	50	47	47	47	47	47	47	47	47	50	47	47	47	47	47	47	47	47	50	47	47	47	47	47	47	47	47	50	47	47	47	47	47	47	47	47	50	47	47	47	47
	Difference Loader and no loader Northern Tripper	0.1	0.1	0.2	0.4	0.1	1.0	1.0	1.0	0.9																																			
	Southern Tripper	0.1	0.1	0.2	0.2	0.1	1.2	1.1	1.2	1.0																																			

NOTES Yellow highlighted cells indicate highest received source sound level

Pink highlighted cells indicate exceed night-time levels without loader by more than 2 dB

Green highlighted cells indicate exceed evening levels with loader by more than 2 dB

Exceedance of Objectives:

Total Northern Tripper location Daytime	0	1	-5	-6	-4	-2	-2	-3	-6	0	1	-5	-6	-4	-2	-2	-3	-6																											
Total Northern Tripper location Evening	1	2	-4	-6	-4	2	2	1	-2	1	2	-4	-6	-4	2	2	1	-2																											
Total Northern Tripper No stockpile loader Night-time	1	2	-3	-5	-5	3	3	2	-1																			1	2	-3	-5	-5	3	3	2	-1									
Total Southern Tripper location Daytime	0	5	-5	-3	-4	-3	-2	-4	-6										0	5	-5	-3	-4	-3	-2	-4	-6																		
Total Southern Tripper location Evening	1	6	-4	-3	-4	1	2	0	-2										1	6	-4	-3	-4	1	2	0	-2																		
Total Southern Tripper No stockpile loader Night-time	1	5	-3	-2	-4	2	3	1	-1																													1	5	-3	-2	-4	2	3	1	-1

Table 4.8: Wollongong Coal - Tripper Conveyor Conveyor Drive House and Sizer-Transfer Station Noise with workshop, Mine Vent fan and Compressor House North Wall vents
Calculated increase in Contributed sound level for weather conditions at receivers for Wind 3m/s L0 compared to Calm and Neutral W0 L0

Source No.	Source Description	Condition	Increase in Received Sound Level dBA for both Tripper locations								
		W0 L0	C1	C2	C3	C4	C5	R1	R2	R3	R4
1	S1 Conveyor Drive Building North Wall Top to R4		3	4	10	7	6	6	6	7	8
2	S2 Conveyor Drive building E side Top to R4		3	7	14	10	7	4	5	5	8
3	S3 Conveyor Drive building S side Top including opening to R4		6	7	8	11	11	5	5	5	7
4	S4 Tripper N end N side to R4		4	10	18	14	9	9	8	9	10
5	S5 Tripper N end E side Trouser Leg to R4		6	9	20	15	11	8	8	9	9
6	S6 Tripper N end W side trouser leg to R4		6	9	20	15	11	8	8	9	9
7	S7 Tripper N end S side entry to R4		6	10	13	13	12	6	5	6	7
8	S8 Tripper S end N side to R4		4	9	19	12	8	9	9	10	10
9	S9 Tripper S end E side Trouser Leg to R4		6	7	21	14	10	9	8	9	9
10	S10 Tripper S end W side trouser leg to R4		6	7	21	14	10	9	8	9	9
11	S11 Tripper S end S side entry to R4		4	6	14	11	9	6	6	7	7
12	S12 Sizer Building E wall R4		3	6	10	5	3	3	4	3	4
13	S13 Loader on stockpile R4		6	6	12	8	8	14	13	15	15
14	S14 Conveyor Building N side 1L down from top R4		2	4	8	8	6	6	7	7	9
15	S15 Conveyor Building E side 1L down from top R4		3	5	10	9	6	4	6	4	8
16	S16 Conveyor Building S side 1L down from top R4		4	6	8	9	8	4	6	4	6
17	S17 Conveyor Building N side 2L down from top R4		3	4	8	7	6	6	7	6	8
18	S18 Conveyor Building E side 2L down from top R4		3	5	11	9	6	5	7	5	9
19	S19 Conveyor Building S side 2L down from top R4		3	4	8	7	7	4	6	4	6
20	S20 Conveyor Building Stair opening R4		4	5	11	9	6	7	10	7	10
21	Sizer Building N wall opening R4		4	10	8	4	4	9	8	8	8
22	Tripper conveyor belt to R4		5	9	14	10	10	7	7	7	9
23	Tripper S side opening No Coal Northern End to R4		5	9	11	11	10	5	6	5	6
24	Tripper S side opening No Coal Southern End to R4		4	7	12	10	7	6	7	6	7
25	Door 1 South		7	8	13	0	8	0	12	0	0
26	Door 2 Centre		9	8	13	0	9	0	12	0	0
27	MVF North		5	6	9	10	4	0	8	0	0
28	MVF North casing		5	5	12	10	4	0	11	0	0
29	Compressor House N Wall vents		6	7	10	8	5	0	10	0	0
30	Substation N of Admin		6	4	10	8	6	0	5	0	0
		Max	9	10	21	15	12	14	13	15	15

NOTE: **Pink highlighted cells with red text indicate the increase in sound level is between 10 and 15 dB**
Yellow highlighted cells indicate the increase in sound level is greater than 15 dB

Table 4.9: Wollongong Coal - Surface noise

Calculated increase in Contributed sound level for weather conditions at receivers for Wind 0 to 4m/s L0 to Receiver C3

Source	Source Name		Received SPL at C3 with wind speed m/s towards receiver.								
no.		Source	0	0.5	1	1.5	2	2.5	3	3.5	4
1	S1 Conveyor Drive Building North Wall Top to C3	S1	-2	-0.6	0.8	2.1	3.2	5.3	8.3	10.4	12
2	S2 Conveyor Drive building E side Top to C3	S2	9	10.8	12.8	14.7	16.2	19.5	22.9	24.9	26.4
3	S3 Conveyor Drive building S side Top including opening to C3	S3	-13.1	-11.8	-10.6	-9.6	-8.7	-7.2	-4.8	-2.8	-1.2
4	S4 Tripper N end N side to C3	S4	11.4	14.4	17.4	19.4	23.2	27.2	29.3	31	32.6
5	S5 Tripper N end E side Trouser Leg to C3	S5	21.6	24.6	28.2	31.9	34.4	37.5	41.9	44.3	45.8
6	S6 Tripper N end W side trouser leg to C3	S6	21.6	24.6	28.2	31.9	34.4	37.5	41.9	44.3	45.8
7	S7 Tripper N end S side entry to C3	S7	19.6	21.3	22.7	23.9	27.3	30.5	32.3	33.8	35.2
8	S8 Tripper S end N side to C3	S8	9.9	13	16.3	18.8	21.2	25.9	28.9	30.6	32.2
9	S9 Tripper S end E side Trouser Leg to C3	S9	21.4	24.5	28.2	31.9	34.4	38.1	42.1	44.2	45.8
10	S10 Tripper S end W side trouser leg to C3	S10	21.4	24.5	28.2	31.9	34.4	38.1	42.1	44.2	45.8
11	S11 Tripper S end S side entry to C3	S11	18.4	20.3	22	23.3	27.1	30.3	32.1	33.6	35.1
12	S12 Sizer Building E wall to C3	S12	26.5	27.3	29	31.1	33	34.6	36	37.4	38.7
13	S13 Loader on stockpile to C3	S13	18.3	20	21.9	23.9	26.1	28.4	30.7	33.1	35.2
14	S14 Conveyor Building N side 1L down from top to C3	S14	-6.3	-4.8	-3.4	-1.9	-0.5	0.7	1.7	3.7	6.5
15	S15 Conveyor Building E side 1L down from top to C3	S15	5.9	7.4	9	10.7	12.5	14.2	15.5	18.2	21.4
16	S16 Conveyor Building S side 1L down from top to C3	S16	-15.2	-13.8	-12.3	-10.9	-9.5	-8.3	-7.2	-5.3	-2.5
17	S17 Conveyor Building N side 2L down from top to C3	S17	-9.6	-8.1	-6.7	-5.2	-3.8	-2.5	-1.2	-0.2	0.8
18	S18 Conveyor Building E side 2L down from top to C3	S18	-1	0.6	2.3	4.1	6	8.3	10.4	12.2	13.8
19	S19 Conveyor Building S side 2L down from top to C3	S19	-13.8	-12.3	-10.8	-9.4	-8.1	-6.9	-5.9	-5.1	-4.3
20	S20 Conveyor Building Stair opening to C3	S20	-9	-7.7	-6.2	-4.4	-2.6	-0.7	1.6	4.1	6.6
21	Sizer Building N wall opening to C3	S21	28.5	29.5	30.6	31.9	33.4	35	36.6	38.2	39.8
22	Tripper Conveyor Belt to C3	S22	0.1	2.1	3.9	5.4	9.2	12.4	14.2	15.9	17.4
23	Tripper S side opening No Coal Northern End to C3	S23	19.8	21.2	22.5	23.6	26	28.9	30.8	32.5	34
24	Tripper S side opening No Coal Southern End to C3	S24	18.8	20.3	21.6	22.8	25.7	28.7	30.6	32.3	33.8
	Change in received sound level from calm										
1	S1 Conveyor Drive Building North Wall Top to C3	S1	0	1.4	2.8	4.1	5.2	7.3	10.3	12.4	14
2	S2 Conveyor Drive building E side Top to C3	S2	0	1.8	3.8	5.7	7.2	10.5	13.9	15.9	17.4
3	S3 Conveyor Drive building S side Top including opening to C3	S3	0	1.3	2.5	3.5	4.4	5.9	8.3	10.3	11.9
4	S4 Tripper N end N side to C3	S4	0	3	6	8	11.8	15.8	17.9	19.6	21.2
5	S5 Tripper N end E side Trouser Leg to C3	S5	0	3	6.6	10.3	12.8	15.9	20.3	22.7	24.2
6	S6 Tripper N end W side trouser leg to C3	S6	0	3	6.6	10.3	12.8	15.9	20.3	22.7	24.2
7	S7 Tripper N end S side entry to C3	S7	0	1.7	3.1	4.3	7.7	10.9	12.7	14.2	15.6
8	S8 Tripper S end N side to C3	S8	0	3.1	6.4	8.9	11.3	16	19	20.7	22.3
9	S9 Tripper S end E side Trouser Leg to C3	S9	0	3.1	6.8	10.5	13	16.7	20.7	22.8	24.4
10	S10 Tripper S end W side trouser leg to C3	S10	0	3.1	6.8	10.5	13	16.7	20.7	22.8	24.4
11	S11 Tripper S end S side entry to C3	S11	0	1.9	3.6	4.9	8.7	11.9	13.7	15.2	16.7
12	S12 Sizer Building E wall to C3	S12	0	0.8	2.5	4.6	6.5	8.1	9.5	10.9	12.2
13	S13 Loader on stockpile to C3	S13	0	1.7	3.6	5.6	7.8	10.1	12.4	14.8	16.9
14	S14 Conveyor Building N side 1L down from top to C3	S14	0	1.5	2.9	4.4	5.8	7	8	10	12.8
15	S15 Conveyor Building E side 1L down from top to C3	S15	0	1.5	3.1	4.8	6.6	8.3	9.6	12.3	15.5
16	S16 Conveyor Building S side 1L down from top to C3	S16	0	1.4	2.9	4.3	5.7	6.9	8	9.9	12.7
17	S17 Conveyor Building N side 2L down from top to C3	S17	0	1.5	2.9	4.4	5.8	7.1	8.4	9.4	10.4
18	S18 Conveyor Building E side 2L down from top to C3	S18	0	1.6	3.3	5.1	7	9.3	11.4	13.2	14.8
19	S19 Conveyor Building S side 2L down from top to C3	S19	0	1.5	3	4.4	5.7	6.9	7.9	8.7	9.5
20	S20 Conveyor Building Stair opening to C3	S20	0	1.3	2.8	4.6	6.4	8.3	10.6	13.1	15.6
21	Sizer Building N wall opening to C3	S21	0	1	2.1	3.4	4.9	6.5	8.1	9.7	11.3
22	Tripper Conveyor Belt to C3	S22	0	2	3.8	5.3	9.1	12.3	14.1	15.8	17.3
23	Tripper S side opening No Coal Northern End to C3	S23	0	1.4	2.7	3.8	6.2	9.1	11	12.7	14.2
24	Tripper S side opening No Coal Southern End to C3	S24	0	1.5	2.8	4	6.9	9.9	11.8	13.5	15

Source PWLs for enm tripper & transfer.xlsx: enm wind c3&4

Table 4.10: Wollongong Coal - Surface noise

Calculated increase in Contributed sound level for weather conditions at receivers for Wind 0 to 4m/s L0 to Receiver C4

Source	Source Name		Received SPL at C4 with wind speed m/s towards receiver.								
no.		Source	0	0.5	1	1.5	2	2.5	3	3.5	4
1	S1 Conveyor Drive Building North Wall Top to C4	S1	-10	-8.8	-7.5	-6.3	-5	-3.9	-2.9	-1.8	0.3
2	S2 Conveyor Drive building E side Top to C4	S2	8.8	10.2	11.9	13.7	15.7	17.7	19.2	20.9	24.1
3	S3 Conveyor Drive building S side Top including opening to C4	S3	3	4.5	6.2	8.1	10.2	12.2	13.8	15.5	18.5
4	S4 Tripper N end N side to C4	S4	9.7	11.8	13.8	15.4	17.6	21.2	24.1	26.2	27.7
5	S5 Tripper N end E side Trouser Leg to C4	S5	24.2	26.6	29.3	32.2	35	37.1	38.7	41.7	44.9
6	S6 Tripper N end W side trouser leg to C4	S6	24.2	26.6	29.3	32.2	35	37.1	38.7	41.7	44.9
7	S7 Tripper N end S side entry to C4	S7	25.2	26.7	28	29.5	32.6	35.6	37.8	39.4	40.7
8	S8 Tripper S end N side to C4	S8	12.4	14	17	19.8	21.9	23.4	24.8	26.2	27.5
9	S9 Tripper S end E side Trouser Leg to C4	S9	28.4	30.8	33.2	35.1	36.5	38.8	41.9	44.3	46.1
10	S10 Tripper S end W side trouser leg to C4	S10	28.4	30.8	33.2	35.1	36.5	38.8	41.9	44.3	46.1
11	S11 Tripper S end S side entry to C4	S11	27.8	30.1	32.4	34.3	35.8	37.1	38.3	39.5	40.7
12	S12 Sizer Building E wall to C4	S12	15.8	16.4	17	17.7	18.6	19.7	20.8	22.1	23.4
13	S13 Loader on stockpile to C4	S13	20.4	20.9	22.3	23.7	25.2	26.7	28.3	29.9	31.4
14	S14 Conveyor Building N side 1L down from top to C4	S14	-15.5	-14.2	-12.9	-11.6	-10.3	-9	-7.8	-6.5	-5.3
15	S15 Conveyor Building E side 1L down from top to C4	S15	4.7	6.1	7.5	9	10.5	12.2	14	16	17.7
16	S16 Conveyor Building S side 1L down from top to C4	S16	-8.3	-7	-5.6	-4.2	-2.8	-1.2	0.4	2	3.6
17	S17 Conveyor Building N side 2L down from top to C4	S17	-18.9	-18	-16.8	-15.5	-14.2	-13	-11.7	-10.4	-9.2
18	S18 Conveyor Building E side 2L down from top to C4	S18	-2.2	-1.3	0.1	1.6	3	4.6	6.3	8.2	10.2
19	S19 Conveyor Building S side 2L down from top to C4	S19	-18.1	-17.3	-16.1	-14.9	-13.6	-12.4	-11.3	-10.2	-9.3
20	S20 Conveyor Building Stair opening to C4	S20	-10.8	-9.9	-8.7	-7.3	-5.8	-4.1	-2.2	-0.3	1.4
21	Sizer Building N wall opening to C4	S21	7.6	8	8.5	9.1	9.9	10.8	11.8	12.9	14.1
22	Tripper conveyor belt to C4	S22	1	2.5	4.2	6	7.6	8.9	10.7	13.6	16.3
23	Tripper S side opening No Coal Northern End to C4	S23	24	25.4	26.7	27.9	29.5	32.4	35.1	37.2	38.6
24	Tripper S side opening No Coal Southern End to C4	S24	25.6	26.7	28.8	31.1	33.2	34.6	36	37.4	38.6
	Change in received sound level from calm										
1	S1 Conveyor Drive Building North Wall Top to C3	S1	0	1.2	2.5	3.7	5	6.1	7.1	8.2	10.3
2	S2 Conveyor Drive building E side Top to C3	S2	0	1.4	3.1	4.9	6.9	8.9	10.4	12.1	15.3
3	S3 Conveyor Drive building S side Top including opening to C3	S3	0	1.5	3.2	5.1	7.2	9.2	10.8	12.5	15.5
4	S4 Tripper N end N side to C3	S4	0	2.1	4.1	5.7	7.9	11.5	14.4	16.5	18
5	S5 Tripper N end E side Trouser Leg to C3	S5	0	2.4	5.1	8	10.8	12.9	14.5	17.5	20.7
6	S6 Tripper N end W side trouser leg to C3	S6	0	2.4	5.1	8	10.8	12.9	14.5	17.5	20.7
7	S7 Tripper N end S side entry to C3	S7	0	1.5	2.8	4.3	7.4	10.4	12.6	14.2	15.5
8	S8 Tripper S end N side to C3	S8	0	1.6	4.6	7.4	9.5	11	12.4	13.8	15.1
9	S9 Tripper S end E side Trouser Leg to C3	S9	0	2.4	4.8	6.7	8.1	10.4	13.5	15.9	17.7
10	S10 Tripper S end W side trouser leg to C3	S10	0	2.4	4.8	6.7	8.1	10.4	13.5	15.9	17.7
11	S11 Tripper S end S side entry to C3	S11	0	2.3	4.6	6.5	8	9.3	10.5	11.7	12.9
12	S12 Sizer Building E wall to C3	S12	0	0.6	1.2	1.9	2.8	3.9	5	6.3	7.6
13	S13 Loader on stockpile to C3	S13	0	0.5	1.9	3.3	4.8	6.3	7.9	9.5	11
14	S14 Conveyor Building N side 1L down from top to C3	S14	0	1.3	2.6	3.9	5.2	6.5	7.7	9	10.2
15	S15 Conveyor Building E side 1L down from top to C3	S15	0	1.4	2.8	4.3	5.8	7.5	9.3	11.3	13
16	S16 Conveyor Building S side 1L down from top to C3	S16	0	1.3	2.7	4.1	5.5	7.1	8.7	10.3	11.9
17	S17 Conveyor Building N side 2L down from top to C3	S17	0	0.9	2.1	3.4	4.7	5.9	7.2	8.5	9.7
18	S18 Conveyor Building E side 2L down from top to C3	S18	0	0.9	2.3	3.8	5.2	6.8	8.5	10.4	12.4
19	S19 Conveyor Building S side 2L down from top to C3	S19	0	0.8	2	3.2	4.5	5.7	6.8	7.9	8.8
20	S20 Conveyor Building Stair opening to C3	S20	0	0.9	2.1	3.5	5	6.7	8.6	10.5	12.2
21	Sizer Building N wall opening to C3	S21	0	0.4	0.9	1.5	2.3	3.2	4.2	5.3	6.5
22	Tripper Conveyor Belt to C3	S22	0	1.5	3.2	5	6.6	7.9	9.7	12.6	15.3
23	Tripper S side opening No Coal Northern End to C3	S23	0	1.4	2.7	3.9	5.5	8.4	11.1	13.2	14.6
24	Tripper S side opening No Coal Southern End to C3	S24	0	1.1	3.2	5.5	7.6	9	10.4	11.8	13

Figure 4.5: Wollongong Coal Surface Noise Source assessment - change in received source sound levels at Receiver C3 for increases in wind speed towards the receiver

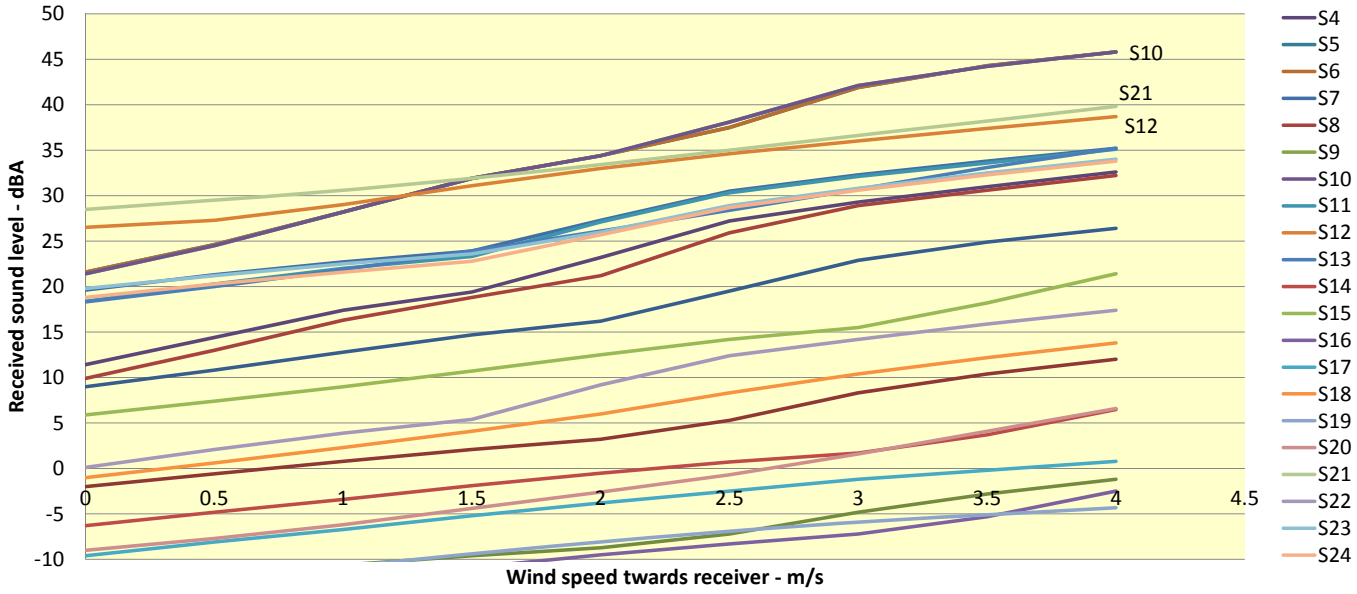
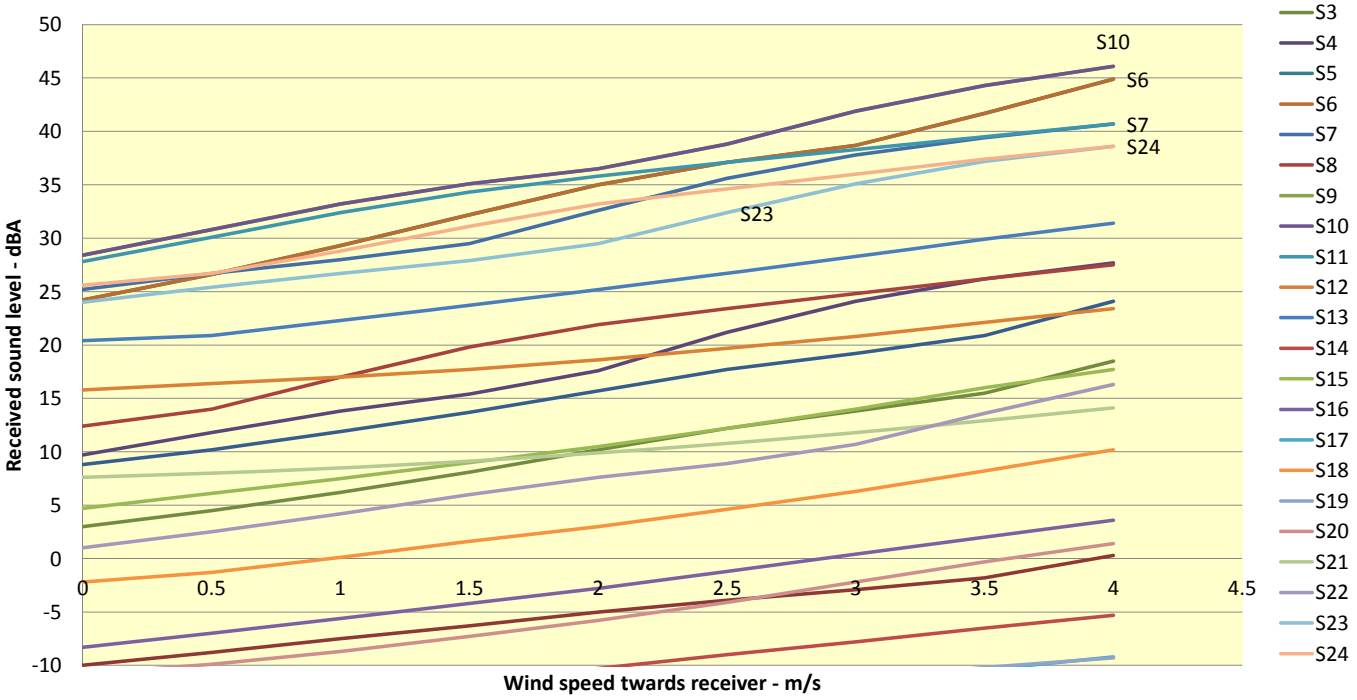


Figure 4.6: Wollongong Coal Surface Noise Source assessment - change in received source sound levels at Receiver C4 for increases in wind speed towards the receiver



Source PWLs for enm tripper & transfer.xlsx: enm wind c3&4

Figure 4.7: Wollongong Coal Surface Noise Source assessment - relative increase in received source sound levels at Receiver C3 for increases in wind speed towards the receiver compared to calm

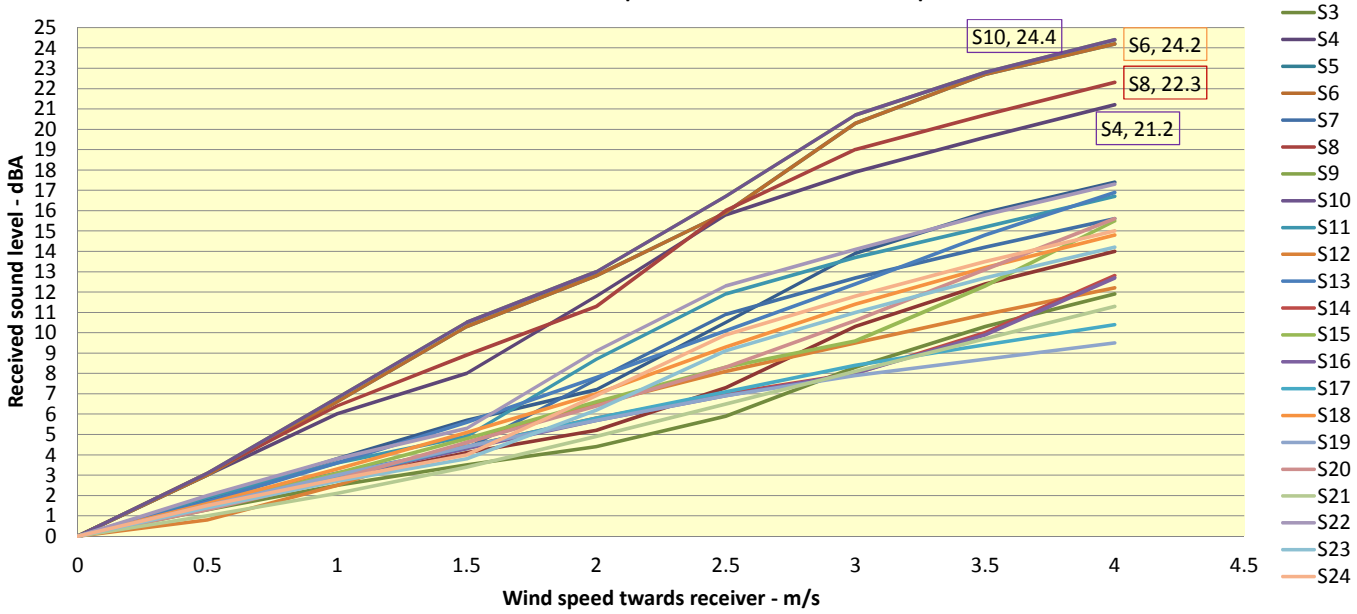
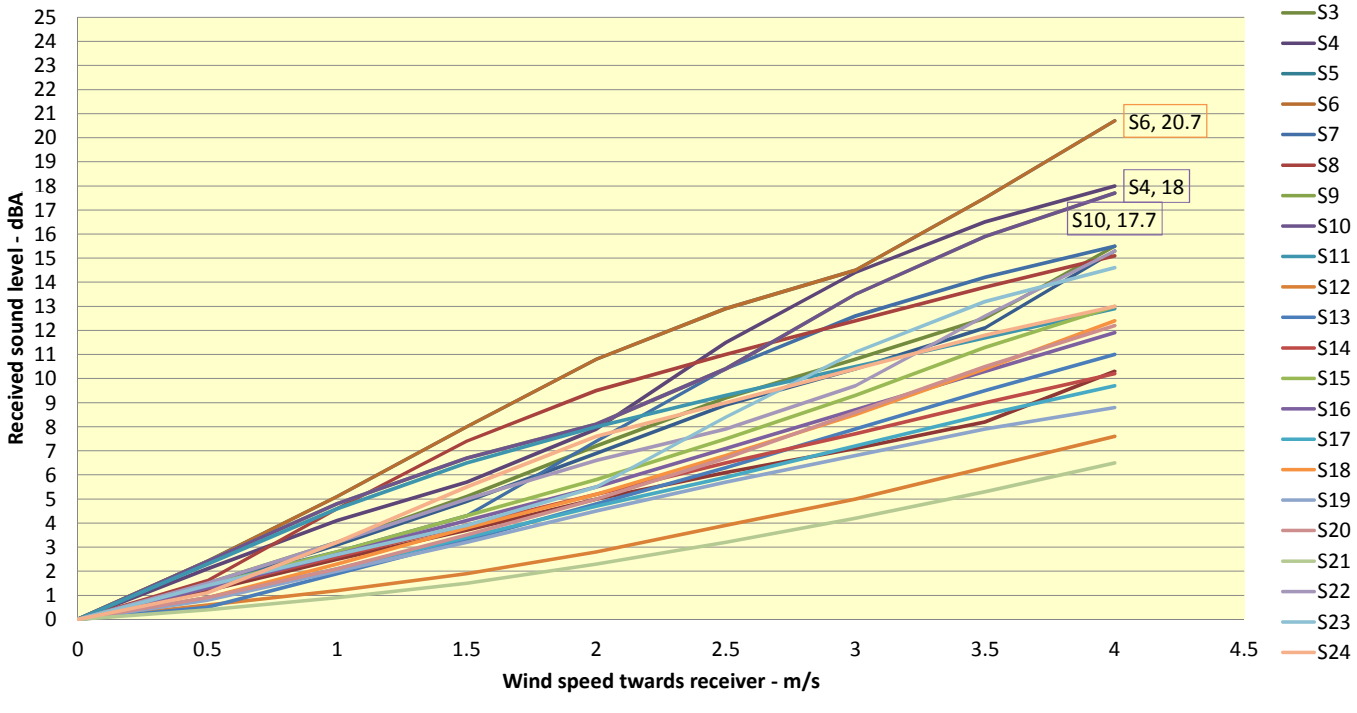


Figure 4.8: Wollongong Coal Surface Noise Source assessment - relative increase in received source sound levels at Receiver C4 for increases in wind speed towards the receiver compared to calm



Source PWLs for enm tripper & transfer.xlsx: enm wind c3&4

4.6 Effects of impact noise & higher flow

The calculations and measurements described above were made for equivalent continuous L_{AEq} sound levels. Impacts of lumps and rocks will cause higher sound levels to be emitted. There are limits in the approval conditions for each site for the 1-percent exceedance sound level $L_{A01.1\text{-minute}}$. These limit values were between 9 and 11 dB above the $L_{AEq.15\text{-minute}}$ long-term night-time objectives for the receivers.

Section 3.2 discussed the differences caused by the impacts and Figures 3.34 to 3.41 and Table 3.2 showed the assumed increases for the conditions measured. These increases have been added to the results for calculations of contributed sound levels and compared with the $L_{A01.1\text{-minute}}$ objectives for each location. These are shown in Table 4.11.

Six receiver locations had sources with L_{A01} results exceeding the $L_{A01.1\text{-minute}}$ objective. Most were in the range 0 to 2 dB above the objective, but for Receiver C2 the exceedance was up to 9 dB for Source No. 11 - the Tripper southern side entry opening.

4.7 Meteorological conditions preferred for modelling

Prediction of noise with computer noise models uses meteorological conditions as input data. These can significantly affect sound propagation between sources and receivers. The approach of the INP is to use typical worst-case meteorological conditions for predictions to allow for those times. It has a requirement that these are used when the conditions of wind from 0 to 3m/s occur for more than 30% of the time in a prevailing direction or directions, or when temperature inversions occur for more than 30% of total evening and night-time periods in winter. The ERMA environmental noise assessment of October 2010 reviewed the meteorological data for the area (Albion Park Airport - Wollongong) and found that these 30% requirements were not exceeded and so did not include them in the predictions.

The modeling done has shown a potential 20 dB increase in sound level from wind for some sources and receiver combinations. Because of this, the approach taken by ERMA that modeling for these conditions is not needed because they don't occur for more than 30% of the time, is considered unhelpful and leads to a false sense of security. It may be an appropriate approach if such conditions were very rare and unlikely. A brief analysis of the meteorological data has been made and is discussed below.

Weather data for Wollongong University shows that for 9am winds, considered indicative of night-time and early morning when inversions occur, show south-westerly winds of up to 3m/s occur for 18 to 25% of the time in all seasons, and north-easterly for 15% of the time in summer. Calm conditions occurred 19% of the time in all seasons except spring when it was 12% of mornings. Bellambi weather station had less calm conditions but similar directions.

Weather data of wind roses for various seasons and other statistical data are given in Appendix F.

Regarding inversion conditions, the ERMA report noted that class F & G conditions (stable indicating a high likelihood of inversions in winter) occur for 14% during winter. No other data is available. 14% is approximately 1 night per week. The modeling showed inversions and wind could increase sound levels by close to 20 dB. This is considered likely to cause annoyance and is recommended to be assessed through modeling.

Table 4.11: Wollongong Coal Russell Vale - Tripper Conveyor and Surface Noise Assessment: Ranked contribution sounbd levels at receivers for typical worst case conditions Wind 3m/s towards receivers, Neutral Atmosphere

Calculated values with L01 increase for relevant sources **(Cells higlighted pink with red text indicate the contribution level exceeds the total L01.1-min objective for the receiver)**

Source	Source Description	Condition	Received dBA for both Tripper Locations									Received dBA for Northern Tripper Location									Received dBA for Southern Tripper Location								
No.		W3 L0	C1	C2	C3	C4	C5	R1	R2	R3	R4	C1	C2	C3	C4	C5	R1	R2	R3	R4	C1	C2	C3	C4	C5	R1	R2	R3	R4
1	S1 Conveyor Drive Building North Wall Top		-17	-2	8	-3	-11	25	25	24	23	-17	-2	8	-3	-11	25	25	24	23	-17	-2	8	-3	-11	25	25	24	23
2	S2 Conveyor Drive building E side Top		1	21	23	19	7	13	12	11	22	1	21	23	19	7	13	12	11	22	1	21	23	19	7	13	12	11	22
3	S3 Conveyor Drive building S side Top including opening		15	24	-5	14	24	4	4	3	3	15	24	-5	14	24	4	4	3	3	15	24	-5	14	24	4	4	3	3
4	S4 Tripper N end N side		11	31	35	30	19	40	40	40	38	11	31	35	30	19	40	40	40										
5	S5 Tripper N end E side Trouser Leg		29	47	47	44	37	49	49	48	46	29	47	47	44	37	49	49	48										
6	S6 Tripper N end W side trouser leg		29	47	47	44	37	49	49	48	46	29	47	47	44	37	49	49	48										
7	S7 Tripper N end S side entry		34	54	42	48	45	39	40	38	38	34	54	42	48	45	39	40	38										
8	S8 Tripper S end N side		10	33	35	31	19	40	40	39	37										10	33	35	31	19	40	40	39	37
9	S9 Tripper S end E side Trouser Leg		29	47	47	47	37	48	49	48	46										29	47	47	47	37	48	49	48	46
10	S10 Tripper S end W side trouser leg		29	47	47	47	37	48	49	48	46										29	47	47	47	37	48	49	48	46
11	S11 Tripper S end S side entry		35	56	42	48	43	39	39	38	37										35	56	42	48	43	39	39	38	37
12	S12 Sizer Building E wall		44	41	39	24	41	27	26	27	29	44	41	39	24	41	27	26	27	29	44	41	39	24	41	27	26	27	29
13	S13 Loader on stockpile		27	30	31	28	27	48	48	47	45	27	30	31	28	27	48	48	47	45	27	30	31	28	27	48	48	47	45
14	S14 Conveyor Building N side 1L down from top		-19	-5	2	-8	-14	21	22	20	18	-19	-5	2	-8	-14	21	22	20	18	-19	-5	2	-8	-14	21	22	20	18
15	S15 Conveyor Building E side 1L down from top		0	16	16	14	5	9	11	8	18	0	16	16	14	5	9	11	8	18	0	16	16	14	5	9	11	8	18
16	S16 Conveyor Building S side 1L down from top		4	15	-7	0	10	-7	-6	-9	-9	4	15	-7	0	10	-7	-6	-9	-9	4	15	-7	0	10	-7	-6	-9	-9
17	S17 Conveyor Building N side 2L down from top		-22	-11	-1	-12	-18	16	17	15	13	-22	-11	-1	-12	-18	16	17	15	13	-22	-11	-1	-12	-18	16	17	15	13
18	S18 Conveyor Building E side 2L down from top		-5	8	10	6	-1	3	4	1	13	-5	8	10	6	-1	3	4	1	13	-5	8	10	6	-1	3	4	1	13
19	S19 Conveyor Building S side 2L down from top		6	12	-6	-11	10	-8	-5	-10	-11	6	12	-6	-11	10	-8	-5	-10	-11	6	12	-6	-11	10	-8	-5	-10	-11
20	S20 Conveyor Building Stair opening		-8	-1	2	-2	-2	11	11	10	10	-8	-1	2	-2	-2	11	11	10	10	-8	-1	2	-2	-2	11	11	10	10
21	Sizer Building N wall opening		30	39	37	12	19	38	38	37	35	30	39	37	12	19	38	38	37	35	30	39	37	12	19	38	38	37	35
22	Tripper conveyor belt		-1	17	14	11	9	15	16	15	13	-1	17	14	11	9	15	16	15	13	-1	17	14	11	9	15	16	15	13
23	Tripper S side opening No Coal Northern End		29	46	36	40	39	34	35	33	32	29	46	36	40	39	34	35	33	32	29	46	36	40	39	34	35	33	32
24	Tripper S side opening No Coal Southern End		29	48	36	41	37	33	34	33	32	29	48	36	41	37	33	34	33	32	29	48	36	41	37	33	34	33	32
25	Door 1 South		27	24	28		25		28			27	24	28		25		28			27	24	28		25		28		
26	Door 2 Centre		33	30	29		27		28			33	30	29		27		28			33	30	29		27		28		
27	MVF North		26	29	28	26	17		16			26	29	28	26	17		16			26	29	28	26	17		16		
28	MVF North casing		18	20	28	18	10		21			18	20	28	18	10		21			18	20	28	18	10		21		
29	Compressor House N Wall vents		11	13	14	10	4		17			11	13	14	10	4		17			11	13	14	10	4		17		
30	Substation N of Admin		13	7	13	13	6		17			13	7	13	13	6		17			13	7	13	13	6		17		
		Max	44	56	47	48	45	49	49	48	46	44	54	47	48	45	49	49	48	45	44	56	47	48	43	48	49	48	46
	Total for Northern Tripper		45	57	52	51	49	54	54	53	46	45	57	52	51	49	54	54	53	46									
	Total for Southern Tripper		45	58	52	53	47	53	54	53	51										45	58	52	53	47	53	54	53	51
	Long-term Objective Night		38	38	36	36	40	37	37	37	37	38	38	36	36	40	37	37	37	37	38	38	36	36	40	37	37	37	37
	Long-term objective L01.1min		47	47	47	47	50	47	47	47	47	47	47	47	47	50	47	47	47	47	47	47	47	47	50	47	47	47	47
	If L01 objective exceeded and amount for individual source			9		1		2	2	1			7		1		2	2	1			9		1		1	2	1	
	Total for Northern Tripper with No Loader		45	57	52	51	48	52	52	52	39	45	57	52	51	48	52	52	52	39									
	Total for Southern Tripper with No Loader		45	58	52	53	47	52	53	52	50										45	58	52	53	47	52	53	52	50

On the basis of this brief analysis, it is recommended that the assessment of noise for this study allow for wind and inversions. Wind effects with a wind speed of 3m/s towards the receivers caused slightly higher sound levels than for an inversion of 3^{o}C/100m lapse rate and 2m/s wind (the default condition for modelling in the INP). A wind speed of 3m/s could occur with the cold-air drainage flow down the escarpment. A higher wind speed will cause higher sound levels but will also result in a higher background sound level as leaves and vegetation rustle and move. On the basis that wind without an inversion is considered to be representative of worst case conditions for the site and is recommended as the condition for prediction modeling in this study.

5. Assessing reductions required to achieve objectives

5.1 Treatment of the top 5 sources for each receiver

The predicted sound levels for each source at each receiver allows further calculations to assess the effects on total received sound levels by reducing source levels.

The first step taken in assessing noise reduction requirements was to calculate the effect of treating the highest 5 contribution sources for each receiver by 5 dB each subsequently to see what effect this had on the total. These calculations for all receivers are given in Table 5.1, shown in Appendix D.

For receivers C1 and C5, if the top 5 sources are reduced by 5 dB in subsequent steps, the objective is achieved after treatment of the 5th source.

For receivers C2, C3, R1 and R2, the objective is not achieved with 15 dB reduction of the top 5 sources.

For receivers C4 and R4, the objective is achieved with 15 dB reduction.

5.2 Identification of equivalent contribution sound levels for receivers

A different approach was considered to identify the reductions required for each source such that the total sound level at the receiver was achieved. This assumes that the sound received from each source is equal and the total equals the objective. For each receiver there are 26 sources identified in this study that contribute to the received sound level. Some of these have been calculated to have receiver sound levels well below the objective and so will not add to the total. Calculations indicated that if all sources did not exceed the objective sound level – 13 dB, then the objective would be achieved in each case.

For example, if the long-term night-time objective at Receiver C2 is 38 dBA, then to ensure that objective was not exceeded, each of the sources would be required to have a contribution level of 38 – 13 = 25 dBA. When these values were used for each receiver, with the sound levels of sources less than the equivalent value, the resulting total sound levels at most receivers were less than or equal to the total objective.

The reduction required in the emission from each source was then calculated for each receiver. Because of the different distances from and topographical cross-sections between sources and receivers, one source might have a high reduction requirement for one receiver but a low or no reduction for another. These reduction requirement values were then collated such that the maximum reduction required for each source was calculated.

To assess the magnitude of the task in terms of numbers of sources requiring treatment, Figures 5.1 to 5.3 show graphically the received levels with wind 3m/s and neutral lapse rate, of each source and receiver combination. Figure 5.1 shows that there are some sources that are well below the minimum equivalent contribution objective of 23 dB, but there are many that are not, depending on the receiver.

Figures 5.4 to 5.6 have sorted the received levels into a complete range, then for each receiver. The equivalent contribution objectives are also shown.

Figure 5.1: Wollongong Coal Russell Vale Noise - Calculated Receiver Level dBA vs Source No

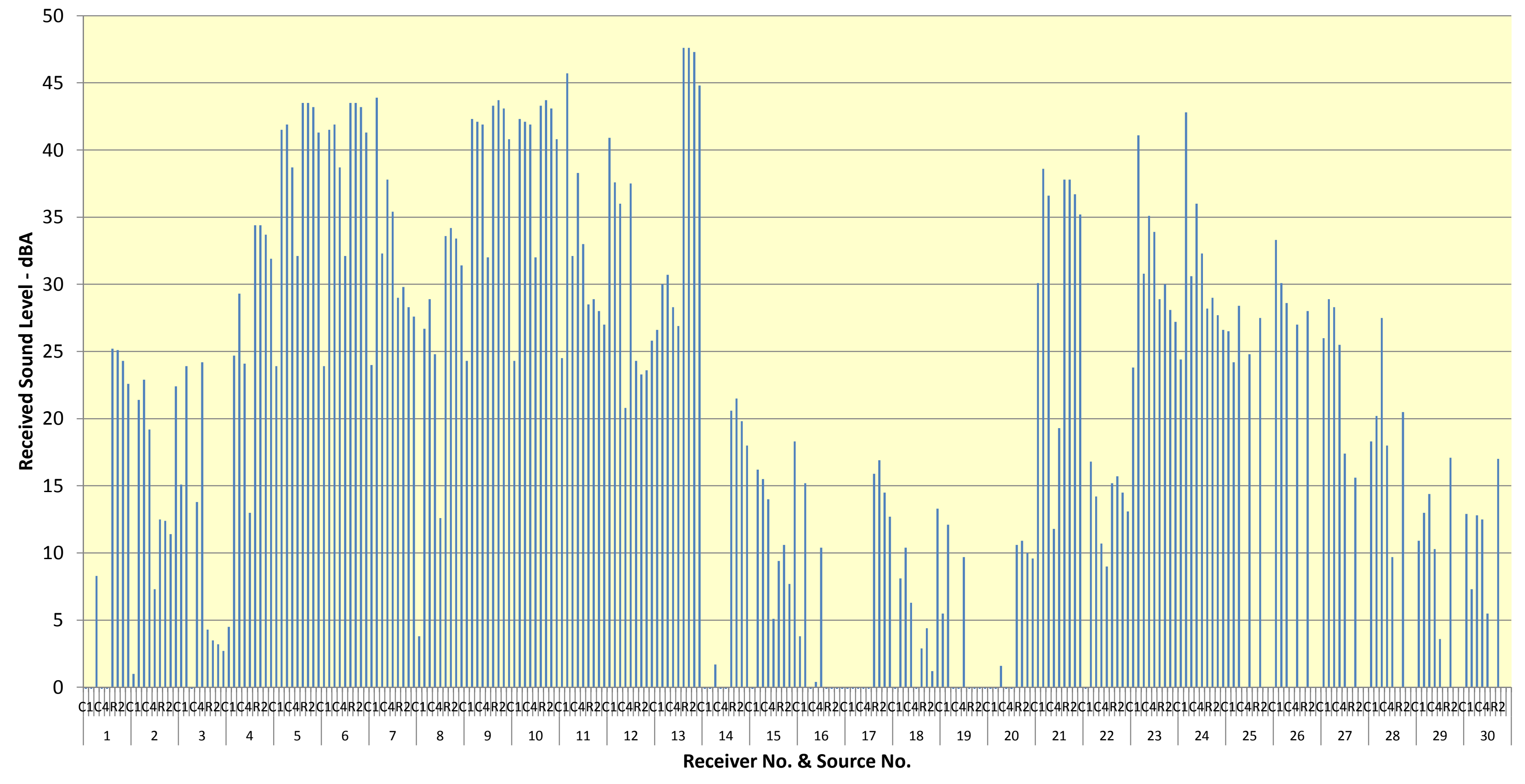


Figure 5.2: Wollongong Coal Russell Vale Noise - Receiver Level dBA vs Receiver No.

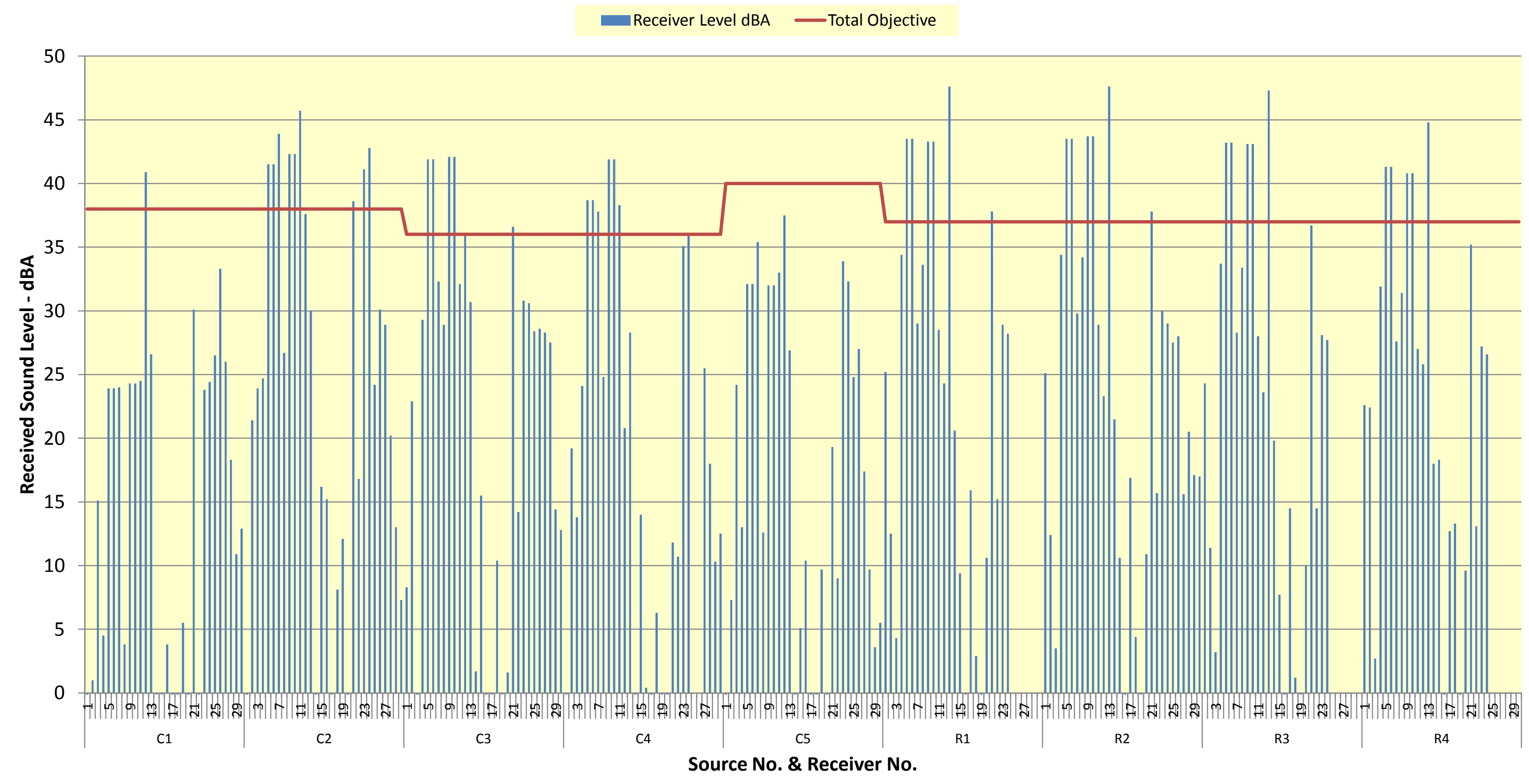


Figure 5.3: Wollongong Coal Russell Vale Noise - Receiver Level dBA vs Source No for receiver levels > 25 dBA

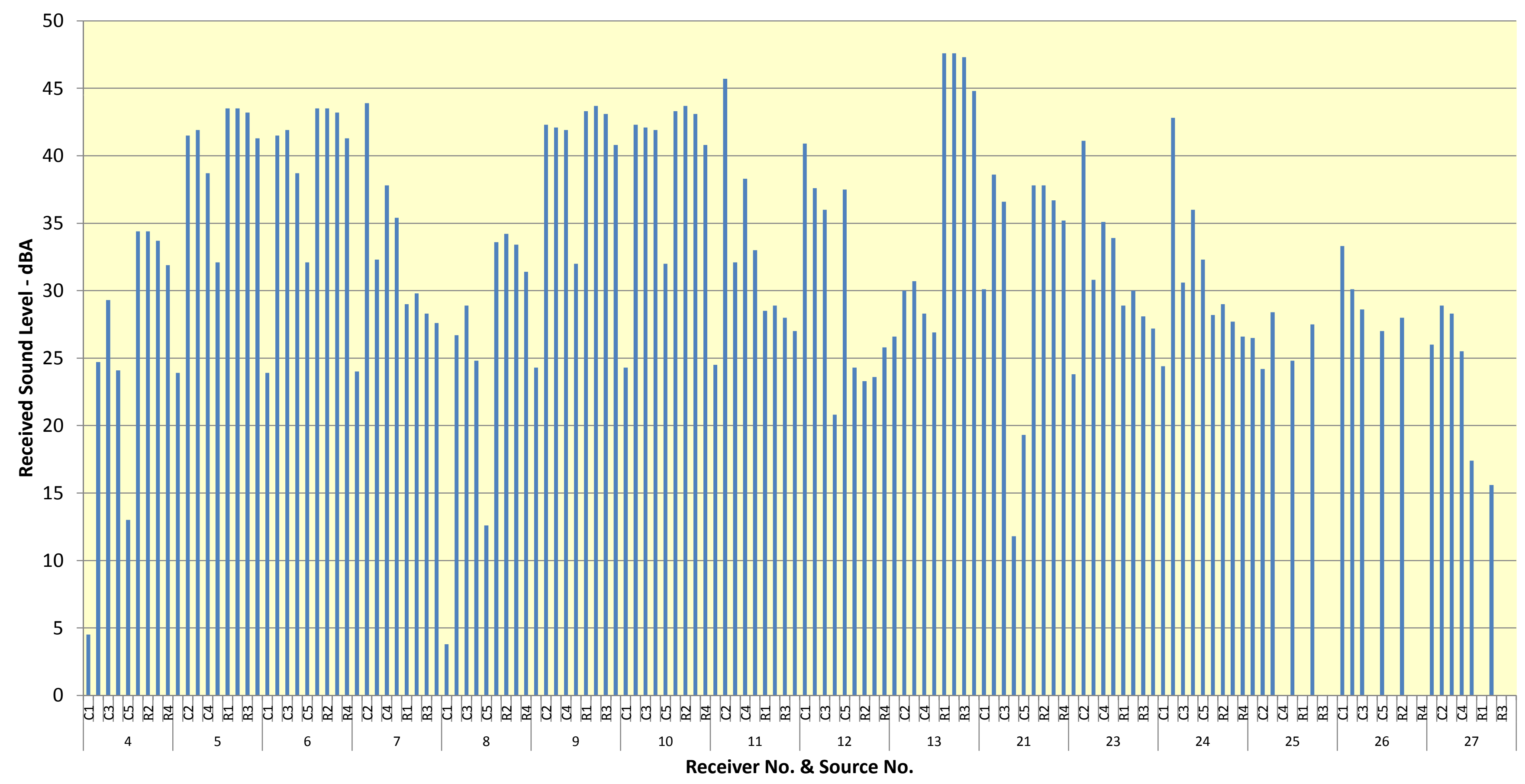


Figure 5.4: Wollongong Coal Russell Vale Noise - Receiver Level dBA vs Source No ranked highest received to lowest

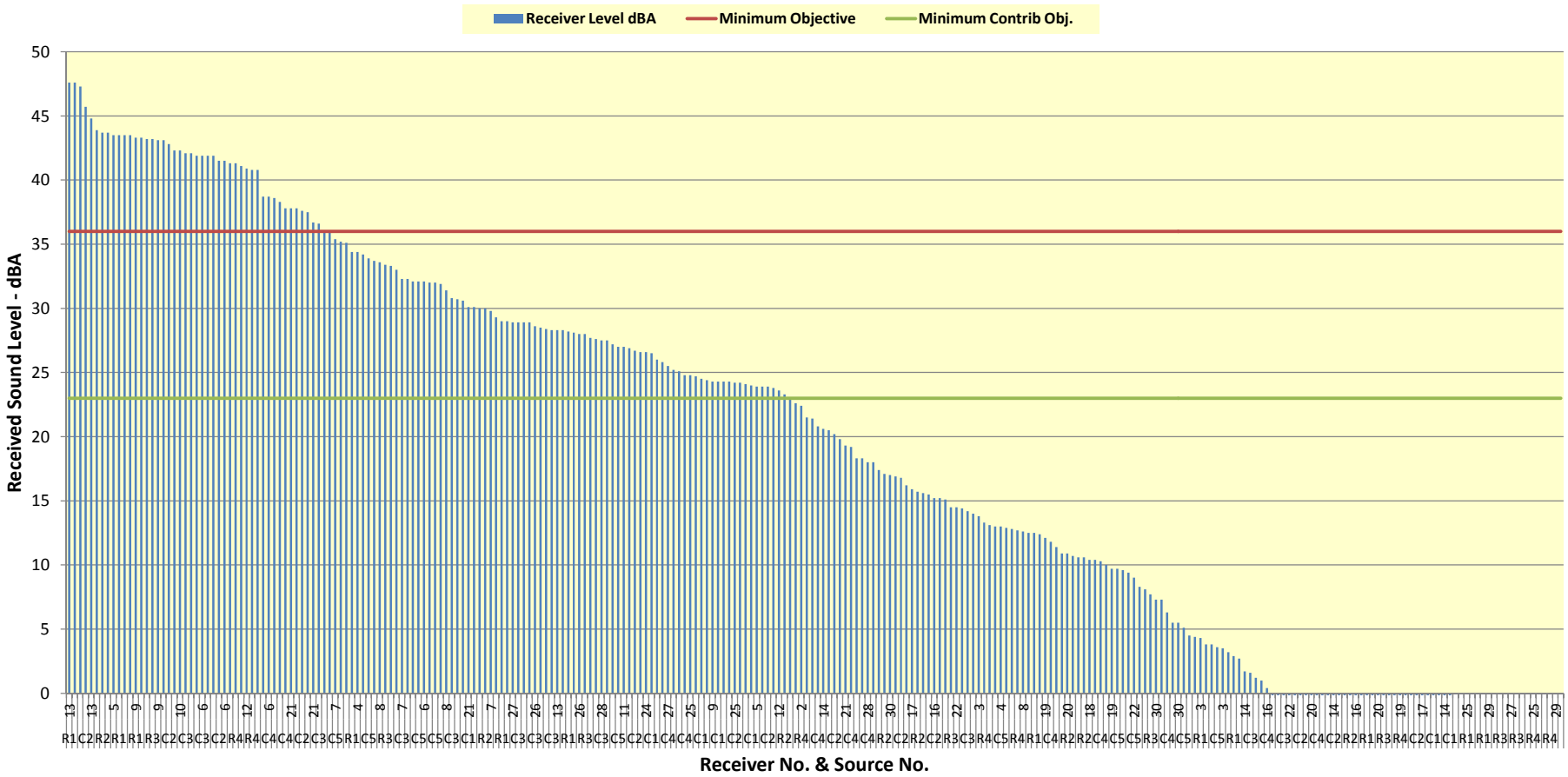


Figure 5.5: Wollongong Coal Russell Vale Noise - Receiver Level of sources dBA vs Receiver No.

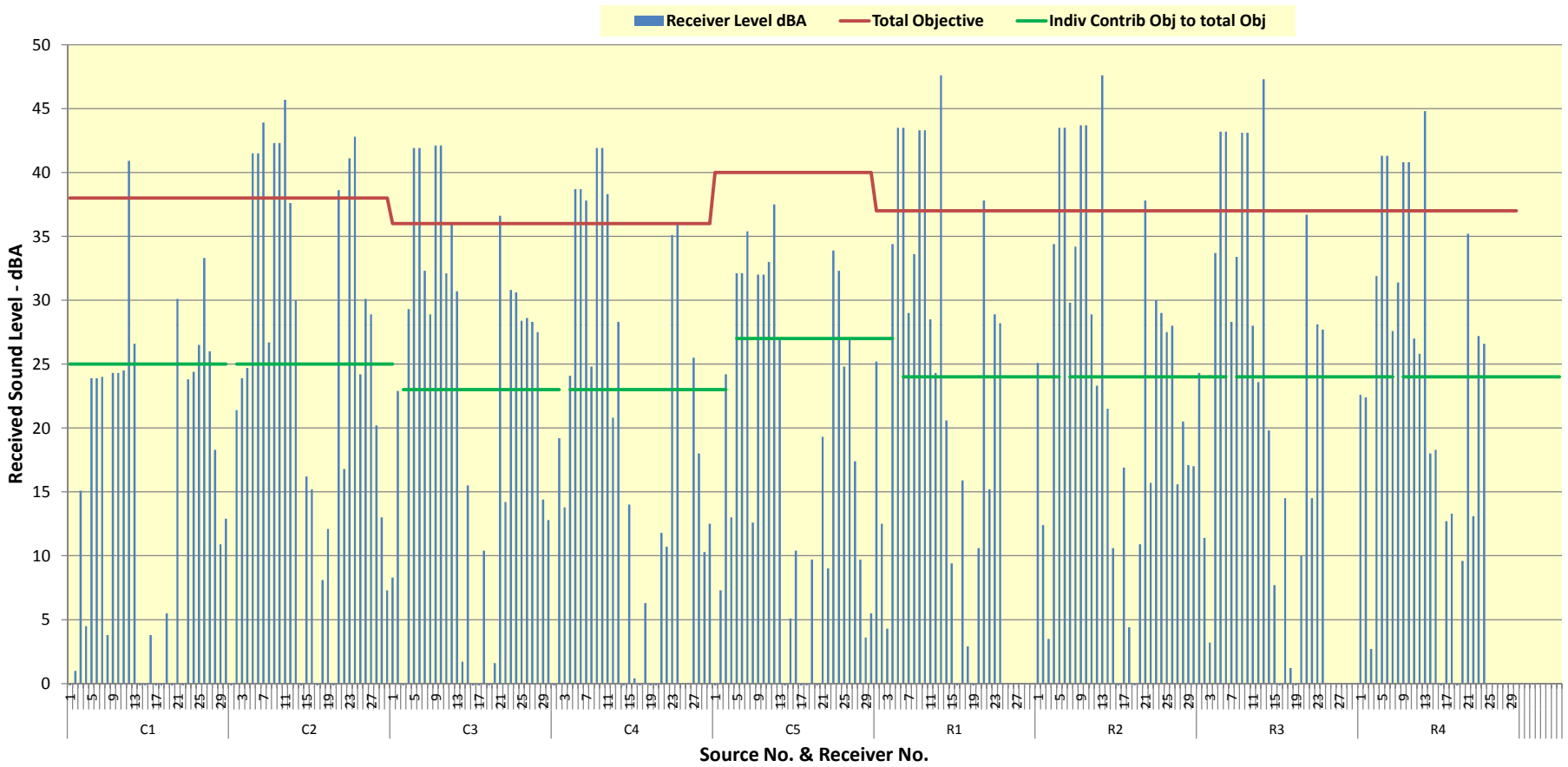


Figure 5.6: Wollongong Coal Russell Vale Noise - Source Receiver Level dBA ranked at Receiver No.

Source PWLs for enm tripper & transfer.xlsx:enm results sorted with fans et

More than half of the source and receiver combinations are above the minimum 23 dBA contribution limit. The reason for doing this is to indicate how many sources may need to be treated. When there are a large number of sources contributing to a total, almost all need to be treated to have any effect.

It is apparent from the graphs (Figure 5.1) that the major sources to be considered are sources 4 to 7 (8 to 11), 12, 13, 21 and 23 (24). These are the tripper, stockpile loader and sizer building.

The reductions required to achieve the equivalent contribution objective for all of the sources were then calculated. The reduction required for each source to Receiver C2 is given in Table 5.2. The results for all receivers are shown in Table 5.3 in Appendix D.

Table 5.4 has collated the maximum reductions required for each source at any receiver. Eleven sources do not require any reduction and one requires only 1 dB. These are:

- Tripper conveyor drive building
- Tripper conveyor belt noise alone
- Compressor house wall vents
- Substation

The source with the highest reduction requirement is the stockpile loader, requiring 24 dB reduction for night-time and 22 dBA in the evening, if used. Parts of the tripper have reduction requirements of 18 to 21 dB, the highest being the southern side entry opening and the trouser leg discharges and stockpile impacts.

Initial considerations for methods of reduction of sound level are given in Table 5.5. This also gives a comment about the priority, difficulty and potential method of treatment required to achieve this reduction. The initial priority suggested is based on the amount of reduction required and the difficulty of achieving it.

The next sections discuss methods for noise reduction of the different sources.

Table 5.2: Wollongong Coal Russell Vale - surface noise sources reduction assessment

Calculation of maximum required reduction for sources to C2 to achieve all receiver objectives

Receiver No.	Source No.	Receiver Level dBA	Night Objective	Indiv Contrib Obj to Night Obj	Individual Objective	Reduction Required	Day Obj dBA	Individual Day	Individual contrib Day	Reduction Day	Evening Obj	Individual Evening	Individual contrib Evening	Reduction Evening
C2	11	46	38	25	25	21	39	26	26	20	38	25	25	21
C2	7	44	38	25	25	19	39	26	26	18	38	25	25	19
C2	24	43	38	25	25	18	39	26	26	17	38	25	25	18
C2	9	42	38	25	25	17	39	26	26	16	38	25	25	17
C2	10	42	38	25	25	17	39	26	26	16	38	25	25	17
C2	5	42	38	25	25	17	39	26	26	16	38	25	25	17
C2	6	42	38	25	25	17	39	26	26	16	38	25	25	17
C2	23	41	38	25	25	16	39	26	26	15	38	25	25	16
C2	21	39	38	25	25	14	39	26	26	13	38	25	25	14
C2	12	38	38	25	25	13	39	26	26	12	38	25	25	13
C2	26	30	38	25	25	5	39	26	26	4	38	25	25	5
C2	13	30	38	25	25	5	39	26	26	4	38	25	25	5
C2	27	29	38	25	25	4	39	26	26	3	38	25	25	4
C2	8	27	38	25	25	2	39	26	26	1	38	25	25	2
C2	4	25	38	25	25	0	39	26	25	-1	38	25	25	0
C2	25	24	38	25	24	0	39	26	24	-2	38	25	24	-1
C2	3	24	38	25	24	0	39	26	24	-2	38	25	24	-1
C2	2	21	38	25	21	0	39	26	21	-5	38	25	21	-4
C2	28	20	38	25	20	0	39	26	20	-6	38	25	20	-5
C2	22	17	38	25	17	0	39	26	17	-9	38	25	17	-8
C2	15	16	38	25	16	0	39	26	16	-10	38	25	16	-9
C2	16	15	38	25	15	0	39	26	15	-11	38	25	15	-10
C2	29	13	38	25	13	0	39	26	13	-13	38	25	13	-12
C2	19	12	38	25	12	0	39	26	12	-14	38	25	12	-13
C2	18	8	38	25	8	0	39	26	8	-18	38	25	8	-17
C2	30	7	38	25	7	0	39	26	7	-19	38	25	7	-18
C2	20	-1	38	25	-1	0	39	26	-1	-27	38	25	-1	-26
C2	1	-2	38	25	-2	0	39	26	-2	-28	38	25	-2	-27
C2	14	-5	38	25	-5	0	39	26	-5	-31	38	25	-5	-30
C2	17	-11	38	25	-11	0	39	26	-11	-37	38	25	-11	-36
Total if all = Contrib Obj					38			41	38			40	38	
Total if all = Contrib Obj but with No Loader					37									

Table 5.4: Wollongong Coal Russell Vale - surface noise sources reduction assessment

Calculation of maximum required reduction for sources to achieve all receiver objectives

Source No	Source Description	Maximum Reduction
1	S1 Conveyor Drive Building North Wall Top to R4	1
2	S2 Conveyor Drive building E side Top to R4	0
3	S3 Conveyor Drive building S side Top including opening to R4	0
4	S4 Tripper N end N side to R4	10
5	S5 Tripper N end E side Trouser Leg to R4	20
6	S6 Tripper N end W side trouser leg to R4	20
7	S7 Tripper N end S side entry to R4	19
8	S8 Tripper S end N side to R4	10
9	S9 Tripper S end E side Trouser Leg to R4	20
10	S10 Tripper S end W side trouser leg to R4	20
11	S11 Tripper S end S side entry to R4	21
12	S12 Sizer Building E wall R4	16
13	S13 Loader on stockpile R4 - night, evening, day	24, 22,18
14	S14 Conveyor Building N side 1L down from top R4	0
15	S15 Conveyor Building E side 1L down from top R4	0
16	S16 Conveyor Building S side 1L down from top R4	0
17	S17 Conveyor Building N side 2L down from top R4	0
18	S18 Conveyor Building E side 2L down from top R4	0
19	S19 Conveyor Building S side 2L down from top R4	0
20	S20 Conveyor Building Stair opening R4	0
21	Sizer Building N wall opening R4	14
22	Tripper conveyor belt to R4	0
23	Tripper S side opening No Coal Northern End to R4	16
24	Tripper S side opening No Coal Southern End to R4	18
25	Door 1 South	5
26	Door 2 Centre	8
27	MVF North	5
28	MVF North casing	5
29	Compressor House N Wall vents	0
30	Substation N of Admin	0

Table 5.5: Wollongong Coal Russell Vale - surface noise sources reduction assessment

Calculation of maximum required reduction for sources to achieve all receiver objectives, initial priority and potential treatment summary

Source No	Source Description	Maximum Reduction	Comments
1	S1 Conveyor Drive Building North Wall Top	1	Low priority for the moment. Line internally if required with absorption.
4 & 8	S4 Tripper N end N side	10	Medium to High priority. Line internally, vibration dampen and isolate impact plate & hangers.
5, 6, 9, 10	S5 Tripper N end E side Trouser Leg	20	High priority. 20 dB reduction is difficult. Source noise includes stockpile impacts. Line chutes internally with vibration damping & provide a solid steel cover top.
7 & 11	S7 Tripper N end S side entry, S 11 S end, S side entry	19 to 21	High priority. 21 dB reduction is difficult. Internal impact plate damping and isolation treatment as per S4; Close off or cover opening on South side where possible, consider a lined-tunnel entry, and provide a lined barrier on the Eastern side for the full height of the tripper and from the northern side back about 4m.
12	S12 Sizer Building E wall	16	High priority. 16 dB reduction is difficult for an already lined building, although the lining may be thicker on the chute level than the conveyor drive level. The result includes some N wall opening. Line drive level internally with absorption.
13	S13 Loader on stockpile – Night – Evening - Day	24 22 18	Highest priority. 24 or 22 dB reduction is difficult for any source. Minimise night-time use. Specify quiet equipment if leased. Include high attenuation exhaust silencers, engine bay covers, air inlet/radiator covers, quiet radiator fan
21	Sizer Building N wall opening	14	High priority. This attenuation is achievable because the wall is open. Close opening with attenuation panels and seal edges. As opening is required for ventilation, provide a lined and covered L-shaped bend on either side
23 & 24	Tripper S side opening No Coal Northern End	16 to 18	High priority. 18 dB reduction is difficult. Treatment is the same as for S7 & S11. Cover openings where possible, install Eastern side covers
25 & 26	Workshop Door 1 South & Door 2 Centre	5 to 8	Medium priority. Reduction is easily achievable. Close doors during high noise activities, repair wall holes and/or install 3m barrier along E side of yard to also cover yard activities.
27	MVF North	5	Low priority. 5dB reduction is difficult for an existing silenced fan. Some contribution from fan drive is included. Clad ductwork.
28	MVF North casing	5	Medium priority. Consider absorptive cover for drive pulley, cladding for ductwork.

6. Approach to noise control

A hierarchical approach is used in developing a noise control strategy. The initial approach is to reduce noise at the source, then consider path control of vibration from impacted surfaces to other parts of the structure, then after that path control of airborne noise from the impact travelling out through open parts of the enclosing structure or holes in it. Combinations of source and path control can also be considered.

Priority of treatment approach

1. Source
2. Path
3. Combination source & path

In each case, the practicality of the approach is also required to be considered. This includes aspects such as safety, life expectancy, ease of installation and engineering, down-time required, lifecycle costs, maintenance requirements and so on.

6.1 Source controls - Tripper

6.1.1 Impact noise reduction – impact plate and diverter gates

The assumption at this stage is that the impact of hard rock on the impact plates and diverter gates of the transfer system are the major sources of noise, followed by impacts on the trouser leg base and sides. Generally the higher the impact force the higher the noise emission – there is also a dependency on the damping of the impacted structure. A lightly damped structure will also ring after an impact and this adds to the total noise emitted. The relative ranking of the impacted surfaces in terms of force and damping will affect their emission.

Reduction in force can be achieved by reducing the size of the lumps (i.e. mass), the speed of the impact (i.e. belt speed), avoiding the impact by changing the trajectory of the path or build-up of coal on the impacted surface.

Belt speed was dropped from 5m/s to 3m/s in August 2013. Measurements of sound levels before and after that were made around the tripper and reported by B. Doering on 21 August 2013. For one location at approximately 80m to the east of the tripper, statistical sound levels consistently reduced by approximately 4 dB for similar conditions – see Table 6.1 below developed form the data in that report. Other locations closer to the tripper measured increases but were not for similar conditions of flow or particle size. The hypothesis of the report also commented as follows:

> *A slower belt speed of RV1 decline will mean that the material traversing the tripper will have a lower impact speed with the tripper and potentially produce less noise.*
>
> *In addition to this, it is believed the tripper makes less noise when it has a lot of material going through compared to when there is only a small amount of material. Slowing the RV1 belt down will allow the belt to load up more, which in turn will mean more a larger stream of material inside the tripper.*

Table 6.1: Difference in sound level parameters with reduced belt speed August 2013

Location	$L_{Aeq, 5min}$	L_{Amax}	L_{Amin}	$L_{A1,5min}$	$L_{A5,5min}$	$L_{A10,5min}$	$L_{A90,5min}$
1 Transfer point - close (west)	-12	-17	-7	-15	-14	-13	-9
2 Transfer point - close (east)	-3	-2	-1	-2	-2	-3	-3
3 Transfer point - at distance to the East	-2	-10	-1	-2	-2	-2	-1
4 Tripper - Top level	-10	-6	-6	-7	-8	-8	-8
5 Tripper - top level near belt entry opening	-4	-3	-3	-5	-5	-5	-3
6 Tripper - middle level	-6	2	-11	2	-2	-4	-13
7 Tripper - bottom level	-6	-3	-6	-3	-3	-3	-8
8 Tripper - at distance to the East (~80m)	4	7	3	4	4	4	3

Changing the belt speed also changes the trajectory of the coal, potentially hitting the impact plate at a lower position or not at all. Therefore if the trajectory is changed, it may be worthwhile to consider whether adjustment of the belt pulley is possible to achieve a trajectory with lower or no impact point on the impact plate. The impact onto the diverter gates will be the same.

Recommendation No. 1: Consider potential to change trajectory to avoid impact plate contact – assess if this will also affect flow performance and life-expectancy wear of diverter gates?

Impacts of hard material onto the impact plate and diverter gates will cause them to ring and emit noise. The level of sound and frequency spectrum depends on the materials and damping of the plates.

The impact plate was treated with rubber material glued to the rear surface prior to installation, as shown in figure 6.1 below.

Figure 6.1: Impact plate with rear surface coated with rubber

This will have had the intention of increasing the damping and reducing both the maximum sound level of an impact and the period it rings for and will reduce the L_{AEq} for the source. The effect of this treatment on reducing the impact noise is not known as measurements were not likely to have been taken before and after treatment.

However, a comparison of the impact noise emission of the surfaces in the transfer system could be done now to assess their relative contribution to emission sound levels. This could be done by using a consistent impact on the impact plate, diverter plate and side wear plates in the transfer and measuring their sound level and spectrum at a known distance. This may be possible in-situ using a roller bearing on a cord, cropped from a consistent height and the sound measured at a known distance. Access would be required through a side inspection door into the transfer system. Figure 6.2 shows a view from the inspection door into the area where the tests could be done. The conveyor would need to be isolated for this to occur. Measurements have yet to be made.

Hatch has used this approach for comparison of treatment on steel conveyor rolls – see Figure 6.3. It would provide an initial assessment of the relative impact noise and ringing from the three different types of impact areas.

Figure 6.2: View of impact plate, diverter gates and side wear-plates

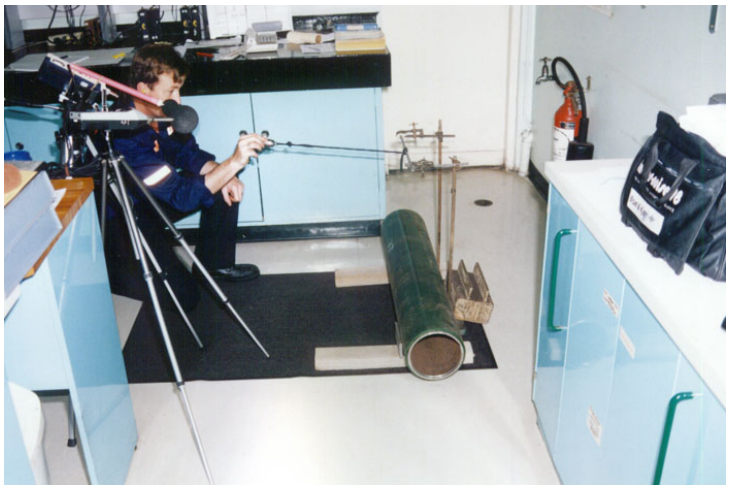


Figure 6.3: Example of simple impact test for lining on steel conveyor rolls

Recommendation No. 2: Consider in-situ impact noise tests of the impact plate, diverter gates, wear plate surfaces and trouser-leg discharge chutes.

If the various surfaces, especially the impact plate and diverter gates are found to have a high impact ringing noise, then the next step is to consider additional damping and isolation of the transmission of the impact vibration to other parts of the structure, through path control. If a steel plate is impacted, it vibrates and this generates noise through contact with the air. It can also transmit the vibration to any connected material and that then also re-radiate the noise. Even if the impact plate is damped, it could be transmitting vibration to the external surfaces of the transfer system enclosure and emitting noise – this is how musical instruments such as pianos and acoustical guitars emit their sound – by transfer of vibration of the strings to the enclosing box and re-radiation of the vibration as sound.

Damping can be increased by fixing softer materials to the surface – as intended with the application of the rubber to the rear surface of the impact plate. Suitable materials include softer rubber or neoprene, and high density polyurethane (HDPU) or ultra-high molecular weight polyethylene (UHMWPE). Damping and impact reduction can also occur by fixing similar material to the front impacted surface to both dampen and absorb some of the energy by elastic deformation, or mounting it as a sandwich between the higher wear front surface and the back mounting plate. This approach is used in materials such as Rubbadex, shown in Figure 6.4.

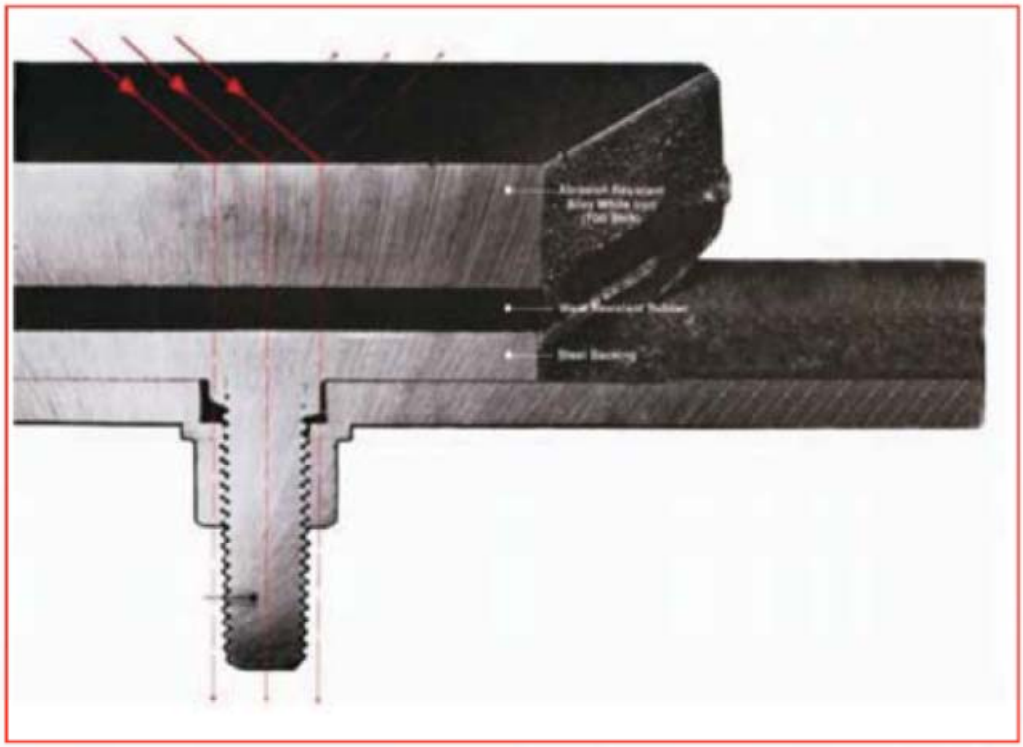


Figure 6.4: Schematic of vibration isolated wear plate Rubbadex

Rubbadex advise reductions of 13 dBA typical for lump ore and large size crushed rocks. Placement of softer material on the front side of an impact zone needs to consider the wear properties, life expectancy and lifecycle costs. If the material wears out too quickly it may not be suitable as a treatment. The expectation is that raw coal would rip a front-side lining off fairly quickly. Wearco are another company which supplies rubber backed wear plates and costs have been obtained by WCL for supply of these types of plates for the tripper.

Suppliers of pre-fabricated lining materials which have been used in the mining industry include Dotmar and East Coast Polymers. Another approach to this is to spray HDPU or UHMWPE onto the surface (rear) to achieve damping. East Coast Polymers and Rhinolining are two suppliers of this approach.

Figure 6.5 shows an example of a high-wear lining provided by East Coast Polymers.

Figure 6.5: Example of large wear liner from East Coast Polymers

Recommendation No. 3: Lining suppliers should be contacted to advise on suitability of materials, similar applications in the coal industry, and lifecycle costs.

Examples of the effectiveness of linings are shown in the graph of Figure 6.6. This was for comparative laboratory tests of linings outside and inside 200mm steel conveyor rolls using a variety of materials, as taken in the photograph of Figure 6.3. Not all are relevant but they give an example of the reductions available.

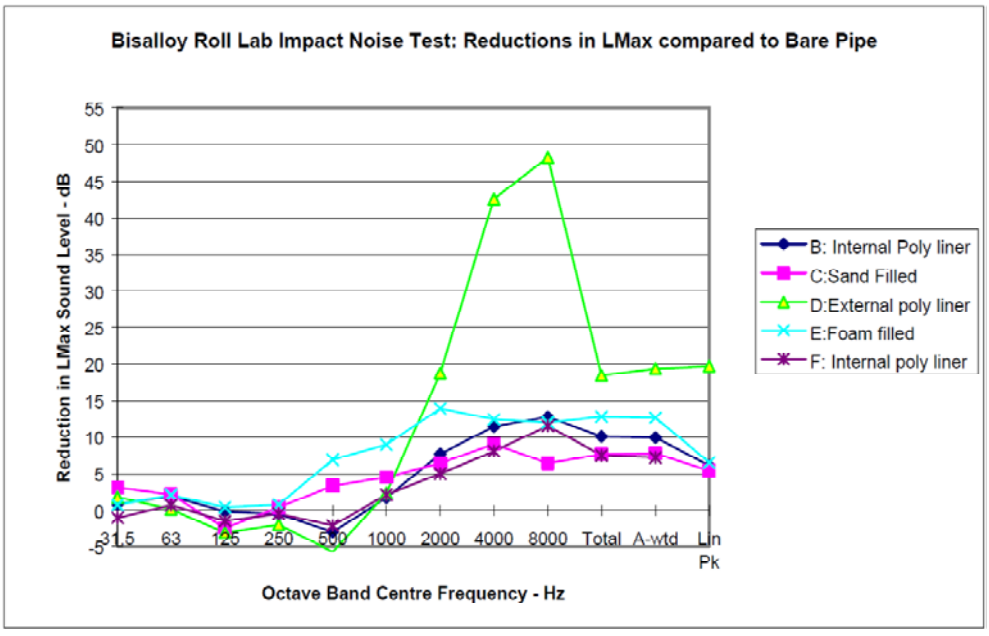


Figure 6.6: Impact sound reduction from polymers and other treatment

6.1.2 *Vibration isolation of impact noise transmission to other parts of the structure*

Vibration isolation is the next stage of consideration – reducing the transmission of vibration from the impact plate to the surrounds through its mounting. Figure 6.1 showed the mounting bar of the impact plate. This fits into a simple U-shaped support in the sides of the enclosure, shown in Figure 6.7.

Figure 6.7: View of internal mounting plate for impact plate shaft support

There are suppliers of vibration isolation materials and hangers, similar to a snubber isolator, which would minimise the transmission between the shaft and the enclosure. There are also holding brackets fixed to the rear of the impact plate which protrude through the enclosure to allow modifying the angle of the impact plate. These are shown in Figure 6.8.

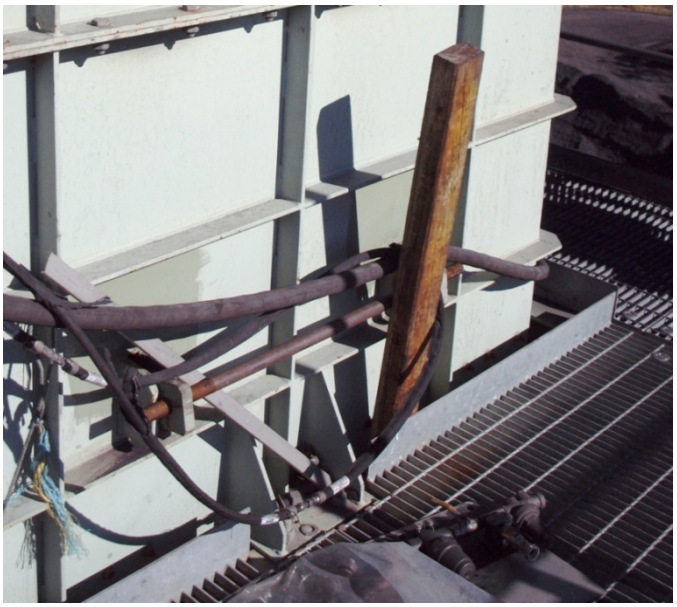


Figure 6.8: View of rear mounting brackets of impact plate

This arrangement could easily transfer vibration from the impact plate to the enclosure. Control of this transmission could be achieved by provision of vibration isolating sleeves over the bolts and washers. The same effect would occur for the mounting shafts of the diverter gates and these could be isolated from the enclosure using vibration isolation pads and sleeves. A check would be required to ensure there is sufficient clearance available.

Examples of potential isolation of the shaft mounting using a seismic restraint snubber and isolation sleeves for the holding brackets provided by one supplier (Embelton) are shown in Figure 6.9:

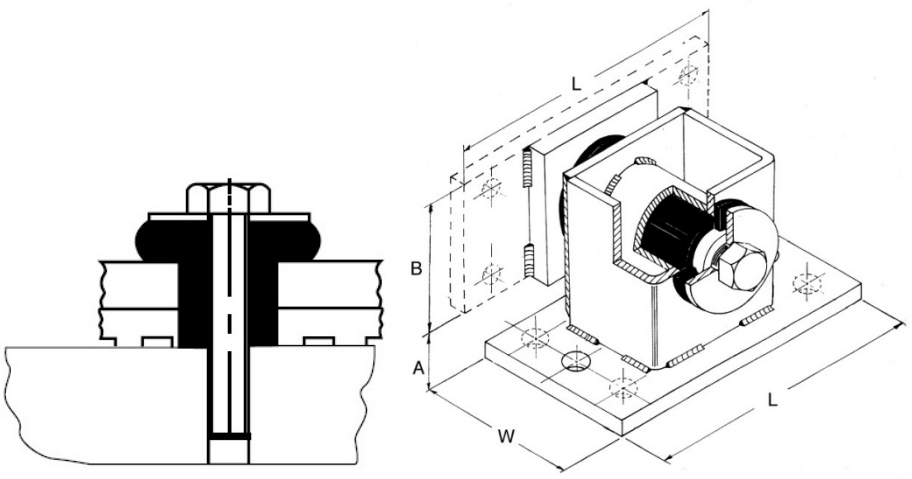


Figure 6.9: Embelton supplied vibration isolation sleeves and seismic restraints

One other location for isolation of vibration transfer is between the enclosure of the transfer and the gantry structure. The enclosure is advised to be supported at five points using pad mountings. If there is vibration transfer from the enclosure to the gantry it could cause the gantry structure to vibrate and emit noise along a wide length and area. Use of vibration isolation materials at these support points and sleeves on bolts would reduce the transfer of this vibration. Regupol and Embelton are amongst suppliers of these types of pad materials. Design of these should allow for any dominant cyclic vibration

In any application of vibration isolation material, the vibration frequency, sprung mass and natural frequency of the structure must be considered to ensure enhancement of vibration does not occur which could affect structural integrity of the system. Figures 3.15 to 3.22 indicated that the only peak in the sound spectrum was at 63 Hz, likely from the belt pulley or belt and idler interactions. Suppliers of vibration isolation devices have the expertise to assess such issues and advise of the most suitable systems for mounting. Recommended suppliers include Embelton, Regupol and Mason Mercer Australia.

Recommendation No.4: Suppliers of vibration isolation mountings should be contacted for advice on the most suitable vibration isolation systems for the impact plate shaft mounting, impact plate holding brackets, diverter gate shaft mountings and enclosure support feet.

Mountings for most of these points could be installed in-situ – some jacking would be required for the enclosure mounting feet. For the shaft mounting, the cover shown in Figure 6.7 would need to be removed to allow modification to the mounting cups or shaft.

6.1.3 *Impact noise reduction – trouser leg discharge chutes*

After the coal strikes the diverter gates it is directed into the trouser-leg discharge chutes, seen in Figure 6.9 and partial views in the photographs of Figure 6.10.

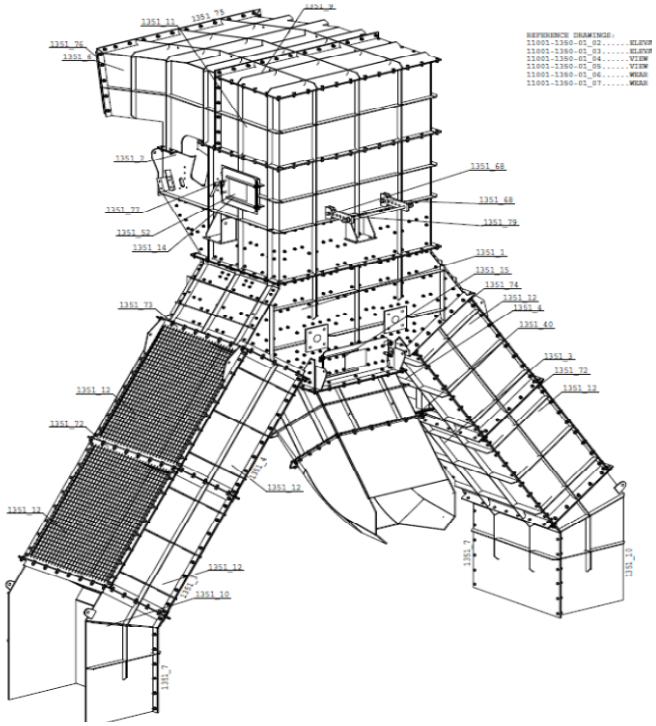


Figure 6.9: View of complete enclosure showing trouser leg discharge chutes

Figure 6.10: Photographs of parts of the trouser leg discharge chutes

The coal sliding down the discharge will create vibration induced noise as it slides and this is likely to be lightly damped. Noise from these two discharges are some of the highest ranked sources for the southern side receivers, with up to 20 dB reduction being required.

The noise emission is expected to be from a combination of the internal sound from the impact plate being struck and impact/sliding noise on the surfaces of the chutes. Reduction of such noise could occur by damping the impact surfaces.

As with the impact plate and diverter gates, an impact test could be done to assess the comparative ringing noise for the discharge surfaces. If impact ringing and impact noise is assessed to be high from measurements during testing and coal flow, treatment could include lining of the inner surfaces with suitable rubber-backed high-wear material or lining the rear surfaces with UHMWPE or HDPU. The photographs of Figure 6.10 shows what appears to be conveyor belting rubber fixed to the sides of the discharge chute. This may be to further add to the transmission loss of the steel or to reduce vibration induced emissions from the sides or part of the top cover. It is unlikely to be increasing damping but may be assisting transmission loss through the sides of the discharge chute.

The left-hand photograph of Figure 6.10 also shows the trajectory of the coal from the end of the discharge chute and it appears to be impacting the outside surface. This would add to the potential noise emission, especially if there is a bracket or plate in place. Modification to the discharge could be considered to avoid this impact.

Recommendation No. 5: Damping internally or externally should be considered on the bottom half of the trouser-leg discharge chutes. Materials similar to those recommended for the impact plate and diverter gates would be relevant. Modification of the bottom of the discharge should be considered to avoid the impacts with the top sides of the discharge.

6.2 Tripper Path noise controls – blocking openings and absorptive liners

Impact noise reduction and vibration isolation described in the previous section has targeted the specific source. The next approach to treatment is to look at the path of the noise from the source to the outside of the enclosure of the tripper, from where the noise can travel to the residential receivers.

6.2.1 Closure and covering of holes

Internal sound from impacts on the various sources could build-up into a reverberant sound and then escape through holes or openings – these are mainly the conveyor inlet and exit openings, but can also include any holes in the sides, top or bottom of the enclosure. This will also include the trouser-leg chute openings. Any openings reduce the potential for effective transmission loss of a panel.

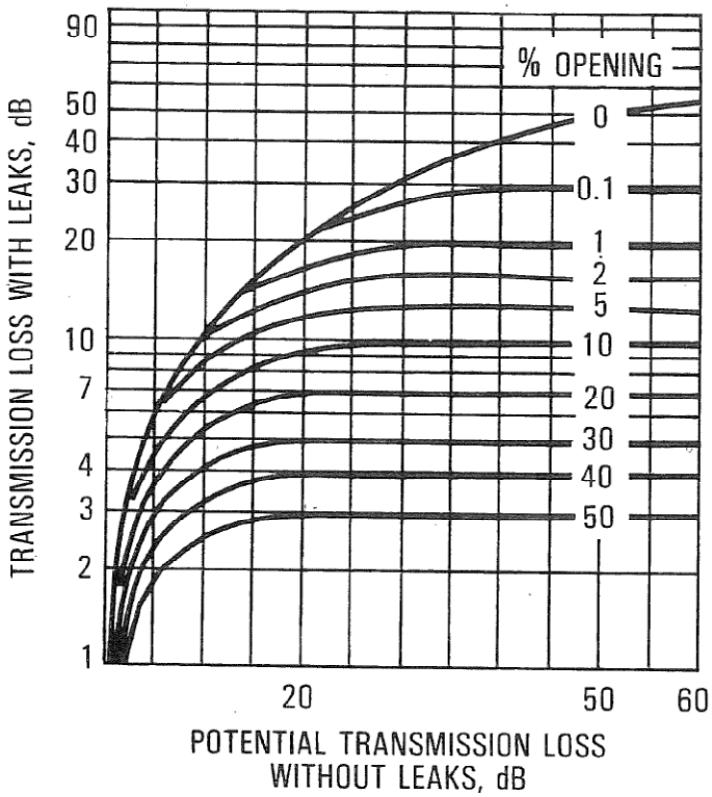


Figure 6.11: Effect of holes on potential panel transmission loss

Figure 6.11 shows the effect that holes have on the potential attenuation of a panel. For example, if a panel with a transmission loss had a surface area of $10m^2$, and it had a total of $100mm^2$ of holes or 1% of the surface area, its effective transmission loss would be 20 dB.

Covering and sealing holes is a simple task. Large holes should be covered with either a steel cover of the same dimensions as the enclosure (such as the inspection doors have done) and sealed with rubber edge seals. Smaller holes or those which can't have doors fitted, and including shaft seals, should be covered with flexible noise barrier material that covers the holes. Suitable material is high density loaded vinyl, such as Wavebar supplied by Pyrotek, or other similar loaded vinyl barrier material. If there are shaft or mounting connections that require flexible connectors, boots can be fabricated of this type of material to cover the opening. Small gaps can be sealed with expandable polyurethane foam.

Recommendation No. 6: Holes in the enclosure cover should be sealed with steel plate or high-density loaded vinyl flexible barrier sheeting, sealed with expandable HDPU foam or silastic.

6.2.2 Conveyor entry opening to the enclosure

Cover flaps have been placed over the conveyor inlet into the discharge enclosure. These can be seen in Figure 6.12, which is a view of the opening. There is a larger opening underneath the conveyor belt for it to exit the tripper chute area. Both of these provide a major opening to allow sound from the inside of the tripper to get out.

Figure 6.12: View of conveyor inlet into tripper enclosure

The flaps shown in the photo are to help to restrict discharge of noise from inside the enclosure when there is coal present on the belt. Measurements of noise emissions from this inlet and underneath, along with the calculations showed that these openings were major source emission points even when coal was not flowing, and up to 21 dB reduction was required (from Table 5.5).

Internal noise is also built up through internal reflection on the steel surfaces of the impact plate, wear plates and enclosure structure. Reduction of this build-up can be achieved by placing absorption on the internal surfaces where impacts are unlikely to occur. This has been attempted through the aluminium foil-faced rockwool lining on the top and sides of the enclosure, shown in Figure 6.7 and in more detail in Figure 6.13. The materials and performance of this lining are unknown and it appears to be approximately 25mm thick.

Absorptive linings work by having the sound enter the softer material and converted to heat energy. Low frequency sounds can penetrate the aluminium foil but middle and higher frequencies require perforations in the facing to have an adequate absorption. However such an approach is compromised in this application from any holes being likely to be blocked by wet coal dust entrained in the airflow. This is likely to be the reason for not using perforated foil.

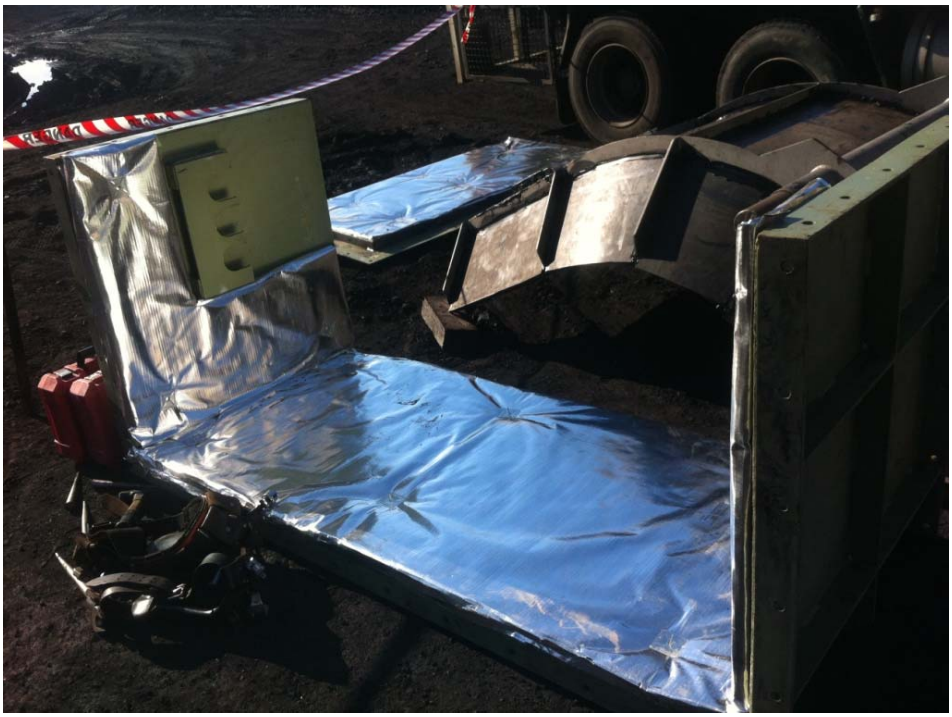


Figure 6.13: Aluminium foil-faced Absorptive lining inside enclosure cover

One alternative to this may be to use plastic film faced (to prevent moisture ingress) rockwool 50 to 75mm thick, with a louvred expanded metal covering for impact protection, as shown in Figure 6.14. This approach would provide much higher open areas to reduce the potential for blockage, allow cleaning and protect the surfaces from impacts. The plastic film would allow better entry of sound into the absorptive layer underneath, and the thicker layer would provide greater absorption.

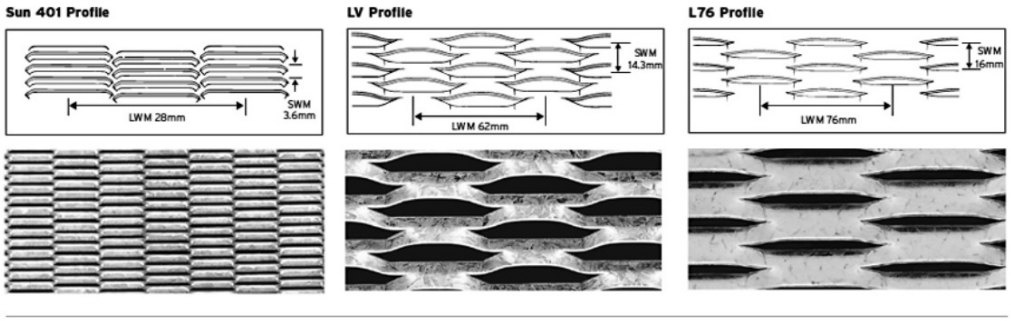


Figure 6.14: Possible expanded metal profiles for protection of absorption and avoidance of blockage by coal particles – steel profiles from Lockyer Group

A second alternative is to use a specially designed microperforated honeycomb panel supplied by Quiet Acoustics, with a schematic shown in Figure 6.15. This also has a high absorption, with some panels having higher absorption at lower frequencies than rockwool or fibreglass. It has been used in quarry screen enclosures for sound absorption, as well as in marine applications. However there is a potential for blockage of the holes with coal dust sludge build-up and would require regular washing to keep clean. To assess this, a trial could be done with a small section of the panel material inside the existing enclosure to determine if coal build up and closure of the holes occurred.

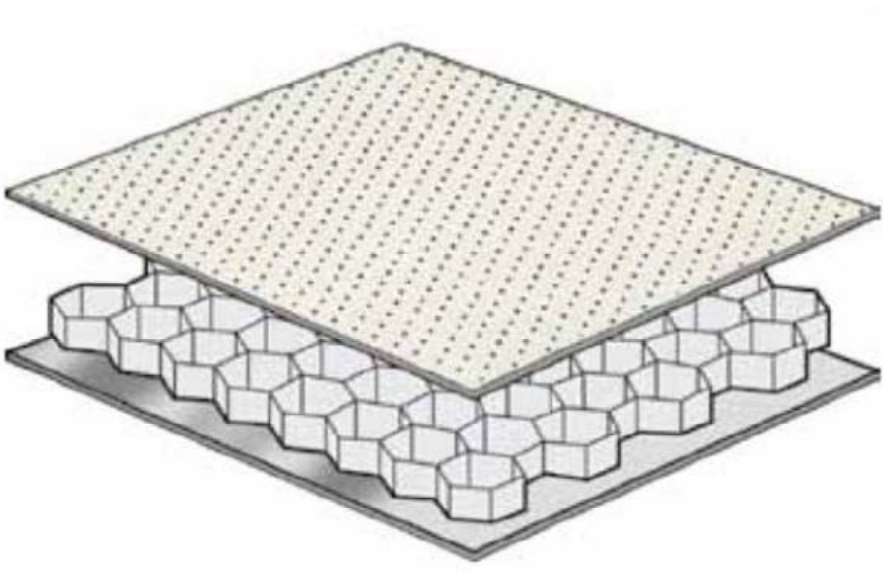


Figure 6.15: Schematic of Quiet Acoustics Panel

As noted above, noise measurement tests identified a significant amount of noise is emitted through the conveyor entry opening to and exit from the tripper enclosure and up to 21 dB reduction was required. Reduction of this noise could be achieved by placing a longer lined section of steel cover above and along the sides of the inlet and exit openings, mounted on the outside of the yellow support frame shown in Figure 6.13.

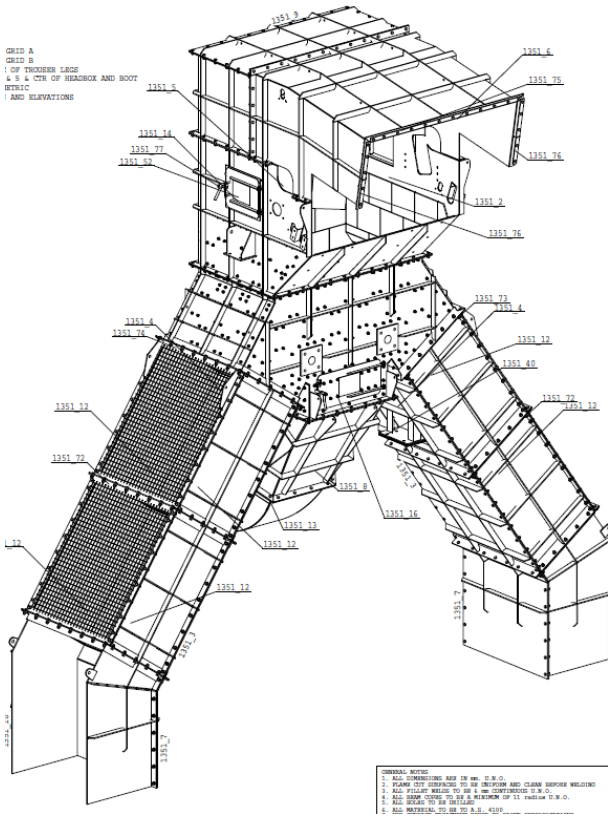


Figure 6.16: View of the Tripper enclosure structure – from drawing 11001-1350-1.

Figure 6.16 shows a view of the tripper opening for the belt entry and discharge. The height of this opening is approximately 1685mm and it is 1351mm wide. The length of the side and top cover would typically be 3 to 4 times the width (say 5m long), extend down for the height of the tripper from the top to the start of the trouser-legs (say 2.5m high), creating an L-shaped cover or half-tunnel entry. This cover would need to be lined on the top and sides with the absorptive material described earlier. This would create an acoustic barrier tunnel or plenum to significantly reduce internal sound as it propagates to the outside of the enclosure.

The outside could be lightweight sheet steel on a steel frame, with the internal lining made of the absorptive material described. There is already a partial frame in place in-front of the entry opening (as a guard on the yellow steel-section frame) for mounting of such an entry cover.

Figures 6.17 and 6.18 show basic conceptual arrangements for this cover location and dimensions.

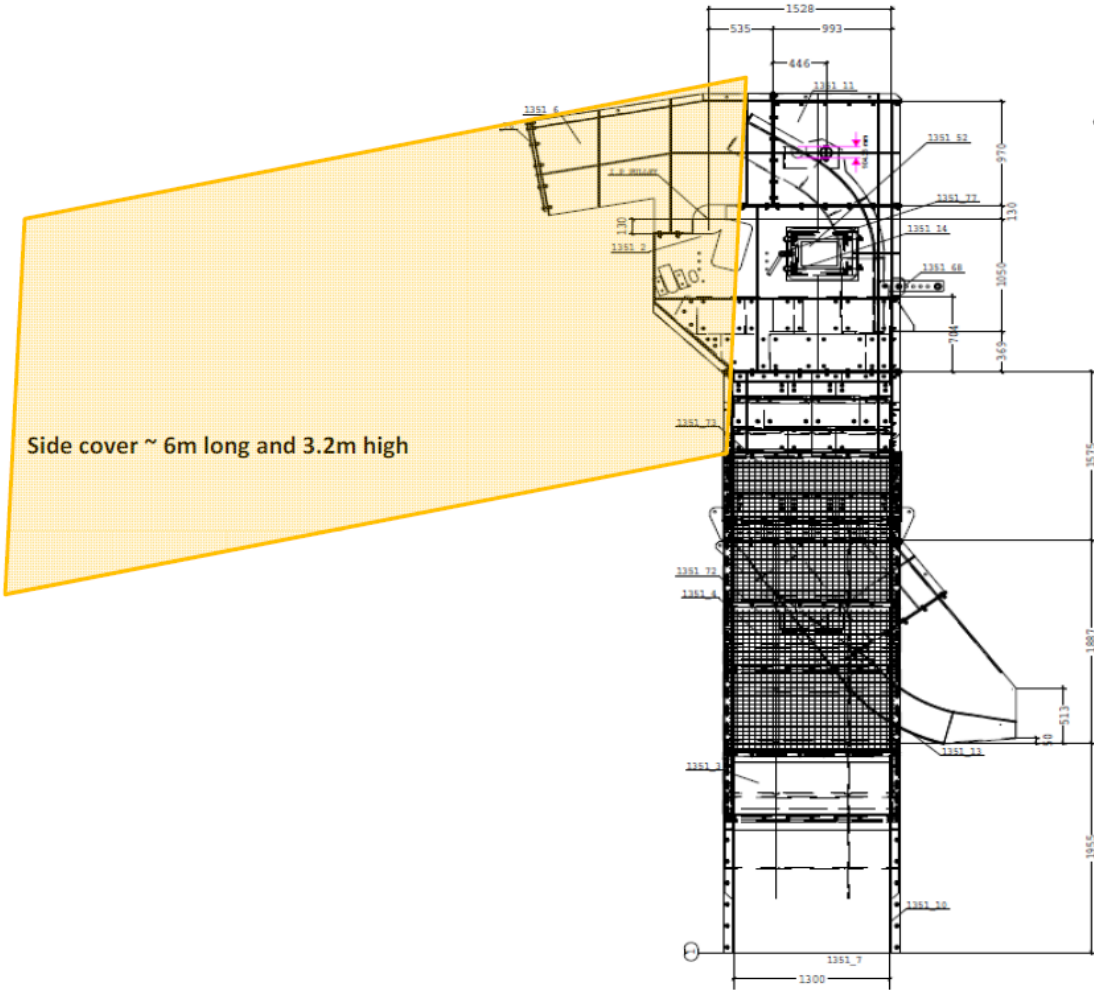


Figure 6.17: Side view of conceptual side and top cover for Tripper belt opening

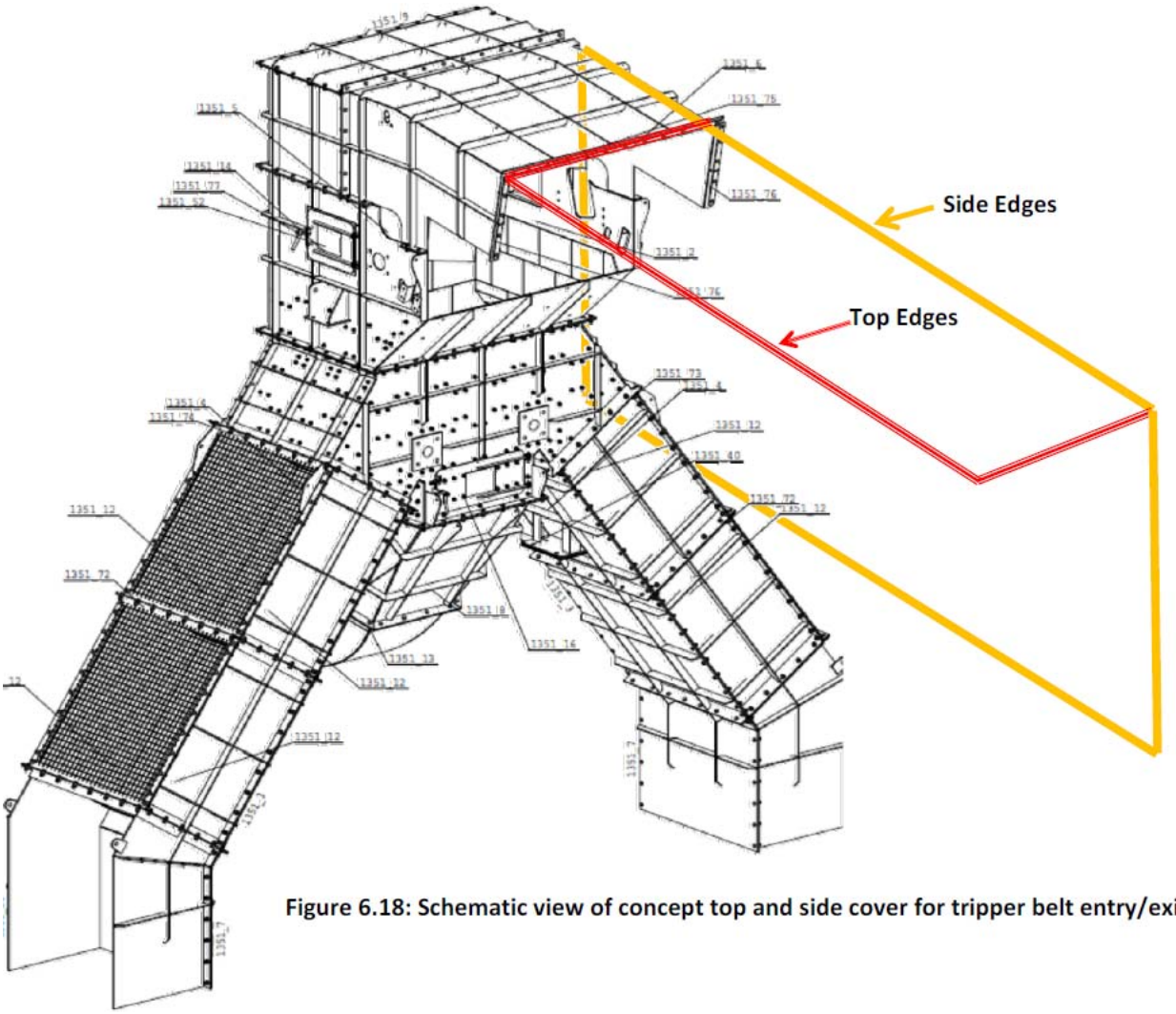


Figure 6.18: Schematic view of concept top and side cover for tripper belt entry/exit

Recommendation No. 7: As the results of the noise emission monitoring and ranking calculations for received sound identified emissions from the tripper enclosure belt entry opening are significant, consider developing a design for an acoustically absorptive side and top cover. Initial selection of suitable materials would involve obtaining typical sample sections of described absorptive cover materials to trial in-situ to assess durability and effects of coal dust on hole openings. Identify the cost of fabrication and installation of an entry cover.

6.2.3 *Trouser-leg discharge chute top covers*

The top of the trouser leg discharge chutes were designed to be open grid mesh, as shown in Figure 6.9 and Figure 6.16. This allows any sliding impact noise and noise from inside the transfer enclosure to be emitted without control. This appears to have been recognised and a rubber conveyor-belt cover placed over the top of the chute, as shown in Figure 6.19. Depending on thickness, sealing and density of this material, it could have an adequate attenuation. However it would be preferable to seal the top with 2mm plate steel sheeting to provide additional attenuation. This could be placed under the existing frame and over the rubber sheeting shown in Figure 6.19.

Recommendation No.8: Consider fitting a 2mm steel plate cover to the top of the trouser leg discharge chute top to provide additional attenuation of noise emitted from the tripper.

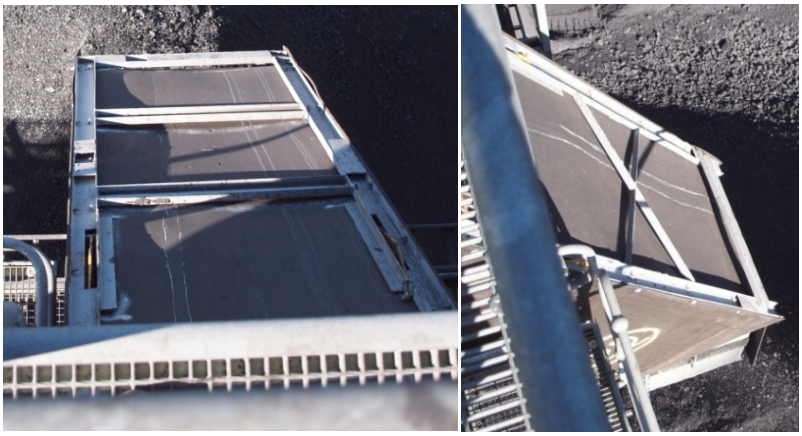


Figure 6.19: Views from the top and sides of the trouser leg discharge chute cover

6.3 Sizer Building

The Eastern wall of the Sizer Building was a significant source for some receivers and had a maximum attenuation requirement calculated to be 16 dB. This sound was observed to mainly arise from the drift conveyor drive gearboxes and this noise was emitted through the walls and through the northern wall opening.

Figure 6.20 shows a view of the Sizer Building from the eastern side, at a similar location to where the sound level measurement was taken that was used in the calculation. The figure shows the unsealed connection to the conveyor gantry. This is also seen in more detail in Figure 6.21.

Figure 6.20: View of the Sizer Building and connection to the conveyor gantry tube

The drift conveyor drive is located on the top level of the building, along the northern side of the conveyor belt. There are two large drives (motors, couplings and gearboxes) and these have a tonal noise at 250 Hz, shown in Figures 3.9 and 3.10. The floor between the drive level and chute to the conveyor is concrete, so it is likely the noise is coming through the wall, not through the bottom and out the gap between the square and round sections.

Figure 6.21: View of the Sizer building, connection to the conveyor gantry tube and area of the northern wall opening at the Portal.

There may be opportunities for improved sealing around the walls and roof connections to reduce the potential for noise leakage through these points.

Additional acoustical absorption on the inside of the drive level would also assist in reducing the internal sound level. This should be placed along the northern and southern walls back past the drives for 3m towards the western end, and all around the eastern wall. A material with a high absorption at 250 Hz is preferable. This could be Bradford R4 ductliner 50mm perf-foil faced rockwool, which has an 83% absorption at 250 Hz.

Measurements in the area did not identify significant noise from impacts on the sides of the chute. This may occur when the Sizer is installed. This would increase the noise emission through the opening between the current square and round sections shown in Figure 6.21. It is recommended that this opening be sealed.

The man-doors on the building seen as light-blue in Figure 6.20 may also be sources for noise leakage. Improved door seals around the edges will assist in reducing the leakage. If the doors are solid core 50mm thick timber they would be expected to have a reasonable attenuation of 30 dB at 250 Hz. Raven acoustic door seals type RP10 around the door edges and RP8 on the bottom edge will be adequate for this purpose.

The Northern Wall opening allows noise from the conveyor drives to escape towards northern receivers and was a source requiring up to 14 dB reduction. This could be achieved by sealing the building to the portal on the northern side. It is understood that this portal provides a ventilation air inlet to the mine and restriction of air entry would provide problems for the mine ventilation system.

It is expected that closing only the northern side would not create a restriction on airflow as the opening is larger on the southern side and at least the same dimensions as the portal opening. This would need to be checked with the mine ventilation engineers. Figure 6.22 shows a view of this opening on the southern side.

Figure 6.22: Sizer building opening on the southern side at the portal

If the northern side opening of the building is able to be closed, it should be sealed to the embankment at the sides and top. Doors could be placed in it to allow access when required. Material for the walls and roof could be Colorbond Steel sheeting of the same profile as the existing wall. As the attenuation required is 14 dB, this could be achieved without the need for high attenuation panels.

If an opening was required on the northern side, then either the air inlet would need to be attenuated or the noise from the conveyor drives emitted through the opening would need to be attenuated. For the opening, a noise reducing lined elbow bend would be required - this essentially creates a labyrinth entry . A concept is shown in Figure 6.23 and involves a pair of lined right-angled bends with an internal splitter wall. Each bend would be expected to have an attenuation of 8 to 10 dB. Wall materials could be Colorbond steel sheet lined internally with 200mm rockwool faced with perforated aluminium foil or fibreglass scrim and held in place with gridmesh. Whether there is space available for this type of arrangement has not been included in the concept as yet. Two lined right-angled bends would be expected to reduce the sound transmission by at least 15 dB.

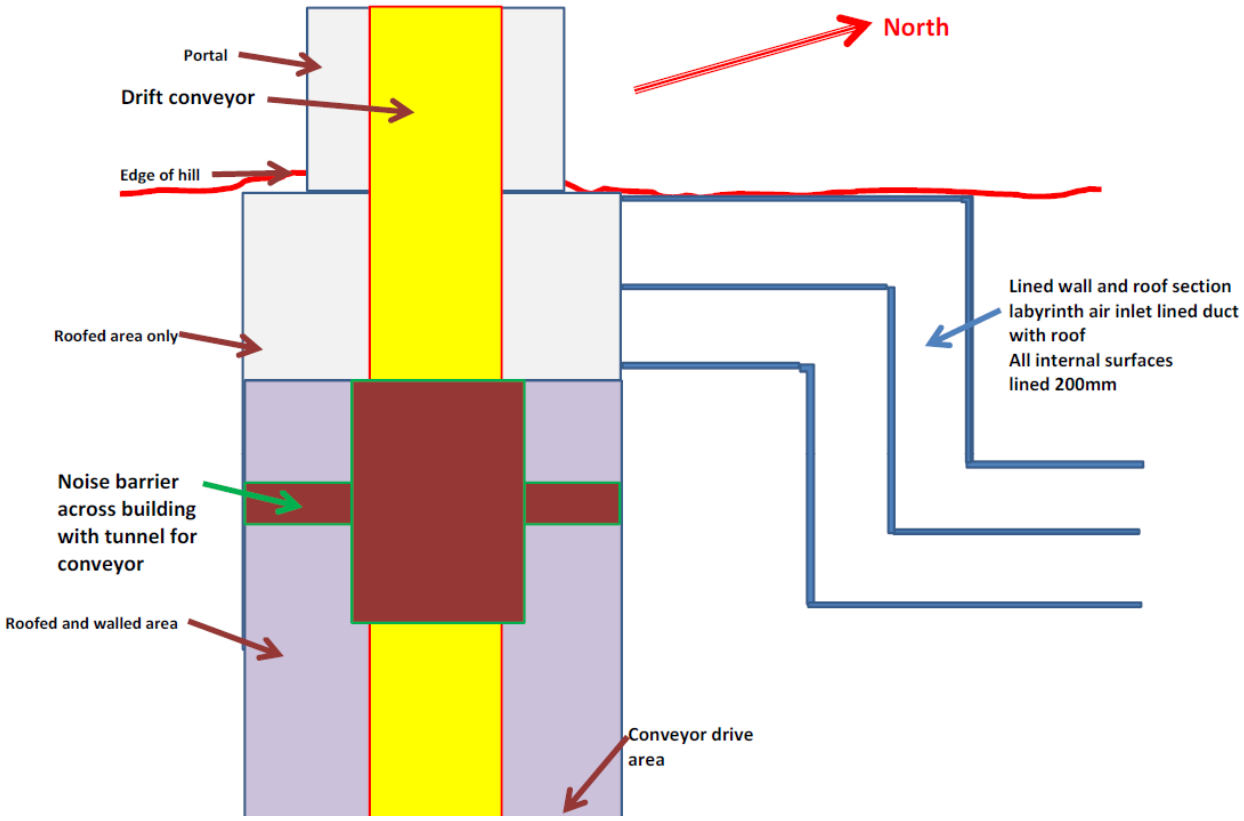


Figure 6:23: Concept plan view of lined labyrinth entry for northern side portal ventilation air entry or barrier across the building to reduce drive noise emission

An alternative to this would be to place a noise barrier across the conveyor path in the building to reduce the noise emission from the conveyor drives to the outside of the building through the opening, as also shown conceptually in Figure 6.23. Wall material could be Colorbond steel sheeting lined internally and sealed to the walls and roof. This would also require tunnel type openings for the conveyor to pass through to be effective in reducing the sound leakage through the conveyor opening. However it would be difficult to achieve 10 dB reduction with the large opening required for the conveyor to pass through. These concepts need to be developed further.

Assessment of the **compressor house** indicated it was not a significant contributor to receiver sound levels and would not require additional attenuation. However it is important that the doors remain closed at night-time.

6.4 Workshop

The workshop building at the Wollongong Coal Russell Vale site can at times house high noise emission activities such as vehicle engine tests. These noise emissions have the potential to be audible at residential receivers.

As part of the general noise management advice being provided for the conveyor system, Hatch was requested to advise on options for control of emissions from the building. This included whether a noise barrier at the eastern edge of the yard would be of value. A memo discussing options for this was provided on 22 May 2014. This is provided in Appendix E. It included recommendations to close and repair the doors and consider a noise barrier along

the eastern side of the hardstand area to reduce noise from vehicles moving around the surface. Calculations indicated that reductions of up to 8 dB were required for the doors.

Reductions of 8 dB could be obtained by closing the doors. The analysis was made for a source such as the workshop forklift at high revs with the reverse alarm operating. If higher sound level sources were being operated inside the workshop, the reduction required would be similarly higher.

6.5 Mine ventilation fans and compressor house

Noise from the northern mine ventilation fan discharge and casing/drive belt were included in the analysis of surface noise sources. Reductions of up to 5 dB were recommended for both sources. This analysis was based on the northern fan. Similar noise arises from the drive belt of the southern fan as for the northern fan. The discharge of the southern fan was not measured as it is elevated and difficult to access, as shown in Figure 6.24.

Figure 6.24: View of the mine ventilation fans – northern fan to the right, southern fan to the left

If it is assumed that the noise emission from the southern fan is the same as that from the northern fan, it is likely to have a lower contribution at residential receivers. This is because it is directed further away from the receivers than the discharge of the northern fan.

There is also a likelihood that the noise from the drive-belt of the southern fan added to the noise measured from the discharge of the northern fan.

A report by BGMA from 2010 assessing the additional fan indicated that acceptable sound levels could be achieved by cladding the inlet and discharge ductwork of each fan, without treating the discharge exhaust by improving the discharge silencer.

Increasing the attenuation from the fan discharges would require a significant increase in the size and attenuation of the silencers. This would have a significant increase in the pressure drop on the fans, affecting the power consumption and adding to the cost. It is considered that providing a noise attenuation barrier screen around the drive belt cover guards would reduce the emissions from the drives. These could be placed on the existing frames for the

weather covers over the fan drives seen in Figure 6.23, on the two sides facing the residential areas. They would also provide some attenuation for emissions from the fan casing.

Suitable material would be Colorbond steel wall sheeting with an internal lining on the walls and roof of Bradford R4 ductliner 50mm perf-foil faced rockwool. They could be made removable to allow access for major maintenance.

6.6 Stockpile Mobile Equipment

Mobile equipment operating on the stockpile was assessed to have the highest requirement for reduction. An attenuation of up to 24 dB was calculated to be required for receivers to the north of the site if this was used at night-time or 22 dB for evening use. Figure 6.25 shows the excavator/loader which was the source measured loading trucks on the stockpile.

During the measurements, sound levels were equally high when the exhaust and air inlet sides were facing the measurement. The measurement used was for 5 minutes of a truck loading event. If a dozer or other loader was used this would be expected to require similar levels of noise reduction. Comparisons for requirements could be made with the sound power level of the measured loader shown in Table 1.1 and the reduction required.

Observations of the periods of high event sound levels at night-time for the Hatch logger placed at the stockpile measurement location indicated the higher periods were related to stockpile vehicle operations.

Figure 6.25: Stockpile excavator loader

Reduction of noise emission from a loader by 22 or 24 dB is a significant amount and greater than would normally be achievable for mobile equipment. General approaches to surface mining equipment where low noise emission levels are required typically includes either leasing a fleet of quiet equipment with a noise specification designed to achieve the required performance objectives. Equipment suppliers are accustomed to achieving low noise emissions from vehicles such as the excavator and trucks.

The calculated sound power level from the excavator loading the trucks was 105 dBA. This means a specification sound power level of 81 dBA for night-time or 83 dBA for evening, which are both extremely low. Typical noise reduction techniques which could be applied to the existing plant would include the following:

- replacement of engine exhaust silencers with high-performance silencers – these are available from Donaldson, Hushpak and others;
- Use of silenced air inlets and discharges using an absorptive labyrinth path or louvres to reduce fan and engine body noise emission;
- Replacement of the radiator fan with an improved aerodynamic fan to reduce noise and increase airflow;
- Side covers on the engine bay to contain noise within it.

These types of treatment need to allow for engine-bay ventilation such that overheating does not occur.

For dozers, reduced track slap noise is possible using proprietary devices supplied by Hushpak Engineering. Scheduling of operations to minimise stockpile loading activities during the night-time is an effective way to reduce the effects of noise on residential receivers.

7. Summary of recommendations

From the noise emission measurements the contributed sound level at the residential receivers have been modelled and ranked. From that ranking of contribution noise sources at the receivers, the requirements for reduction of emissions have been calculated, based on an equivalent contribution from all sources. These calculated reductions can be modified slightly but with the relatively large number of sources in place at the Russell Vale site, all need to be treated to a similar level to that recommended to ensure the noise objectives are achieved.

Major noise sources identified in order of maximum reduction required to achieve the noise objectives at receivers are as follows:

A. Stockpile mobile equipment loading coal into trucks (if at night-time) – up to 24 dB

B. Tripper southern side belt entry and exit opening – up to 21 dB

C. Tripper trouser leg discharges - up to 20 dB

D. Sizer building/transfer station Eastern wall - up to 16 dB

E. Sizer building/transfer station northern wall opening at portal - up to 14 dB

F. Tripper northern side - up to 10 dB

G. Workshop doors - up to 8 dB

H. Mine ventilation fan drives belt covers and casing - up to 5 dB

Some engineering studies have commenced investigating general recommendations made in an earlier draft strategy document, including wear plate suppliers, rubber mountings and vibration isolators. The recommendations from both the earlier document and this report are provided below.

Recommendation No. 1*: Consider potential to change trajectory to avoid impact plate contact – assess if this will also affect flow performance and life-expectancy wear of diverter gates?* **Not economically feasible to undertake.**

Recommendation No. 2*: Consider in-situ impact noise tests of the impact plate, diverter gates, wear plate surfaces and trouser-leg discharge chutes.* **Ongoing.**

Recommendation No. 3*: Lining suppliers should be contacted to advise on suitability of materials, similar applications in the coal industry, and lifecycle costs.* **Completed – material installed**.

Recommendation No.4*: Suppliers of vibration isolation mountings should be contacted for advice on the most suitable vibration isolation systems for the impact plate shaft mounting, impact plate holding brackets, diverter gate shaft mountings and enclosure support feet.* **Completed – material installed**.

Recommendation No. 5*: Damping internally or externally should be considered on the bottom half of the trouser-leg discharge chutes. Materials similar to those recommended for the impact plate and diverter gates would be relevant. Modification of the bottom of the discharge should be considered to avoid the impacts with the top sides of the discharge.* **Completed – material installed.**

Recommendation No. 6*: Holes in the enclosure cover should be sealed with steel plate or high-density loaded vinyl flexible barrier sheeting, sealed with expandable HDPU foam or silastic.* **Ongoing**.

Recommendation No. 7*: Based on the results of the noise emission monitoring and calculation of contributions from the tripper enclosure, provision of a barrier to noise propagation on the eastern side and top of the southern side entry and exit areas is recommended. Typical sample sections of the described absorptive cover materials should be obtained to trial in-situ to assess durability and effects of coal dust on hole openings. Identify the cost of fabrication and installation of an entry cover.* **Ongoing**.

Recommendation No.8*: Consider fitting a 2mm steel plate cover to the top of the trouser leg discharge chute top to provide additional attenuation of noise emitted from the tripper.* **Complete – material installed.**

Recommendation No.9*: The Sizer building eastern wall emissions are significant. Line the insides of the conveyor drive level with sound absorption material, check seals on wall and floor edges and doors. Complete the sealing of the building to the conveyor gantry tube.* **Complete – material installed.**

Recommendation No.10: *The Sizer building north wall opening by the portal entry allows a significant noise emission to residences to the north of the site. Mine ventilation engineers should be requested to advise if this can be closed off without affecting mine operation. The southern side can remain open. If this is acceptable, prepare design for a closing wall sealed to the roof and hillside. If closure is not acceptable, develop comparative engineering designs for either an absorptive labyrinth air entry to reduce noise emission from the entry opening, or a noise barrier (with an absorptive tunnel) across the conveyor pathway to reduce the drive noise passing back along the building and out of the openings.* **Ongoing.**

Recommendation No.11: *Mobile equipment noise reduction requirements are the highest identified for the site and will be difficult to achieve. Stockpile equipment operations at night-time should be minimised and have the most feasible noise control treatments applied. Either quieter leased vehicles should be considered, or additional silencers and engine bay noise reduction applied to the loader and trucks working on the stockpile. Design of controls will need to allow for adequate ventilation of vehicle components to avoid overheating.* **Ongoing.**

Quantification of the potential reductions available from each recommendation is unable to be made. They are based on principles and methods successfully used in other industrial applications.

Further treatment options are available but these would typically involve a significant engineering effort requiring dismantling of the tripper and installation of additional and heavier materials to the frame. This could include providing isolation material between wear plates and the support frame – many of these are welded into position and such an approach would require significant work and potentially change the fitting of sections of the transfer chute.

Another potential approach for the tripper is to build an acoustic enclosure to cover the whole structure. This would have a significant cost and weight, be difficult to implement and affect maintenance access and possibly of only limited attenuation performance if other treatment is not applied first. Principles of noise control always suggest treatment of the source before

considering enclosure, unless enclosure is simple, effective and does not affect operation or maintenance of the item – this is the approach taken in the development of this draft strategy.

8. Material suppliers

Potential and recommended suppliers for materials described in the draft strategy are shown below. There are other suppliers for some of the materials described.

CQMS	Suppliers of high-strength isolated wear plate Rubbadex
CSR Bradford	Supplier of Bradford R4 ductliner 50mm perf-faced rockwool
Dotmar	Suppliers of HDPU or UHMWPE wear linings
East Coast Polymers	Suppliers and fabricators of HDPU or UHMWPE wear linings
Embelton	vibration isolation
Hushpak Engineering	high performance mobile equipment silencers and treatment
Locker Group	Expanded metal suppliers
Mason Mercer Australia	vibration isolation
Ortech Industries	High attenuation wall panels & systems
Pyrotek	Supplier of Wavebar loaded vinyl attenuation barrier
Quiet Acoustics	Supplier of high absorption panels
Raven	Suppliers of acoustic door seals
Regupol	Suppliers of vibration isolation material
Rhinolining	Suppliers of spray-on HDPU or UHMWPE wear linings
Sound Block Solutions	Suppliers of waterproof sound absorption panels Reapor

Appendices

Appendix A: Description of noise parameters and terms

Appendix B: Scope of the noise measurements and quantification of contributions at receivers from Hatch proposal

Appendix C: Inputs to noise model – sound power level spectra and cross-sections

Appendix D: Calculations of effects of source reduction on total received sound levels

Appendix E: Workshop doors noise reduction memo 22 May 2014

Appendix F: Meteorological data for Bellambi and University of Wollongong weather stations

Appendix A: Description of noise parameters and terms

Sound level parameters measured during both types of monitoring are described below.

Sound is a fluctuation of pressure received by a microphone or ear. It has frequency and level components.

Sound Pressure Level or Sound Level (SPL) is a measure of the sound pressure, given in units of decibels (***dB***), which have a logarithmic base (not arithmetic). When measured near a source of noise, the sound pressure level depends on the distance of the measurement from the source.

Sound or noise is composed of many different frequency components. Frequency is the number of cycles per second of the fluctuating sound pressure. The human ear responds to sound with different sensitivities at different frequencies. A sound can be measured with a scale corresponding to the way the human ear responds to noise. This is an internationally standardised scale, known as the A-scale. Sound levels measured with the A-scale are given units ***dBA***.

Sound also has an energy component. The sound power of a source can be calculated, and this is independent of the distance of the measurement from the source. The ***sound power level (PWL)*** of a source is also reported in decibels, and can be used in calculating the sound pressure level of the noise source at any distance.

Environmental noise varies continuously as different noise sources operate, get closer or further from the receiver or are influenced by meteorological conditions, such as wind speed and direction. To provide a parameter to account for the variation, an ***equivalent continuous sound level***, or energy averaged sound level over the measurement time is used. This parameter is known as the $L_{AEQ.T}$, the equivalent continuous A-weighted sound level over the time T, in units of dBA. A commonly used period for environmental noise is 15-minutes.

Environmental noise variation can also be reported as an exceedance level to indicate what percentage of the time the sound level exceeds a value. Commonly used parameters in environmental noise are the:

$L_{A10.15\text{-}min}$ – the sound level exceeded for 10% of the time, or the sound level exceeded for 90 seconds in a 15-minute period; and,

$L_{A90.15\text{-}min}$ – the sound level exceeded for 90% of the time, or the sound level exceeded for 13 minutes 30 seconds in a 15-minute period.

L_{A10}.18 hours – the average of the $L_{A10.1\text{-}hour}$ values over the period 6:00am to 12:00am.

L_{AEQ}.15hr – the energy average of the $L_{AEQ15\text{-}min}$ values for the period 7:00am to 10:00pm.

L_{AEQ}.9hr – the energy average of the $L_{AEQ15\text{-}min}$ values for the period 10:00pm to 7:00am.

The NSW Industrial Noise Policy (INP) refers to objectives for environmental noise in terms of Intrusive or Amenity criteria.

Intrusive noise objective ($L_{AEQ.15\text{-}min}$) $\leq$ Rating background sound level + 5 dB

The **Rating background sound level (RBL)** is the median of the 10^{th} percentile of the $L_{A90.15\text{-}min}$ for each period of the day, evening or night, over the long-term monitoring period.

The **Amenity objectives** ($L_{AEQ.period}$) are listed in Table 2.1 of the INP, with recommended acceptable sound levels for receivers in different noise amenity areas (rural, suburban, urban, etc.) for different periods of the day (day, evening, night).

Project Specific Noise Levels (PSNL's) are specific to a proposed development project, and provide the contribution environmental noise objective for the project. They are taken as the lower of either the Intrusive or Amenity noise objectives determined for a specific receiver. There may be different receivers with different PSNL's for a project.

A **contribution** objective means that the sound level is specific to contributions from the project, not the total noise received at a receiver location

Appendix B: Scope of the noise measurements and quantification of contributions at receivers from Hatch proposal

Source measurement

a) Measure sound levels emitted from the various source components under different operating conditions, and record the sound as well for frequency matching. For example measure during high lump or rock flows, compared to typical coal flow.

b) Identify sound spectral components through one-third octave band and narrow-band frequency analysis (where relevant).

c) Calculate sound power levels of sources and rank these.

Receiver contribution measurement

a) Measure sound levels and record sound received at the residential boundary and note if specific identifiable sources stand-out. Measurements would need to be taken in different operating conditions of the sources, and probably different times of the day and night when ambient conditions have lower sound levels. The recordings allow frequency matching with sources and also to determine tonality.

b) Measured sound levels can include attended measurements for identification of sources or conditions at the time, and unattended results for statistical variation over a longer period (say 2 weeks). If sounds are recorded over the same period then these can be analysed for levels or sources during periods of complaint, if they arise. A complaint history would need to be kept for this period, or an agreeing receiver requested to keep notes of times when sound levels were perceived to be high.

c) For this task item, unattended measurements are proposed for a two week period at boundary locations near four residential receivers (shown in Figure 1 attached) and two site locations. Attended measurements will also be taken. If weather data is recorded on-site, this will be included with the measured data; otherwise data from the Bureau of Meteorology site at Bellambi will be used. Unattended statistical sound level measurements will be taken at 15-minute intervals over a two week period. By comparison with wind speed and direction data over time and matching with operational details (flow through the tripper if this is possible to obtain) then initial estimates of contribution sound levels from the site can be assessed.

d) Compare received sound levels and spectra with source emitted sound levels and spectra and determine potential contribution levels and relevance at the receiver. (Frequency spectra matching will be used for this item).

e) Review existing Gujarat NRE measurement data and reports of source emitted and receiver sound levels.

f) Compare received sound levels with approval limit conditions and acceptable sound levels from the Industrial Noise Policy.

Calculate source contribution sound level ranking at receivers

a) Obtain a ground terrain topographic model of the site out to the nearest residential receivers. If possible this is to be provided by Gujarat NRE in software format (dxf or dwg file).

b) Prepare a computer noise model of the site including source locations for the sizer building, stockpile conveyor, tripper structure and conveyor drive building. Two different locations for the tripper position along the stockpile conveyor will be used; limit locations for the tripper are to be advised by Gujarat NRE.

c) Run the noise model for four different weather scenarios (all with 5^{o}C (1% minimum statistic for University of Wollongong), 95% rh):

   i) Calm, neutral lapse rate,

   ii) Calm, inversion lapse rate (+3^{o}c/100m)

   iii) Wind 2m/s from sources to receivers, inversion lapse rate (+3^{o}c/100m)

   iv) Wind 3m/s from sources to receivers, neutral lapse rate.

d) Rank received source sound levels at each receiver for each weather scenario and determine relative priority for control.

Appendix C: Inputs to noise model – sound power level spectra and cross-sections

Appendix C: Table 3.1: Wollongong Coal Ltd - Russell Vale Site: Tripper Conveyor and some surface equipment sound level measurements April, May and June 2014

Table 3.1 A: Results of measurements on 1 and 10 April 2014 Yellow highlighted cells are Z-weighted measurements

Location	File No.	Time	Period dd:hh:mm:ss	Measured Sound Levels - dB					Comments	One-third Octave Band Sound Level LAEq																																
				LAEq	LA01	LA10	LA90	LCEq		Total dBA	A-weighted Leq sound pressure level dBA in 1/3 Octave Band - Hz																															
Measurements 1 April 2014											12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	12.5 kHz	16 kHz	20 kHz
Stockpile excavator loading coal to truck ~50m	3	3:10 PM	00d 00:04:00	65	68	67	61	75		65	-5	5	7	14	24	25	37	44	44	49	45	43	45	44	46	52	54	54	56	56	55	53	54	53	51	49	46	44	42	37	30	30	27
Measurements 10 April 2014																																										
Drive house Top Level																																										
Doorway E side	5	11:03 AM	00d 00:00:30	84	85	85	84	95		84	8	20	25	30	31	37	54	61	64	69	73	67	68	69	69	74	74	76	73	73	72	72	76	68	66	69	64	60	57	53	46	37	29
2m inside SE corner	6	11:04 AM	00d 00:00:30	84	85	85	84	92		84	9	23	29	32	32	37	43	49	58	68	69	68	68	70	69	74	74	77	73	73	72	72	75	69	67	71	66	61	57	53	46	37	28
2m inside E wall centre	7	11:05 AM	00d 00:00:33	84	86	85	84	92		84	6	11	25	34	35	37	50	58	53	65	68	66	68	72	70	74	74	75	73	73	72	73	77	69	66	70	63	60	58	54	47	36	29
2m inside NE corner	8	11:06 AM	00d 00:00:30	84	85	85	84	93		84	8	16	25	31	32	36	49	56	57	67	73	65	69	72	70	74	74	75	73	73	72	73	75	68	64	69	60	57	55	52	44	33	25
2m inside N wall centre	9	11:07 AM	00d 00:00:44	85	86	86	85	93		85	12	21	30	37	36	38	50	56	56	69	70	65	68	71	70	75	75	77	74	72	72	73	79	69	67	72	63	60	58	53	46	35	29
2m inside NW corner	10	11:08 AM	00d 00:00:30	86	87	87	86	93		86	10	20	25	33	31	37	51	57	55	65	71	66	69	72	69	79	78	76	73	73	72	76	77	69	67	73	64	60	58	54	47	36	30
2m inside W wall centre opp motor @ 3m	11	11:09 AM	00d 00:00:31	87	88	87	86	94		87	6	23	31	35	35	40	50	57	58	68	73	67	68	72	70	76	76	79	74	74	74	76	79	71	69	76	65	63	62	59	54	44	39
2m inside SW corner	12	11:10 AM	00d 00:00:39	87	88	87	86	93		87	8	25	34	36	32	36	47	54	56	69	69	67	70	71	70	77	77	76	75	74	74	77	81	72	68	73	63	61	59	56	48	39	34
Gearbox @ 1m W side	13	11:11 AM	00d 00:00:32	89	90	90	88	98		89	9	22	32	36	34	37	53	60	61	73	78	66	71	72	70	77	78	81	77	75	75	80	83	74	69	73	63	62	61	58	49	41	34
Gearbox S end @ 0.8m	14	11:12 AM	00d 00:00:31	88	88	88	88	94		88	8	26	32	30	32	38	46	53	58	66	71	67	72	71	70	78	77	81	77	76	77	76	80	73	70	72	67	63	60	55	48	41	32
Motor W side @ 1m	15	11:13 AM	00d 00:00:34	89	90	90	89	95		89	8	24	31	35	36	38	53	60	58	68	73	66	70	71	71	79	78	80	76	76	75	80	84	73	69	76	66	64	65	63	61	49	45
Motor N end @ 1m	16	11:13 AM	00d 00:00:32	88	88	88	87	97		88	8	19	25	35	40	40	59	66	59	66	72	67	71	72	72	78	78	78	75	75	75	76	81	74	69	74	67	64	62	58	51	43	37
Doorway W side	17	11:14 AM	00d 00:00:31	86	87	86	85	94		86	8	18	26	29	30	35	52	59	64	70	71	64	66	68	70	75	74	78	74	73	73	72	80	70	67	71	63	60	58	53	46	37	29
Drive house 1 level below top																																										
2m inside E wall centre by stairs	18	11:16 AM	00d 00:00:32	83	84	83	82	93		83	6	9	23	34	30	33	45	54	54	67	74	65	67	70	69	73	72	73	71	71	70	69	75	66	62	66	59	54	51	47	40	29	20
2m inside N wall centre	19	11:17 AM	00d 00:00:34	82	83	83	82	91		82	5	19	28	34	36	36	49	56	53	65	70	66	66	68	68	74	72	73	70	70	69	71	75	66	64	67	61	55	52	46	39	29	19
2m inside W wall centre opp motor @ 3m	20	11:17 AM	00d 00:00:31	83	83	83	82	90		83	8	12	22	32	30	34	45	53	55	64	67	66	67	70	69	74	73	74	71	71	70	69	73	66	64	68	62	56	52	47	39	29	20
2m inside S wall centre by belt E side	21	11:18 AM	00d 00:00:31	83	84	84	83	91		83	5	16	27	33	33	38	45	52	57	65	69	67	67	71	70	73	73	74	72	71	70	71	75	67	67	70	66	59	54	49	42	34	25
Drive house 2 levels below top																																										
Floor area SE corner by stair	22	11:19 AM	00d 00:00:43	78	79	78	77	88		78	8	9	19	27	27	32	42	49	51	62	67	62	64	66	65	69	69	69	66	65	64	63	67	60	57	60	53	48	45	39	32	22	12
Inside NW corner @ 2m	23	11:20 AM	00d 00:00:31	77	78	77	76	88		77	11	14	24	28	29	33	42	50	54	63	69	62	62	65	64	68	67	67	64	64	62	61	64	57	53	56	49	45	42	37	31	24	14
2m to W side centre by opening in wall	24	11:21 AM	00d 00:00:30	77	78	77	76	87		77	9	15	23	30	27	34	44	49	48	61	65	62	63	66	65	68	68	68	65	64	62	61	67	58	56	59	53	47	43	37	30	22	13
S side centre by E side belt	25	11:22 AM	00d 00:00:36	79	81	80	78	92		79	16	12	24	26	29	34	46	53	54	66	73	64	63	66	65	69	68	69	66	65	64	63	69	60	59	62	56	50	46	41	34	26	16
2 flights down on stair by bottom of wall sheeting																																										
On stairway	26	11:23 AM	00d 00:00:42	72	74	73	72	82		72	1	9	17	23	23	27	36	43	50	58	59	56	57	60	61	64	64	63	63	60	58	57	59	52	52	54	48	43	39	34	28	25	16
On Tripper No coal																																										
On E walkway under TL chute @ 1m	27	11:27 AM	00d 00:00:49	70	71	71	70	88		70	-2	3	12	24	27	33	54	60	48	53	57	55	56	58	59	59	61	60	59	58	58	56	55	53	53	51	49	45	42	39	34	31	22
S end tripper stairs access	28	11:28 AM	00d 00:00:33	66	67	66	65	79		66	-7	-3	4	16	21	27	44	49	42	50	52	53	54	56	55	53	55	57	54	53	53	50	48	47	45	44	42	39	38	34	29	29	21
At portal to covered conveyor @ 2m, 1m to belt	29	11:29 AM	00d 00:00:30	71	72	72	71	80		71	7	0	7	22	25	26	36	42	47	51	56	59	61	61	60	62	64	62	57	55	54	54	54	51	50	46	44	41	38	35	30	24	16
Top Level of Tripper No Coal																																										
E side Entry to hood @ 1m, 0.5m to belt	30	11:35 AM	00d 00:00:31	76	77	76	75	93		76	-3	11	15	27	30	37	58	64	51	56	61	59	60	63	60	64	68	65	66	67	65	63	58	58	59	60	58	52	48	45	41	34	25
E side by Inspection hatch @ 0.8m	31	11:36 AM	00d 00:00:30	71	72	71	70	84		71	-8	7	13	25	25	33	46	51	48	57	63	54	56	58	55	58	61	61	58	59	57	56	53	55	55	57	55	49	46	43	37	30	20
N side @ 1m	32	11:36 AM	00d 00:00:32	67	68	67	66	84		67	-8	9	13	22	26	32	49	56	48	51	54	54	57	59	55	54	56	55	53	53	53	50	52	47	45	42	40	36	32	28	22	18	10
W side inspection hatch @ 0.8m	33	11:37 AM	00d 00:00:41	70	71	71	69	84		70	-5	12	14	27	25	33	48	53	49	54	57	58	58	61	58	58	59	59	59	60	58	56	52	51	49	49	47	42	39	37	32	27	19
W side Entry to hood @ 1m, 0.5m to belt	34	11:38 AM	00d 00:00:30	77	77	77	76	95		77	1	16	16	28	31	39	61	67	51	57	62	61	60	63	62	63	68	66	65	68	68	64	60	58	58	59	57	51	47	44	39	34	25
W side @ 3m to entry, 0.5m to belt	35	11:39 AM	00d 00:00:30	75	76	75	75	91		75	-7	6	13	25	27	35	57	63	49	55	58	59	57	60	59	63	68	65	65	66	64	60	58	57	59	59	57	51	47	44	40	34	25
W side @ 6m to entry, 0.5m to belt	36	11:40 AM	00d 00:00:30	73	74	73	72	86		73	-7	6	11	22	24	31	50	56	49	54	59	57	56	60	58	62	66	64	63	64	62	56	54	53	54	55	53	47	43	41	36	32	24
Tripper Mid level No coal																																										
N side @ 1m	37	11:41 AM	00d 00:00:30	69	70	69	68	85		69	-2	6	14	24	29	35	49	56	48	51	56	55	56	59	59	57	59	59	57	56	57	54	54	49	47	45	43	39	36	33	28	24	16
1m N of E TL	38	11:42 AM	00d 00:00:33	68	69	68	67	80		68	-8	4	12	23	24	32	40	46	45	54	58	53	56	60	57	55	57	58	55	55	54	51	51	48	46	45	44	41	39	36	30	26	17
Logger location 1-min No coal or loading																																										
	39	12:50 PM	00d 00:01:01	56	57	56	55	70		56	-8	-4	2	10	13	18	35	41	35	40	43	37	39	40	44	49	49	44	44	43	42	41	40	37	35	36	36	33	29	24	18	14	6
Forklift Reverse Alarm																																										
Rear @ 7m	40	1:19 PM	00d 00:00:35	74						74	-4	-2	8	13	27	24	28	42	36	39	46	45	48	51	51	53	54	57	62	72	61	61	59	59	57	55	57	52	52	43	36	31	24
45° rear @ 7m	41	1:19 PM	00d 00:00:30	69						69	-3	-2	8	13	23	22	25	37	34	36	39	37	45	46	47	48	51	55	56	67	58	57	59	56	55	55	53	50	46	41	34	29	22

Appendix C: Table 3.1: Wollongong Coal Ltd - Russell Vale Site: Tripper Conveyor and some surface equipment sound level measurements April, May and June 2014

Table 3.1 B: Results of measurements on 27 May 2014

Yellow highlighted cells are Z-weighted measurements

Location	File No.	Time	Period dd:hh:mm:ss	Measured Sound Levels - dB					Comments	Total	A-weighted Leq sound pressure level dBA in 1/3 Octave Band - Hz																													
Measurements 27 May 2014				LAEq	LA01	LA10	LA90	LCEq		dBA	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kH	1.6 kHz	2 kHz	2.5 kHz	3.15 kH	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	12.5 kH	16 kHz	20 kHz
Transfer Point @ 16m Background	44	2:55 PM	00d 00:00:34	47	55	51	40	55	Background, belt off, birds, people, stockpile area vehicles	47	-10	-4	1	4	6	6	11	17	23	25	26	30	29	30	34	38	41	39	36	36	36	35	35	32	32	30	27	25	21	16	13	9	3
Transfer Point @ 16m Background	45	3:05 PM	00d 00:02:01	43	53	44	38	54	-----	43	-9	-5	-1	2	5	8	13	18	22	25	25	24	25	25	26	29	32	29	30	31	32	31	34	36	30	22	21	19	16	13	9	7	2
Transfer Point @ pole 50m Background	46	3:10 PM	00d 00:02:00	45	53	47	41	56	-----	45	-9	-4	-1	3	8	18	15	21	25	26	26	26	27	29	30	35	35	35	35	34	34	34	35	30	29	27	25	22	21	18	12	9	1
Substation N of Admin @ 12.4m	47	3:35 PM	00d 00:00:24	52	53	53	52	66	Tone @ 100 Hz	52	--.-	-9	10	10	3	15	18	29	30	44	31	33	47	36	39	47	36	36	36	40	38	36	34	32	29	26	23	21	18	14	10	5	0
Comp House S doorway Open	48	3:48 PM	00d 00:01:00	80	82	81	80	86	S doorway half open	80	6	10	16	23	29	30	35	44	46	55	57	62	65	73	64	67	76	68	69	70	69	67	65	63	61	61	55	50	45	40	34	24	17
Comp house S wall @ 1m	49	3:49 PM	00d 00:00:27	68	70	69	68	78	Some leakage through small hole and out of S doorway	68	5	11	17	24	28	31	33	43	41	41	49	53	55	65	53	55	60	53	56	57	55	54	49	46	44	43	38	34	30	23	17	11	6
Comp House N doorway closed @ 2m	50	3:50 PM	00d 00:00:30	71	73	72	71	81	S doorway half open	71	6	13	20	27	35	37	41	43	42	48	55	58	59	66	58	58	63	58	58	60	61	58	55	53	50	48	42	38	33	27	21	13	5
Comp house N man doorway open	51	3:51 PM	00d 00:00:28	84	85	84	83	91	Comp noise & vent fan noise	84	9	15	20	27	36	38	42	50	51	60	67	68	70	75	69	70	76	72	73	74	73	71	69	67	65	65	60	56	52	47	41	33	24
Comp House between N comps	52	3:52 PM	00d 00:00:30	89	91	90	88	96	Both on	89	14	20	27	34	42	46	51	57	57	60	66	68	73	84	73	76	84	75	76	77	76	74	71	70	68	68	63	60	55	50	44	35	28
Comp House N wall by wall vents @ 2m, exhaust vents 3.2m above	53	3:54 PM	00d 00:00:35	82	83	82	82	88	Vents & door open	82	5	11	18	26	34	36	42	48	47	59	66	66	67	69	65	70	74	71	73	74	72	71	69	67	65	63	59	55	50	45	39	30	19
Comp House N wall @ 8m	54	3:55 PM	00d 00:00:29	80	81	80	79	84	Vents & door open	80	4	7	12	23	31	30	35	42	43	48	54	60	64	64	61	67	74	68	72	72	70	68	66	65	63	62	58	55	50	45	40	31	21
Comp House S door closed @ 2m	55	3:57 PM	00d 00:00:34	69	70	70	68	78	All doors closed	69	5	8	15	21	29	30	33	41	41	50	50	54	58	64	54	56	61	55	57	57	57	55	53	50	47	45	40	37	33	27	20	12	5
Comp House E wall centre @ 8m	56	3:58 PM	00d 00:00:27	63	64	64	62	75	All doors closed	63	2	7	14	20	28	32	35	43	39	46	47	49	51	55	49	50	56	51	51	53	52	50	48	45	43	41	37	33	29	22	14	7	1
MVF North @ 12m to discharge, 8.2m to side S fan	57	4:05 PM	00d 00:00:40	73	74	74	73	85	No tones apparent. Minor wind buffeting	73	19	24	30	36	40	43	45	46	50	52	56	54	56	57	57	59	63	62	61	64	66	63	61	60	60	58	55	52	49	44	37	29	20
MVF North @ 12m to discharge, 8.2m to side S fan, out of wind	58	4:06 PM	00d 00:01:00	72	73	73	72	84	Out of wind, no buffeting	72	16	20	28	35	39	42	44	46	47	54	54	53	55	55	56	60	64	60	61	62	64	63	60	59	59	56	54	51	47	43	36	28	19
MVF North @ 12m to discharge, 8.2m to side S fan, out of wind	59	4:08 PM	00d 00:00:30	72	73	73	72	84	Record A wt	72	16	20	28	35	39	43	44	46	47	54	53	53	56	55	56	60	64	60	61	62	64	63	61	59	59	56	54	51	48	43	36	28	19
MVF North @ 12m to discharge, 8.2m to side S fan, out of wind Zwt	60	4:08 PM	00d 00:00:31	90	96	93	87	84	Record Z wt	90	79	76	78	79	78	78	74	73	69	73	70	67	66	64	62	65	67	63	62	63	64	62	59	58	58	55	53	51	49	45	40	35	29
MVF South Drive Belt side @ 2m	61	4:12 PM	00d 00:00:34	80	81	81	80	87	3m to drive stand	80	17	22	31	39	39	41	43	46	51	55	61	62	62	62	64	65	70	68	71	71	71	72	69	68	68	66	64	60	57	53	47	41	33
MVF South fan casing @ 1.5m	62	4:13 PM	00d 00:00:20	79	80	79	78	88	-----	79	18	27	32	38	41	46	46	49	52	58	61	62	62	62	63	63	66	66	67	69	72	68	66	66	67	66	63	61	58	52	45	37	28
MVF South fan 2m to scroll @ 1.5m	63	4:14 PM	00d 00:00:21	74	75	75	74	86	-----	74	20	24	30	38	39	41	43	48	49	59	57	55	58	58	60	59	62	62	63	65	67	65	61	61	62	60	58	55	52	47	41	33	24
MVF South fan 2m to inlet scroll & exp joint	64	4:14 PM	00d 00:00:27	74	75	74	74	85	-----	74	16	20	29	37	41	42	42	46	49	55	55	59	58	60	60	60	64	64	61	63	63	63	61	61	61	60	58	57	54	51	46	40	32
MVF North fan 2m to inlet scroll & exp joint S side & 4m to drive motor end	65	4:15 PM	00d 00:00:28	79	80	80	78	86	-----	79	19	23	29	35	37	41	46	50	49	53	58	61	61	62	63	62	69	66	69	71	73	69	65	64	65	62	59	58	56	52	48	43	36
MVF North fan 1m to fan casing and drive motor end	66	4:16 PM	00d 00:00:19	83	84	84	83	90	-----	83	19	21	29	36	41	47	48	53	54	58	64	66	68	67	66	67	73	70	74	75	76	72	70	70	71	68	65	64	62	57	50	41	32
MVF North fan 1m to side drive motor end	67	4:16 PM	00d 00:00:25	84	85	85	84	88	-----	84	17	20	26	34	39	43	44	49	55	55	57	63	65	66	66	69	76	72	73	77	78	74	70	69	69	67	64	63	62	57	50	40	29
MVF North fan 2m to side drive belt	68	4:17 PM	00d 00:00:23	85	85	85	84	86	Belt is a bit squeaky	85	14	18	26	28	34	40	42	45	49	56	58	60	61	61	62	62	67	66	71	73	74	80	76	76	72	71	67	66	63	58	50	41	32
MVF North fan 1m to side fan casing scroll	69	4:17 PM	00d 00:00:21	76	77	77	75	85	-----	76	15	20	26	32	36	45	46	48	50	58	59	59	62	58	59	59	61	60	63	65	67	67	64	63	65	66	62	60	58	52	42	33	23
MVF North fan 2m to side fan inlet casing & inlet exp joint	70	4:18 PM	00d 00:00:23	73	73	73	72	84	-----	73	18	24	26	34	38	41	46	48	49	59	55	56	58	56	58	58	61	62	59	61	62	64	61	59	60	59	56	56	54	51	47	42	35
Small substation 110m from fans towards washery site	71	4:29 PM	00d 00:00:31	47	49	48	46	61	-----	47	-8	2	8	15	17	18	19	22	25	30	30	31	34	33	28	34	36	33	36	37	38	37	34	35	33	32	31	26	18	16	7	3	-1
Small substation 110m from fans towards washery site	72	4:30 PM	00d 00:00:20	47	49	48	46	62	-----	47	-7	2	7	16	17	18	19	22	26	31	31	32	34	33	28	34	36	33	36	37	36	36	32	34	33	35	30	26	17	14	6	3	-1
Small substation 110m from fans towards washery site Zwt	73	4:30 PM	00d 00:00:21	67	69	68	65	62	Record Z wt	67	54	57	57	59	57	52	49	49	50	52	48	48	45	41	37	40	40	35	37	38	36	35	32	33	30	30	26	25	21	16	12	12	10
Small substation 110m from fans towards washery site	74	4:31 PM	00d 00:00:25	47	48	47	46	62	-----	47	-7	2	8	16	18	18	19	22	29	31	32	32	34	33	29	34	37	33	36	39	36	36	33	34	31	30	25	23	19	15	8	4	-1

Table 3.1: Wollongong Coal Ltd - Russell Vale Site: Tripper Conveyor and some surface equipment sound level measurements April, May and June 2014

Table 3.1 C: Results of measurements on 12 June 2014

Measurement results adjusted for extension microphone calibration difference

Yellow highlighted cells are Z-weighted measurements

	Location	File No.	Time	Period dd:hh:mm:ss	Measured Sound Levels - dB					Comments	Total	A-weighted Leq sound pressure level dBA in 1/3 Octave Band - Hz																												
	Measurements 12 June 2014				LAEq	LA01	LA10	LA90	LCEq		dBA	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kH	1.6 kHz	2 kHz	2.5 kHz	3.15 kH	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	12.5 kH	16 kHz	20 kHz
	Transfer Point Power Pole, 51m to join, 67m to Transfer Bld	75	2:37 PM	00d 00:03:01	55	57	56	53	66	Belt on, occasional coal not significant	55	-7	6	8	10	19	24	25	32	33	36	39	39	42	50	43	43	45	41	42	41	40	38	37	37	35	34	31	28	23	18	13	9	3
	Post opposite join 18m	76	2:41 PM	00d 00:02:01	60	61	61	59	72	Belt on, occasional coal not significant	60	-5	9	17	17	25	26	29	37	39	43	43	46	48	54	48	50	51	48	49	48	45	45	43	43	42	41	39	35	31	24	17	9	5
	Post opposite join 18m	77	2:44 PM	00d 00:01:03	68	69	68	66	77	Belt on, occasional coal not significant, Drive house higher than transfer	68	-3	15	22	20	30	31	32	37	42	45	45	48	53	65	52	54	56	53	54	53	51	51	48	48	47	46	44	40	35	30	24	20	16
	Post opposite join 18m	78	2:45 PM	00d 00:01:00	68	72	69	67	78	Belt on, occasional coal not significant up to 72	68	0	14	22	25	27	33	37	39	45	46	46	50	54	65	53	55	58	56	56	57	56	54	51	51	48	47	44	40	36	30	25	20	15
	E side Transfer Bld @ 5m	79	2:48 PM	00d 00:01:01	72	73	73	71	82	Strong tone from drive 200Hz	72	-3	15	16	21	35	32	36	38	42	44	49	51	57	71	53	52	57	50	52	53	52	51	49	49	49	49	47	45	41	35	29	20	11
	E side Transfer Bld @ 5m	80	2:54 PM	00d 00:03:55	74	75	74	73	83	Some coal at times	74	-1	13	17	23	32	32	36	39	43	44	49	51	58	73	56	53	57	53	54	55	55	52	51	51	50	49	47	45	41	36	29	20	8
	Inside Transfer, 1m E side of chute	81	3:00 PM	00d 00:00:44	83	84	84	82	93	No coal - drive noise from above	83	10	27	36	40	52	46	47	53	55	59	61	66	70	76	70	70	73	70	72	71	69	69	68	69	69	69	67	64	60	55	47	39	27
	Drive level NE corner, 2.4m to E Gearbox	82	3:02 PM	00d 00:01:00	94	96	95	93	98	Drive noise only	94	18	30	35	37	49	45	45	50	56	62	66	71	73	81	77	79	88	81	85	83	81	81	80	81	82	82	80	77	74	69	63	55	44
	Drive level 1m side E Gearbox	83	3:04 PM	00d 00:00:18	103	104	103	103	110	Drive noise only	103	15	26	30	37	47	47	51	60	60	64	66	73	85	101	83	85	91	86	92	87	87	85	85	87	88	89	87	85	82	78	73	66	58
	Drive level 0.6m side E Fluid Coupling	84	3:05 PM	00d 00:00:22	98	99	99	98	104	Drive noise only	98	18	27	33	42	49	50	53	57	62	67	68	72	79	93	83	83	88	84	85	87	84	85	83	85	86	86	84	82	78	74	68	60	50
	Drive level 1.5m end E motor	85	3:05 PM	00d 00:00:21	93	95	94	93	99	Drive noise only	93	15	29	32	41	46	45	48	57	61	65	66	72	76	86	78	80	85	82	85	81	80	80	78	78	79	78	77	74	70	66	60	53	43
	Drive level 1m End W Gearbox	86	3:06 PM	00d 00:00:21	93	94	94	93	98	Drive noise only	93	11	26	31	36	42	44	49	54	61	62	66	71	76	85	77	80	85	81	82	82	81	80	80	81	80	80	79	77	74	70	64	57	47
	Drive level 1m side W Gearbox	87	3:07 PM	00d 00:00:20	97	98	98	96	101	Drive noise only	97	13	25	30	39	46	46	51	61	63	65	67	71	78	89	78	83	87	84	87	86	84	83	83	85	85	84	83	81	79	75	70	64	55
	Drive level 0.6m side W Fluid Coupling	88	3:07 PM	00d 00:00:25	98	100	99	96	105	Drive noise only	98	14	28	31	39	49	47	52	60	65	67	68	71	80	95	81	79	84	85	85	85	84	83	83	84	85	84	83	81	77	73	67	60	50
	Drive level 1m end W motor	89	3:08 PM	00d 00:00:30	90	91	90	89	96	Drive noise only	90	10	27	29	33	45	42	48	60	60	61	64	70	75	83	73	79	81	78	78	79	76	75	74	76	76	75	74	71	68	64	59	52	43
	At N side opening in N wall	90	3:10 PM	00d 00:00:36	85	86	86	84	92	Opening ~ 6mwide & 5m high. Drive noise	85	6	25	25	27	40	36	43	58	58	57	60	67	69	79	69	72	76	72	73	75	72	71	70	71	71	70	69	67	63	59	54	46	36
	E side Transfer Bld @ 5m	91	3:12 PM	00d 00:00:37	81	83	82	80	80	Record Z wt	81	59	69	68	66	73	66	66	64	66	64	66	65	65	78	61	57	62	53	54	54	52	51	49	48	49	48	46	45	42	38	33	27	19
	Transfer Point Power Pole, 51m to join, 67m to Transfer Bld	92	3:14 PM	00d 00:01:00	54	56	55	54	66	Record A wt	54	-6	3	10	10	19	19	25	32	33	37	39	39	42	47	44	47	44	42	41	41	40	41	38	38	36	36	34	31	25	22	15	12	10
	Stockpile Logger Location	93	3:29 PM	00d 00:00:41	71	73	72	69	70	No coal - belt & drive house noise, record	71	51	52	52	54	52	50	62	67	55	59	63	49	49	50	51	52	50	47	45	43	41	40	41	35	35	35	32	29	26	23	18	14	11
No coal	Stockpile Logger Location	94	3:31 PM	00d 00:01:01	56	56	56	55	70	No coal - belt & drive house noise	56	-9	-3	3	9	10	17	34	40	36	38	42	36	38	41	45	47	47	46	44	43	43	41	42	37	36	35	32	29	25	21	15	9	8
Coal	Stockpile Logger Location	95	3:34 PM	00d 00:01:00	60	64	62	59	69	Coal out at high rate	60	-8	-3	3	9	11	17	32	38	35	39	43	37	38	42	47	50	49	50	48	48	49	49	50	50	49	49	47	45	41	36	29	19	7
No coal	Tripper Gantry - top 1.5m to belt entry	96	3:52 PM	00d 00:00:39	77	78	78	77	96	No coal	77	-4	12	12	21	28	38	61	67	52	62	67	57	60	64	61	64	69	65	66	67	66	61	58	58	59	60	58	54	50	47	43	38	33
No coal	Tripper Gantry - top 1m to E side of chute	97	3:52 PM	00d 00:00:30	69	70	70	69	80	No coal	69	-7	5	12	23	22	32	44	48	46	53	57	52	53	56	56	58	58	60	60	60	58	57	55	52	52	51	52	51	49	53	52	35	24
	Tripper Gantry - top 1m to N side of chute	98	3:53 PM	00d 00:00:43	66	67	67	66	80	No coal, belt noise impact on rolls	66	-7	3	10	19	22	31	45	49	49	53	54	52	55	56	54	55	56	55	55	54	52	51	52	48	46	45	43	42	41	40	38	27	19
No coal	Tripper Gantry - top 1m to W side of chute	99	3:54 PM	00d 00:00:29	69	70	69	68	83	No coal	69	-4	11	12	23	26	32	49	54	47	52	56	54	55	59	56	57	58	59	58	59	57	56	52	51	50	50	48	45	43	40	36	30	23
Coal	Tripper Gantry - top 1.5m to belt entry	100	3:57 PM	00d 00:00:30	80	82	81	79	92	Coal on, not many lumps, belt ~ 1/3rd to half full	80	-5	5	14	25	31	38	58	63	50	56	64	62	62	65	64	68	72	70	71	70	70	68	65	65	66	65	64	62	58	55	49	42	33
Coal	Tripper Gantry - top 1m to E side chute & above impact point	101	3:58 PM	00d 00:00:25	83	87	86	80	88	Coal on, not many lumps, belt ~ 1/3rd to half full	83	-5	8	15	26	29	37	46	50	51	56	60	63	66	69	68	72	76	75	74	73	73	71	69	68	67	65	65	61	57	60	50	44	36
	Tripper Gantry - top 1.5m to belt entry	102	3:59 PM	00d 00:00:31	96	98	97	96	95	No coal, record Z, tone 63 Hz	96	57	67	63	70	66	72	88	95	75	77	80	71	72	73	69	69	74	68	70	69	67	64	59	57	56	55	54	52	50	49	47	44	41
	Tripper Gantry - top 1m to E side of chute	103	4:00 PM	00d 00:00:30	86	87	87	85	85	No coal, record Z, tone 63 Hz	86	53	66	63	65	60	66	78	83	70	74	77	69	71	70	66	62	62	62	62	61	59	55	53	52	52	51	50	50	49	56	57	45	38
No coal	E Trouser Leg discharge @ 1m N	106	4:45 PM	00d 00:00:29	71	72	72	71	92	Level with discharge, no coal, water fall noise	71	-9	-2	6	16	22	34	57	64	46	54	56	56	57	61	61	58	59	58	57	56	56	55	55	56	56	56	55	54	53	50	46	41	32
No coal	E Trouser Leg - under @ 1m centre	107	4:47 PM	00d 00:00:33	73	74	73	72	86	Under chute - belt roller impact noise	73	-4	3	12	25	24	32	50	55	49	59	63	52	56	58	61	62	61	62	63	61	59	59	59	59	58	58	56	55	54	51	47	43	35
No coal	E side 2m S of Chute box	108	4:48 PM	00d 00:00:40	75	78	75	74	88	Belt noise	75	0	8	14	26	29	35	53	59	50	59	58	58	57	63	64	65	65	66	65	64	63	60	57	57	56	55	53	51	48	45	42	37	29
No coal	E Trouser Leg Top surface @ 400mm from N side walkway	109	4:51 PM	00d 00:00:25	67	68	68	67	85	~1/2 up leg from bottom	67	-9	5	10	17	19	30	50	57	43	52	56	50	53	57	58	57	57	56	56	55	54	52	50	49	47	47	45	43	42	41	40	32	23
No coal	Noisy idler N of chute @ 1m	110	4:53 PM	00d 00:00:33	72	74	73	71	81	From walkway	72	-2	1	9	13	17	27	41	47	49	57	59	50	53	56	57	59	62	60	62	61	60	60	63	61	60	55	52	49	45	42	38	41	34
	Compare Fixed & Extension mic at same loc 3m E of belt inside drive house	111	5:18 PM	00d 00:00:30	86	89	87	85	99	-	86	8	18	23	31	31	38	45	53	57	74	80	69	70	72	70	75	75	76	74	74	73	73	73	69	65	69	64	60	57	52	46	38	30
	Compare Fixed & Extension mic at same loc 3m E of belt inside drive house	112	5:21 PM	00d 00:00:38	85	87	86	85	96	-	85	8	20	27	29	30	38	46	54	59	71	76	67	69	73	70	74	75	76	74	74	74	73	76	68	65	70	62	60	57	53	45	37	29
	E doorway by belt on walkway	113	5:22 PM	00d 00:00:41	84	86	85	83	97	Drive noise	84	6	14	21	30	30	37	51	58	61	73	78	66	69	70	68	73	74	74	72	71	71	70	75	67	63	68	61	58	56	51	43	35	29
Coal	E Trouser Leg discharge @ 1m N	114	6:35 PM	00d 00:00:20	86	91	88	84	93	Coal on, 2m to impact zone	86	-3	2	9	16	25	37	57	63	49	56	57	60	67	69	69	70	74	74	74	74	75	75	76	76	77	76	75	74	72	71	68	65	59	49
Coal	E Trouser Leg Top surface @ 400mm from N side walkway	115	6:36 PM	00d 00:00:21	79	82	81	77	83	Coal on	79	-9	1	9	18	27	37	41	44	43	51	54	53	62	62	62	65	69	69	69	69	69	69	69	68	67	66	64	62	60	55	50	43	32
Coal	E Trouser Leg - under @ 1m centre	116	6:36 PM	00d 00:00:21	88	92	90	82	92	Coal on - most noise from drop impact at stockpile	88	-4	4	16	25	29	37	49	57	53	62	63	65	72	74	73	75	77	77	79	77	76	76	76	76	75	74	72	70	67	64	60	53	44
Coal	E side 2m S of Chute box	117	6:43 PM	00d 00:00:24	84	94	85	80	91	Coal on	84	-1	6	15	25	29	35	52	58	50	58	59	60	73	74	70	71	72	73	73	73	72	71	72	72	70	69	67	65	63	61	57	51	40
Coal	E Trouser Leg Top surface @ 400mm from S side walkway	118	6:44 PM	00d 00:00:19	81	84	82	80	84	Coal on	81	-9	1	10	17	29	40	42	44	44	53	56	56	62	63	66	65	68	70	70	70	70	70	69	70	70	70	70	69	66	63	59	53	44
Coal	E Trouser Leg discharge @ 1m S	119	6:45 PM	00d 00:00:09	85	91	88	78	93	Coal on, 2-3m to impact zone	85	-9	-3	7	16	23	35	58	65	46	55	57	59	63	66	67	68	70	71	72	72	73	75	75	76	76	75	73	72	71	68	65	59	50
No coal	Mid-level of N side Chute 1m to wall	120	6:51 PM	00d 00:00:31	69	70	70	69	85	No coal	69	-7	4	11	22	24	36	50	56	49	52	51	53	55	58	58	60	60	60	60	58	57	55	55	53	50	48	46	44	43	41	39	35	28
Some Coal	Mid-level of N side Chute 1m to wall	121	6:52 PM	00d 00:01:08	75	83	78	71	86	Some coal	75	-7	4	12	21	24	34	51	57	50	52	52	54	57	61	61	63	64	66	65	65	65	64	64	62	61	60	58	56	55	52	48	42	33
No coal	E Trouser Leg Top surface @ 500mm from N side Mid level	122	6:54 PM	00d 00:00:30	70	71	70	69	91	No coal	70	-9	1	11	21	24	33	57	62	45	54	58	50	53	57	59	57	58	57	57	56	55	55	52	52	52	53	55	49	47	49	43	33	23
Some Coal	E Trouser Leg Top surface @ 500mm from N side Mid level	123	6:55 PM	00d 00:00:38	71	75	73	70	89	Some coal	71	-9	3	13	24	26	34	54	60	44	52	54	50	53	59	60	59	61	60	61	60	59	59	58	57	56	56	56	52	50	50	45	37	26
Some Coal	Mid-level of N side Chute 1m to wall	124	6:57 PM	00d 00:01:20	73	81	75	69	89	Some coal	73	-9	2	12	22	24	33	55	61	45	53	56	52	59	60	60	61	62	63	64	63	62	61	59	59	58	57	56	53	51	50	45	38	27
High Coal	Mid-level of N side Chute 1m to wall	125	7:00 PM	00d 00:00:52	81	86	83	78	87	High flow coal	81	-4	4	16	21	25	34	48	54	50	55	54	59	65	67	65	69	71	73	72	72	70	70	70	68	67	65	63	61	58	55	50	44	35
No coal	Tripper Gantry - top 1m to N side of chute	126	7:03 PM	00d 00:00:21	66	67	67	66	84	No coal	66	-8	8	8	15	19	31	50	56	46	51	52	51	54	55	55	56	55	56	55	53	52	50	52	49	47	48	46	45	42	43	37	32	24
No coal	Tripper Gantry - top walkway level E side of belt level with top of inlet	127	7:10 PM	00d 00:00:28	82	83	83	82	96	No coal - gets belt opening area noise	82	10	22	18	31	33	42	60	67	56	64	70	60	62	68	68	66	70	72	74	74	75	72	68	64	61	62	63	60	55	54	51	45	36
High Coal	Tripper Gantry - top 1m to N side of chute	128	7:31 PM	00d 00:00:32	77	81	78	75	82	Coal	77	-5	1	9	19	24	32	45	49	48	53	54	55	60	61	61	64	66	67	67	67	66	65	65	65	65	63	61	58	54	52	48	41	31
High Coal	Tripper Gantry - top walkway level E side of belt level with top of inlet	129	7:32 PM	00d 00:00:19	87	91	89	85	93	Coal on gets belt opening noise	87	5	14	18	30	32	40	55	60	53	62	68	61	65	71	74	74	74	76	82	79	78	77	75	72	71	70	69	66	63	59	55	48	39

Appendix D: Calculations of effects of source reduction on total received sound levels

Table 4.1: Wollongong Coal Russell Vale Noise Assessment

Angles from Sources to Receivers to be included in source file directivity

Source	Area	Angles to Receiver from Source								
	m2	RC1	RC2	RC3	RC4	RC5	RR1	RR2	RR3	RR4
S1, S14, S17: Drive Building N wall	61	160	130	75	115	160	30	30	30	40
S2, 15, S16: Drive Building E wall	71	60	40	20	15	60	70	70	70	50
S3, S16, S19: Drive Building S wall	61	20	55	110	75	20	160	165	160	140
S4 Tripper N side chute wall N end	5	160	130	75	115	160	30	30	30	40
S5 Trouser Leg discharge E side N end	1	60	35	20	15	60	75	80	75	50
S6 Trouser Leg discharge W side N end	1	110	135	160	170	110	110	105	110	130
S7 & 23 Tripper S side openings N end	4	20	55	110	75	20	160	165	160	140
S8 Tripper N side chute wall S end	5	160	130	75	115	160	30	30	30	40
S9 Trouser Leg discharge E side S end	1	60	35	20	15	60	75	80	75	50
S10 Trouser Leg discharge W side S end	1	110	135	160	170	110	110	105	110	130
S11 & 24 Tripper S side openings S end	4	20	55	110	75	20	160	165	160	140
S12 Sizer E wall	30	10	30	45	25	10	75	80	75	65
S13 Stockpile excavator loader	Point									
S20 Stairway door opening	10	90	90	90	90	90	90	90	90	90
S21 Transfer Station N wall opening	30	75	55	45	65	105	15	10	15	25
S22 Tripper conveyor belt	Line									
S25 Workshop Door South	Point									
S26 Workshop Door Centre	Point									
S27 Mine Vent Fan N discharge	8	35	45	60	40	25	90	90	90	
S28 Mine Vent fan N casing/belt	Point									
S29 Compressor House N wall	8	155	135	120	135	160	90			
S30 Substation	Point									

Table 4.2: Wollongong Coal Russell Vale Noise - Sound Power levels of sources to each receiver for use in ENM model

Table 4.2 A: Receivers C1 and C5

Source	Sound Power Level dB in Octave Band Frequency - Hz								
	31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
S1	70	69	71	55	49	39	30	6	
S2	84	85	89	74	69	63	54	32	22
S3	86	95	98	89	90	85	85	78	70
S4 Northern side tripper chute northern end			76	82	77	72	64	57	48
S5 Eastern side trouser leg northern end			91	99	98	97	97	96	93
S6 Western side trouser leg northern end			91	99	98	97	97	96	93
S7 Southern tripper chute entry northern end Coal On			92	104	97	95	92	90	86
S8 Northern side tripper chute southern end			76	82	77	72	64	57	48
S9 Eastern side trouser leg southern end			91	99	98	97	97	96	93
S10 Western side trouser leg southern end			91	99	98	97	97	96	93
S11 Southern tripper chute entry northern end Coal On			92	104	97	95	92	90	86
S12 Transfer Station E wall	104	101	99	107	95	90	85	82	74
S13 Coal loading excavator on stockpile East side centre	107	114	107	99	101	100	97	93	88
S14 = S1A	69	70	68	51	44	35	26	1	
S15 = S2A	80	82	88	71	65	58	50	26	13
S16 = S3A	84	83	90	79	76	72	67	50	40
S17 = S1B	64	63	66	48	39	29	16		
S18 = S2B	76	74	82	67	61	53	43	20	7
S19 = S3B	80	81	93	74	71	67	61	42	32
S20 = S2C	76	77	81	73	67	58	49	41	27
S21 Transfer Station N wall opening to RC1 only	92	95	90	93	84	78	70	67	61
S21 Transfer Station N wall opening to RC5 only	89	90	84	86	76	69	62	58	50
S22 Tripper Belt	74	86	80	77	71	66	60	56	51
S23 Tripper S wall opening N end No Coal	95	116	106	97	96	90	83	85	77
S24 Tripper S wall opening S End No Coal	95	116	106	97	96	90	83	85	77
S25 Workshop Door 1 South - Fork lift full Revs & Alarm	92	94	90	88	88	98	88	85	81
S26 workshop Door 2 Centre - Fork lift full Revs & Alarm	92	94	90	88	88	98	88	85	81
S27 MVF North	113	107	105	99	99	97	95	90	83
S28 MVF North casing	92	91	93	89	88	92	95	88	83
S29 Compressor House N Wall vents to C1	90	86	88	88	84	78	68	58	45
S29 Compressor House N Wall vents to C5	95	91	92	92	90	84	75	66	54
S30 Substation N of Admin	85	86	92	87	81	72	67	59	53

Table 4.2: Wollongong Coal Russell Vale Noise - Sound Power levels of sources to each receiver for use in ENM model
Table 4.2 B: Receiver C2

Source	Sound Power Level dB in Octave Band Frequency - Hz								
	31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
S1	73	72	75	58	53	44	36	13	0
S2	85	88	94	82	79	76	70	51	44
S3	86	94	96	84	83	76	74	65	55
S4 Northern side tripper chute northern end			78	83	80	75	68	60	52
S5 Eastern side trouser leg northern end			91	99	98	97	97	96	93
S6 Western side trouser leg northern end			91	99	98	97	97	96	93
S7 Southern tripper chute entry northern end			92	104	97	95	91	87	81
S8 Northern side tripper chute southern end			78	83	80	75	68	60	52
S9 Eastern side trouser leg southern end			91	99	98	97	97	96	93
S10 Western side trouser leg southern end			91	99	98	97	97	96	93
S11 Southern tripper chute entry southern end			92	104	97	95	91	87	81
S12 Sizer Building/Transfer Station E wall	104	101	99	107	95	90	85	82	74
S13 Coal loading excavator on stockpile East side centre	107	114	107	99	101	100	97	93	88
S14 = S1A	72	73	72	54	48	40	32	8	
S15 = S2A	81	85	93	78	75	71	66	45	35
S16 = S3A	84	83	90	79	76	72	67	50	40
S17 = S1B	67	66	70	51	43	34	22		
S18 = S2B	77	77	87	74	71	66	59	39	29
S19 = S3B	80	81	93	74	71	67	61	42	32
S20 = S2C	76	77	81	73	67	58	49	41	27
S21 Transfer Station N wall opening	95	100	97	101	92	86	78	75	68
S22 Tripper Belt	74	86	80	77	71	66	60	56	51
S23 Tripper S wall opening N end No Coal	95	116	106	97	96	90	82	82	72
S24 Tripper S wall opening S End No Coal	95	116	106	97	96	90	82	82	72
S25 Workshop Door 1 South - Fork lift full Revs & Alarm	92	94	90	88	88	98	88	85	81
S26 workshop Door 2 Centre - Fork lift full Revs & Alarm	92	94	90	88	88	98	88	85	81
S27 MVF North	113	107	105	99	99	97	93	87	77
S28 MVF North casing	92	91	93	89	88	92	95	88	83
S29 Compressor House N Wall vents to C1	92	88	89	89	86	80	70	61	48
S30 Substation N of Admin	85	86	92	87	81	72	67	59	53

Table 4.2: Wollongong Coal Russell Vale Noise - Sound Power levels of sources to each receiver for use in ENM model
Table 4.2 C: Receiver C3

Source	Sound Power Level dB in Octave Band Frequency - Hz								
	31.5	63	125	250	500	1000	2000	4000	8000
S1	80	80	84	68	65	57	51	29	17
S2	85	88	94	82	79	76	70	51	44
S3	73	74	73	55	50	43	36	13	0
S4 Northern side tripper chute northern end			82	88	86	82	76	70	62
S5 Eastern side trouser leg northern end			91	99	98	97	97	96	93
S6 Western side trouser leg northern end			91	99	98	97	97	96	93
S7 Southern tripper chute entry northern end			88	99	89	83	77	71	64
S8 Northern side tripper chute southern end			82	88	86	82	76	70	62
S9 Eastern side trouser leg southern end			91	99	98	97	97	96	93
S10 Western side trouser leg southern end			91	99	98	97	97	96	93
S11 Southern tripper chute entry southern end			88	99	89	83	77	71	64
S12 Sizer Building/Transfer Station E wall	104	101	99	107	95	83	68	53	35
S13 Coal loading excavator on stockpile East side centre	107	114	107	99	101	100	97	93	88
S14 = S1A	79	81	81	64	60	53	47	24	11
S15 = S2A	81	85	93	78	75	71	66	45	35
S16 = S3A	73	69	72	57	51	44	36	16	3
S17 = S1B	74	74	79	61	55	47	37	13	1
S18 = S2B	77	77	87	74	71	66	59	39	29
S19 = S3B	69	67	75	52	46	39	30	8	-5
S20 = S2C	76	77	81	73	67	58	49	41	27
S21 Transfer Station N wall opening	95	100	97	103	96	86	71	60	45
S22 Tripper Belt	74	86	80	77	71	66	60	56	51
S23 Tripper S wall opening N end No Coal	94	114	103	91	87	79	68	66	55
S24 Tripper S wall opening S End No Coal	94	114	103	91	87	79	68	66	55
S25 Workshop Door 1 South - Fork lift full Revs & Alarm	92	94	90	88	88	98	88	85	81
S26 workshop Door 2 Centre - Fork lift full Revs & Alarm	92	94	90	88	88	98	88	85	81
S27 MVF North	113	107	104	97	96	92	87	80	70
S28 MVF North casing	92	91	93	89	88	92	95	88	83
S29 Compressor House N Wall vents to C1	93	89	90	90	87	82	72	63	52
S30 Substation N of Admin	85	86	92	87	81	72	67	59	53

Table 4.2: Wollongong Coal Russell Vale Noise - Sound Power levels of sources to each receiver for use in ENM model
Table 4.2 D: Receiver C4

Source	Sound Power Level dB in Octave Band Frequency - Hz								
	31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
S1	74	73	76	59	55	47	40	18	6
S2	85	88	94	82	79	76	70	51	44
S3	81	88	88	76	75	67	65	55	44
S4 Northern side tripper chute northern end			79	85	81	76	69	62	54
S5 Eastern side trouser leg northern end			91	99	98	97	97	96	93
S6 Western side trouser leg northern end			91	99	98	97	97	96	93
S7 Southern tripper chute entry northern end			90	102	94	89	85	80	73
S8 Northern side tripper chute southern end			79	85	81	76	69	62	54
S9 Eastern side trouser leg southern end			91	99	98	97	97	96	93
S10 Western side trouser leg southern end			91	99	98	97	97	96	93
S11 Southern tripper chute entry southern end			90	102	94	89	85	80	73
S12 Sizer Building/Transfer Station E wall	104	101	99	107	95	90	85	82	74
S13 Coal loading excavator on stockpile East side centre	107	114	107	99	101	100	97	93	88
S14 = S1A	73	74	73	55	50	43	36	13	0
S15 = S2A	81	85	93	78	75	71	66	45	35
S16 = S3A	79	76	80	66	61	54	47	27	14
S17 = S1B	68	67	71	52	45	37	26	2	
S18 = S2B	77	77	87	74	71	66	59	39	29
S19 = S3B	66	64	72	49	41	32	21		
S20 = S2C	76	77	81	73	67	58	49	41	27
S21 Transfer Station N wall opening	94	98	93	97	88	82	74	71	64
S22 Tripper Belt	74	86	80	77	71	66	60	56	51
S23 Tripper S wall opening N end No Coal	95	115	105	95	92	85	75	75	64
S24 Tripper S wall opening S End No Coal	95	115	105	95	92	85	75	75	64
S25 Workshop Door 1 South - Fork lift full Revs & Alarm	92	94	90	88	88	98	88	85	81
S26 workshop Door 2 Centre - Fork lift full Revs & Alarm	92	94	90	88	88	98	88	85	81
S27 MVF North	113	107	105	99	99	97	93	87	77
S28 MVF North casing	92	91	93	89	88	92	95	88	83
S29 Compressor House N Wall vents to C1	92	88	89	89	86	80	70	61	48
S30 Substation N of Admin	85	86	92	87	81	72	67	59	53

Table 4.2: Wollongong Coal Russell Vale Noise - Sound Power levels of sources to each receiver for use in ENM model
Table 4.2 E: Receivers R1 and R3

Source	Sound Power Level dB in Octave Band Frequency - Hz								
	31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
S1	85	87	94	81	80	75	71	52	43
S2	81	81	85	70	65	59	51	29	19
S3	71	77	75	63	59	49	44	32	19
S4 Northern side tripper chute northern end			84	90	90	87	84	80	75
S5 Eastern side trouser leg northern end			91	99	98	97	97	96	93
S6 Western side trouser leg northern end			91	99	98	97	97	96	93
S7 Southern tripper chute entry northern end			85	95	85	79	73	67	59
S8 Northern side tripper chute southern end			84	90	90	87	84	80	75
S9 Eastern side trouser leg southern end			91	99	98	97	97	96	93
S10 Western side trouser leg southern end			91	99	98	97	97	96	93
S11 Southern tripper chute entry southern end			85	95	85	79	73	67	59
S12 Sizer Building/Transfer Station E wall	101	95	92	97	82	75	67	61	51
S13 Coal loading excavator on stockpile East side centre	107	114	107	99	101	100	97	93	88
S14 = S1A	84	88	91	77	75	71	67	47	37
S15 = S2A	77	78	84	66	60	54	46	23	10
S16 = S3A	69	65	67	53	45	36	26	4	
S17 = S1B	79	81	89	74	70	65	57	36	27
S18 = S2B	73	70	78	62	56	49	39	17	4
S19 = S3B	65	63	70	48	40	31	20		
S20 = S2C	76	77	81	73	67	58	49	41	27
S21 Transfer Station N wall opening	95	100	97	103	97	93	89	88	84
S22 Tripper Belt	74	86	80	77	71	66	60	56	51
S23 Tripper S wall opening N end No Coal	93	112	100	88	83	75	63	62	50
S24 Tripper S wall opening S End No Coal	93	112	100	88	83	75	63	62	50
S25 Workshop Door 1 South - Fork lift full Revs & Alarm	92	94	90	88	88	98	88	85	81
S26 workshop Door 2 Centre - Fork lift full Revs & Alarm	92	94	90	88	88	98	88	85	81
S27 MVF North	110	102	97	88	85	79	74	66	55
S28 MVF North casing	92	91	93	89	88	92	95	88	83
S29 Compressor House N Wall vents to C1	95	91	92	92	90	84	75	66	54
S30 Substation N of Admin	85	86	92	87	81	72	67	59	53

Table 4.2: Wollongong Coal Russell Vale Noise - Sound Power levels of sources to each receiver for use in ENM model

Table 4.2 F: Receiver R2

Source	Sound Power Level dB in Octave Band Frequency - Hz								
	31.5	63	125	250	500	1000	2000	4000	8000
S1	85	87	94	81	80	75	71	52	43
S2	81	81	85	70	65	59	51	29	19
S3	71	76	75	61	58	47	41	28	14
S4 Northern side tripper chute northern end			84	90	90	87	84	80	75
S5 Eastern side trouser leg northern end			91	99	98	97	97	96	93
S6 Western side trouser leg northern end			91	99	98	97	97	96	93
S7 Southern tripper chute entry northern end			85	95	85	79	73	67	81
S8 Northern side tripper chute southern end			84	90	90	87	84	80	75
S9 Eastern side trouser leg southern end			91	99	98	97	97	96	93
S10 Western side trouser leg southern end			91	99	98	97	97	96	93
S11 Southern tripper chute entry southern end			85	95	85	79	73	67	81
S12 Sizer Building/Transfer Station E wall	100	94	91	95	81	73	65	59	49
S13 Coal loading excavator on stockpile East side centre	107	114	107	99	101	100	97	93	88
S14 = S1A	84	88	91	77	75	71	67	47	37
S15 = S2A	77	78	84	66	60	54	46	23	10
S16 = S3A	69	64	67	51	44	34	23	0	
S17 = S1B	79	81	89	74	70	65	57	36	27
S18 = S2B	73	70	78	62	56	49	39	17	4
S19 = S3B	65	62	70	46	39	29	17		
S20 = S2C	76	77	81	73	67	58	49	41	27
S21 Transfer Station N wall opening	95	100	97	103	97	93	89	88	84
S22 Tripper Belt	74	86	80	77	71	66	60	56	51
S23 Tripper S wall opening N end No Coal	93	112	100	88	83	75	63	62	50
S24 Tripper S wall opening S End No Coal	93	112	100	88	83	75	63	62	50
S25 Workshop Door 1 South - Fork lift full Revs & Alarm	92	94	90	88	88	98	88	85	81
S26 workshop Door 2 Centre - Fork lift full Revs & Alarm	92	94	90	88	88	98	88	85	81
S27 MVF North	110	102	97	88	85	79	74	66	55
S28 MVF North casing	92	91	93	89	88	92	95	88	83
S29 Compressor House N Wall vents to C1	95	91	92	92	90	84	75	66	54
S30 Substation N of Admin	85	86	92	87	81	72	67	59	53

Table 4.2: Wollongong Coal Russell Vale Noise - Sound Power levels of sources to each receiver for use in ENM model
Table 4.2 G: Receiver R4

Source	Sound Power Level dB in Octave Band Frequency - Hz								
	31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
S1	85	87	94	81	80	75	71	52	43
S2	85	88	94	82	79	76	70	51	44
S3	72	78	77	64	60	50	45	33	20
S4 Northern side tripper chute northern end			84	90	90	87	84	80	75
S5 Eastern side trouser leg northern end			91	99	98	97	97	96	93
S6 Western side trouser leg northern end			91	99	98	97	97	96	93
S7 Southern tripper chute entry northern end			85	96	86	80	74	68	61
S8 Northern side tripper chute southern end			84	90	90	87	84	80	75
S9 Eastern side trouser leg southern end			91	99	98	97	97	96	93
S10 Western side trouser leg southern end			91	99	98	97	97	96	93
S11 Southern tripper chute entry southern end			85	96	86	80	74	68	61
S12 Sizer Building/Transfer Station E wall	102	98	96	100	86	78	71	64	54
S13 Coal loading excavator on stockpile East side centre	107	114	107	99	101	100	97	93	88
S14 = S1A	84	88	91	77	75	71	67	47	37
S15 = S2A	81	85	93	78	75	71	66	45	35
S16 = S3A	70	66	69	54	46	37	27	5	
S17 = S1B	79	81	89	74	70	65	57	36	27
S18 = S2B	77	77	87	74	71	66	59	39	29
S19 = S3B	66	64	72	49	41	32	21		
S20 = S2C	76	77	81	73	67	58	49	41	27
S21 Transfer Station N wall opening	95	100	97	103	97	93	89	88	84
S22 Tripper Belt	74	86	80	77	71	66	60	56	51
S23 Tripper S wall opening N end No Coal	93	112	101	89	84	76	65	63	52
S24 Tripper S wall opening S End No Coal	93	112	101	89	84	76	65	63	52
S25 Workshop Door 1 South - Fork lift full Revs & Alarm	92	94	90	88	88	98	88	85	81
S26 workshop Door 2 Centre - Fork lift full Revs & Alarm	92	94	90	88	88	98	88	85	81
S27 MVF North	110	102	97	88	85	79	74	66	55
S28 MVF North casing	92	91	93	89	88	92	95	88	83
S29 Compressor House N Wall vents to C1	95	91	92	92	90	84	75	66	54
S30 Substation N of Admin	85	86	92	87	81	72	67	59	53

Table 4.3: Wollongong Coal Russell Vale - Ground cross-sections between sources and receivers

Table 4.3A: Receiver C1 & C5

Source	S1 to S11, S14 to S20, 23, 24		Source	S12		Source	S13		Source	S21		Source	S22		Source	S26		Source	S27 & S28		Source	S29		Source	S30	
Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item
0	57	S1,2,3, 14-20	0	120	S12	0	57		0	120	S21	0	57		0	139	S26	0	141	S27, S28	0	141	S29	0	135	S30
36	56	S4,5,6,7, 23	22	121		36	56	S13	44	120		36	56	S22	17	139		125	141		150	140		50	133	
56	60		44	120		67	62		58	118		67	62		47	139		150	140		175	135		100	132	
67	62		58	118		77	65		72	115		77	65		48	139		160	135		200	128		150	130	
77	65		72	115		83	68		83	112		83	68		466	88	C1	175	127		225	117		200	122	
83	68	S8,9,10,11, 24	83	112		93	70		94	110		93	70					200	118		250	119		250	116	
93	70		94	110		100	72		106	108		100	72					225	121		265	120		300	111	
100	72		106	108		109	75		118	105		109	75					250	120		275	118		350	110	
109	75		118	105		121	78		133	102		121	78					275	116		300	115		400	109	
121	78		133	102		130	80		150	100		130	80					300	111		325	111		420	109	
130	80		150	100		146	82		172	98		146	82		0	139	S26	325	106		350	106		440	102	
146	82		172	98		165	85		176	97	C1	165	85		39	139		350	102		375	101		450	102	
165	85		176	97	C1	216	86					216	86		39	143		375	97		400	98		500	108	
216	86					239	85					239	85		52	143		377	97	C1	403	97	C1	520	108	
239	85		**Source**	**S12**		255	82					255	82		52	139								550	105	
255	82		**Distance**	**Elevation**	**Item**	278	85					278	85		110	139								600	100	
278	85		0	120	S12	292	88					292	88		535	98	C5	0	141	S27, S28	0	141	S29	625	99	C1
292	88		36	122		304	90					304	90					50	141		80	141				
304	90		61	120		315	92					315	92					100	160		100	143		0	135	S30
315	92		71	118		332	95					332	95					120	162		111	145		50	134	
332	95		78	115		396	96					396	96					150	141		150	151		100	134	
396	96		84	112		399	95					399	95					200	125		200	133		150	135	
399	95		90	110		403	92					403	92					250	124		225	122		180	133	
403	92		97	108		408	90					408	90					300	109		250	123		200	130	
408	90		104	105		413	88					413	88					327	102		275	121		250	122	
413	88		115	102		417	85					417	85					350	99		300	121		300	117	
417	85		128	100		420	85	C1				420	85	RC1				375	99		325	112		350	119	
420	85	C1	151	98		424	82					424	82					400	96		350	103		400	121	
424	82		185	95		429	80					429	80					450	88		375	99		420	122	
429	80		208	92		434	78					434	78					453	88	C5	400	98		450	116	
434	78		228	90	C5	436	77					436	77								425	96		465	113	
436	77					447	78					447	78								450	93		500	117	
447	78					478	80					478	80								484	88	C5	520	118	
478	80					489	82					489	82											550	115	
489	82					503	85					503	85											600	105	
503	85					510	87	C5				510	87	C5										650	97	
510	87	C5																						700	92	
																								742	91	C5

Table 4.3B: Receiver C2

Source	S1-11, 14 to 20, 23, 24		Source	S12		Source	S13		Source	S21		Source	S22		Source	S26		Source	S27 & S28		Source	S29		Source	S30	
Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item
0	57	S1-3, 14-20	0	120	SC12	0	57		0	120	S21	0	57		0	139	S26	0	141	S27, S28	0	141	S29	0	135	S30
11	57		22	121		11	57		22	121		11	57		45	139		100	138		80	140		50	132	
20	57	S4,5,6,7, 23	38	120		20	57		38	120		20	57	S22	46	139		150	131		100	133		100	130	
32	58		69	115		32	58		69	115		32	58		508	71	C2	175	125		150	130		150	125	
48	59		96	110		45	59	S13	96	110		48	59					200	113		200	122		200	119	
53	60		122	105		48	59		122	105		53	60					215	110		225	108		250	107	
63	62	S8,9,10,11, 24	151	100		53	60		151	100		63	62					250	110		250	108		300	92	
71	65		183	95		63	62		183	95		71	65					300	104		275	108		350	83	
78	68		214	90		71	65		214	90		78	68					317	100		300	106		400	84	
86	70		236	85		78	68		236	85		86	70					350	92		350	97		450	82	
94	72		261	80		86	70		261	80		94	72					400	86		400	86		500	86	
103	75		294	75		94	72		294	75		103	75					450	80		444	83		530	87	
113	78		294	75		103	75		306	73	C2	113	78					493	70		450	82		55	83	
124	80		306	73	RC2	113	78		381	65		124	80								500	73		600	79	
142	82		381	65		124	80		436	60		142	82								513	70	C2	650	76	
166	82		436	60		142	82		470	55		166	82											670	73	C2
187	80		470	55		166	82		568	50		187	80													
211	78		568	50		187	80		570	46	C4	211	78													
276	75		570	46	RC4	211	78					276	75													
299	72					276	75					299	72													
326	70					299	72					326	70													
332	70	RC2				326	70					332	70	C2												
						332	70	C2																		

Table 4.3: Wollongong Coal Russell Vale - Ground cross-sections between sources and receivers

Table 4.3C: Receiver C3

Source	S1 to S3, S14 to S20		Source	S4 to S7		Source	S8 to S11		Source	S12		Source	S13		Source	S21		Source	S22		Source	S25		Source	S27 & S28		Source	S29		Source	S30	
Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item
0	57	S1,2,3	0	59	S4,5,6,7	0	59	S8,9,10,11	0	120	S12	0	59		0	120	S21	0	59	S22	0	139	S25	0	141	S27, S28	0	141	S29	0	135	S30
18	56		45	59		17	62		24	121		25	59	S13	24	121		25	59		44	139		50	141		100	140		75	128	
100	58		56	60		31	65		63	115		56	60		63	115		56	60		45	139		75	136		150	122		150	120	
158	58		81	62		43	68		97	110		81	62		97	110		81	62		876	38	C3	159	124		225	103		225	112	
176	60		99	63		53	70		121	105		99	63		121	105		99	63					225	105		300	87		300	91	
187	62		135	63		67	72		142	100		135	63		142	100		135	63					300	91		375	86		375	69	
202	65		153	62		91	74		160	95		153	62		160	95		153	62		Source	S26		375	88		450	79		450	56	
218	68		176	62		105	74		181	90		176	60		181	90		176	60		Distance	Elevation	Item	450	77		525	76		525	58	
263	70		187	65		134	72		199	85		187	65		199	85		187	65		0	139	S26	525	73		584	73		600	61	
281	68		208	68		180	71		248	80		208	68		248	80		208	68		42	139		600	70		600	73		675	70	
294	65		232	70		225	72		299	75		232	70		299	75		232	70		43	139		675	59		675	60		750	66	
307	62		244	71		302	70		338	70		244	71		338	70		244	71		882	38	C3	750	46		750	46		825	43	
321	60		287	70		316	68		368	65		287	70		368	65		287	70					825	42		825	42		900	37	
334	58		298	68		330	65		393	60		298	68		393	60		298	68					905	38	C3	909	38	C3	979	37	C3
347	55		314	65		342	62		408	59		314	65		408	59		314	65												
355	52		327	62		354	60		459	61		327	62		459	61		327	62												
365	50		343	60		364	58		492	60		343	60		492	60		343	60												
373	48		352	58		374	55		544	55		352	58		544	55		352	58												
386	45		361	55		378	52		574	50		361	55		574	50		361	55												
399	42		372	52		388	50		634	45		372	52		634	45		372	52												
412	40		379	50		393	48		664	40		379	50		664	40		379	50												
428	38		386	48		407	45		758	36		386	50		758	36		386	50												
447	35		395	45		419	42		773	36	C3	395	45		773	36	C3	395	45												
486	33		411	42		443	40					411	42					411	42												
536	35		426	40		477	38					426	40					426	40												
578	37	C3	447	38		546	36					447	38					447	38												
			478	35		575	36					478	35					478	35												
			503	34		613	38	C3				503	34					503	34												
			519	34								519	34					519	34												
			553	35								553	35					553	35												
			598	37	C3							598	37	C3				598	37	C3											

Table 4.3D: Receiver C4

Source	S1-11, 14-20, 23,24		Source	S12		Source	S13		Source	S21		Source	S22		Source	S25		Source	S27 & S28		Source	S29		Source	S30	
Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item	Distance	Elevation	Item
0	59	S1-11, 14-20, 23,24	0	120	S12	0	59		0	120	S21	0	59		17	139	S25	0	141	S27, S28	0	141	S29	0	135	S30
12	57		22	121		12	57		22	121		12	57		17	143		50	141		80	140		75	130	
37	58		38	120		37	58		38	120		37	58		27	143		100	141		100	133		150	123	
62	60		69	115		62	60		69	115		62	60	S22	27	139		120	141		150	130		225	110	
77	62		96	110		77	62	S13	96	110		77	62		43	139		150	134		200	122		300	88	
86	65		122	105		86	65		122	105		86	65		44	139		200	116		225	108		375	69	
99	68		151	100		99	68		151	100		99	68		498	71	C2	220	112		250	108		450	73	
121	70		183	95		121	70		183	95		121	70		790	46	C4	250	113		275	108		491	83	
148	72		214	90		148	72		214	90		148	72					300	106		300	106		500	85	
180	75		236	85		180	75		236	85		180	75		Source	S26		350	96		350	97		525	83	
200	77		261	80		200	77		261	80		200	77		Distance	Elevation	Item	360	95		400	86		600	75	
222	77		294	75		222	77		294	75		222	77		0	139	S26	400	90		444	83		675	68	
244	75		294	75		244	75		306	73		244	75		45	139		450	81		450	82		750	52	
259	72		306	73	RC2	259	72		381	65		259	72		46	139		500	71		500	73		825	51	
272	70		381	65		272	70		436	60		272	70		508	71	C2	550	65		513	70	C2	900	47	
284	68		436	60		284	68		470	55		284	68		800	46	C4	600	62		800	46	C4	948	46	C4
294	65		470	55		294	65		568	50		294	65					650	58							
306	62		568	50		306	62		570	46	C4	306	62					700	50							
321	60		570	46	RC4	321	60					321	60					750	46							
336	58					336	58					336	58					786	45	C4						
346	55					346	55					346	55													
360	52					360	52					360	52													
373	50					373	50					373	50													
402	48					402	48					402	48													
412	46					412	46					412	46													
434	46					434	46					434	46													
457	48					457	48					457	48													
476	48					476	48					476	48													
543	45	RC4				543	45	C4				543	45	C4												

Table 4.3: Wollongong Coal Russell Vale - Ground cross-sections between sources and receivers

Table 4.3E: Receiver R1/R3

Source	S1 to 11, S14 to S20, 23, 24			Source	S12			Source	S13			Source	S21			Source	S22			Source	S25			Source	S27 & S28			Source	S29			Source	S30	
Distance	Elevation	Item		Distance	Elevation	Item		Distance	Elevation	Item		Distance	Elevation	Item		Distance	Elevation	Item		Distance	Elevation	Item		Distance	Elevation	Item		Distance	Elevation	Item		Distance	Elevation	Item
0	63	S 8 to 11, 24		0	120	SC12		0	63			0	120	S21		0	63			0	139			0	141	S27 & S28		0	141	S29		0	135	S30
37	62			53	115			37	62			53	115			37	62			48	139			75	141			80	141			50	126	
56	61	S 4 to 7, 23		85	110			56	61	S13		85	110			56	61	S22		49	139			100	141			100	135			100	109	
101	61	S1-3, 14-20		109	105			101	61			109	105			101	61			790	40	R2		135	125			150	118			150	103	
142	56			130	100			142	56			130	100			142	56			849	37	R1		150	118			225	101			200	100	
149	57			148	95			149	57			148	95			149	57			903	34	R3		225	98			300	81			250	92	
160	55			166	90			160	55			166	90			160	55							300	75			335	78			300	85	
179	52			197	85			179	52			197	85			179	52			Source	S26			355	65			375	79			350	82	
205	50			218	82			205	50			218	82			205	50			Distance	Elevation	Item		375	64			450	76			400	75	
258	48			299	80			258	48			299	80			258	48			0	139			450	67			525	68			450	68	
341	45			328	75			341	45			328	75			341	45			45	139			525	62			600	53			500	62	
404	43			352	70			404	43			352	70			404	43			46	139			600	57			655	51			550	56	
437	44			377	65			437	44			377	65			437	44			781	40	R2		675	50			675	50			600	52	
485	42			398	60			485	42			398	60			485	42			843	37	R1		725	48			750	47			650	48	
520	40			469	55			520	40			469	55			520	40			898	34	R3		750	47			825	42			700	44	
555	37			514	50			555	37			514	50			555	37							825	44			845	41	R2		741	41	R2
559	37	R1		599	45			559	37	R1		599	45			559	37	R1						872	41	R2		890	37	R1		808	37	R1
623	35	R3		687	44			623	35	R2		687	44			623	35	R3						914	37	R1		970	34	R3		855	34	R3
				712	45							712	45											986	34	R3								
				782	40							782	40																					
				824	37	R1						824	37	R1																				
				902	35	R3						902	35	R3																				

Table 4.3F: Receiver R2

Source	S1-11, S14-S20, 23, 24			Source	S12			Source	S13			Source	S21			Source	S22			Source	S25			Source	S27 & S28			Source	S29			Source	S30	
Distance	Elevation	Item		Distance	Elevation	Item		Distance	Elevation	Item		Distance	Elevation	Item		Distance	Elevation	Item		Distance	Elevation	Item		Distance	Elevation	Item		Distance	Elevation	Item		Distance	Elevation	Item
0	63	S 8 to 11, 24		0	120	S12		0	63			0	120	S21		0	63			0	139			0	141	S27 & S28		0	141	S29		0	135	S30
28	60			37	115			28	60			37	115			28	60			48	139			75	141			80	141			50	126	
50	59	S 4 to 7, 23		81	110			50	59			81	110			50	59			49	139			100	141			100	135			100	109	
88	58	S1-3, 14-20		106	105			58	58	S13		106	105			58	58	S22		790	40	R2		135	125			150	118			150	103	
96	58			131	100			88	58			131	100			88	58			849	37	R1		150	118			225	101			200	100	
153	55			149	95			96	58			149	95			96	58			903	34	R3		225	98			300	81			250	92	
190	52			171	90			153	55			171	90			153	55							300	75			335	78			300	85	
212	50			199	85			190	52			199	85			190	52			Source	S26			355	65			375	79			350	82	
324	48			224	80			212	50			224	80			212	50			Distance	Elevation	Item		375	64			450	76			400	75	
385	45			283	75			324	48			283	75			324	48			0	139			450	67			525	68			450	68	
425	47			327	70			385	45			327	70			385	45			45	139			525	62			600	53			500	62	
447	45			349	65			425	47			349	65			425	47			46	139			600	57			655	51			550	56	
475	42			383	60			447	45			383	60			447	45			781	40	R2		675	50			675	50			600	52	
512	40	R2		448	55			475	42			448	55			475	42			843	37	R1		725	48			750	47			650	48	
				492	50			512	40	R2		492	50			512	40	R2		898	34	R3		750	47			825	42			700	44	
				651	45							651	45											825	44			845	41	R2		741	41	R2
				797	41	R2						797	41	R2										872	41	R2								

Table 4.3G: Receiver R4

Source	S1-11, S14-S20, 23, 24			Source	S12			Source	S13			Source	S21			Source	S22		
Distance	Elevation	Item		Distance	Elevation	Item		Distance	Elevation	Item		Distance	Elevation	Item		Distance	Elevation	Item	
0	63	S 8 to 11, 24		0	120	S12		0	63			0	120	S21		0	63		
46	62	S 4 to 7, 23		63	115			27	62	S13		63	115			27	62	S22	
79	61	S1-3, 14-20		99	110			46	62			99	110			46	62		
84	60			118	105			79	61			118	105			79	61		
147	58			146	100			84	60			146	100			84	60		
209	55			166	95			147	58			166	95			147	58		
248	52			197	90			209	55			197	90			209	55		
281	50			256	85			248	52			256	85			248	52		
299	48			327	80			281	50			327	80			281	50		
335	45			367	75			299	48			367	75			299	48		
407	42			422	70			335	45			422	70			335	45		
473	40			544	65			407	42			544	65			407	42		
595	38			576	60			473	40			576	60			473	40		
628	35			612	55			595	38			612	55			595	38		
733	32			635	50			628	35			635	50			628	35		
763	30	R4		671	45			733	32			671	45			733	32		
				690	40			763	30	R4		690	40			763	30	R4	
				868	35							868	35						
				1010	30	R4						1010	30	R4					

Table 5.1: Wollongong Coal Russell Vale Noise -Effects of reducing contribution sound levels

Caluclation of effect on total received level of reducing top 5 sources by 5 dB then 10 dB subsequently.

Source	Source Description	Condition	Receiver	Receiver	Receiver	Total Subsequent 5dB reduction sources in order					Total Subsequent 10dB reduction sources in order				
No.		W3 L0	C1	C1	C1	C1 Tripper Southern Location					C1 Tripper Southern Location				
12	S12 Sizer Building E wall		41	41	41	36	36	36	36	36	31	31	31	31	31
26	Door 2 Centre		33	33	33	33	28	28	28	28	28	23	23	23	23
21	Sizer Building N wall opening		30	30	30	30	30	25	25	25	25	25	20	20	20
13	S13 Loader on stockpile		27	27	27	27	27	27	22	22	22	22	22	17	17
25	Door 1 South		27	27	27	27	27	27	27	22	22	22	22	22	17
27	MVF North		26	26	26	26	26	26	26	26	26	26	26	26	26
11	S11 Tripper S end S side entry		25		25	25	25	25	25	25	25	25	25	25	25
24	Tripper S side opening No Coal Southern End		24	24	24	24	24	24	24	24	24	24	24	24	24
9	S9 Tripper S end E side Trouser Leg		24		24	24	24	24	24	24	24	24	24	24	24
10	S10 Tripper S end W side trouser leg		24		24	24	24	24	24	24	24	24	24	24	24
7	S7 Tripper N end S side entry		24	24		0	0	0	0	0	0	0	0	0	0
5	S5 Tripper N end E side Trouser Leg		24	24		0	0	0	0	0	0	0	0	0	0
6	S6 Tripper N end W side trouser leg		24	24		0	0	0	0	0	0	0	0	0	0
23	Tripper S side opening No Coal Northern End		24	24	24	24	24	24	24	24	24	24	24	24	24
28	MVF North casing		18	18	18	18	18	18	18	18	18	18	18	18	18
3	S3 Conveyor Drive building S side Top including opening		15	15	15	15	15	15	15	15	15	15	15	15	15
30	Substation N of Admin		13	13	13	13	13	13	13	13	13	13	13	13	13
29	Compressor House N Wall vents		11	11	11	11	11	11	11	11	11	11	11	11	11
19	S19 Conveyor Building S side 2L down from top		6	6	6	6	6	6	6	6	6	6	6	6	6
4	S4 Tripper N end N side		5	5		0	0	0	0	0	0	0	0	0	0
8	S8 Tripper S end N side		4		4	4	4	4	4	4	4	4	4	4	4
16	S16 Conveyor Building S side 1L down from top		4	4	4	4	4	4	4	4	4	4	4	4	4
2	S2 Conveyor Drive building E side Top		1	1	1	1	1	1	1	1	1	1	1	1	1
15	S15 Conveyor Building E side 1L down from top		0	0	0	0	0	0	0	0	0	0	0	0	0
22	Tripper conveyor belt		-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
18	S18 Conveyor Building E side 2L down from top		-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
20	S20 Conveyor Building Stair opening		-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8
1	S1 Conveyor Drive Building North Wall Top		-17	-17	-17	-17	-17	-17	-17	-17	-17	-17	-17	-17	-17
14	S14 Conveyor Building N side 1L down from top		-19	-19	-19	-19	-19	-19	-19	-19	-19	-19	-19	-19	-19
17	S17 Conveyor Building N side 2L down from top		-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22
		Max	41												
	Total Northern Tripper Location			43											
	Total southern Tripper Location				43	40	39	39	39	38	36	36	36	36	35
	Total Northern Tripper Location with No Loader (Night-time)			42											
	Total southern Tripper Location with No Loader (Night-time)				43	40	39	39	39	38	36	36	36	36	35
	Long-term Objective Night		38	38	38	38	38	38	38	38	38	38	38	38	38

Table 5.1: Wollongong Coal Russell Vale Noise -Effects of reducing contribution sound levels

Caluclation of effect on total received level of reducing top 5 sources by 5 dB then 10 dB subsequently.

Source No.	Source Description	Condition	Receiver	Receiver	Receiver	Total Subsequent 5dB reduction sources in order					Total Subsequent 10dB reduction sources in order					Total Subsequent 15dB reduction sources in order				
		W3 L0	C2	C2	C2	C2 Tripper Southern Location					C2 Tripper Southern Location					C2 Tripper Southern Location				
11	S11 Tripper S end S side entry		46		46	41	41	41	41	41	36	36	36	36	36	31	31	31	31	31
7	S7 Tripper N end S side entry		44	44		0					0					0				
24	Tripper S side opening No Coal Southern End		43	43	43	43	38	38	38	38	38	33	33	33	33	33	28	28	28	28
9	S9 Tripper S end E side Trouser Leg		42		42	42	42	37	37	37	37	37	32	32	32	32	32	27	27	27
10	S10 Tripper S end W side trouser leg		42		42	42	42	42	37	32	32	32	32	27	22	22	22	22	17	12
5	S5 Tripper N end E side Trouser Leg		42	42																
6	S6 Tripper N end W side trouser leg		42	42																
23	Tripper S side opening No Coal Northern End		41	41	41	41	41	41	41	36	36	36	36	36	31	31	31	31	31	26
21	Sizer Building N wall opening		39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39
12	S12 Sizer Building E wall		38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
26	Door 2 Centre		30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
13	S13 Loader on stockpile		30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
27	MVF North		29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
8	S8 Tripper S end N side		27		27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
4	S4 Tripper N end N side		25	25		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	Door 1 South		24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
3	S3 Conveyor Drive building S side Top including opening		24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
2	S2 Conveyor Drive building E side Top		21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
28	MVF North casing		20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
22	Tripper conveyor belt		17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
15	S15 Conveyor Building E side 1L down from top		16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
16	S16 Conveyor Building S side 1L down from top		15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
29	Compressor House N Wall vents		13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
19	S19 Conveyor Building S side 2L down from top		12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
18	S18 Conveyor Building E side 2L down from top		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
30	Substation N of Admin		7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
20	S20 Conveyor Building Stair opening		-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
1	S1 Conveyor Drive Building North Wall Top		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
14	S14 Conveyor Building N side 1L down from top		-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
17	S17 Conveyor Building N side 2L down from top		-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
		Max	46	44	46															
	Total Northern Tripper Location		52	50																
	Total southern Tripper Location				51	50	49	48	48	47	46	45	45	45	44	44	43	43	43	43
	Total Northern Tripper Location with No Loader (Night-time)			50																
	Total southern Tripper Location with No Loader (Night-time)				51	50	49	48	48	47	46	45	45	44	44	44	43	43	43	43
	Long-term Objective Night		38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38

Table 5.1: Wollongong Coal Russell Vale Noise -Effects of reducing contribution sound levels

Caluclation of effect on total received level of reducing top 5 sources by 5 dB then 10 dB subsequently.

Source	Source Description	Condition	Receiver	Receiver	Receiver	Total Subsequent 5dB reduction sources in order					Total Subsequent 10dB reduction sources in order					Total Subsequent 15dB reduction sources in order				
No.		W3 L0	C3	C3	C3	C3 Tripper Southern Location					C3 Tripper Southern Location					C3 Tripper Southern Location				
9	S9 Tripper S end E side Trouser Leg		42		42	37	37	37	37	37	32	32	32	32	32	27	27	27	27	27
10	S10 Tripper S end W side trouser leg		42		42	42	37	37	37	37	37	32	32	32	32	32	27	27	27	27
5	S5 Tripper N end E side Trouser Leg		42	42		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	S6 Tripper N end W side trouser leg		42	42		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	Sizer Building N wall opening		37	37	37	37	37	32	32	27	27	27	22	22	17	17	17	12	12	7
12	S12 Sizer Building E wall		36	36	36	36	36	36	31	31	31	31	31	26	26	26	26	26	21	21
7	S7 Tripper N end S side entry		32	32																
11	S11 Tripper S end S side entry		32		32	32	32	32	32	27	27	27	27	27	22	22	22	22	22	17
23	Tripper S side opening No Coal Northern End		31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
13	S13 Loader on stockpile		31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
24	Tripper S side opening No Coal Southern End		31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
4	S4 Tripper N end N side		29	29		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	S8 Tripper S end N side		29		29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
26	Door 2 Centre		29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
25	Door 1 South		28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
27	MVF North		28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
28	MVF North casing		28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
2	S2 Conveyor Drive building E side Top		23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
15	S15 Conveyor Building E side 1L down from top		16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
29	Compressor House N Wall vents		14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
22	Tripper conveyor belt		14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
30	Substation N of Admin		13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
18	S18 Conveyor Building E side 2L down from top		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1	S1 Conveyor Drive Building North Wall Top		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
14	S14 Conveyor Building N side 1L down from top		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
20	S20 Conveyor Building Stair opening		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
17	S17 Conveyor Building N side 2L down from top		-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3	S3 Conveyor Drive building S side Top including opening		-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
19	S19 Conveyor Building S side 2L down from top		-6	-6	-6	-6	-6	-6	-6	-6	-6	-6	-6	-6	-6	-6	-6	-6	-6	-6
16	S16 Conveyor Building S side 1L down from top		-7	-7	-7	-7	-7	-7	-7	-7	-7	-7	-7	-7	-7	-7	-7	-7	-7	-7
		Max	42	42	42															
	Total Northern Tripper Location			47																
	Total southern Tripper Location				47	46	44	44	43	43	42	41	41	41	40	40	40	39	39	39
	Total Northern Tripper Location with No Loader (Night-time)			47																
	Total southern Tripper Location with No Loader (Night-time)				47	46	44	44	43	43	42	41	41	40	40	39	39	39	39	39
	Long-term Objective Night		36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36

Table 5.1: Wollongong Coal Russell Vale Noise -Effects of reducing contribution sound levels

Caluclation of effect on total received level of reducing top 5 sources by 5 dB then 10 dB subsequently.

Source No.	Source Description	Condition	Receiver	Receiver	Receiver	Total Subsequent 5dB reduction sources in order					Total Subsequent 10dB reduction sources in order					Total Subsequent 15dB reduction sources in order				
		W3 L0	C4	C4	C4	C4 Tripper Southern Location					C4 Tripper Southern Location					C4 Tripper Southern Location				
9	S9 Tripper S end E side Trouser Leg		42		42	37	37	37	37	37	32	32	32	32	32	27	27	27	27	27
10	S10 Tripper S end W side trouser leg		42		42	42	37	37	37	37	37	32	32	32	32	32	27	27	27	27
5	S5 Tripper N end E side Trouser Leg		39	39		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	S6 Tripper N end W side trouser leg		39	39		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	S11 Tripper S end S side entry		38		38	38	38	33	33	33	33	33	28	28	28	28	28	23	23	23
7	S7 Tripper N end S side entry		38	38		0	0	0			0	0	0			0	0	0		
24	Tripper S side opening No Coal Southern End		36	36	36	36	36	36	31	31	31	31	31	26	26	26	26	26	21	21
23	Tripper S side opening No Coal Northern End		35	35	35	35	35	35	35	30	30	30	30	30	25	25	25	25	25	20
13	S13 Loader on stockpile		28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
27	MVF North		26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
8	S8 Tripper S end N side		25		25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
4	S4 Tripper N end N side		24	24		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	S12 Sizer Building E wall		21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
2	S2 Conveyor Drive building E side Top		19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
28	MVF North casing		18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
15	S15 Conveyor Building E side 1L down from top		14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
3	S3 Conveyor Drive building S side Top including opening		14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
30	Substation N of Admin		13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
21	Sizer Building N wall opening		12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
22	Tripper conveyor belt		11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
29	Compressor House N Wall vents		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
18	S18 Conveyor Building E side 2L down from top		6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
16	S16 Conveyor Building S side 1L down from top		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	S20 Conveyor Building Stair opening		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
1	S1 Conveyor Drive Building North Wall Top		-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3
14	S14 Conveyor Building N side 1L down from top		-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8
19	S19 Conveyor Building S side 2L down from top		-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
17	S17 Conveyor Building N side 2L down from top		-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12
25	Door 1 South					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	Door 2 Centre					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Max	42	39	42															
	Total Northern Tripper Location			45																
	Total southern Tripper Location				47	46	44	43	43	42	41	40	39	38	38	37	36	36	35	35
	Total Northern Tripper Location with No Loader (Night-time)			45																
	Total southern Tripper Location with No Loader (Night-time)				47	45	44	43	42	42	41	39	39	38	37	37	35	35	34	34
	Long-term Objective Night		36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36

Table 5.1: Wollongong Coal Russell Vale Noise -Effects of reducing contribution sound levels

Caluclation of effect on total received level of reducing top 5 sources by 5 dB then 10 dB subsequently.

Source No.	Source Description	Condition	Receiver	Receiver	Receiver	Total Subsequent 5dB reduction sources in order				
		W3 L0	C5	C5	C5	C5 Tripper Southern Location				
12	S12 Sizer Building E wall		38	38	38	33	33	33	33	33
7	S7 Tripper N end S side entry		35	35		0	-5	-5	-5	-5
23	Tripper S side opening No Coal Northern End		34	34	34	34	29	29	29	29
11	S11 Tripper S end S side entry		33		33	33	33	28	28	28
24	Tripper S side opening No Coal Southern End		32	32	32	32	32	32	27	27
5	S5 Tripper N end E side Trouser Leg		32	32		0	0	0		
6	S6 Tripper N end W side trouser leg		32	32		0	0	0	-5	-5
9	S9 Tripper S end E side Trouser Leg		32		32	32	32	32	32	27
10	S10 Tripper S end W side trouser leg		32		32	32	32	32	32	32
26	Door 2 Centre		27	27	27	27	27	27	27	27
13	S13 Loader on stockpile		27	27	27	27	27	27	27	27
25	Door 1 South		25	25	25	25	25	25	25	25
3	S3 Conveyor Drive building S side Top including opening		24	24	24	24	24	24	24	24
21	Sizer Building N wall opening		19	19	19	19	19	19	19	19
27	MVF North		17	17	17	17	17	17	17	17
4	S4 Tripper N end N side		13	13		0	0	0	0	0
8	S8 Tripper S end N side		13		13	13	13	13	13	13
16	S16 Conveyor Building S side 1L down from top		10	10	10	10	10	10	10	10
19	S19 Conveyor Building S side 2L down from top		10	10	10	10	10	10	10	10
28	MVF North casing		10	10	10	10	10	10	10	10
22	Tripper conveyor belt		9	9	9	9	9	9	9	9
2	S2 Conveyor Drive building E side Top		7	7	7	7	7	7	7	7
30	Substation N of Admin		6	6	6	6	6	6	6	6
15	S15 Conveyor Building E side 1L down from top		5	5	5	5	5	5	5	5
29	Compressor House N Wall vents		4	4	4	4	4	4	4	4
18	S18 Conveyor Building E side 2L down from top		-1	-1	-1	-1	-1	-1	-1	-1
20	S20 Conveyor Building Stair opening		-2	-2	-2	-2	-2	-2	-2	-2
1	S1 Conveyor Drive Building North Wall Top		-11	-11	-11	-11	-11	-11	-11	-11
14	S14 Conveyor Building N side 1L down from top		-14	-14	-14	-14	-14	-14	-14	-14
17	S17 Conveyor Building N side 2L down from top		-18	-18	-18	-18	-18	-18	-18	-18
		Max	38	38	38					
	Total Northern Tripper Location			43						
	Total southern Tripper Location				42	41	40	40	39	39
	Total Northern Tripper Location with No Loader (Night-time)			42						
	Total southern Tripper Location with No Loader (Night-time)				42	41	40	40	39	39
	Long-term Objective Night		40	40	40	40	40	40	40	40

Table 5.1: Wollongong Coal Russell Vale Noise -Effects of reducing contribution sound levels

Caluclation of effect on total received level of reducing top 5 sources by 5 dB then 10 dB subsequently.

Source	Source Description	Condition	Receiver	Receiver	Receiver	Total Subsequent 5dB reduction sources in order					Total Subsequent 5dB reduction sources in order					Total Subsequent 15dB reduction sources in order				
No.		W3 L0	R1	R1	R1	R1 Tripper Northern Location					R1 Tripper Northern Location					R1 Tripper Northern Location				
13	S13 Loader on stockpile		48	48	48	43	43	43	43	43	38	38	38	38	38	33	33	33	33	33
5	S5 Tripper N end E side Trouser Leg		44	44		44	39	39	39	39	39	34	34	34	34	34	29	29	29	29
6	S6 Tripper N end W side trouser leg		44	44		44	44	39	39	39	39	39	34	34	34	34	34	29	29	29
9	S9 Tripper S end E side Trouser Leg		43		43	0	0	-5	-5	-5	-5	5	-10	-10	-10	-10	-10	-15	-15	-15
10	S10 Tripper S end W side trouser leg		43		43	0	0	0	-5	-5	-5	-5	-5	-10	-10	-10	-10	-10	-15	-15
21	Sizer Building N wall opening		38	38	38	38	38	38	33		33	33	33	28		28	28	28	23	
4	S4 Tripper N end N side		34	34		34	34	34	34	29	34	34	34	34	29	34	34	34	34	29
8	S8 Tripper S end N side		34		34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	S7 Tripper N end S side entry		29	29		29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
23	Tripper S side opening No Coal Northern End		29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
11	S11 Tripper S end S side entry		29		29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	Tripper S side opening No Coal Southern End		28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
1	S1 Conveyor Drive Building North Wall Top		25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
12	S12 Sizer Building E wall		24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
14	S14 Conveyor Building N side 1L down from top		21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
17	S17 Conveyor Building N side 2L down from top		16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
22	Tripper conveyor belt		15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
2	S2 Conveyor Drive building E side Top		13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
20	S20 Conveyor Building Stair opening		11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
15	S15 Conveyor Building E side 1L down from top		9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
3	S3 Conveyor Drive building S side Top including opening		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
18	S18 Conveyor Building E side 2L down from top		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
16	S16 Conveyor Building S side 1L down from top		-7	-7	-7	-7	-7	-7	-7	-7	-7	-7	-7	-7	-7	-7	-7	-7	-7	-7
19	S19 Conveyor Building S side 2L down from top		-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8
25	Door 1 South					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	Door 2 Centre					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	MVF North					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	MVF North casing					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	Compressor House N Wall vents					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	Substation N of Admin					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Max	48	48	48															
	Total Northern Tripper Location		52	51	50	49	48	46	46	46	44	44	43	42	42	41	40	40	40	39
	Total southern Tripper Location																			
	Total Northern Tripper Location with No Loader (Night-time)		50	48	47	48	46	44	43	43	43	42	41	40	39	40	40	39	39	37
	Total southern Tripper Location with No Loader (Night-time)																			
	Long-term Objective Night		37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37

Table 5.1: Wollongong Coal Russell Vale Noise -Effects of reducing contribution sound levels

Caluclation of effect on total received level of reducing top 5 sources by 5 dB then 10 dB subsequently.

Source	Source Description	Condition	Receiver	Receiver	Receiver	Total Subsequent 5dB reduction sources in order					Total Subsequent 5dB reduction sources in order					Total Subsequent 15dB reduction sources in order				
No.		W3 L0	R2	R2	R2	R2 Tripper Northern Location					R2 Tripper Northern Location					R2 Tripper Northern Location				
13	S13 Loader on stockpile		48	48	48	43	43	43	43	43	38	38	38	38	38	33	33	33	33	33
9	S9 Tripper S end E side Trouser Leg		44		44	0	-5	-5	-5	-5	-5	-10	-10	-10	-10	-10	-15	-15	-15	-15
10	S10 Tripper S end W side trouser leg		44		44	0	0	-5	-5	-5	-5	-5	-10	-10	-10	-10	-10	-15	-15	-15
5	S5 Tripper N end E side Trouser Leg		44	44		44	44	39	39	39	39	39	34	34	34	34	34	29	29	29
6	S6 Tripper N end W side trouser leg		44	44		44	44	44	39	39	39	39	39	34	34	34	34	34	29	29
21	S20 Conveyor Building Stair opening		38	38	38	38	38	38	33		33	33	33	28		28	28	28	23	
4	S4 Tripper N end N side		34	34		34	34	34	34	29	34	34	34	34	29	34	34	34	34	29
8	S8 Tripper S end N side		34		34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Tripper conveyor belt		30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
7	S7 Tripper N end S side entry		30	30		30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
24	Tripper S side opening No Coal Northern End		29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
11	S11 Tripper S end S side entry		29		29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	Door 1 South		28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
25	Tripper S side opening No Coal Southern End		28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
1	S1 Conveyor Drive Building North Wall Top		25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
12	S12 Sizer Building E wall		23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
14	S14 Conveyor Building N side 1L down from top		22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
28	MVF North		21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
29	MVF North casing		17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
30	Compressor House N Wall vents		17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
17	S16 Conveyor Building S side 1L down from top		17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
22	Sizer Building N wall opening		16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
27	Door 2 Centre		16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
2	S2 Conveyor Drive building E side Top		12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
20	S19 Conveyor Building S side 2L down from top		11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
15	S15 Conveyor Building E side 1L down from top		11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
18	S17 Conveyor Building N side 2L down from top		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
3	S3 Conveyor Drive building S side Top including opening		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
19	S18 Conveyor Building E side 2L down from top		-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
16	Substation N of Admin		-6	-6	-6	-6	-6	-6	-6	-6	-6	-6	-6	-6	-6	-6	-6	-6	-6	-6
		Max	48	48	48															
	Total Northern Tripper Location		52	51	51	49	49	48	46	46	45	45	44	43	42	42	42	41	40	40
	Total southern Tripper Location																			
	Total Northern Tripper Location with No Loader (Night-time)		50	48	48	48	48	46	44	43	44	44	43	41	40	41	41	41	40	39
	Total southern Tripper Location with No Loader (Night-time)																			
	Long-term Objective Night		37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37

Table 5.1: Wollongong Coal Russell Vale Noise -Effects of reducing contribution sound levels

Caluclation of effect on total received level of reducing top 5 sources by 5 dB then 10 dB subsequently.

Source	Source Description	Condition	Receiver	Receiver	Receiver	Total Subsequent 5dB reduction sources in order					Total Subsequent 5dB reduction sources in order					Total Subsequent 15dB reduction sources in order				
No.		W3 L0	R3	R3	R3	R3 Tripper Northern Location					R3 Tripper Northern Location					R3 Tripper Northern Location				
13	S13 Loader on stockpile		47	47	47	42	42	42	42	42	37	37	37	37	37	32	32	32	32	32
5	S5 Tripper N end E side Trouser Leg		43	43		43	38	38	38	38	38	33	33	33	33	33	28	28	28	28
6	S6 Tripper N end W side trouser leg		43	43		43	43	38	38	38	38	38	33	33	33	33	33	28	28	28
9	S9 Tripper S end E side Trouser Leg		43		43	0	0	-5	-5	-5	-5	5	-10	-10	-10	-10	-10	-15	-15	-15
10	S10 Tripper S end W side trouser leg		43		43	0	0	0	-5	-5	-5	-5	-5	-10	-10	-10	-10	-10	-15	-15
21	Sizer Building N wall opening		37	37	37	37	37	37	32		32	32	32	27		27	27	27	22	
4	S4 Tripper N end N side		34	34		34	34	34	34	29	34	34	34	34	29	34	34	34	34	29
8	S8 Tripper S end N side		33		33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	S7 Tripper N end S side entry		28	28		28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
23	Tripper S side opening No Coal Northern End		28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
11	S11 Tripper S end S side entry		28		28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	Tripper S side opening No Coal Southern End		28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
1	S1 Conveyor Drive Building North Wall Top		24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
12	S12 Sizer Building E wall		24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
14	S14 Conveyor Building N side 1L down from top		20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
17	S17 Conveyor Building N side 2L down from top		15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
22	Tripper conveyor belt		15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
2	S2 Conveyor Drive building E side Top		11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
20	S20 Conveyor Building Stair opening		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
15	S15 Conveyor Building E side 1L down from top		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
3	S3 Conveyor Drive building S side Top including opening		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
18	S18 Conveyor Building E side 2L down from top		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
16	S16 Conveyor Building S side 1L down from top		-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9
19	S19 Conveyor Building S side 2L down from top		-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
25	Door 1 South					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	Door 2 Centre					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	MVF North					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	MVF North casing					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	Compressor House N Wall vents					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	Substation N of Admin					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Max	47	47	47															
	Total Northern Tripper Location		52	50		48	47	46	46	45	44	43	42	42	41	41	40	39	39	38
	Total southern Tripper Location				50															
	Total Northern Tripper Location with No Loader (Night-time)		50	47		47	46	44	43	42	43	42	40	40	39	40	39	38	38	37
	Total southern Tripper Location with No Loader (Night-time)				47															
	Long-term Objective Night		37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37

Table 5.1: Wollongong Coal Russell Vale Noise -Effects of reducing contribution sound levels

Caluclation of effect on total received level of reducing top 5 sources by 5 dB then 10 dB subsequently.

Source	Source Description	Condition	Receiver	Receiver	Receiver	Total Subsequent 5dB reduction sources in order					Total Subsequent 5dB reduction sources in order					Total Subsequent 15dB reduction sources in order				
No.		W3 L0	R4	R4	R4	R4 Tripper Northern Location					R4 Tripper Northern Location					R4 Tripper Northern Location				
13	S13 Loader on stockpile		45	45	45	40	40	40	40	40	35	35	35	35	35	30	30	30	30	30
5	S5 Tripper N end E side Trouser Leg		41	41		41	36	36	36	36	36	31	31	31	31	31	26	26	26	26
6	S6 Tripper N end W side trouser leg		41	41		41	41	36	36	36	36	36	31	31	31	31	31	26	26	26
9	S9 Tripper S end E side Trouser Leg		41		41	0	0	-5	-5	-5	-5	5	-10	-10	-10	-10	-10	-15	-15	-15
10	S10 Tripper S end W side trouser leg		41		41	0	0	0	-5	-5	-5	-5	-5	-10	-10	-10	-10	-10	-15	-15
21	Sizer Building N wall opening		35	35	35	35	35	35	30		30	30	30	25		25	25	25	20	
4	S4 Tripper N end N side		32	32		32	32	32	32	27	32	32	32	32	27	32	32	32	32	27
8	S8 Tripper S end N side		31		31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	S7 Tripper N end S side entry		28	28		28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
23	Tripper S side opening No Coal Northern End		27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
11	S11 Tripper S end S side entry		27		27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	Tripper S side opening No Coal Southern End		27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
12	S12 Sizer Building E wall		26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
1	S1 Conveyor Drive Building North Wall Top		23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
2	S2 Conveyor Drive building E side Top		22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
15	S15 Conveyor Building E side 1L down from top		18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
14	S14 Conveyor Building N side 1L down from top		18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
18	S18 Conveyor Building E side 2L down from top		13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
22	Tripper conveyor belt		13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
17	S17 Conveyor Building N side 2L down from top		13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
20	S20 Conveyor Building Stair opening		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
3	S3 Conveyor Drive building S side Top including opening		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
16	S16 Conveyor Building S side 1L down from top		-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9
19	S19 Conveyor Building S side 2L down from top		-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
25	Door 1 South					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	Door 2 Centre					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	MVF North					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	MVF North casing					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	Compressor House N Wall vents					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	Substation N of Admin					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Max	45	45	45															
	Total Northern Tripper Location		50	48		46	45	44	44	43	42	41	40	40	39	39	39	38	38	37
	Total southern Tripper Location				48															
	Total Northern Tripper Location with No Loader (Night-time)		48	45		45	44	42	41	41	41	40	39	39	38	39	38	37	37	36
	Total southern Tripper Location with No Loader (Night-time)				45															
	Long-term Objective Night		37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37

Source PWLs for enm tripper & transfer (Autosaved).xlsx:enm results sorted no loader

Table 5.2: Wollongong Coal Russell Vale - surface noise sources reduction assessment

Calculation of maximum required reduction for sources to C2 to achieve all receiver objectives

Receiver No.	Source No.	Receiver Level dBA	Night Objective	Indiv Contrib Obj to Night Obj	Individual Objective	Reduction Required	Day Obj dBA	Individual Day	Individual contrib Day	Reduction Day	Evening Obj	Individual Evening	Individual contrib Evening	Reduction Evening
C2	11	46	38	25	25	21	39	26	26	20	38	25	25	21
C2	7	44	38	25	25	19	39	26	26	18	38	25	25	19
C2	24	43	38	25	25	18	39	26	26	17	38	25	25	18
C2	9	42	38	25	25	17	39	26	26	16	38	25	25	17
C2	10	42	38	25	25	17	39	26	26	16	38	25	25	17
C2	5	42	38	25	25	17	39	26	26	16	38	25	25	17
C2	6	42	38	25	25	17	39	26	26	16	38	25	25	17
C2	23	41	38	25	25	16	39	26	26	15	38	25	25	16
C2	21	39	38	25	25	14	39	26	26	13	38	25	25	14
C2	12	38	38	25	25	13	39	26	26	12	38	25	25	13
C2	26	30	38	25	25	5	39	26	26	4	38	25	25	5
C2	13	30	38	25	25	5	39	26	26	4	38	25	25	5
C2	27	29	38	25	25	4	39	26	26	3	38	25	25	4
C2	8	27	38	25	25	2	39	26	26	1	38	25	25	2
C2	4	25	38	25	25	0	39	26	25	-1	38	25	25	0
C2	25	24	38	25	24	0	39	26	24	-2	38	25	24	-1
C2	3	24	38	25	24	0	39	26	24	-2	38	25	24	-1
C2	2	21	38	25	21	0	39	26	21	-5	38	25	21	-4
C2	28	20	38	25	20	0	39	26	20	-6	38	25	20	-5
C2	22	17	38	25	17	0	39	26	17	-9	38	25	17	-8
C2	15	16	38	25	16	0	39	26	16	-10	38	25	16	-9
C2	16	15	38	25	15	0	39	26	15	-11	38	25	15	-10
C2	29	13	38	25	13	0	39	26	13	-13	38	25	13	-12
C2	19	12	38	25	12	0	39	26	12	-14	38	25	12	-13
C2	18	8	38	25	8	0	39	26	8	-18	38	25	8	-17
C2	30	7	38	25	7	0	39	26	7	-19	38	25	7	-18
C2	20	-1	38	25	-1	0	39	26	-1	-27	38	25	-1	-26
C2	1	-2	38	25	-2	0	39	26	-2	-28	38	25	-2	-27
C2	14	-5	38	25	-5	0	39	26	-5	-31	38	25	-5	-30
C2	17	-11	38	25	-11	0	39	26	-11	-37	38	25	-11	-36
Total if all = Contrib Obj					38			41	38			40	38	
Total if all = Contrib Obj but with No Loader					37									

Table 5.3: Wollongong Coal Russell Vale - surface noise sources reduction assessment

Calculation of required reduction to achieve receiver objectives

Receiver No.	Source No.	Receiver Level dBA	Total Objective	Indiv Contrib Obj to total Obj	Individual Objective	Reduction Required	Day Obj dBA	Individual Day	Individual contrib Day	Reduction Day	Evening Obj	Individual Evening	Individual contrib Evening	Reduction Evening
C1	12	41	38	25	25	16	39	26	26	15	38	25	25	16
C1	26	33	38	25	25	8	39	26	26	7	38	25	25	8
C1	21	30	38	25	25	5	39	26	26	4	38	25	25	5
C1	13	27	38	25	25	2	39	26	26	1	38	25	25	2
C1	25	27	38	25	25	2	39	26	26	1	38	25	25	2
C1	27	26	38	25	25	1	39	26	26	0	38	25	25	1
C1	11	25	38	25	25	-1	39	26	26	-2	38	25	25	-1
C1	24	24	38	25	24	0	39	26	26	-2	38	25	25	-1
C1	9	24	38	25	24	0	39	26	26	-2	38	25	25	-1
C1	10	24	38	25	24	0	39	26	26	-2	38	25	25	-1
C1	7	24	38	25	24	0	39	26	26	-2	38	25	25	-1
C1	5	24	38	25	24	0	39	26	26	-2	38	25	25	-1
C1	6	24	38	25	24	0	39	26	26	-2	38	25	25	-1
C1	23	24	38	25	24	0	39	26	26	-2	38	25	25	-1
C1	28	18	38	25	18	0	39	26	18	-8	38	25	18	-7
C1	3	15	38	25	15	0	39	26	15	-11	38	25	15	-10
C1	30	13	38	25	13	0	39	26	13	-13	38	25	13	-12
C1	29	11	38	25	11	0	39	26	11	-15	38	25	11	-14
C1	19	6	38	25	6	0	39	26	6	-21	38	25	6	-20
C1	4	5	38	25	5	0	39	26	5	-22	38	25	5	-21
C1	8	4	38	25	4	0	39	26	4	-22	38	25	4	-21
C1	16	4	38	25	4	0	39	26	4	-22	38	25	4	-21
C1	2	1	38	25	1	0	39	26	1	-25	38	25	1	-24
C1	15	0	38	25	0	0	39	26	0	-26	38	25	0	-25
C1	22	-1	38	25	-1	0	39	26	-1	-27	38	25	-1	-26
C1	18	-5	38	25	-5	0	39	26	-5	-31	38	25	-5	-30
C1	20	-8	38	25	-8	0	39	26	-8	-34	38	25	-8	-33
C1	1	-17	38	25	-17	0	39	26	-17	-43	38	25	-17	-42
C1	14	-19	38	25	-19	0	39	26	-19	-45	38	25	-19	-44
C1	17	-22	38	25	-22	0	39	26	-22	-48	38	25	-22	-47
Total if all = Contrib Obj					36				38				37	
Total if all = Contrib Obj but with No Loader					36									

Table 5.3: Wollongong Coal Russell Vale - surface noise sources reduction assessment

Calculation of required reduction to achieve receiver objectives

Receiver No.	Source No.	Receiver Level dBA	Total Objective	Indiv Contrib Obj to total Obj	Individual Objective	Reduction Required	Day Obj dBA	Individual Day	Individual contrib Day	Reduction Day	Evening Obj	Individual Evening	Individual contrib Evening	Reduction Evening
C2	11	46	38	25	25	21	39	26	26	20	38	25	25	21
C2	7	44	38	25	25	19	39	26	26	18	38	25	25	19
C2	24	43	38	25	25	18	39	26	26	17	38	25	25	18
C2	9	42	38	25	25	17	39	26	26	16	38	25	25	17
C2	10	42	38	25	25	17	39	26	26	16	38	25	25	17
C2	5	42	38	25	25	17	39	26	26	16	38	25	25	17
C2	6	42	38	25	25	17	39	26	26	16	38	25	25	17
C2	23	41	38	25	25	16	39	26	26	15	38	25	25	16
C2	21	39	38	25	25	14	39	26	26	13	38	25	25	14
C2	12	38	38	25	25	13	39	26	26	12	38	25	25	13
C2	26	30	38	25	25	5	39	26	26	4	38	25	25	5
C2	13	30	38	25	25	5	39	26	26	4	38	25	25	5
C2	27	29	38	25	25	4	39	26	26	3	38	25	25	4
C2	8	27	38	25	25	2	39	26	26	1	38	25	25	2
C2	4	25	38	25	25	0	39	26	25	-1	38	25	25	0
C2	25	24	38	25	24	0	39	26	24	-2	38	25	24	-1
C2	3	24	38	25	24	0	39	26	24	-2	38	25	24	-1
C2	2	21	38	25	21	0	39	26	21	-5	38	25	21	-4
C2	28	20	38	25	20	0	39	26	20	-6	38	25	20	-5
C2	22	17	38	25	17	0	39	26	17	-9	38	25	17	-8
C2	15	16	38	25	16	0	39	26	16	-10	38	25	16	-9
C2	16	15	38	25	15	0	39	26	15	-11	38	25	15	-10
C2	29	13	38	25	13	0	39	26	13	-13	38	25	13	-12
C2	19	12	38	25	12	0	39	26	12	-14	38	25	12	-13
C2	18	8	38	25	8	0	39	26	8	-18	38	25	8	-17
C2	30	7	38	25	7	0	39	26	7	-19	38	25	7	-18
C2	20	-1	38	25	-1	0	39	26	-1	-27	38	25	-1	-26
C2	1	-2	38	25	-2	0	39	26	-2	-28	38	25	-2	-27
C2	14	-5	38	25	-5	0	39	26	-5	-31	38	25	-5	-30
C2	17	-11	38	25	-11	0	39	26	-11	-37	38	25	-11	-36
Total if all = Contrib Obj					38				38				38	
Total if all = Contrib Obj but with No Loader					37									

Table 5.3: Wollongong Coal Russell Vale - surface noise sources reduction assessment

Calculation of required reduction to achieve receiver objectives

Receiver No.	Source No.	Receiver Level dBA	Total Objective	Indiv Contrib Obj to total Obj	Individual Objective	Reduction Required	Day Obj dBA	Individual Day	Individual contrib Day	Reduction Day	Evening Obj	Individual Evening	Individual contrib Evening	Reduction Evening
C3	9	42	36	23	23	19	38	25	25	17	37	24	24	18
C3	10	42	36	23	23	19	38	25	25	17	37	24	24	18
C3	5	42	36	23	23	19	38	25	25	17	37	24	24	18
C3	6	42	36	23	23	19	38	25	25	17	37	24	24	18
C3	21	37	36	23	23	14	38	25	25	12	37	24	24	13
C3	12	36	36	23	23	13	38	25	25	11	37	24	24	12
C3	7	32	36	23	23	9	38	25	25	7	37	24	24	8
C3	11	32	36	23	23	9	38	25	25	7	37	24	24	8
C3	23	31	36	23	23	8	38	25	25	6	37	24	24	7
C3	13	31	36	23	23	8	38	25	25	6	37	24	24	7
C3	24	31	36	23	23	8	38	25	25	6	37	24	24	7
C3	4	29	36	23	23	6	38	25	25	4	37	24	24	5
C3	8	29	36	23	23	6	38	25	25	4	37	24	24	5
C3	26	29	36	23	23	6	38	25	25	4	37	24	24	5
C3	25	28	36	23	23	5	38	25	25	3	37	24	24	4
C3	27	28	36	23	23	5	38	25	25	3	37	24	24	4
C3	28	28	36	23	23	5	38	25	25	3	37	24	24	4
C3	2	23	36	23	23	0	38	25	23	-2	37	24	23	-1
C3	15	16	36	23	16	0	38	25	16	-10	37	24	16	-9
C3	29	14	36	23	14	0	38	25	14	-11	37	24	14	-10
C3	22	14	36	23	14	0	38	25	14	-11	37	24	14	-10
C3	30	13	36	23	13	0	38	25	13	-12	37	24	13	-11
C3	18	10	36	23	10	0	38	25	10	-15	37	24	10	-14
C3	1	8	36	23	8	0	38	25	8	-17	37	24	8	-16
C3	14	2	36	23	2	0	38	25	2	-23	37	24	2	-22
C3	20	2	36	23	2	0	38	25	2	-23	37	24	2	-22
C3	17	-1	36	23	-1	0	38	25	-1	-26	37	24	-1	-25
C3	3	-5	36	23	-5	0	38	25	-5	-30	37	24	-5	-29
C3	19	-6	36	23	-6	0	38	25	-6	-31	37	24	-6	-30
C3	16	-7	36	23	-7	0	38	25	-7	-32	37	24	-7	-31
Total if all = Contrib Obj					36				38				37	
Total if all = Contrib Obj but with No Loader					35									

Table 5.3: Wollongong Coal Russell Vale - surface noise sources reduction assessment

Calculation of required reduction to achieve receiver objectives

Receiver No.	Source No.	Receiver Level dBA	Total Objective	Indiv Contrib Obj to total Obj	Individual Objective	Reduction Required	Day Obj dBA	Individual Day	Individual contrib Day	Reduction Day	Evening Obj	Individual Evening	Individual contrib Evening	Reduction Evening
C4	9	42	36	23	23	19	37	24	24	18	37	24	24	18
C4	10	42	36	23	23	19	37	24	24	18	37	24	24	18
C4	5	39	36	23	23	16	37	24	24	15	37	24	24	15
C4	6	39	36	23	23	16	37	24	24	15	37	24	24	15
C4	11	38	36	23	23	15	37	24	24	14	37	24	24	14
C4	7	38	36	23	23	15	37	24	24	14	37	24	24	14
C4	24	36	36	23	23	13	37	24	24	12	37	24	24	12
C4	23	35	36	23	23	12	37	24	24	11	37	24	24	11
C4	13	28	36	23	23	5	37	24	24	4	37	24	24	4
C4	27	26	36	23	23	3	37	24	24	2	37	24	24	2
C4	8	25	36	23	23	2	37	24	24	1	37	24	24	1
C4	4	24	36	23	23	1	37	24	24	0	37	24	24	0
C4	12	21	36	23	21	0	37	24	21	-3	37	24	21	-3
C4	2	19	36	23	19	0	37	24	19	-5	37	24	19	-5
C4	28	18	36	23	18	0	37	24	18	-6	37	24	18	-6
C4	15	14	36	23	14	0	37	24	14	-10	37	24	14	-10
C4	3	14	36	23	14	0	37	24	14	-10	37	24	14	-10
C4	30	13	36	23	13	0	37	24	13	-12	37	24	13	-12
C4	21	12	36	23	12	0	37	24	12	-12	37	24	12	-12
C4	22	11	36	23	11	0	37	24	11	-13	37	24	11	-13
C4	29	10	36	23	10	0	37	24	10	-14	37	24	10	-14
C4	18	6	36	23	6	0	37	24	6	-18	37	24	6	-18
C4	16	0	36	23	0	0	37	24	0	-24	37	24	0	-24
C4	20	-2	36	23	-2	0	37	24	-2	-26	37	24	-2	-26
C4	1	-3	36	23	-3	0	37	24	-3	-27	37	24	-3	-27
C4	14	-8	36	23	-8	0	37	24	-8	-32	37	24	-8	-32
C4	19	-11	36	23	-11	0	37	24	-11	-35	37	24	-11	-35
C4	17	-12	36	23	-12	0	37	24	-12	-36	37	24	-12	-36
C4	25		36	23	0	0	37	24	0	-24	37	24	0	-24
C4	26		36	23	0	0	37	24	0	-24	37	24	0	-24
Total if all = Contrib Obj					34				35				35	
Total if all = Contrib Obj but with No Loader					34									

Table 5.3: Wollongong Coal Russell Vale - surface noise sources reduction assessment

Calculation of required reduction to achieve receiver objectives

Receiver No.	Source No.	Receiver Level dBA	Total Objective	Indiv Contrib Obj to total Obj	Individual Objective	Reduction Required	Day Obj dBA	Individual Day	Individual contrib Day	Reduction Day	Evening Obj	Individual Evening	Individual contrib Evening	Reduction Evening
C5	12	38	40	27	27	11	40	27	27	11	40	27	27	11
C5	7	35	40	27	27	8	40	27	27	8	40	27	27	8
C5	23	34	40	27	27	7	40	27	27	7	40	27	27	7
C5	11	33	40	27	27	6	40	27	27	6	40	27	27	6
C5	24	32	40	27	27	5	40	27	27	5	40	27	27	5
C5	5	32	40	27	27	5	40	27	27	5	40	27	27	5
C5	6	32	40	27	27	5	40	27	27	5	40	27	27	5
C5	9	32	40	27	27	5	40	27	27	5	40	27	27	5
C5	10	32	40	27	27	5	40	27	27	5	40	27	27	5
C5	26	27	40	27	27	0	40	27	27	0	40	27	27	0
C5	13	27	40	27	27	0	40	27	27	0	40	27	27	0
C5	25	25	40	27	25	0	40	27	25	-2	40	27	25	-2
C5	3	24	40	27	24	0	40	27	24	-3	40	27	24	-3
C5	21	19	40	27	19	0	40	27	19	-8	40	27	19	-8
C5	27	17	40	27	17	0	40	27	17	-10	40	27	17	-10
C5	4	13	40	27	13	0	40	27	13	-14	40	27	13	-14
C5	8	13	40	27	13	0	40	27	13	-14	40	27	13	-14
C5	16	10	40	27	10	0	40	27	10	-17	40	27	10	-17
C5	19	10	40	27	10	0	40	27	10	-17	40	27	10	-17
C5	28	10	40	27	10	0	40	27	10	-17	40	27	10	-17
C5	22	9	40	27	9	0	40	27	9	-18	40	27	9	-18
C5	2	7	40	27	7	0	40	27	7	-20	40	27	7	-20
C5	30	6	40	27	6	0	40	27	6	-22	40	27	6	-22
C5	15	5	40	27	5	0	40	27	5	-22	40	27	5	-22
C5	29	4	40	27	4	0	40	27	4	-23	40	27	4	-23
C5	18	-1	40	27	-1	0	40	27	-1	-28	40	27	-1	-28
C5	20	-2	40	27	-2	0	40	27	-2	-29	40	27	-2	-29
C5	1	-11	40	27	-11	0	40	27	-11	-38	40	27	-11	-38
C5	14	-14	40	27	-14	0	40	27	-14	-41	40	27	-14	-41
C5	17	-18	40	27	-18	0	40	27	-18	-45	40	27	-18	-45
Total if all = Contrib Obj					38				38				38	
Total if all = Contrib Obj but with No Loader					38									

Table 5.3: Wollongong Coal Russell Vale - surface noise sources reduction assessment

Calculation of required reduction to achieve receiver objectives

Receiver No.	Source No.	Receiver Level dBA	Total Objective	Indiv Contrib Obj to total Obj	Individual Objective	Reduction Required	Day Obj dBA	Individual Day	Individual contrib Day	Reduction Day	Evening Obj	Individual Evening	Individual contrib Evening	Reduction Evening
R1	13	48	37	24	24	24	43	30	30	18	39	26	26	22
R1	5	44	37	24	24	20	43	30	30	14	39	26	26	18
R1	6	44	37	24	24	20	43	30	30	14	39	26	26	18
R1	9	43	37	24	24	19	43	30	30	13	39	26	26	17
R1	10	43	37	24	24	19	43	30	30	13	39	26	26	17
R1	21	38	37	24	24	14	43	30	30	8	39	26	26	12
R1	4	34	37	24	24	10	43	30	30	4	39	26	26	8
R1	8	34	37	24	24	10	43	30	30	4	39	26	26	8
R1	7	29	37	24	24	5	43	30	29	-1	39	26	26	3
R1	23	29	37	24	24	5	43	30	29	-1	39	26	26	3
R1	11	29	37	24	24	5	43	30	29	-2	39	26	26	3
R1	24	28	37	24	24	4	43	30	28	-2	39	26	26	2
R1	1	25	37	24	24	1	43	30	25	-5	39	26	25	-1
R1	12	24	37	24	24	0	43	30	24	-6	39	26	24	-2
R1	14	21	37	24	21	0	43	30	21	-9	39	26	21	-5
R1	17	16	37	24	16	0	43	30	16	-14	39	26	16	-10
R1	22	15	37	24	15	0	43	30	15	-15	39	26	15	-11
R1	2	13	37	24	13	0	43	30	13	-18	39	26	13	-14
R1	20	11	37	24	11	0	43	30	11	-19	39	26	11	-15
R1	15	9	37	24	9	0	43	30	9	-21	39	26	9	-17
R1	3	4	37	24	4	0	43	30	4	-26	39	26	4	-22
R1	18	3	37	24	3	0	43	30	3	-27	39	26	3	-23
R1	16	-7	37	24	-7	0	43	30	-7	-37	39	26	-7	-33
R1	19	-8	37	24	-8	0	43	30	-8	-38	39	26	-8	-34
R1	25		37	24	0	0	43	30	0	-30	39	26	0	-26
R1	26		37	24	0	0	43	30	0	-30	39	26	0	-26
R1	27		37	24	0	0	43	30	0	-30	39	26	0	-26
R1	28		37	24	0	0	43	30	0	-30	39	26	0	-26
R1	29		37	24	0	0	43	30	0	-30	39	26	0	-26
R1	30		37	24	0	0	43	30	0	-30	39	26	0	-26
Total if all = Contrib Obj					36				41				37	
Total if all = Contrib Obj but with No Loader					35									

Table 5.3: Wollongong Coal Russell Vale - surface noise sources reduction assessment

Calculation of required reduction to achieve receiver objectives

Receiver No.	Source No.	Receiver Level dBA	Total Objective	Indiv Contrib Obj to total Obj	Individual Objective	Reduction Required	Day Obj dBA	Individual Day	Individual contrib Day	Reduction Day	Evening Obj	Individual Evening	Individual contrib Evening	Reduction Evening
R2	13	48	37	24	24	24	43	30	30	18	39	26	26	22
R2	9	44	37	24	24	20	43	30	30	14	39	26	26	18
R2	10	44	37	24	24	20	43	30	30	14	39	26	26	18
R2	5	44	37	24	24	20	43	30	30	14	39	26	26	18
R2	6	44	37	24	24	20	43	30	30	14	39	26	26	18
R2	21	38	37	24	24	14	43	30	30	8	39	26	26	12
R2	4	34	37	24	24	10	43	30	30	4	39	26	26	8
R2	8	34	37	24	24	10	43	30	30	4	39	26	26	8
R2	23	30	37	24	24	6	43	30	30	0	39	26	26	4
R2	7	30	37	24	24	6	43	30	30	0	39	26	26	4
R2	24	29	37	24	24	5	43	30	29	-1	39	26	26	3
R2	11	29	37	24	24	5	43	30	29	-1	39	26	26	3
R2	26	28	37	24	24	4	43	30	28	-2	39	26	26	2
R2	25	28	37	24	24	4	43	30	28	-3	39	26	26	2
R2	1	25	37	24	24	1	43	30	25	-5	39	26	25	-1
R2	12	23	37	24	23	0	43	30	23	-7	39	26	23	-3
R2	14	22	37	24	22	0	43	30	22	-9	39	26	22	-5
R2	28	21	37	24	21	0	43	30	21	-10	39	26	21	-6
R2	29	17	37	24	17	0	43	30	17	-13	39	26	17	-9
R2	30	17	37	24	17	0	43	30	17	-13	39	26	17	-9
R2	17	17	37	24	17	0	43	30	17	-13	39	26	17	-9
R2	22	16	37	24	16	0	43	30	16	-14	39	26	16	-10
R2	27	16	37	24	16	0	43	30	16	-14	39	26	16	-10
R2	2	12	37	24	12	0	43	30	12	-18	39	26	12	-14
R2	20	11	37	24	11	0	43	30	11	-19	39	26	11	-15
R2	15	11	37	24	11	0	43	30	11	-19	39	26	11	-15
R2	18	4	37	24	4	0	43	30	4	-26	39	26	4	-22
R2	3	4	37	24	4	0	43	30	4	-27	39	26	4	-23
R2	19	-5	37	24	-5	0	43	30	-5	-35	39	26	-5	-31
R2	16	-6	37	24	-6	0	43	30	-6	-36	39	26	-6	-32
Total if all = Contrib Obj					37				41				38	
Total if all = Contrib Obj but with No Loader					36									

Table 5.3: Wollongong Coal Russell Vale - surface noise sources reduction assessment

Calculation of required reduction to achieve receiver objectives

Receiver No.	Source No.	Receiver Level dBA	Total Objective	Indiv Contrib Obj to total Obj	Individual Objective	Reduction Required	Day Obj dBA	Individual Day	Individual contrib Day	Reduction Day	Evening Obj	Individual Evening	Individual contrib Evening	Reduction Evening
R3	13	47	37	24	24	23	43	30	30	17	39	26	26	21
R3	5	43	37	24	24	19	43	30	30	13	39	26	26	17
R3	6	43	37	24	24	19	43	30	30	13	39	26	26	17
R3	9	43	37	24	24	19	43	30	30	13	39	26	26	17
R3	10	43	37	24	24	19	43	30	30	13	39	26	26	17
R3	21	37	37	24	24	13	43	30	30	7	39	26	26	11
R3	4	34	37	24	24	10	43	30	30	4	39	26	26	8
R3	8	33	37	24	24	9	43	30	30	3	39	26	26	7
R3	7	28	37	24	24	4	43	30	28	-2	39	26	26	2
R3	23	28	37	24	24	4	43	30	28	-2	39	26	26	2
R3	11	28	37	24	24	4	43	30	28	-2	39	26	26	2
R3	24	28	37	24	28	0	43	30	28	-2	39	26	26	2
R3	1	24	37	24	24	0	43	30	24	-6	39	26	24	-2
R3	12	24	37	24	24	0	43	30	24	-6	39	26	24	-2
R3	14	20	37	24	20	0	43	30	20	-10	39	26	20	-6
R3	17	15	37	24	15	0	43	30	15	-16	39	26	15	-12
R3	22	15	37	24	15	0	43	30	15	-16	39	26	15	-12
R3	2	11	37	24	11	0	43	30	11	-19	39	26	11	-15
R3	20	10	37	24	10	0	43	30	10	-20	39	26	10	-16
R3	15	8	37	24	8	0	43	30	8	-22	39	26	8	-18
R3	3	3	37	24	3	0	43	30	3	-27	39	26	3	-23
R3	18	1	37	24	1	0	43	30	1	-29	39	26	1	-25
R3	16	-9	37	24	-9	0	43	30	-9	-39	39	26	-9	-35
R3	19	-10	37	24	-10	0	43	30	-10	-40	39	26	-10	-36
R3	25		37	24	0	0	43	30	0	-30	39	26	0	-26
R3	26		37	24	0	0	43	30	0	-30	39	26	0	-26
R3	27		37	24	0	0	43	30	0	-30	39	26	0	-26
R3	28		37	24	0	0	43	30	0	-30	39	26	0	-26
R3	29		37	24	0	0	43	30	0	-30	39	26	0	-26
R3	30		37	24	0	0	43	30	0	-30	39	26	0	-26
Total if all = Contrib Obj					36				41				37	
Total if all = Contrib Obj but with No Loader					36									

Table 5.3: Wollongong Coal Russell Vale - surface noise sources reduction assessment

Calculation of required reduction to achieve receiver objectives

Receiver No.	Source No.	Receiver Level dBA	Total Objective	Indiv Contrib Obj to total Obj	Individual Objective	Reduction Required	Day Obj dBA	Individual Day	Individual contrib Day	Reduction Day	Evening Obj	Individual Evening	Individual contrib Evening	Reduction Evening
R4	13	45	37	24	24	21	43	30	30	15	39	26	26	19
R4	5	41	37	24	24	17	43	30	30	11	39	26	26	15
R4	6	41	37	24	24	17	43	30	30	11	39	26	26	15
R4	9	41	37	24	24	17	43	30	30	11	39	26	26	15
R4	10	41	37	24	24	17	43	30	30	11	39	26	26	15
R4	21	35	37	24	24	11	43	30	30	5	39	26	26	9
R4	4	32	37	24	24	8	43	30	30	2	39	26	26	6
R4	8	31	37	24	24	7	43	30	30	1	39	26	26	5
R4	7	28	37	24	24	4	43	30	28	-2	39	26	26	2
R4	23	27	37	24	24	3	43	30	27	-3	39	26	26	1
R4	11	27	37	24	24	3	43	30	27	-3	39	26	26	1
R4	24	27	37	24	24	3	43	30	27	-3	39	26	26	1
R4	12	26	37	24	24	2	43	30	26	-4	39	26	26	0
R4	1	23	37	24	23	0	43	30	23	-7	39	26	23	-3
R4	2	22	37	24	22	0	43	30	22	-8	39	26	22	-4
R4	15	18	37	24	18	0	43	30	18	-12	39	26	18	-8
R4	14	18	37	24	18	0	43	30	18	-12	39	26	18	-8
R4	18	13	37	24	13	0	43	30	13	-17	39	26	13	-13
R4	22	13	37	24	13	0	43	30	13	-17	39	26	13	-13
R4	17	13	37	24	13	0	43	30	13	-17	39	26	13	-13
R4	20	10	37	24	10	0	43	30	10	-20	39	26	10	-16
R4	3	3	37	24	3	0	43	30	3	-27	39	26	3	-23
R4	16	-9	37	24	-9	0	43	30	-9	-39	39	26	-9	-35
R4	19	-11	37	24	-11	0	43	30	-11	-41	39	26	-11	-37
R4	25		37	24	0	0	43	30	0	-30	39	26	0	-26
R4	26		37	24	0	0	43	30	0	-30	39	26	0	-26
R4	27		37	24	0	0	43	30	0	-30	39	26	0	-26
R4	28		37	24	0	0	43	30	0	-30	39	26	0	-26
R4	29		37	24	0	0	43	30	0	-30	39	26	0	-26
R4	30		37	24	0	0	43	30	0	-30	39	26	0	-26
Total if all = Contrib Obj					36				40				38	
Total if all = Contrib Obj but with No Loader					36									

Appendix E: Workshop doors noise reduction memo 22 May 2014

HATCH™

Project Memo

H-346292

22 May 2014

To: Kamlesh Prajapati From: Colin Tickell

cc: G Dyer, D Clarkson

Wollongong Coal Limited
Russell Vale Conveyor Noise Management

Options for Workshop wall noise control

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1. Introduction

The workshop building at the Wollongong Coal Russell Vale site can at times house high noise emission activities such as vehicle engine tests. These noise emissions have the potential to be audible at residential receivers.

As part of the general noise management advice being provided for the conveyor system, Hatch was requested to advise on options for control of emissions from the building. This included whether a noise barrier at the eastern edge of the yard would be of value. Figure 1 shows an aerial photo of the building with door locations, assumed barrier location used in the assessment and directions to the nominated residential receivers in the Noise Management Plan (NMP).

This document provides an initial advice on general options to reduce noise from the workshop building, including the calculated effects of a barrier.

2. Building condition – wall and door openings

Photographs of the building east wall are shown in Figures 2 to 7. The wall has a brick section to approximately 2.4m height for a part of its length, with the balance up to approximately 7.2m height being steel wall sheeting in Custom Orb profile. Some sections have translucent fibreglass sheeting 1.2m wide. There are also a number of doors with steel roller doors to approximately 4m height. Doors are normally open although they may be closed at night-time if they are able to be closed – some are damaged and need repair to allow closure. Some doors also have poor or damaged edge sheeting to the door frame.

Wall and door condition is important in terms of noise emission control. If a wall panel has edge openings or holes, for example ventilation louvers or ducts or a door is open slightly, or lower attenuation sections such as fibreglass sheeting, this reduces the potential noise reduction available. This is shown in Figure 8 below.

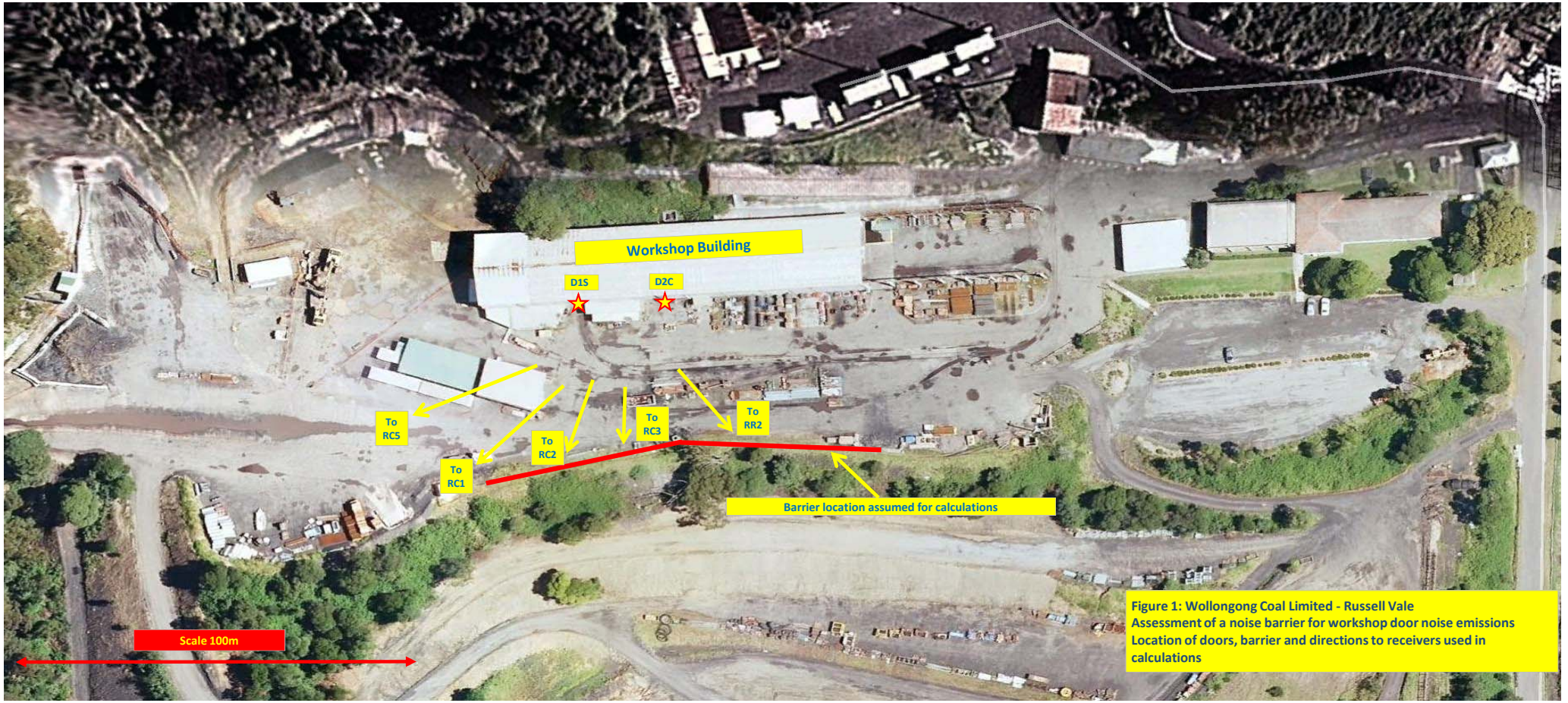


Figure 1: Wollongong Coal Limited - Russell Vale
Assessment of a noise barrier for workshop door noise emissions
Location of doors, barrier and directions to receivers used in calculations

Figure 2: Photograph of centre to northern end

Figure 3: Photograph of southern end

Figure 4: Photograph of doorway

Figure 5: Photograph of centre doorway area

Figure 6: Photograph of centre doorway

Figure 7: Photograph of northern end

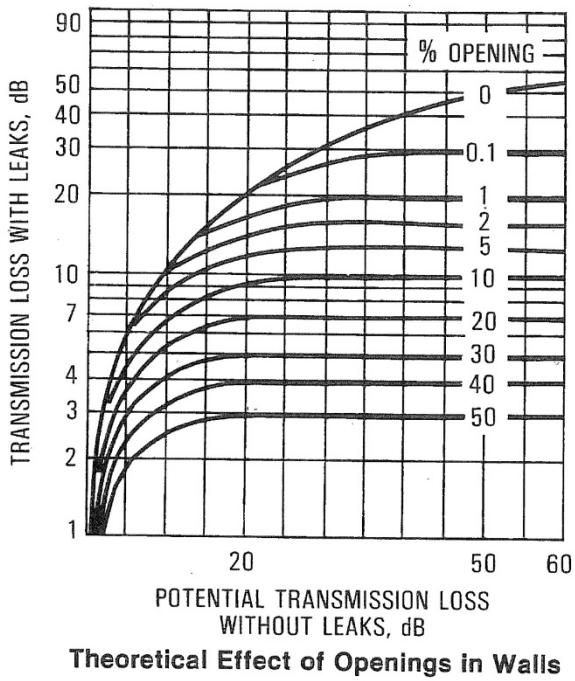


Figure 8: Effect of transmission loss in walls from openings

So if a steel sheet wall with a theoretical attenuation of 20 dB has a 5% opening from doors or other gaps, the maximum potential attenuation is reduced to 13 dB. Also if a point source such as a vehicle being tested is located in the doorway, then noise emission from this would have no attenuation.

Vehicle engine tests were advised to be done with the doors open to allow for ventilation of exhaust gases. If a test is done at night-time the doors are closed after the tests.

The first step in achieving improvements in wall attenuation would be by repair of damaged sections of walls, sealing the sheeting to the door frames and repair of doors so they can be closed.

- The existing brick wall section would be expected to have an attenuation of approximately 45 dB.
- The steel wall would be expected to have an attenuation of 20 dB.
- The fibreglass sheeting would be expected to have an attenuation of 20 dB.

The need to improve the attenuation of the wall beyond those values above depends on the likely range of sound levels occurring inside the building and the sound levels of these received at the residential locations. Increasing the attenuation of the wall is possible by various methods such as adding an internal lining or replacing the external sheeting with a higher performance material, but if the doors are open then the effect is negated.

It is recommended that the wall and doors be repaired in the first instance. Internal tests of diesel mobile equipment engines at present requires doors to be open to provide adequate ventilation, but this allows increased noise emission during times of high noise. An alternative approach could consider providing an exhaust ventilation extraction system to direct the exhaust gases to the outside of the building. This could be of a significantly lower cost than providing a noise barrier and allow the doors to remain closed.

3. Wall attenuation improvement and yard noise barrier effects

An assessment of the current emissions and their expected receiver sound levels will assist in determining the need for improvement. Wollongong Coal advised they were considering the construction of a noise barrier along the eastern side of the yard adjacent to the workshop, at the point where the edge of the embankment is located. This would be to reduce emissions from the mobile equipment moving around the yard at workshop level and potentially from the workshop building. The location of the barrier is shown on Figure 1. Figure 9 shows a combined photo of the view towards this area from the centre door of the workshop.

A noise model has been prepared for calculation of received sound levels at nominated residential receiver locations for emissions from the workshop doors. The computer noise model ENM was used with simple sections calculated.

Two source locations were selected. These were the doors at the southern end and the centre, known as Door 1 South and Door 2 Centre respectively. Ground level cross-sections for the straight lines between these doors and the nominated receivers in the NMP C5, C1, C2, C3 and R2, were obtained from GoogleEarthPro. Figures 10 to 19.

Figure 1 and the sections of Figures 10 and 12 show that the open shed to the south-west of the workshop provides a barrier to noise from the southern doorway Door 1 South to receivers C1 and C5 and partially to C2, and for the centre doorway to C5. The addition of a 3m high barrier is shown in the section of Figure 20 and a 4m high barrier in Figure 21. These graphs have different vertical and horizontal scales to show the changes in elevation more easily. If they were on the same scale, as given in Figures 22 and 23, the effect of the barrier is much smaller.

The acoustical performance of a barrier depends on its height and the relative distance on either side to the source or receiver. The closer either is to one side the better attenuation that occurs. Initially the addition of a barrier is not expected to achieve a significant reduction in this case for workshop noise emissions because the distance between the workshop and barrier is relatively long compared to the height. However in this case the barrier effect is increased by the topography falling away to the receivers. The reduction expected would be higher for noise sources closer to the barrier, such as mobile equipment. Therefore the calculated reductions expected would be a minimum.

The source of noise used in the calculations was the workshop forklift measured at the site during high-idle with the reversing alarm operating, measured at 7m distance.

Table 1 and Figure 24 show the measured sound pressure levels and calculated power levels used for the forklift in the calculations. The forklift sound level was 69 to 74 dBA at 7m, depending on location. The sound power level used in the calculations was 101 dB.

Calculations of receiver sound levels were made for four weather conditions typical of those expected for worst case sound propagation from the site towards the receivers. These were each calculated with an atmospheric temperature of 10^{o}C and relative humidity of 95%:

- Wind calm, neutral atmosphere (lapse rate = 0^{o}C / 100m);
- Wind 2m/s towards receivers, medium inversion atmosphere lapse rate = +3^{o}C / 100m;
- Wind 3m/s towards receivers, neutral atmosphere (lapse rate = 0^{o}C / 100m);

Figure 9: Combined photograph of the view towards the East from the Workshop Centre Doorway.

Figure 10: Wollongong Coal Russell Vale - Workshop Noise Barrier Calculations
Simplified cross-section from Door 1 South to Receiver C5 with No Barrier

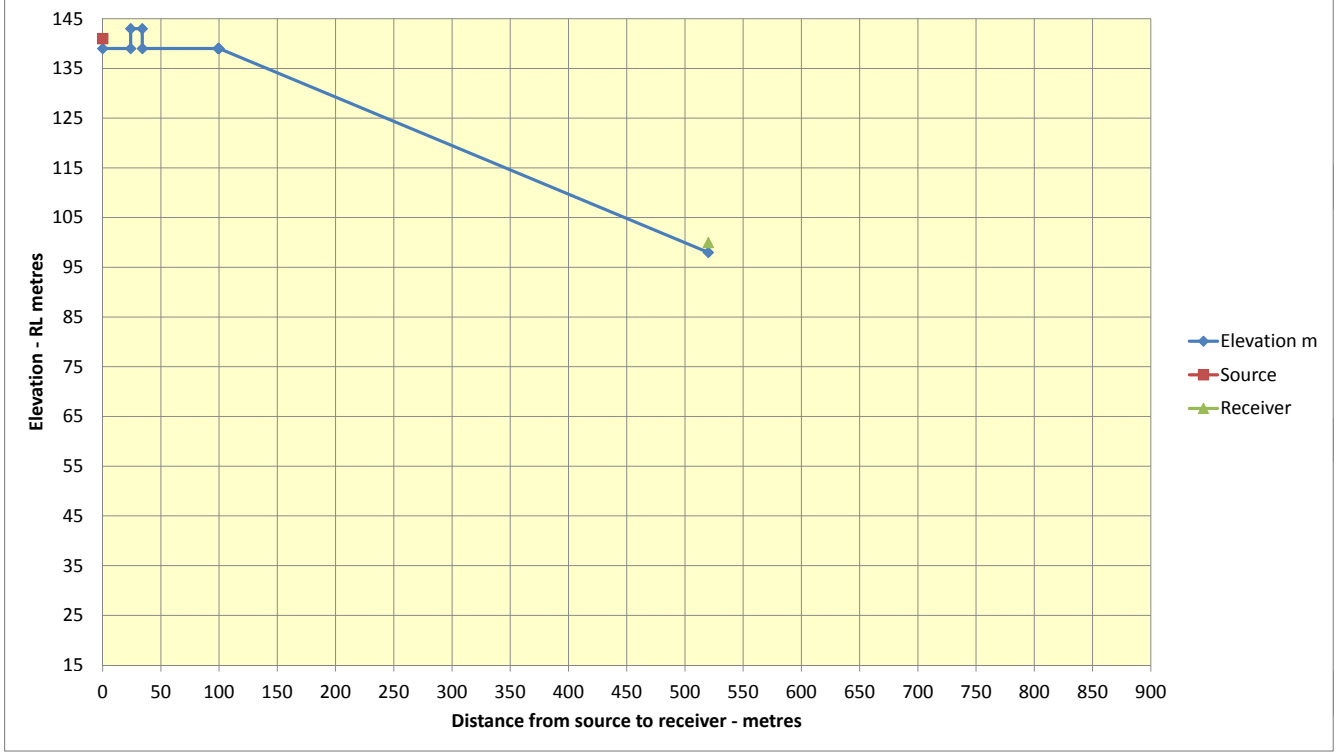


Figure 11: Wollongong Coal Russell Vale - Workshop Noise Barrier Calculations
Simplified cross-section from Door 2 Centre to Receiver C5 with No Barrier

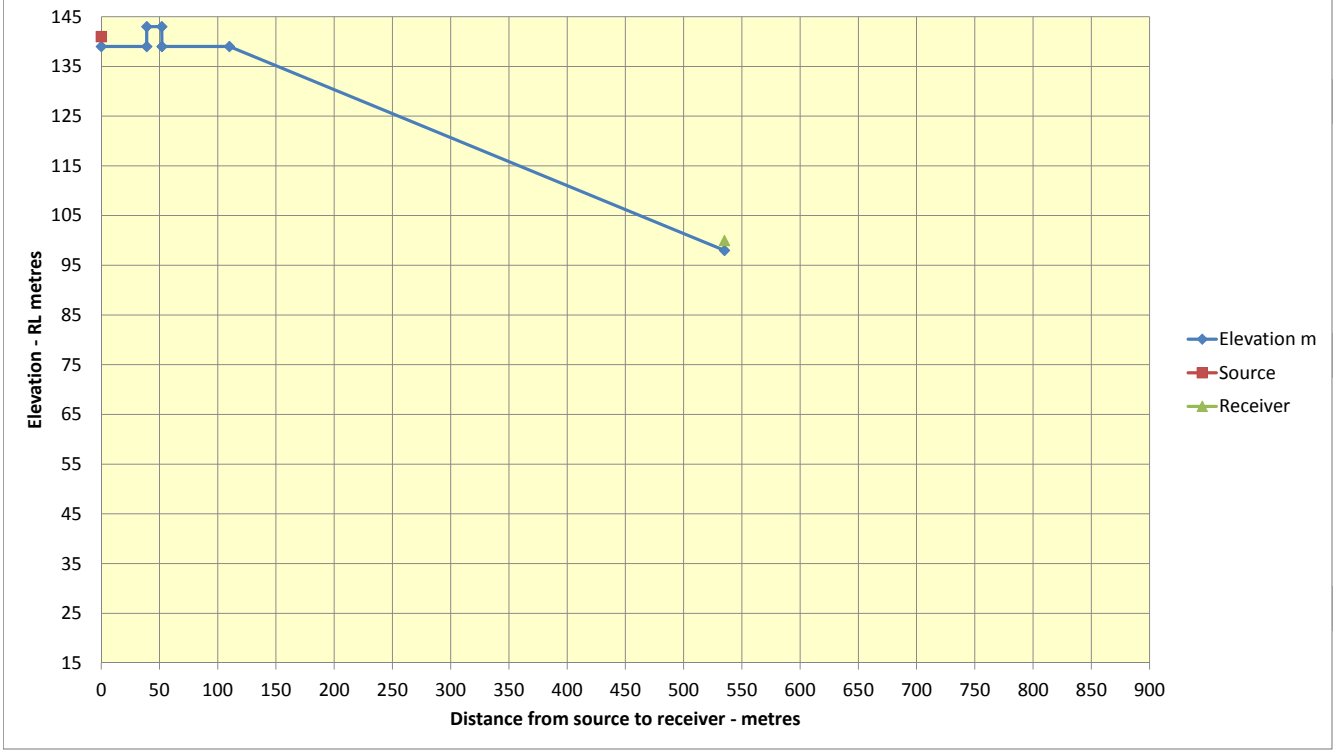


Figure 12: Wollongong Coal Russell Vale - Workshop Noise Barrier Calculations
Simplified cross-section from Door 1 South to Receiver C1 with No Barrier

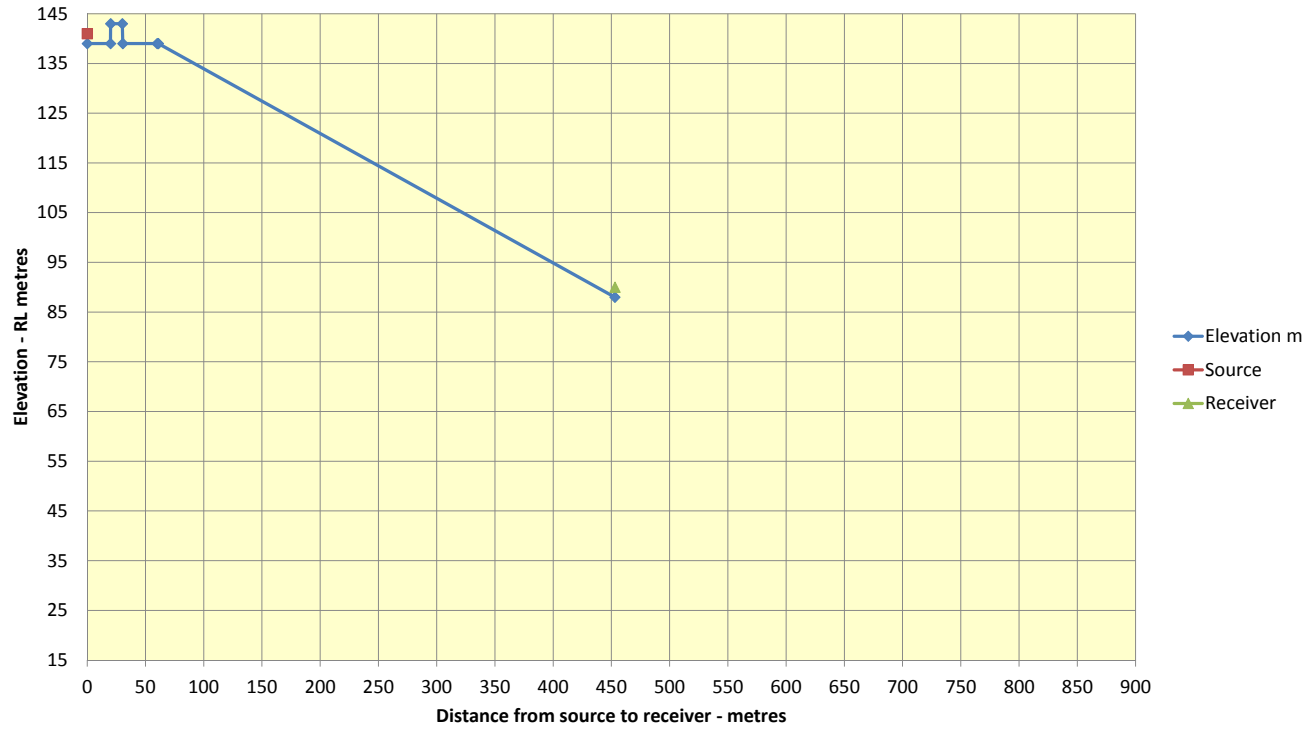


Figure 13: Wollongong Coal Russell Vale - Workshop Noise Barrier Calculations
Simplified cross-section from Door 2 Centre to Receiver C1 with No Barrier

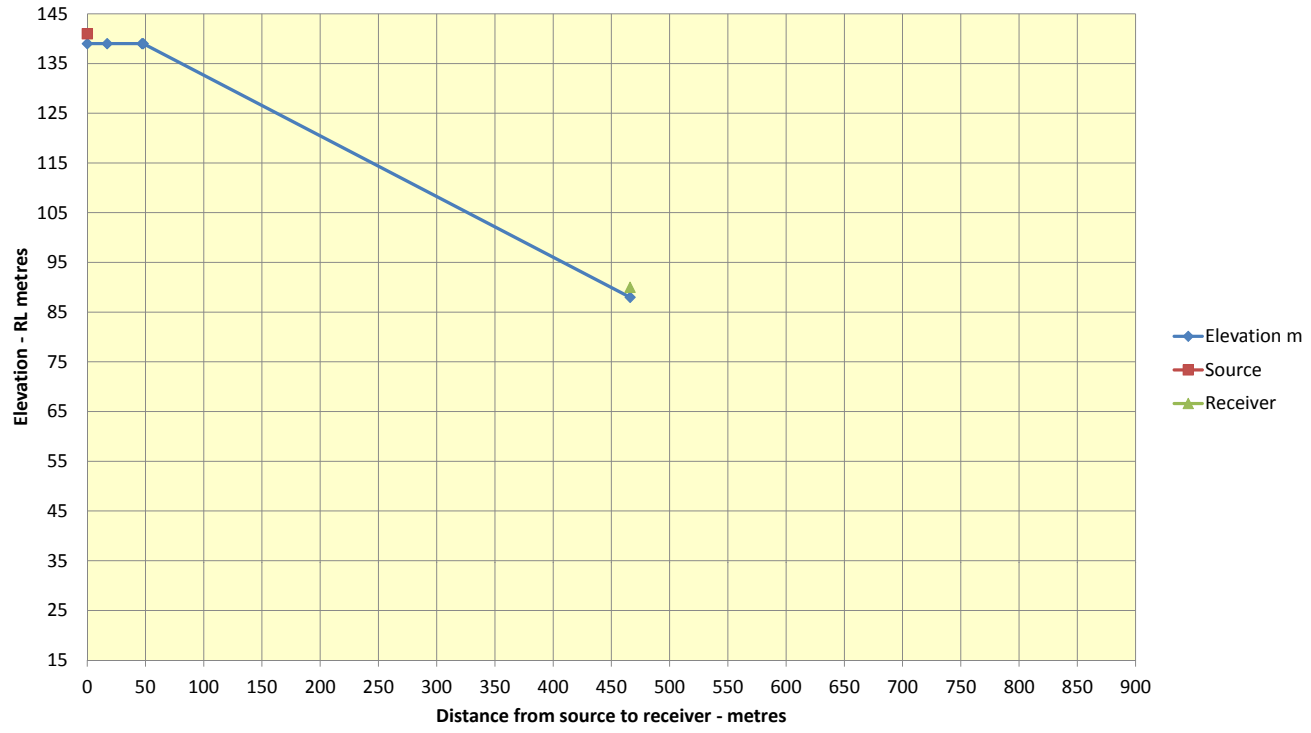


Figure 14: Wollongong Coal Russell Vale - Workshop Noise Barrier Calculations
Simplified cross-section from Door 1 South to Receiver C2 with No Barrier

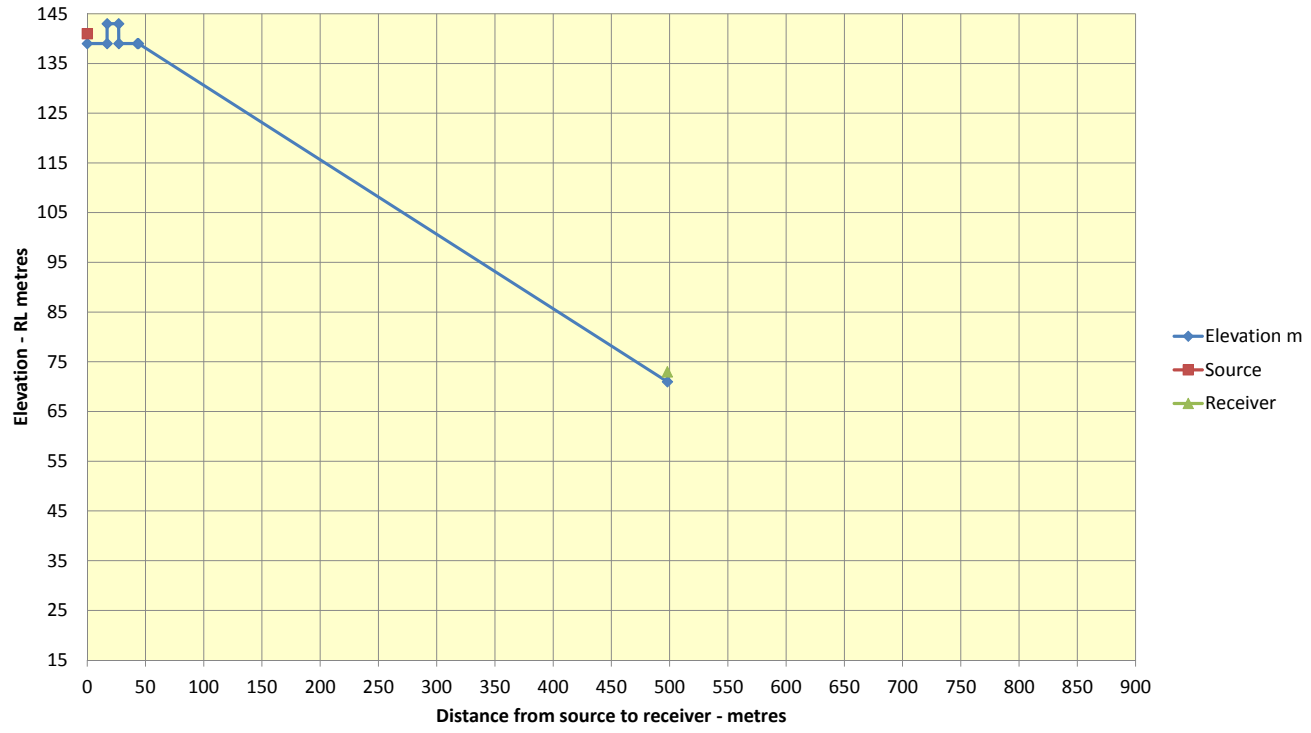


Figure 15: Wollongong Coal Russell Vale - Workshop Noise Barrier Calculations
Simplified cross-section from Door 2 Centre to Receiver C2 with No Barrier

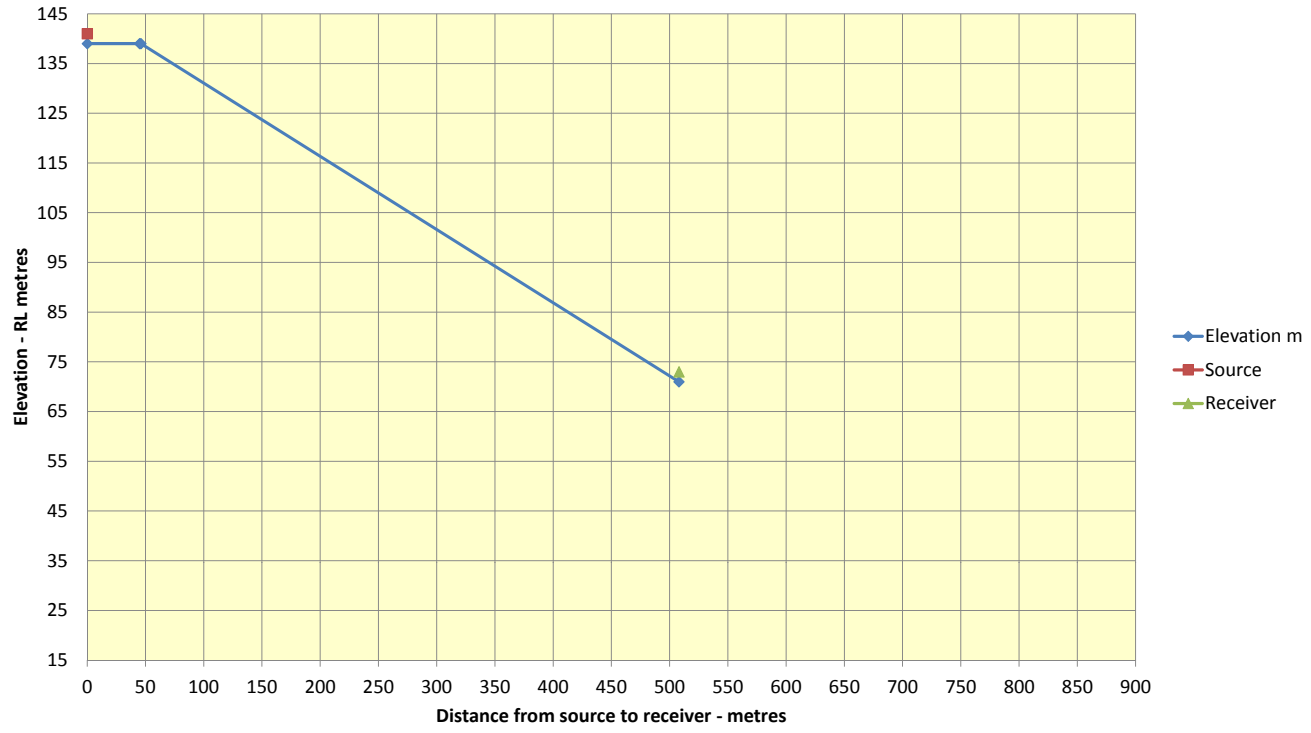


Figure 16: Wollongong Coal Russell Vale - Workshop Noise Barrier Calculations
Simplified cross-section from Door 1 South to Receiver C3 with No Barrier

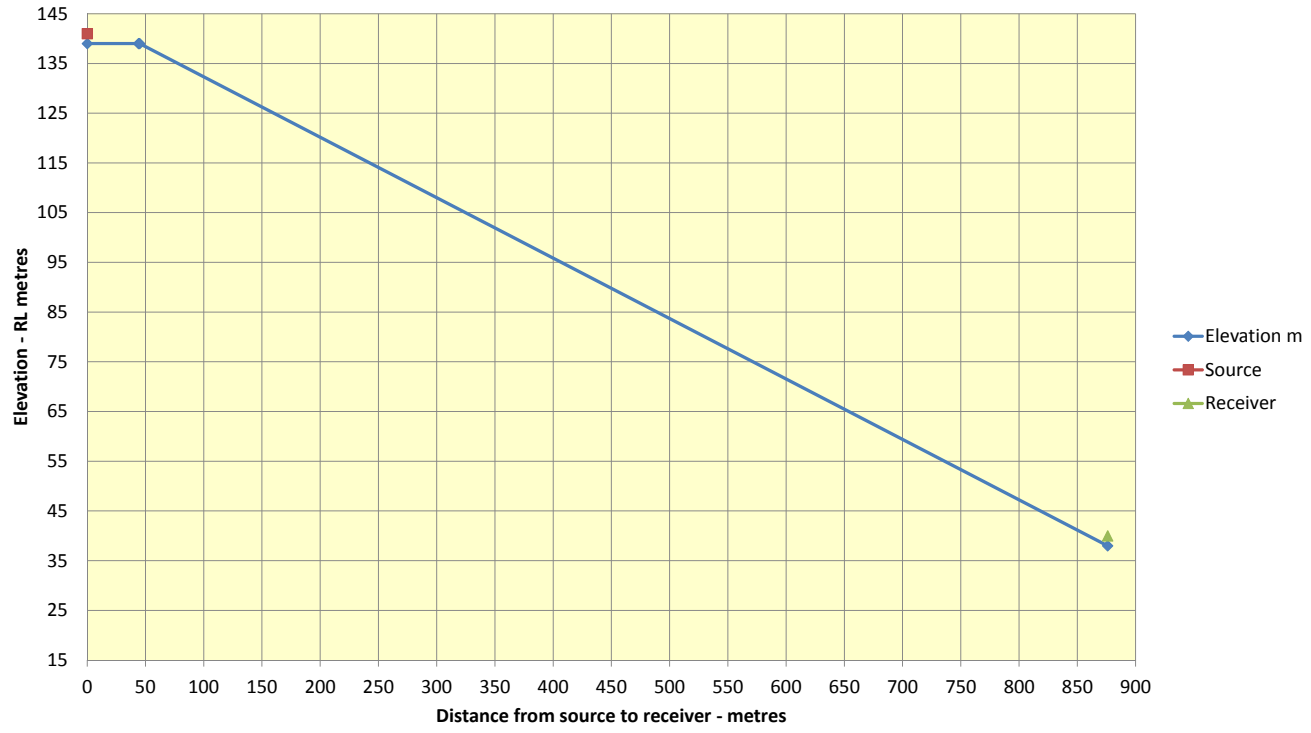


Figure 17: Wollongong Coal Russell Vale - Workshop Noise Barrier Calculations
Simplified cross-section from Door 2 Centre to Receiver C3 with No Barrier

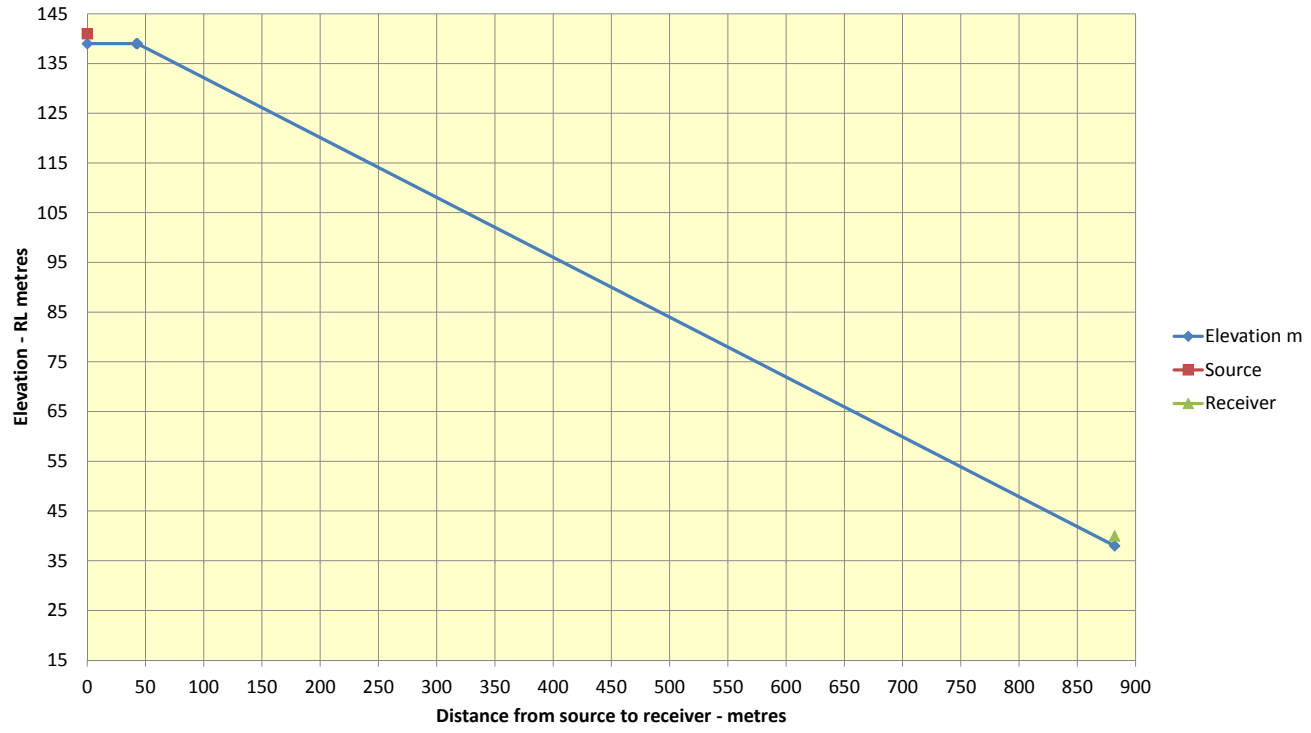


Figure 18: Wollongong Coal Russell Vale - Workshop Noise Barrier Calculations
Simplified cross-section from Door 1 South to Receiver R2 with No Barrier

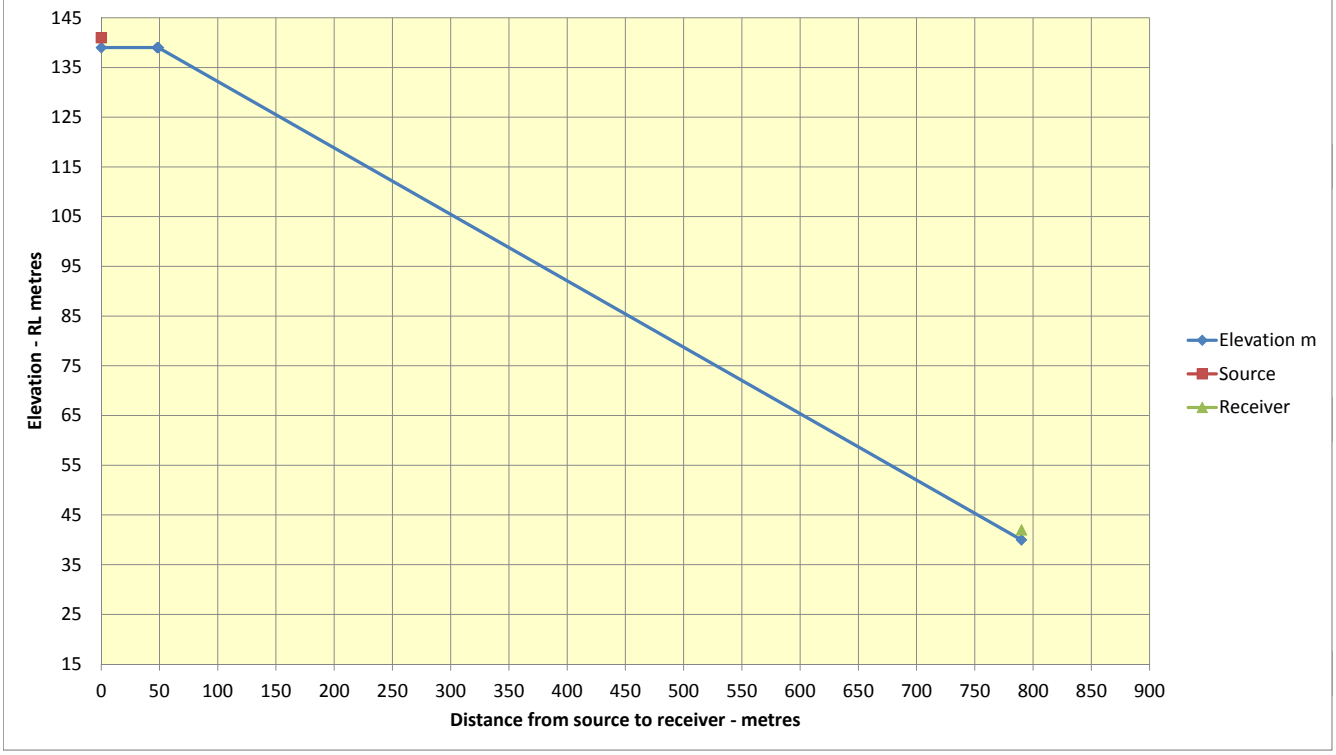


Figure 19: Wollongong Coal Russell Vale - Workshop Noise Barrier Calculations
Simplified cross-section from Door 2 Centre to Receiver R2 with No Barrier

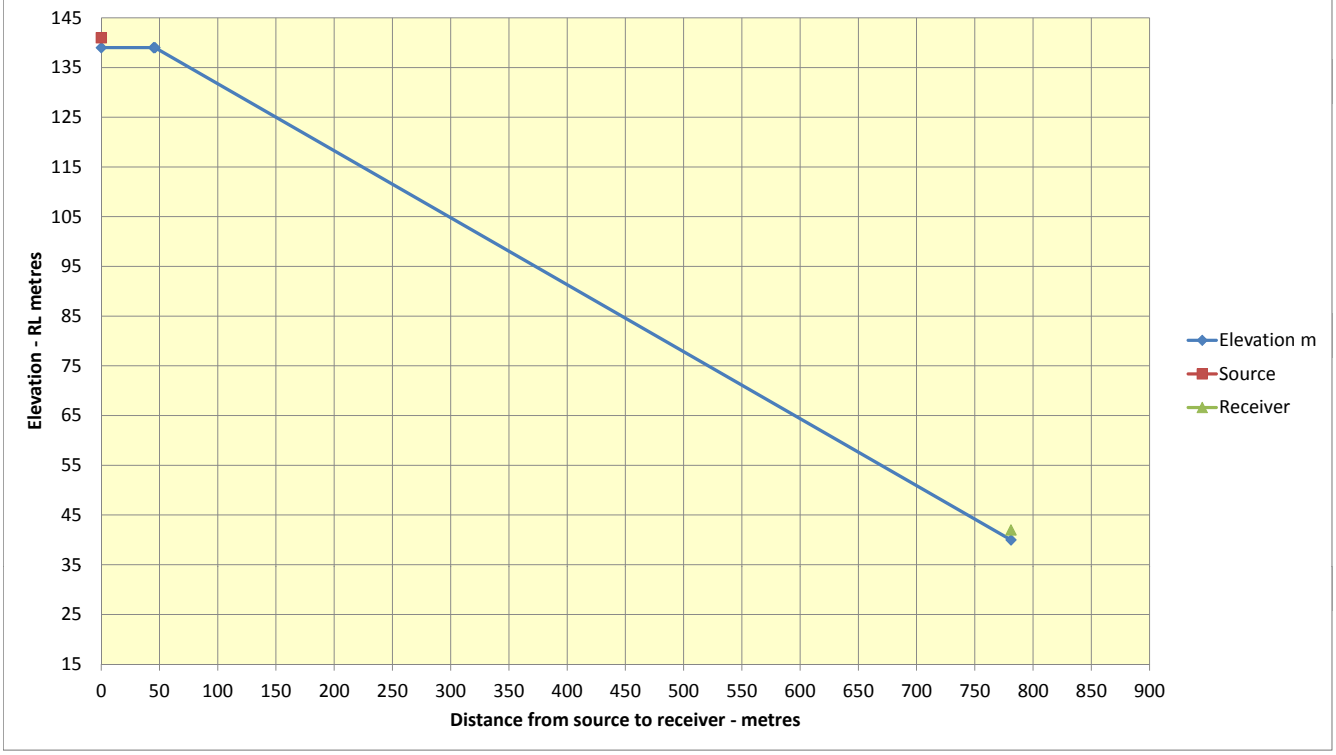


Figure 20: Wollongong Coal Russell Vale - Workshop Noise Barrier Calculations
Simplified cross-section from Door 2 Centre to Receiver C3 with 3m Barrier

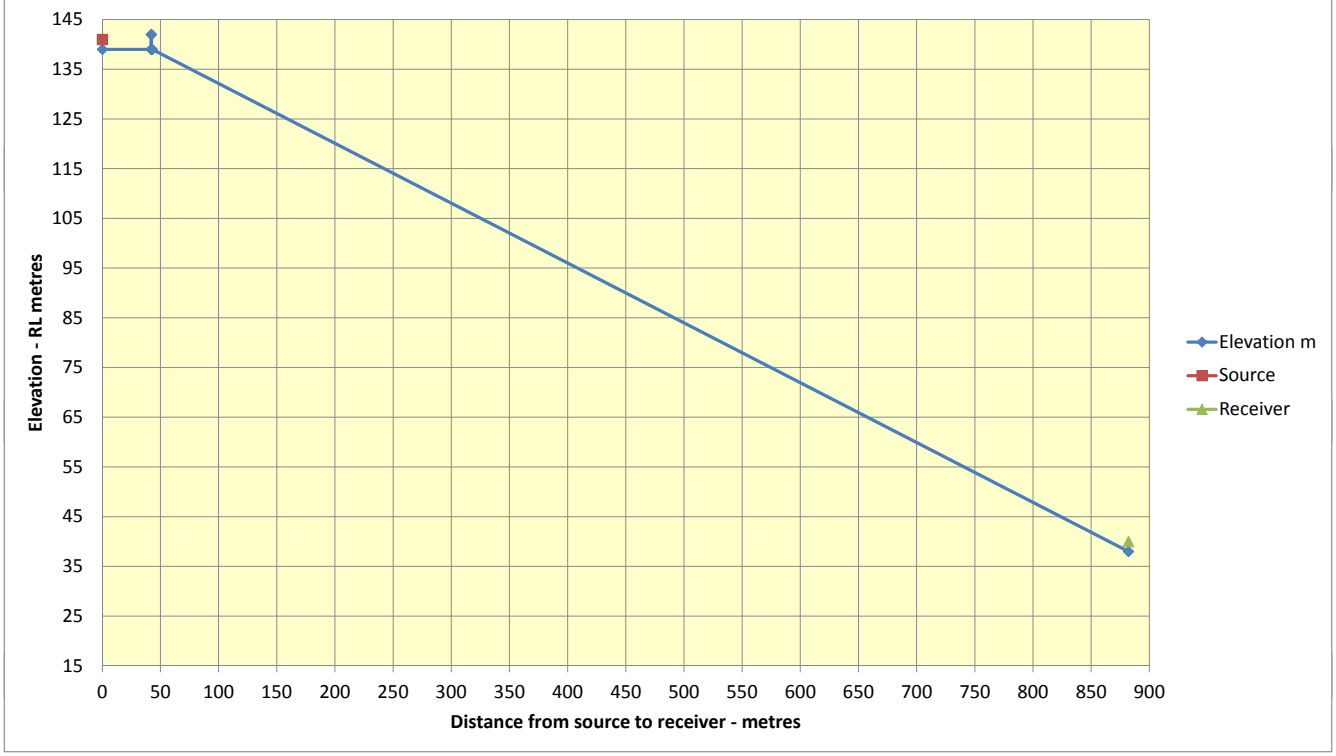


Figure 21: Wollongong Coal Russell Vale - Workshop Noise Barrier Calculations
Simplified cross-section from Door 2 Centre to Receiver C3 with 4m Barrier

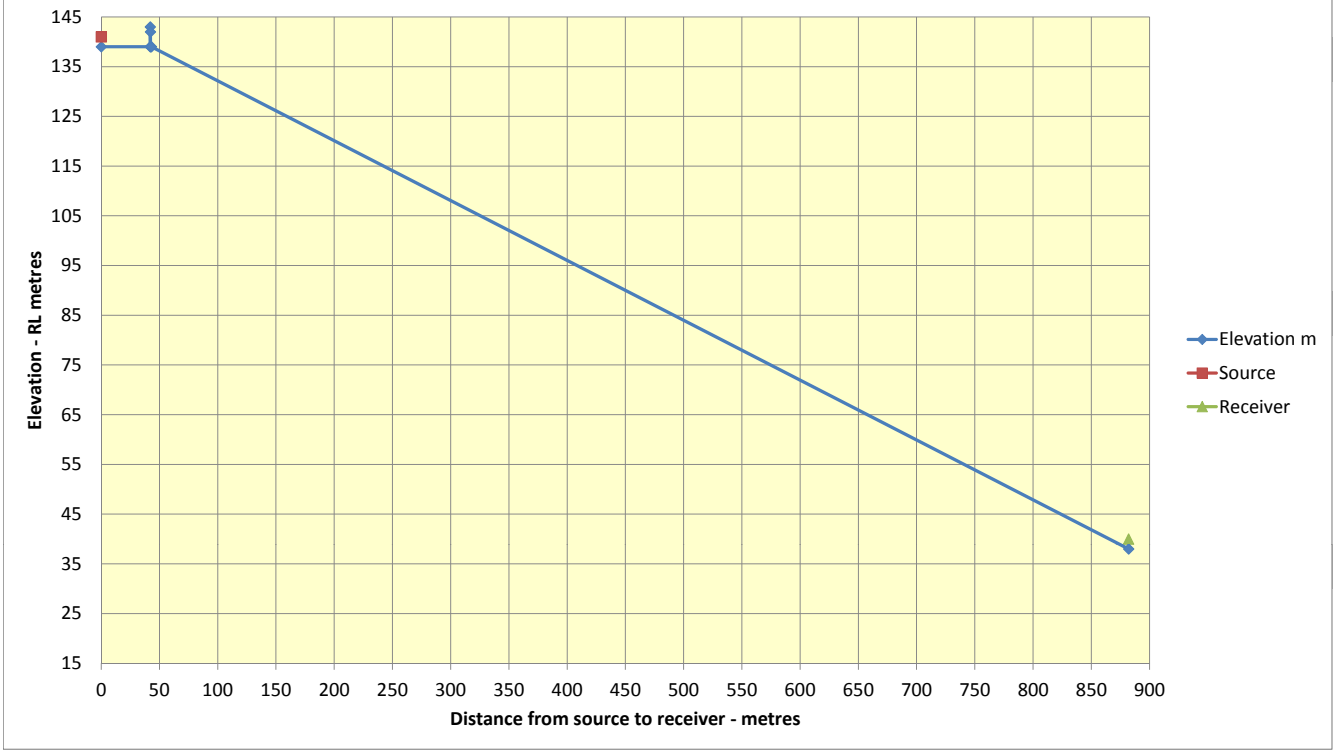


Figure 22: Wollongong Coal Russell Vale - Workshop Noise Barrier Calculations
Simplified cross-section from Door 1 South to Receiver C5 with No Barrier
Elevation & Distance ~ same scale

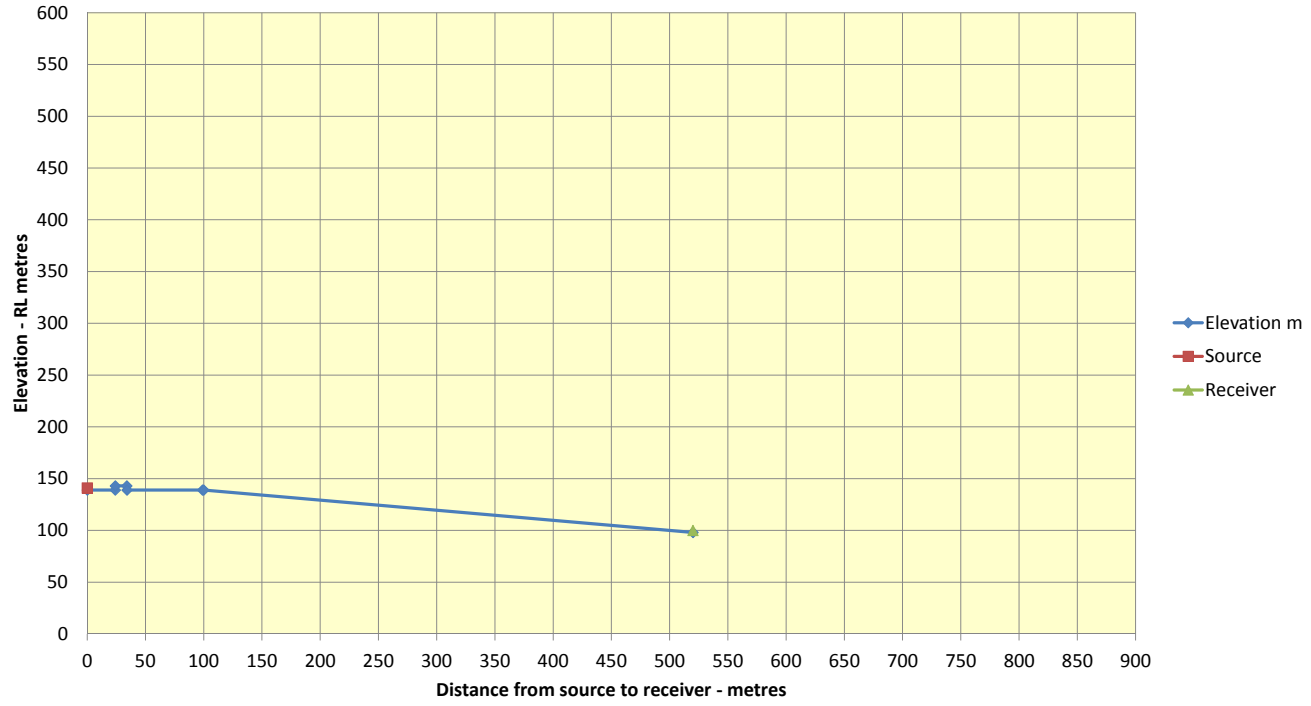


Figure 23: Wollongong Coal Russell Vale - Workshop Noise Barrier Calculations
Simplified cross-section from Door 1 South to Receiver C3 with No Barrier
with Elevation & distance ~ same scale

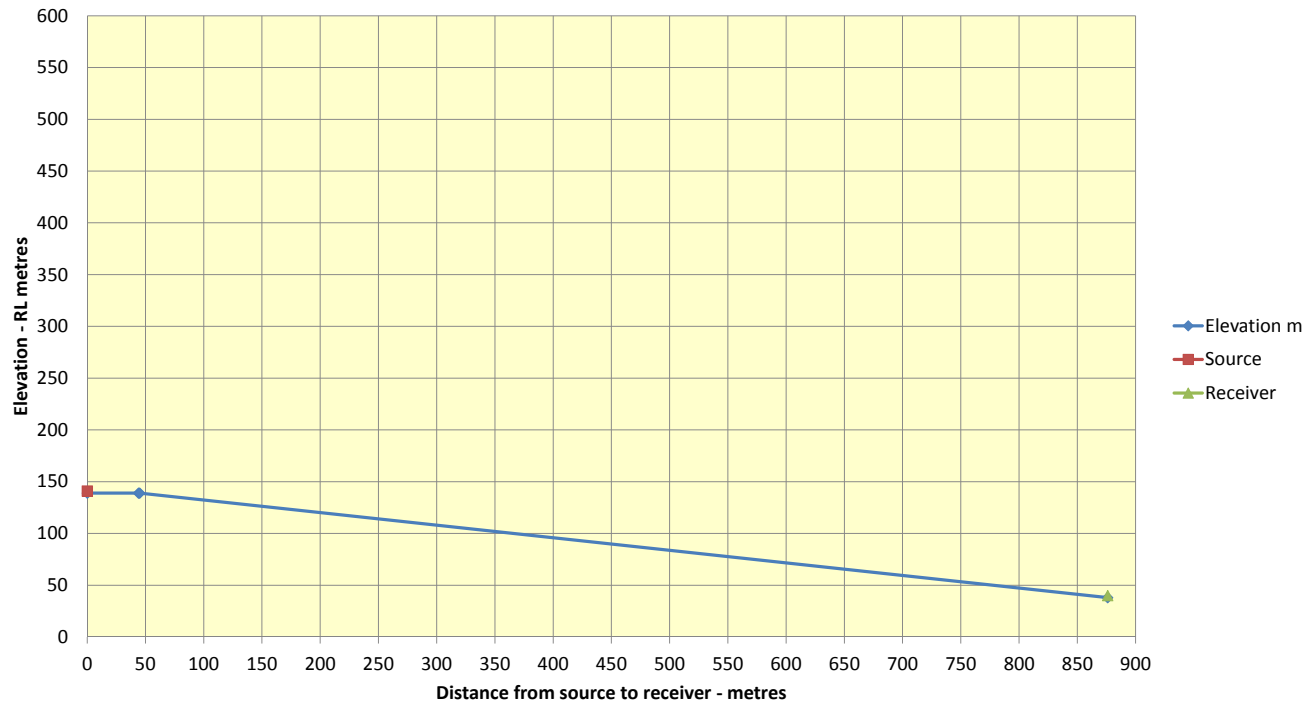
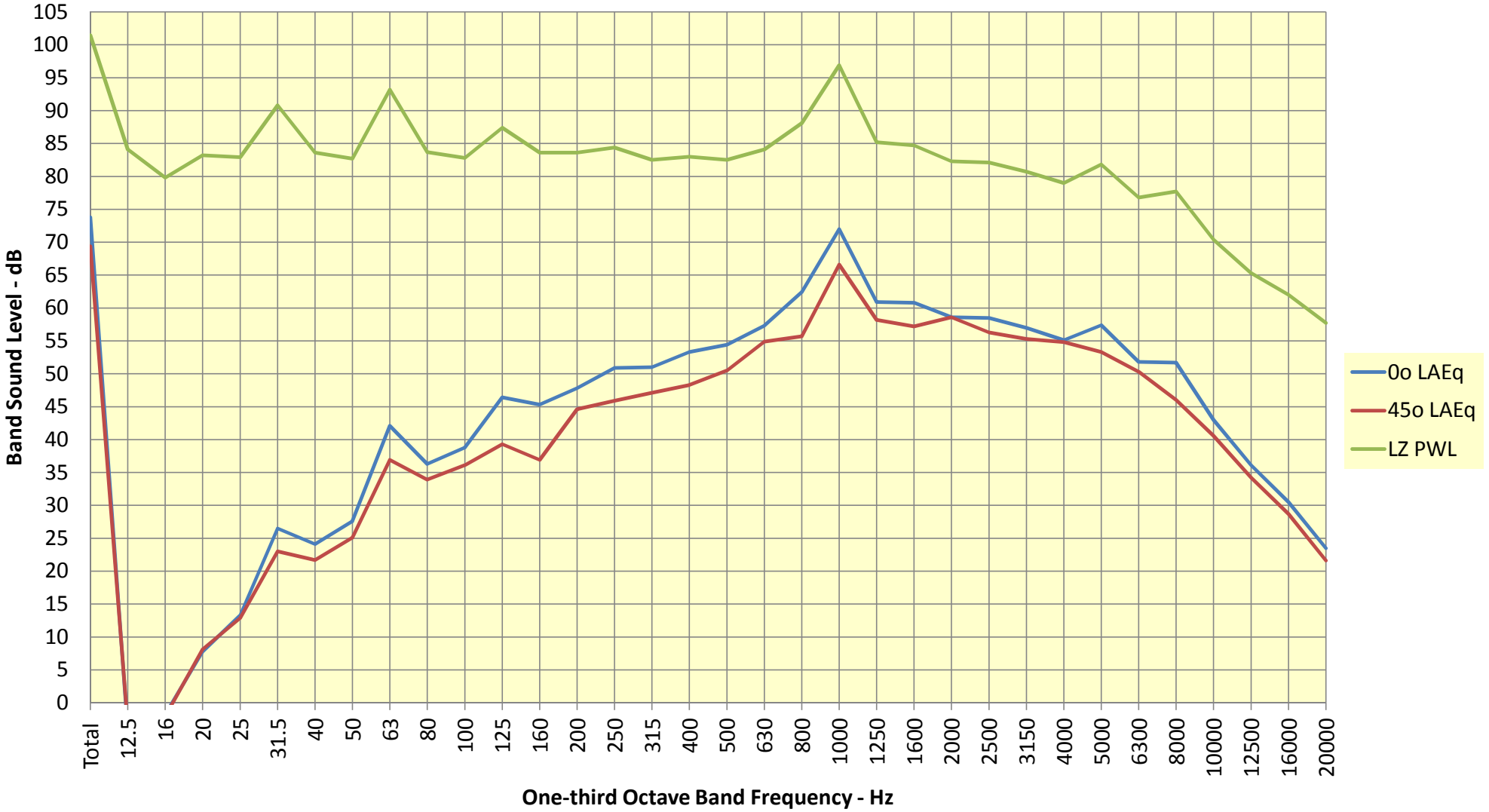


Table 1: Wollongong Coal Limited - Russell Vale
Tieman Forklift Reverse Alarm Sound Levels
Measured 10 April 2014

Item	Sound Pressure Levels at Location - dBA				Sound Power Level LZ dB
	7m to rear at 0° (F40)		7m to rear at 45° (F41)		
	LAeq,35s	LAMax,35s	LAeq,30s	LAMax,30s	
Total A	74	77	69	72	101
Total C	76	78	71	75	
One-third Octave Band Frequency Level LAEq					Lzeq
12.5	-4	4	-3	4	84
16	-2	5	-2	4	80
20	8	17	8	14	83
25	13	24	13	19	83
31.5	27	34	23	27	91
40	24	31	22	29	84
50	28	37	25	31	83
63	42	47	37	48	93
80	36	43	34	42	84
100	39	43	36	39	83
125	46	50	39	43	87
160	45	49	37	45	84
200	48	54	45	47	84
250	51	57	46	52	84
315	51	55	47	53	83
400	53	59	48	55	83
500	54	58	51	55	83
630	57	60	55	58	84
800	62	65	56	58	88
1000	72	76	67	71	97
1250	61	65	58	60	85
1600	61	63	57	59	85
2000	59	62	59	62	82
2500	59	61	56	58	82
3150	57	61	55	58	81
4000	55	59	55	59	79
5000	57	63	53	59	82
6300	52	57	50	55	77
8000	52	58	46	52	78
10000	43	52	41	51	70
12500	36	50	34	48	65
16000	31	46	29	43	62
20000	24	40	22	37	58

Figure 24: Wollongong Coal Russell Vale - Sound levels of Tieman Forklift at high idle with reverse alarm operating measured at 7m to rear at 0º and 45º.
Graph shows A-weighted sound pressure levels and Z-weighted sound power levels



- Wind 3m/s away from receivers, neutral atmosphere (lapse rate = 0°C / 100m);
- Wind calm, medium inversion atmosphere lapse rate = +3°C / 100m.

The results are shown in Table 2. Results for each meteorological condition are shown together. The effect of no barrier, then adding a 3m high and 4m barrier are compared for each case. The columns in the table are for each of the 10 source to receiver combinations selected. If a higher sound level source of the same type was used, then the results would be higher by the difference in sound level, for example a 111 dBA sound power level diesel engine source would have 10 dB higher levels than shown in the table. This would be the same as 84 dBA at 7m sound pressure level.

If the licence condition is for a total site contribution sound level of 37 dBA at each receiver, then the preferred acceptable sound level from a source such as the forklift would be 22 dBA. This is below the level which would add to the total from most other sources at the site – it would require 31 sources of a received level of 22 dBA to add to a total of more than 37 dBA. If the calculated level is above this the cell is shaded pink and font coloured red. If the calculated result is greater than 27 dBA, then it could add to other sounds from the site and cause the 37 dBA to be exceeded. In this case the cell is shaded pink but the font is bold red. This shading helps to identify if the received sound level is potentially an issue for achievement of licence compliance.

With calm conditions the received sound levels at all receivers are less than 22 dBA, except for the centre door to receiver C1. This is not considered significant. So for calm conditions a barrier would not be needed. The effect of the 3m high barrier ranges from 4 to 8 dB reduction for those locations where the open shed has no effect. Changing the height from 3m to 4m adds a further 0 to 5 dB attenuation, depending on the receiver.

The meteorological condition Hatch prefers to use for assessment of potential for annoyance is wind of 2m/s towards the receiver and an inversion atmospheric condition of +3°C/100m lapse rate. In this case the results are the highest of those calculated.

The highest received sound level at any of the receivers is 34 dBA (for Door 2 Centre to C1) and all source combinations have received sound levels that are greater than 25 dBA for the no barrier case. Of these, 7 source-receiver combinations are above 27 dBA. Adding a 3m high barrier at the eastern edge of the yard reduces the received sound levels by 5 to 9 dB and causes the maximum level to be reduced to 26 dBA at Receiver C1.

These calculations indicate that for this source, the barrier can be effective in assisting achievement of compliance. Some form of reduction is required if there are enhancing propagation conditions occurring. Closing the door where the noise was occurring would achieve a greater reduction. It may be more cost effective to install an exhaust gas ventilation collection system to discharge the gases from test vehicles out of the building than installing a barrier. The barrier would also be more effective for times when the mobile equipment was operating in the yard. In any case, the existing walls and door damage should be repaired to achieve improved performance.

Table 2: Wollongong Coal Limited - Russell Vale: Site Noise Management

Effect of a noise barrier at the eastern side of the workshop embankement, 46m away at South end, 39m at centre and 45m at North end

Comparison of Model Results for Tieman Forklift at High-revs with Reverse Alarm on measured at 7m to rear 74 dBA for 0, 3m & 4m high

For Total Site objective <37dBA seek individual contribution <22 for no addition caused to assess significance of barrier or not

Wind calm, Neutral atmosphere

Source to Receiver Item	D1SRC5	D2C RC5	D1S RC1	D2C RC1	D1S RC2	D2C RC2	D1S RC3	D2C RC3	D1S RR2	D2C RR2
Section No. With No Barrier	1	2	3	4	5	6	7	8	9	10
Received SPL dBA	17	17	19	24	17	22	15	15	16	16
Section No. With 3m barrier	11	12	13	14	15	16	17	18	19	20
Received SPL dBA	17	19	13	17	12	14	11	11	10	10
Section No. With 4m barrier	21	22	23	24	25	26	27	28	29	30
Received SPL dBA	17	19	13	17	12	15	6	7	7	7
Reduction 3m barrier	-0.4	-2.2	5.8	7	4.7	8	3.9	3.9	5.4	5.9
Reduction 4m barrier	-0.4	-2.2	5.9	7.3	4.9	6.3	8.8	8.4	8.9	9.3
Difference 3 to 4m	0	0	0.1	0.3	0.2	-1.7	4.9	4.5	3.5	3.4
Distance to receiver	520	535	453	466	498	508	876	882	790	781

Wind 2m/s, +3oc lapse atmosphere

Source to Receiver Item	D1SRC5	D2C RC5	D1S RC1	D2C RC1	D1S RC2	D2C RC2	D1S RC3	D2C RC3	D1S RR2	D2C RR2
Section No. With No Barrier	1	2	3	4	5	6	7	8	9	10
Received SPL dBA	25	26	27	34	25	31	29	29	29	29
Section No. With 3m barrier	11	12	13	14	15	16	17	18	19	20
Received SPL dBA	26	28	21	26	19	22	23	23	21	21
Section No. With 4m barrier	21	22	23	24	25	26	27	28	29	30
Received SPL dBA	26	28	21	25	19	24	17	17	17	17
Reduction 3m barrier	-0.3	-2.6	6.4	8.4	5.3	8.7	6.4	6.3	7.4	7.9
Reduction 4m barrier	-0.3	-2.6	6.5	9.1	5.3	7	12.6	12.3	11.9	12.3
Difference 3 to 4m	0	0	0.1	0.7	0	-1.7	6.2	6	4.5	4.4
Distance to receiver	520	535	453	466	498	508	876	882	790	781

Wind 3m/s, Neutral atmosphere

Source to Receiver Item	D1SRC5	D2C RC5	D1S RC1	D2C RC1	D1S RC2	D2C RC2	D1S RC3	D2C RC3	D1S RR2	D2C RR2
Section No. With No Barrier	1	2	3	4	5	6	7	8	9	10
Received SPL dBA	25	25	27	33	24	30	28	29	28	28
Section No. With 3m barrier	11	12	13	14	15	16	17	18	19	20
Received SPL dBA	25	28	20	25	19	22	22	22	20	20
Section No. With 4m barrier	21	22	23	24	25	26	27	28	29	30
Received SPL dBA	25	28	20	24	19	23	16	16	16	16
Reduction 3m barrier	-0.4	-2.7	6.3	8.3	5.3	8.6	6.3	6.3	7.2	7.7
Reduction 4m barrier	-0.4	-2.7	6.4	9	5.4	6.9	12.5	12.3	11.6	12
Difference 3 to 4m	0	0	0.1	0.7	0.1	-1.7	6.2	6	4.4	4.3
Distance to receiver	520	535	453	466	498	508	876	882	790	781

Wind 3m/s, Opposite direction Neutral atmosphere

Source to Receiver Item	D1SRC5	D2C RC5	D1S RC1	D2C RC1	D1S RC2	D2C RC2	D1S RC3	D2C RC3	D1S RR2	D2C RR2
Section No. With No Barrier	1	2	3	4	5	6	7	8	9	10
Received SPL dBA	13	12	15	20	13	17	11	11	11	12
Section No. With 3m barrier	11	12	13	14	15	16	17	18	19	20
Received SPL dBA	13	15	10	13	8	10	8	8	6	7
Section No. With 4m barrier	21	22	23	24	25	26	27	28	29	30
Received SPL dBA	13	15	10	13	8	12	3	3	3	3
Reduction 3m barrier	-0.3	-2.4	5.4	6.8	4.6	7.5	3.4	3.4	5	5.4
Reduction 4m barrier	-0.3	-2.4	5.7	7.1	4.8	5.8	8.3	7.9	8.5	8.9
Difference 3 to 4m	0	0	0.3	0.3	0.2	-1.7	4.9	4.5	3.5	3.5
Distance to receiver	520	535	453	466	498	508	876	882	790	781

Wind 0m/s, +3oC Lapse atmosphere

Source to Receiver Item	D1SRC5	D2C RC5	D1S RC1	D2C RC1	D1S RC2	D2C RC2	D1S RC3	D2C RC3	D1S RR2	D2C RR2
Section No. With No Barrier	1	2	3	4	5	6	7	8	9	10
Received SPL dBA	20	20	22	28	20	25	20	21	20	20
Section No. With 3m barrier	11	12	13	14	15	16	17	18	19	20
Received SPL dBA	20	22	16	20	15	17	16	16	14	14
Section No. With 4m barrier	21	22	23	24	25	26	27	28	29	30
Received SPL dBA	20	22	16	20	15	19	10	11	10	10
Reduction 3m barrier	-0.4	-2.5	6.1	7.3	5.1	8.4	4.6	4.8	5.6	6
Reduction 4m barrier	-0.4	-2.5	6.2	7.7	5.1	6.6	10.1	10	9.5	9.8
Difference 3 to 4m	0	0	0.1	0.4	0	-1.8	5.5	5.2	3.9	3.8
Distance to receiver	520	535	453	466	498	508	876	882	790	781

4. Barrier and wall improvement material

Suitable material for a barrier has to have an attenuation through it that is at least 10 dB greater than the attenuation from diffraction over it. The maximum diffraction attenuation is 13 dB. Therefore a material with an attenuation of at least 23 dB in the 500 Hz band is recommended. This could be achieved with the following materials:

- 1.2mm steel sheet
- 25mm solid timber or plywood
- 8 kg/m2 loaded vinyl blanket

Other materials such as concrete, Speedpanel (steel/concrete/steel sandwich), or autoclaved aerated concrete would also be suitable.

If sustained levels of high noise activities were to occur inside the workshop with the doors closed, improved wall attenuation materials may be required. This could be assessed but would require information on the expected internal sound levels and times of operation. Advice can be provided on this if required.

5. Summary and findings

The sound levels form the reverse alarm of the Tieman forklift used in the workshop are up to 74 dBA at 7m to the rear with the reverse alarm operating.

If this operates in the workshop doorway or on the yard area to the east of the workshop, sound levels could cause an increase in total sound levels from the site at residential receivers during enhancing propagation.

The eastern wall of the workshop building currently has damaged sections, especially around some doorways, that will allow increased noise emissions from the building. It is recommended that these be repaired so that when the doors are closed, there is reduced noise leakage from the building.

Closing the doorway would be expected to reduce the received sound level by at least 12 dB. This would make the received sound level below the recommended maximum of 22 dBA at any receiver.

Placing a noise barrier on the eastern side of the workshop yard would reduce noise emissions from the area to the residential receivers. In worst case enhanced noise propagation conditions, this could help to reduce the contribution of noise from this area to the total sound levels at receivers. The calculations provided allow consideration of a range of scenarios in assisting to identify the benefits of a barrier. Relatively simple materials could be used for the construction of a barrier. A minimum height of 3m is recommended

Procuring quieter mobile equipment would also assist in reducing noise emissions from the site.

Please don’t hesitate to contact me if there are any questions

Colin Tickell

Appendix F: Met. data for Bellambi and University of Wollongong

Table 4.3 Summary of Existing Road Noise Levels

Location	Leq, 15hr dB(A)	Leq, 1hr Day, dB(A)
63 Bellambi Lane	65	67
99 Bellambi Lane	63	64

4.3 METEOROLOGICAL CONDITIONS

Noise propagation over distance can be significantly affected by the prevailing weather conditions. Source to receiver winds, the presence of temperature inversions and drainage flow effects can enhance received noise levels. To account for these phenomena, the INP specifies meteorological analysis procedures to determine the prevalent weather conditions that enhance noise propagation in a particular area, with a view to determining whether they can be described as a feature of the project area.

Wind

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

The prevailing wind directions in the area have been determined in accordance with Section 5 of the INP. The prevailing wind directions during 1 January 2008 to 3 September 2009 for Wollongong (Weather Station 68241), NSW have been analysed. The INP requires that winds below 3m/s with an occurrence greater than 30 per cent of the time be assessed. The results of this analysis shown in *Table 4.4* indicate there are no prevailing winds.

Table 4.4 INP Prevailing Wind Analysis Summary

DAYTIME					
Period	**Calm**	**Wind Direction**	**0.5 to 2 m/s**	**2 to 3 m/s**	**0.5 to 3 m/s**
Summer	0.4%	ESE±45	1.0%	2.8%	3.8%
Autumn	1.8%	ESE±45	1.8%	4.2%	6.0%
Winter	1.2%	WNW±45	1.8%	3.4%	5.1%
Spring	0.7%	NNE±45	1.1%	3.0%	4.0%
EVENING					
Period	**Calm**	**Wind Direction**	**0.5 to 2 m/s**	**2 to 3 m/s**	**0.5 to 3 m/s**
Summer	0.8%	NNW±45	2.0%	2.8%	4.8%
Autumn	3.0%	WNW±45	4.6%	12.6%	17.1%
Winter	1.4%	W±45	4.6%	11.0%	15.6%
Spring	2.6%	NW±45	2.6%	5.8%	8.3%
NIGHT TIME					
Period	**Calm**	**Wind Direction**	**0.5 to 2 m/s**	**2 to 3 m/s**	**0.5 to 3 m/s**
Summer	4.3%	W±45	5.5%	8.6%	14.0%
Autumn	2.6%	W±45	5.6%	13.2%	18.8%
Winter	1.6%	W±45	5.0%	9.1%	14.0%
Spring	4.1%	W±45	4.4%	8.9%	13.3%

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. For a temperature inversion to be considered as significant it needs to occur for approximately 30 percent of the total night-time (i.e. the evening and night time periods) during winter, or approximately two nights per week. Temperature inversions are generally determined based on the occurrence of atmospheric stability classes, with moderate and strong inversions corresponding to atmospheric stability categories F and G respectively.

Meteorological data was assessed in accordance with INP methodology to determine the likelihood of temperature inversions during the night-time period. These results are presented in *Table 4.5*..

Table 4.5 ***Inversion Analysis Summary – Frequency of Stability Classes during Winter Evening and Night time Periods***

Pasquill-Gifford Stability Class	Frequency of Stability Class [1]
A	0.0%
B	0.0%
C	0.0%
D	70.8%
E	15.1%
F	10.7%
G	3.4%
F & G	14.1%

This assessment found that the frequency of occurrence of F and G atmospheric stability categories is less than 30 per cent of the winter evening and night time periods. Therefore, the effects of temperature inversions have not been considered in this NIA.

Drainage Flow

In areas where temperature inversions are a feature of the meteorological environment, drainage flow winds may occur. Drainage flows may occur when a development is at a higher altitude than a residential receiver with no intervening topography. When source to receiver winds occur during a temperature inversion, noise levels may be increased due the focusing of sound waves at the receiver. Drainage flow winds are not considered to be applicable for this assessment as temperature inversions are not considered to be a feature of the area.

Monthly Climate Statistics for 'BELLAMBI AWS' [068228]
Created on [16 Jul 2014 13:34:47 GMT+00:00]

068228 BELLAMBI AWS
Commenced: 1988
Last Record: 2014
Latitude: 34.37 Degrees South
Longitude: 150.93 Degrees East
Elevation: 10 m
State: NSW

Statistic Element	January	February	March	April	May	June	July	August	September	October	November	December	Annual	Number of Years	Start Year	End Year
Mean maximum temperature (Degrees C) for years 1997 to 2013	24.9	24.8	24	22.1	19.7	17.6	16.8	18	20.1	21.4	22.1	23.8	21.3	16	1997	2013
Highest temperature (Degrees C) for years 1997 to 2013	43.7	39.5	37.1	32.2	28	24.4	23.9	26.7	33	37.7	39.4	38.3	43.7	16	1997	2013
Date of Highest temperature for years 1997 to 2013	1-Jan-06	5-Feb-11	9-Mar-04	3-Apr-05	20-May-98	14-Jun-04	4-Jul-04	23-Aug-12	28-Sep-08	13-Oct-04	22-Nov-09	1-Dec-04	1-Jan-06	N/A	1997	2013
Lowest maximum temperature (Degrees C) for years 1997 to 2013	19.6	18	17.9	15.6	13	12.7	10.8	11.7	13	14.3	16	16.8	10.8	16	1997	2013
Date of Lowest maximum temperature for years 1997 to 2013	3-Jan-11	1-Feb-12	21-Mar-08	29-Apr-09	30-May-00	11-Jun-06	28-Jul-08	22-Aug-08	9-Sep-11	3-Oct-09	19-Nov-01	4-Dec-11	28-Jul-08	N/A	1997	2013
Decile 1 maximum temperature (Degrees C) for years 1997 to 2013	22	21.8	20.9	19	17	15.1	14.5	15	16	17	18.1	20		16	1997	2013
Decile 9 maximum temperature (Degrees C) for years 1997 to 2013	27.4	27.4	26.7	25	22.7	20.4	19.4	21.2	25	26.7	26.2	28		16	1997	2013
Mean number of days >= 30 Degrees C for years 1997 to 2013	1.9	1.3	0.9	0.2	0	0	0	0	0.6	1.8	1.3	1.9	9.9	16	1997	2013
Mean number of days >= 35 Degrees C for years 1997 to 2013	0.4	0.3	0.2	0	0	0	0	0	0	0.2	0.4	0.4	1.9	16	1997	2013
Mean number of days >= 40 Degrees C for years 1997 to 2013	0.3	0	0	0	0	0	0	0	0	0	0	0	0.3	16	1997	2013
Mean minimum temperature (Degrees C) for years 1997 to 2013	19	19.2	18.1	15.5	13	11	10	10.5	12.4	13.9	15.7	17.4	14.6	16	1997	2013
Lowest temperature (Degrees C) for years 1997 to 2013	12.8	13.1	11.8	9	6	5.4	4.1	5.7	6.2	6.1	8.9	10.8	4.1	16	1997	2013
Date of Lowest temperature for years 1997 to 2013	19-Jan-10	29-Feb-08	31-Mar-08	29-Apr-08	25-May-98	30-Jun-10	17-Jul-07	19-Aug-08	1-Sep-12	12-Oct-12	16-Nov-06	5-Dec-11	17-Jul-07	N/A	1997	2013
Highest minimum temperature (Degrees C) for years 1997 to 2013	23.6	24.5	23	21	19	17	15.2	16.5	18.9	21	21.1	22	24.5	16	1997	2013
Date of Highest minimum temperature for years 1997 to 2013	11-Jan-06	6-Feb-11	23-Mar-98	7-Apr-98	4-May-00	8-Jun-01	12-Jul-03	31-Aug-07	20-Sep-06	13-Oct-04	21-Nov-09	21-Dec-01	6-Feb-11	N/A	1997	2013
Decile 1 minimum temperature (Degrees C) for years 1997 to 2013	16.2	16.6	15.3	13	10	8.2	7.7	8	9.4	10.7	12.6	14.8		16	1997	2013
Decile 9 minimum temperature (Degrees C) for years 1997 to 2013	21.1	21.9	20.8	18.2	16	13.9	12.4	13.2	15.9	17	18.5	20		16	1997	2013
Mean number of days <= 2 Degrees C for years 1997 to 2013	0	0	0	0	0	0	0	0	0	0	0	0	0	16	1997	2013
Mean number of days <= 0 Degrees C for years 1997 to 2013	0	0	0	0	0	0	0	0	0	0	0	0	0	16	1997	2013
Mean daily ground minimum temperature Degrees C for years null to null																
Lowest ground temperature Degrees C for years null to null																
Date of Lowest ground temperature for years null to null														N/A		
Mean number of days ground min. temp. <= -1 Degrees C for years null to null																
Mean rainfall (mm) for years 1997 to 2014	72.6	145.3	106.6	105.1	88.2	112.7	85	77	59.1	77.3	100.7	72.2	1101.1	17	1997	2014
Highest rainfall (mm) for years 1997 to 2014	241	355.2	290.4	304.6	423.4	345.8	223	682	180.6	219.4	253.6	159.6	1657	17	1997	2014
Date of Highest rainfall for years 1997 to 2014	2013	2008	2014	2004	2003	2007	2011	1998	2006	2004	2013	2007	1998	N/A	1997	2014
Lowest rainfall (mm) for years 1997 to 2014	16.8	18.4	21.8	0	4	18	22.4	2.4	6.4	8.4	9.8	14.6	770	17	1997	2014
Date of Lowest rainfall for years 1997 to 2014	2009	2000	2009	1997	2008	2002	2003	2005	2002	2013	2002	2005	2000	N/A	1997	2014
Decile 1 monthly rainfall (mm) for years 1997 to 2014	25.2	27.4	34.6	10.1	8.2	32.5	29.5	5	12.7	17.5	29.9	34	797.8	17	1997	2014
Decile 5 (median) monthly rainfall (mm) for years 1997 to 2014	57.4	114.4	97.2	102.9	65	91.5	61	35.6	59.4	65.2	97	76	1136.2	17	1997	2014
Decile 9 monthly rainfall (mm) for years 1997 to 2014	126.4	300.5	239.2	192.5	157.3	209.6	188.3	92.3	101.5	157.8	182	126.6	1523.8	17	1997	2014
Highest daily rainfall (mm) for years 1997 to 2014	139	117.4	113	179.2	105.6	71.4	82.6	240	64.8	100.4	72	71.6	240	17	1997	2014
Date of Highest daily rainfall for years 1997 to 2014	29-Jan-13	5-Feb-08	25-Mar-14	5-Apr-04	14-May-03	26-Jun-13	22-Jul-11	18-Aug-98	25-Sep-11	15-Oct-11	2-Nov-10	26-Dec-13	18-Aug-98	N/A	1997	2014
Mean number of days of rain for years 1800 to 3000	11.8	13.4	13.6	10.9	9.6	10.4	9.4	7.8	9	11.2	13.1	11.8	132	17	1997	2014
Mean number of days of rain >= 1 mm for years 1997 to 2014	7.9	9.4	9.2	8.6	6.4	8.1	6.6	5.2	6.4	7.6	9.6	8.2	93.2	17	1997	2014
Mean number of days of rain >= 10 mm for years 1997 to 2014	1.9	3.8	3.1	3.1	2.3	3.2	2.2	1.8	1.5	2.2	3.5	2	30.6	17	1997	2014
Mean number of days of rain >= 25 mm for years 1997 to 2014	0.5	1.9	1.1	0.9	0.9	1.4	0.8	0.7	0.6	0.9	0.9	0.7	11.3	17	1997	2014
Mean daily wind run (km) for years 2003 to 2013	386	390	384	348	333	365	363	373	393	383	394	402	376	10	2003	2013
Maximum wind gust speed (km/h) for years 2003 to 2013	102	83	89	89	94	109	111	141	126	113	104	91	141	10	2003	2013
Date of Maximum wind gust speed for years 2003 to 2013	23-Jan-10	24-Feb-13	23-Mar-05	6-Apr-06	4-May-13	26-Jun-08	2-Jul-08	24-Aug-03	5-Sep-10	31-Oct-03	1-Nov-03	13-Dec-08	24-Aug-03	N/A	2003	2013
Mean daily sunshine (hours) for years null to null																
Mean daily solar exposure (MJ/(m*m)) for years 2007 to 2014														8	2007	2014
Mean number of clear days for years 2005 to 2010														3	2005	2010
Mean number of cloudy days for years 2005 to 2010														3	2005	2010
Mean daily evaporation (mm) for years null to null																
Mean 9am temperature (Degrees C) for years 1997 to 2010	21.8	21.9	20.7	19.4	16.6	14.3	13.4	14.4	16.8	18.2	18.9	20.8	18.1	14	1997	2010
Mean 9am wet bulb temperature (Degrees C) for years 1997 to 2010	19.1	19.2	17.5	15.6	13.7	10.9	9.7	10.6	12.5	14.2	16	17.6	14.7	11	1997	2010
Mean 9am dew point temperature (Degrees C) for years 1997 to 2010	16.7	17.3	15.6	12.5	9.2	6.9	5.4	5.4	8.2	10.1	13.3	14.9	11.3	13	1997	2010
Mean 9am relative humidity (%) for years 1997 to 2010	75	76	74	66	63	63	60	56	59	62	72	71	66	13	1997	2010
Mean 9am cloud cover (okas) for years 2005 to 2010														4	2005	2010
Mean 9am wind speed (km/h) for years 1997 to 2010	17	15.9	15	16.1	15.8	17	16.7	17.7	18.1	18.2	18.7	17.5	17	13	1997	2010
Mean 3pm temperature (Degrees C) for years 1997 to 2010	23.2	23.3	22.6	20.7	18.5	16.5	15.8	16.7	18.1	19.1	20.3	22.2	19.7	14	1997	2010
Mean 3pm wet bulb temperature (Degrees C) for years 1997 to 2010	19.7	20.9	18.8	17	14.2	12.2	11.3	11.9	14.1	15.4	17.2	18.4	15.9	11	1997	2010
Mean 3pm dew point temperature (Degrees C) for years 1997 to 2010	17.4	18.2	16.6	13.9	10.3	7.8	6.3	6.4	9.5	11.2	14	15.6	12.3	13	1997	2010
Mean 3pm relative humidity (%) for years 1997 to 2010	72	74	70	67	61	59	56	54	61	64	70	69	65	13	1997	2010
Mean 3pm cloud cover (oktas) for years 2005 to 2010														4	2005	2010
Mean 3pm wind speed (km/h) for years 1997 to 2010	24.5	23.9	23.7	22	20.9	21	20.7	23.6	24.8	24.7	24.6	25.4	23.3	13	1997	2010

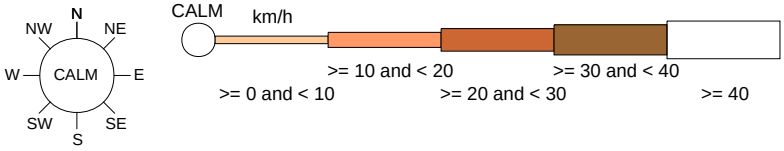
Rose of Wind direction versus Wind speed in km/h (29 Apr 1997 to 30 Sep 2010)

Custom times selected, refer to attached note for details

BELLAMBI AWS

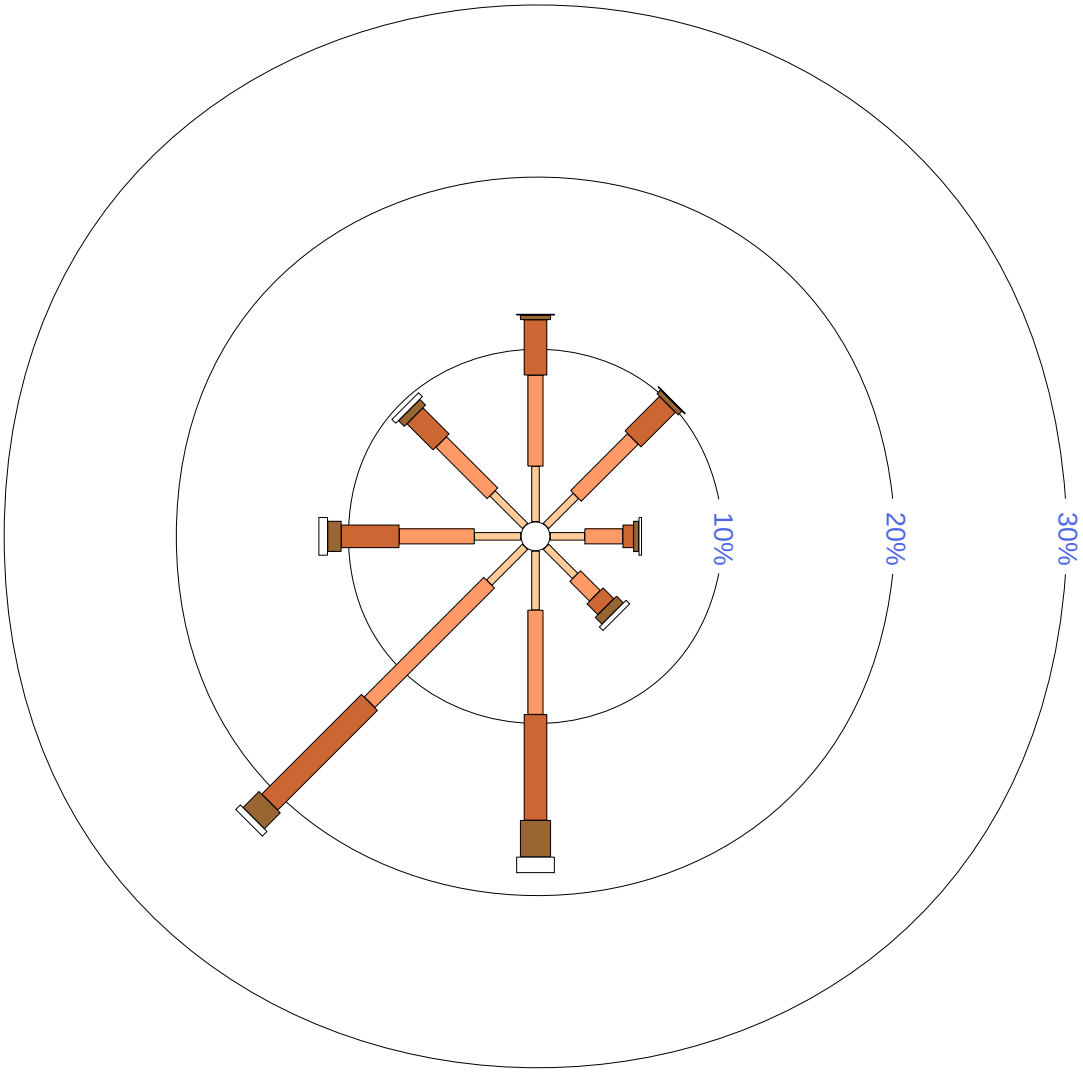
Site No: 068228 • Opened Nov 1988 • Still Open • Latitude: -34.3691° • Longitude: 150.9291° • Elevation 10m

An asterisk (*) indicates that calm is less than 0.5%.
Other important info about this analysis is available in the accompanying notes.



9 am
4778 Total Observations

Calm 4%



Rose of Wind direction versus Wind speed in km/h (29 Apr 1997 to 30 Sep 2010)

Custom times selected, refer to attached note for details

BELLAMBI AWS

Site No: 068228 • Opened Nov 1988 • Still Open • Latitude: -34.3691° • Longitude: 150.9291° • Elevation 10m

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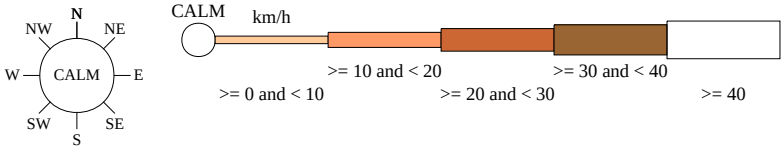
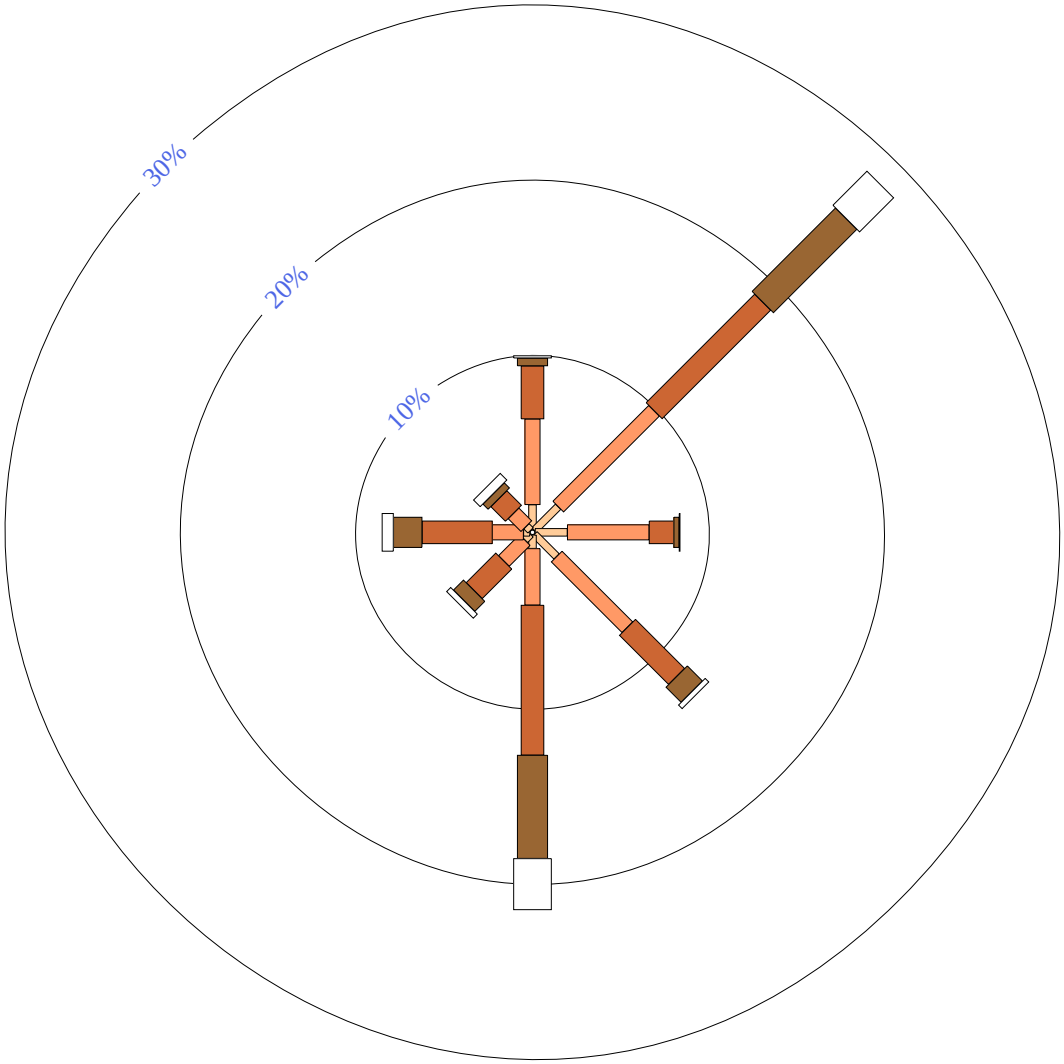


3 pm
4794 Total Observations

Calm 1%



Rose of Wind direction versus Wind speed in km/h (29 Apr 1997 to 30 Sep 2010)

Custom times selected, refer to attached note for details

BELLAMBI AWS

Site No: 068228 • Opened Nov 1988 • Still Open • Latitude: -34.3691° • Longitude: 150.9291° • Elevation 10m

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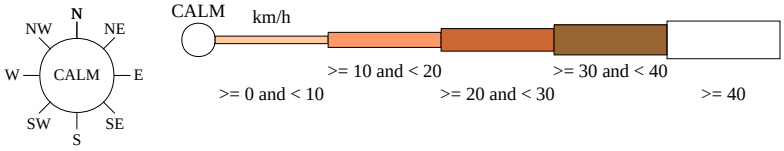
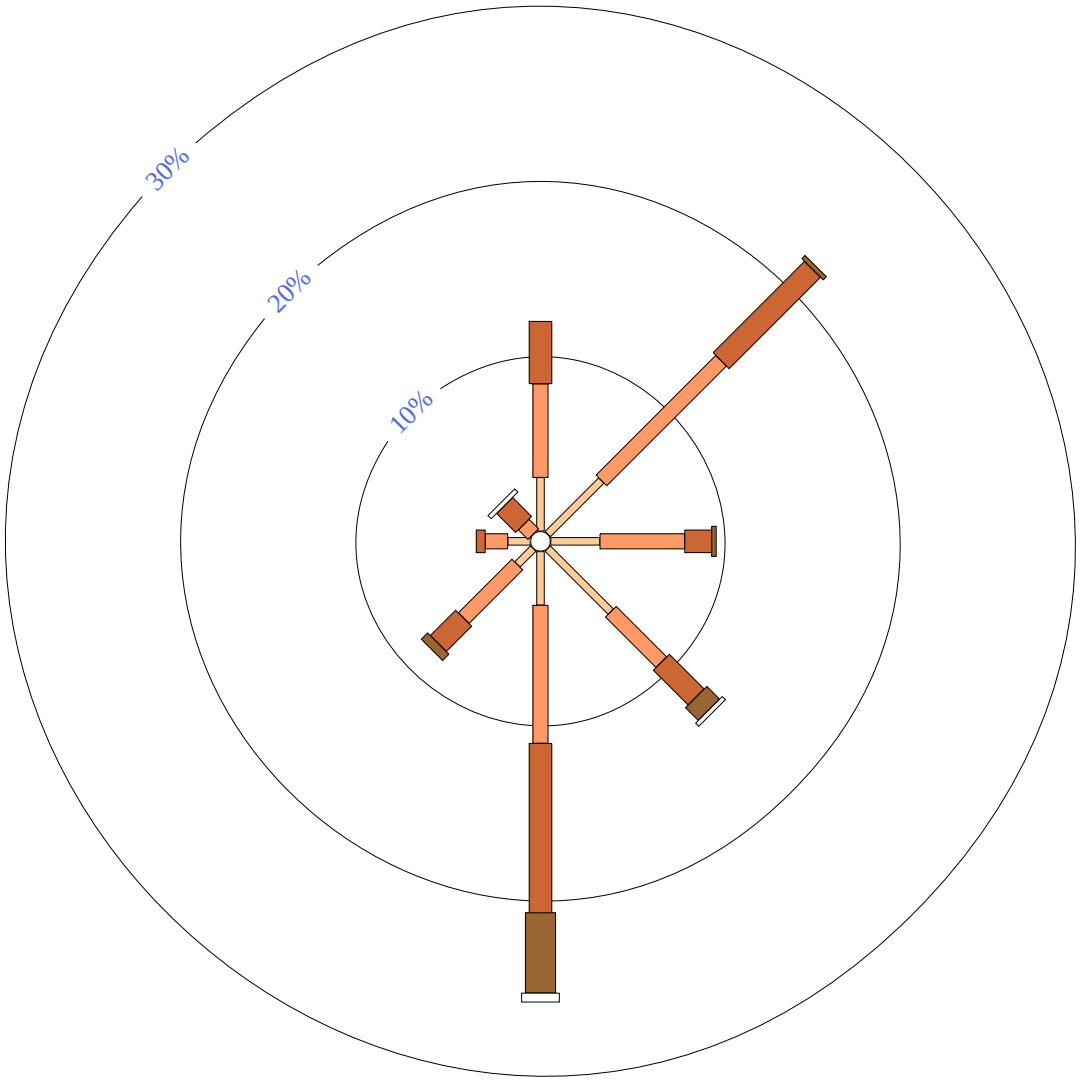


9 am Jan
387 Total Observations

Calm 3%



Rose of Wind direction versus Wind speed in km/h (29 Apr 1997 to 30 Sep 2010)

Custom times selected, refer to attached note for details

BELLAMBI AWS

Site No: 068228 • Opened Nov 1988 • Still Open • Latitude: -34.3691° • Longitude: 150.9291° • Elevation 10m

An asterisk (*) indicates that calm is less than 0.5%.
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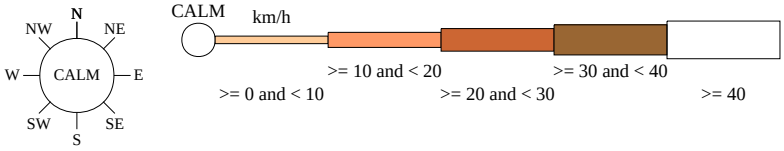
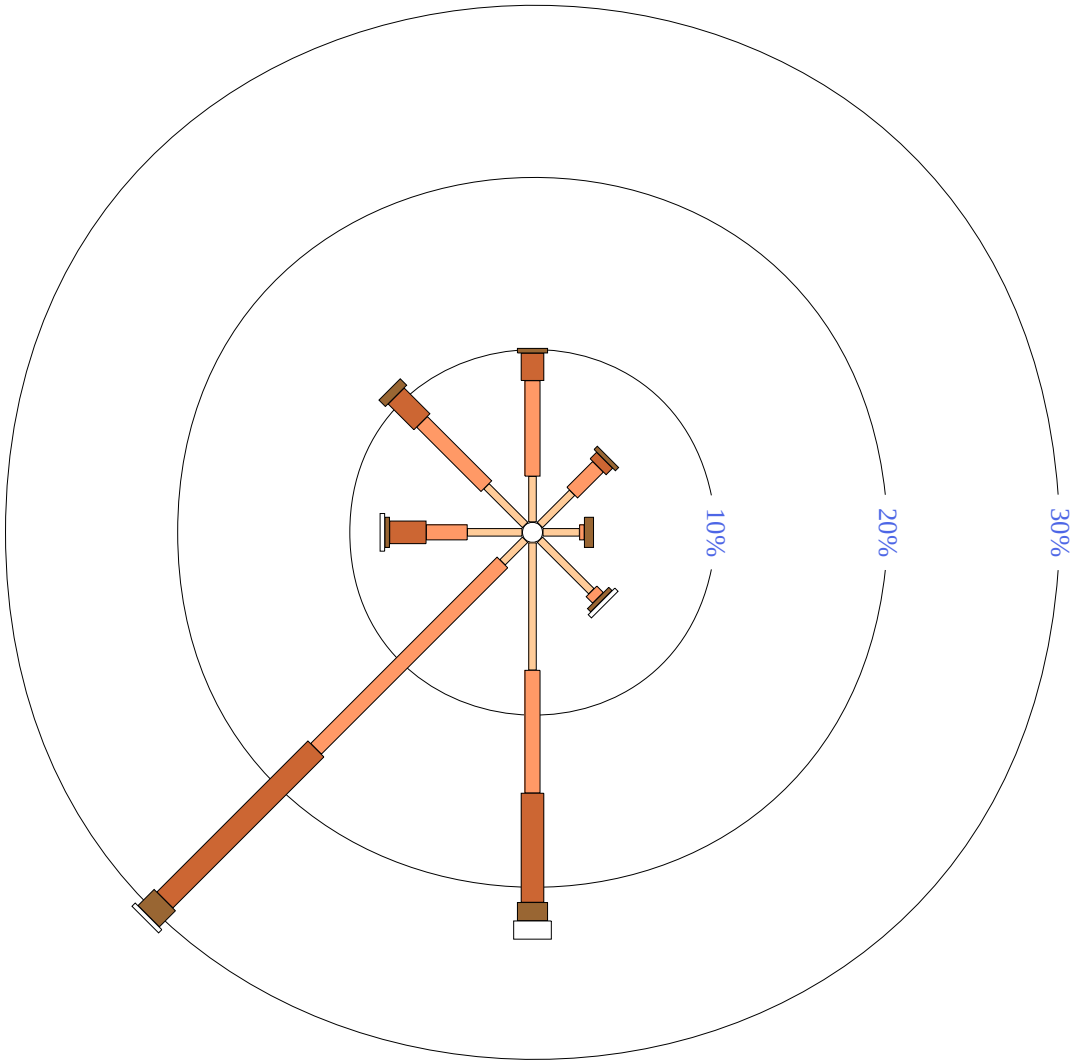


9 am Apr
379 Total Observations

Calm 3%



Rose of Wind direction versus Wind speed in km/h (29 Apr 1997 to 30 Sep 2010)

Custom times selected, refer to attached note for details

BELLAMBI AWS

Site No: 068228 • Opened Nov 1988 • Still Open • Latitude: -34.3691° • Longitude: 150.9291° • Elevation 10m

An asterisk (*) indicates that calm is less than 0.5%.
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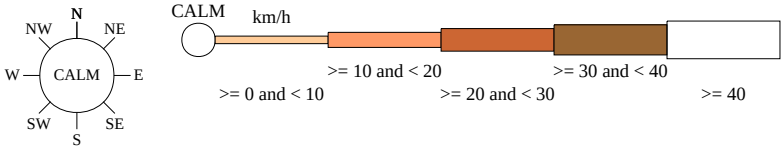
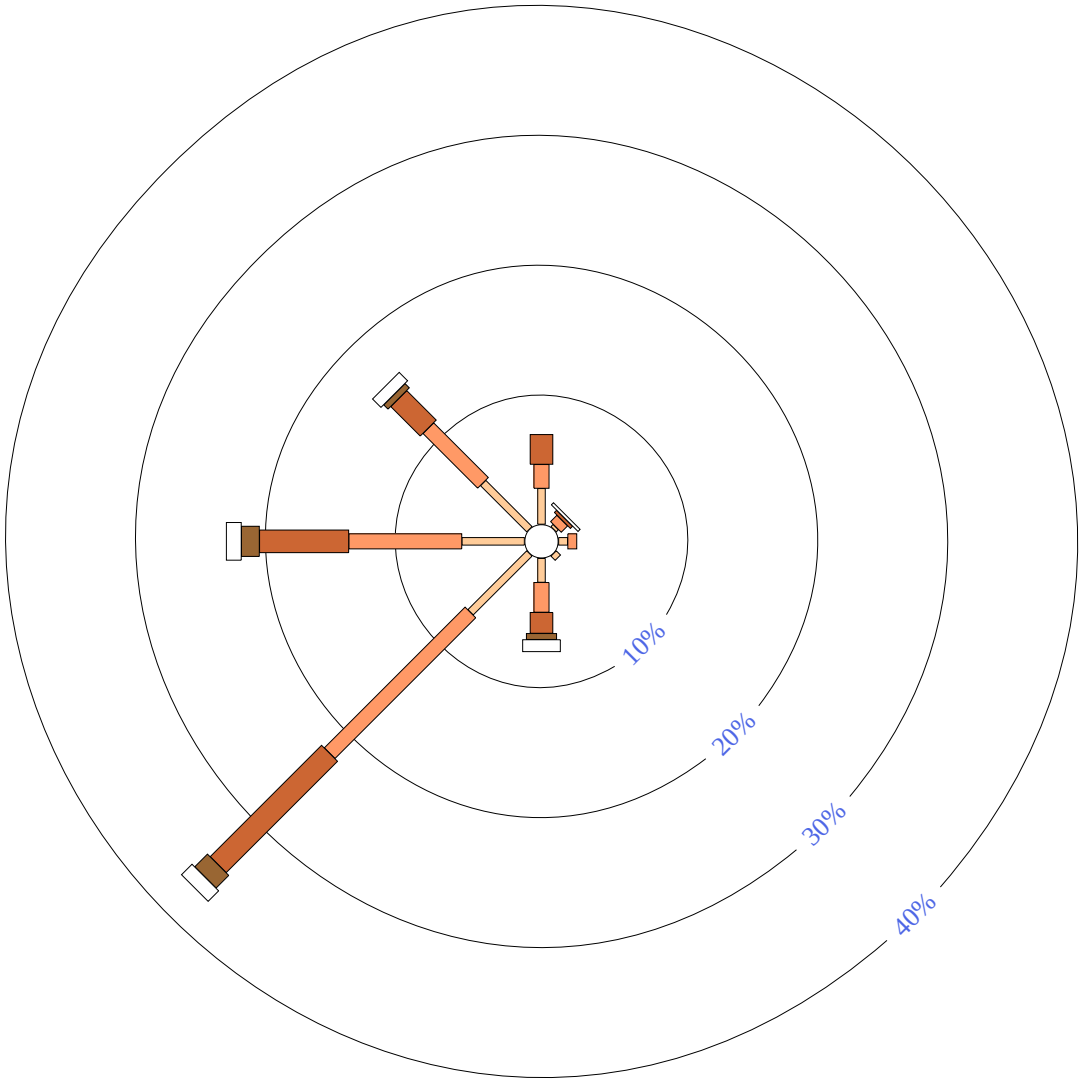


9 am Jul
430 Total Observations

Calm 7%



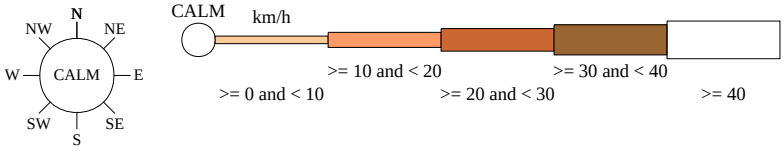
Rose of Wind direction versus Wind speed in km/h (29 Apr 1997 to 30 Sep 2010)

Custom times selected, refer to attached note for details

BELLAMBI AWS

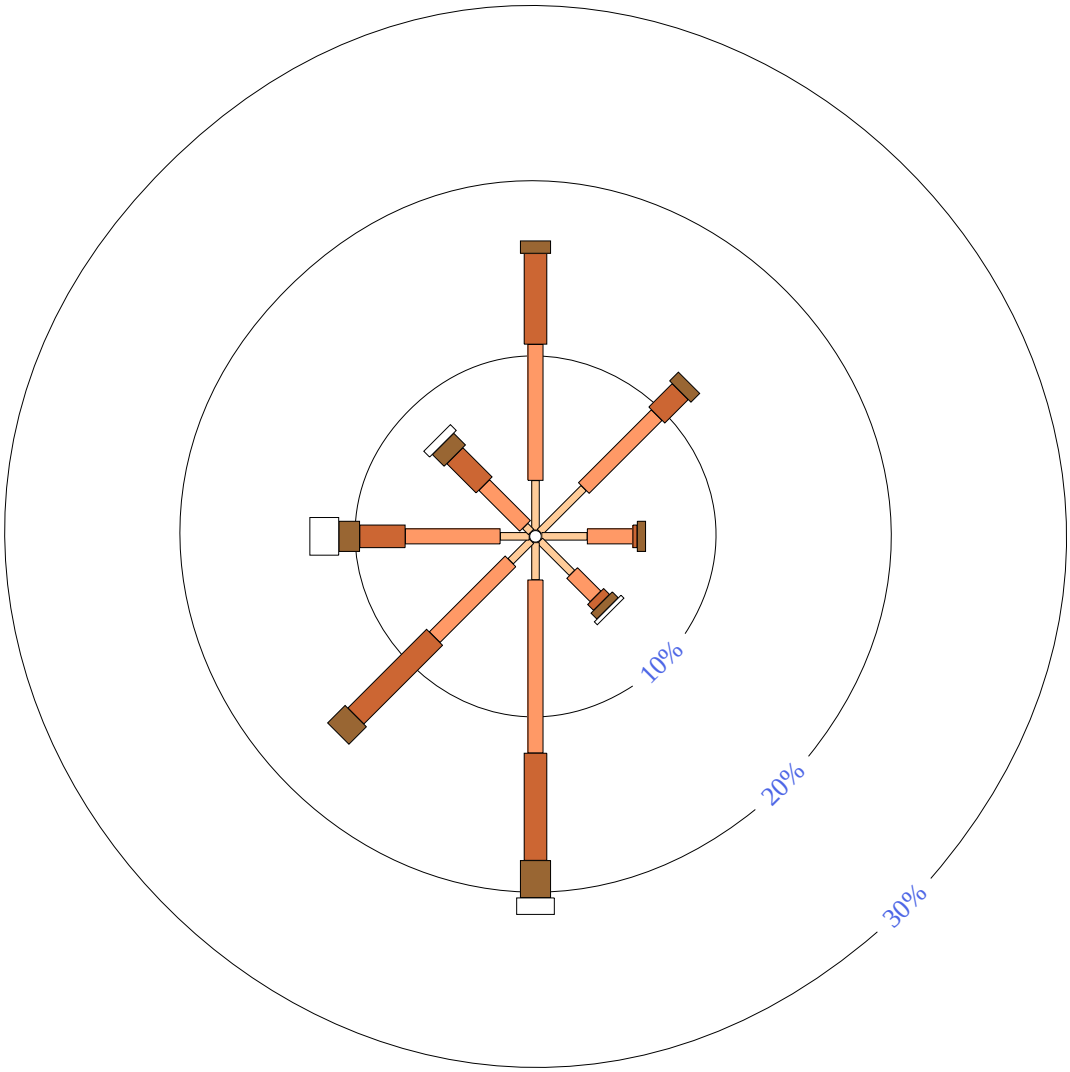
Site No: 068228 • Opened Nov 1988 • Still Open • Latitude: -34.3691° • Longitude: 150.9291° • Elevation 10m

An asterisk (*) indicates that calm is less than 0.5%.
Other important info about this analysis is available in the accompanying notes.



9 am Sep
418 Total Observations

Calm 2%



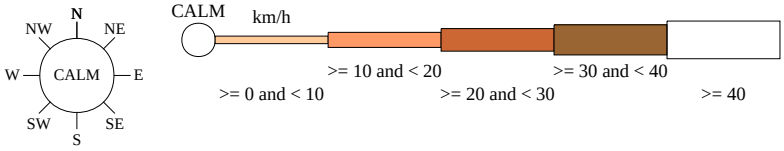
Rose of Wind direction versus Wind speed in km/h (29 Apr 1997 to 30 Sep 2010)

Custom times selected, refer to attached note for details

BELLAMBI AWS

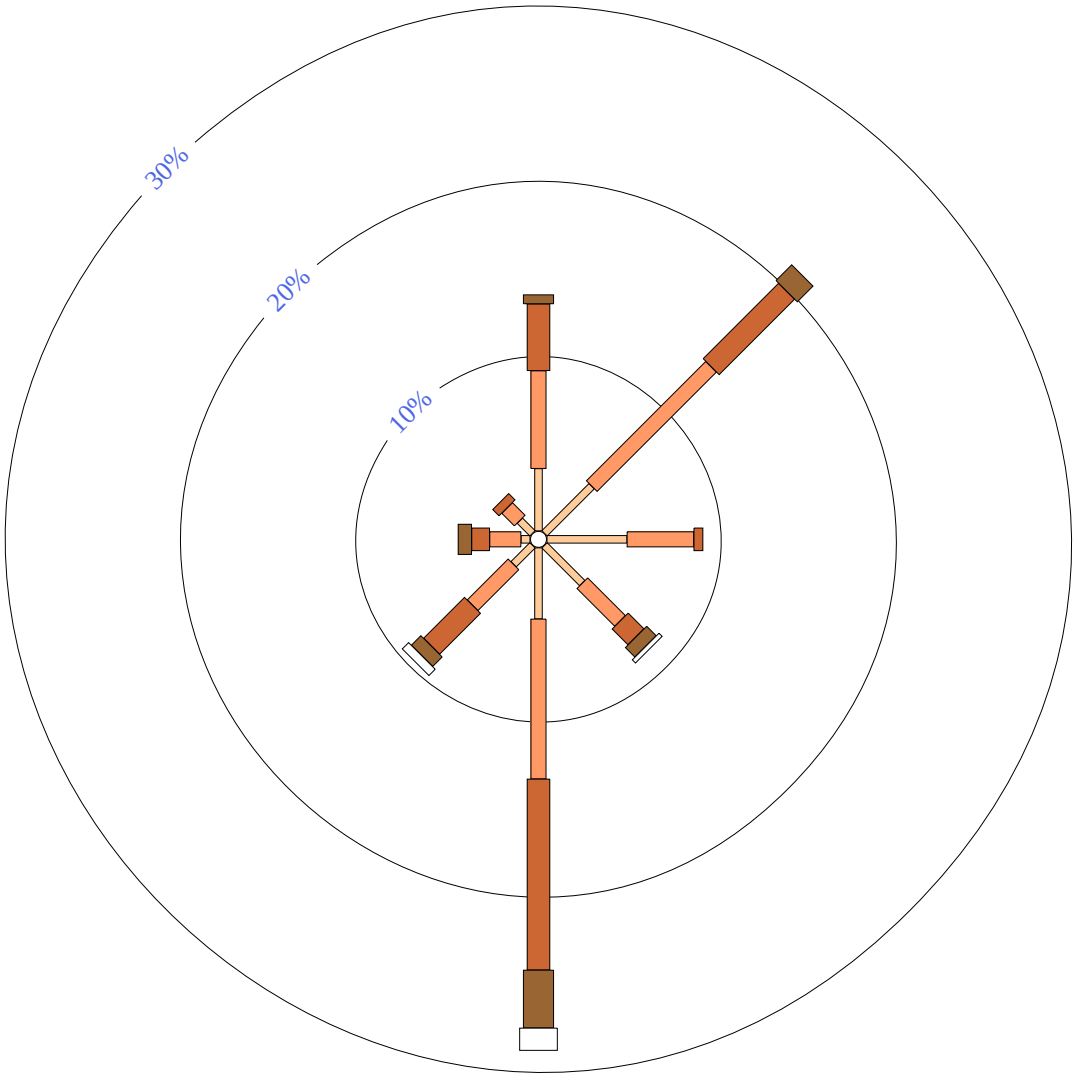
Site No: 068228 • Opened Nov 1988 • Still Open • Latitude: -34.3691° • Longitude: 150.9291° • Elevation 10m

An asterisk (*) indicates that calm is less than 0.5%.
Other important info about this analysis is available in the accompanying notes.



9 am Dec
388 Total Observations

Calm 2%



Monthly Climate Statistics for 'WOLLONGONG UNIVERSITY' [068188]
Created on [16 Jul 2014 14:40:33 GMT+00:00]

068188 WOLLONGONG UNIVERSITY
Commenced: 1970
Last Record: 2008
Latitude: 34.40 Degrees South
Longitude: 150.88 Degrees East
Elevation: 25 m
State: NSW

Statistic Element	January	February	March	April	May	June	July	August	September	October	November	December	Annual	Number of Years	Start Year	End Year
Mean maximum temperature (Degrees C) for years 1970 to 2008	25.6	25.6	24.5	22.5	20	17.6	17	18.3	20.3	22.1	22.9	25	21.8	38	1970	2008
Highest temperature (Degrees C) for years 1970 to 2008	44.1	41.7	40.2	35.4	28.5	24.7	25.7	30.3	34.2	38.8	40.6	41.5	44.1	38	1970	2008
Date of Highest temperature for years 1970 to 2008	1-Jan-06	1-Feb-77	9-Mar-83	4-Apr-86	1-May-94	26-Jun-91	31-Jul-75	26-Aug-95	25-Sep-80	13-Oct-04	25-Nov-82	18-Dec-90	1-Jan-06	N/A	1970	2008
Lowest maximum temperature (Degrees C) for years 1970 to 2008	17.2	17.7	17.5	16.3	12	10.8	9.9	11.7	13	14	13.9	16.8	9.9	38	1970	2008
Date of Lowest maximum temperature for years 1970 to 2008	13-Jan-72	7-Feb-73	9-Mar-82	28-Apr-08	31-May-77	12-Jun-73	3-Jul-84	3-Aug-83	25-Sep-95	16-Oct-76	16-Nov-88	23-Dec-95	3-Jul-84	N/A	1970	2008
Decile 1 maximum temperature (Degrees C) for years 1970 to 2008	21.7	22	21.2	19.2	17.1	15	14.4	15.2	16.3	17.6	18.7	20.7		38	1970	2008
Decile 9 maximum temperature (Degrees C) for years 1970 to 2008	29.7	29.4	28	26.3	23.1	20.5	20	22	25.6	27.9	28	30.4		38	1970	2008
Mean number of days >= 30 Degrees C for years 1970 to 2008	2.8	2.4	1.3	0.4	0	0	0	0	0.4	1.9	1.7	3.4	14.3	38	1970	2008
Mean number of days >= 35 Degrees C for years 1970 to 2008	0.7	0.5	0.2	0	0	0	0	0	0	0.2	0.4	0.6	2.6	38	1970	2008
Mean number of days >= 40 Degrees C for years 1970 to 2008	0.1	0.1	0	0	0	0	0	0	0	0	0	0.1	0.3	38	1970	2008
Mean minimum temperature (Degrees C) for years 1970 to 2008	17.9	18.2	16.7	14.2	11.8	9.5	8.3	8.8	10.6	12.6	14.4	16.5	13.3	38	1970	2008
Lowest temperature (Degrees C) for years 1970 to 2008	9.6	10.3	9.1	5.1	3.1	2	0.8	2	3.3	4.7	5.4	8.3	0.8	38	1970	2008
Date of Lowest temperature for years 1970 to 2008	30-Jan-91	23-Feb-93	31-Mar-08	30-Apr-08	29-May-87	4-Jun-00	27-Jul-86	24-Aug-81	22-Sep-94	10-Oct-03	11-Nov-96	26-Dec-06	27-Jul-86	N/A	1970	2008
Highest minimum temperature (Degrees C) for years 1970 to 2008	25.6	24	22.8	21.7	19	16.9	14.6	18.6	19	23.8	24.5	24.1	25.6	38	1970	2008
Date of Highest minimum temperature for years 1970 to 2008	9-Jan-83	2-Feb-06	8-Mar-82	16-Apr-73	7-May-92	5-Jun-88	15-Jul-01	27-Aug-95	24-Sep-03	3-Oct-81	25-Nov-82	11-Dec-76	9-Jan-83	N/A	1970	2008
Decile 1 minimum temperature (Degrees C) for years 1970 to 2008	15	15.4	14	10.9	8.3	6	5	5.5	7.2	9.1	11	13.4		38	1970	2008
Decile 9 minimum temperature (Degrees C) for years 1970 to 2008	20.5	20.8	19.6	17.3	15	12.5	11.6	11.9	14	15.8	17.6	19.5		38	1970	2008
Mean number of days <= 2 Degrees C for years 1970 to 2008	0	0	0	0	0	0	0.2	0	0	0	0	0	0.2	38	1970	2008
Mean number of days <= 0 Degrees C for years 1970 to 2008	0	0	0	0	0	0	0	0	0	0	0	0	0	38	1970	2008
Mean daily ground minimum temperature Degrees C for years 1970 to 2008	15	15.5	13.8	11	8.4	6	4.6	4.8	6.8	9.3	11.6	13.6	10	37	1970	2008
Lowest ground temperature Degrees C for years 1970 to 2008	4	5.5	0.2	0.6	-1.5	-2.9	-4.6	-3.8	-2.5	-0.8	2.1	0.1	-4.6	37	1970	2008
Date of Lowest ground temperature for years 1970 to 2008	31-Jan-04	28-Feb-04	24-Mar-04	22-Apr-06	29-May-87	23-Jun-71	3-Jul-71	1-Aug-81	12-Sep-71	12-Oct-72	11-Nov-96	14-Dec-92	3-Jul-71	N/A	1970	2008
Mean number of days ground min. temp. <= -1 Degrees C for years 1970 to 2008	0	0	0	0	0	0.2	1.2	0.8	0.2	0	0	0	2.4	37	1970	2008
Mean rainfall (mm) for years 1970 to 2008	130.3	156.4	160.4	129.3	106.4	112.4	63.4	83.3	67.4	100.5	115.6	94.6	1320.9	38	1970	2008
Highest rainfall (mm) for years 1970 to 2008	423.9	488.3	484.1	655.8	415.5	637.6	249.7	763.8	214.6	400.4	367.6	367.8	1984.5	38	1970	2008
Date of Highest rainfall for years 1970 to 2008	1972	1992	1978	1988	2003	1991	1999	1998	1982	1987	1984	1991	1974	N/A	1970	2008
Lowest rainfall (mm) for years 1970 to 2008	22.8	20.1	11.5	1.8	1.9	7.4	0.4	0.6	2.8	4.4	16	14.3	752.9	38	1970	2008
Date of Lowest rainfall for years 1970 to 2008	1975	2000	1981	1997	1982	1986	1977	1995	1989	1988	1982	1986	1994	N/A	1970	2008
Decile 1 monthly rainfall (mm) for years 1970 to 2008	40.9	49.7	26.8	18.1	19.1	22.9	8.6	6.2	9.4	12.5	34.9	25.8	865.2	38	1970	2008
Decile 5 (median) monthly rainfall (mm) for years 1970 to 2008	109.8	111.1	142.6	73.8	69.4	81.1	50.6	29.2	51.7	61.9	97.9	75.3	1309	38	1970	2008
Decile 9 monthly rainfall (mm) for years 1970 to 2008	249.2	358.3	347.1	310.9	237.1	253.6	160.2	253.4	151.3	248.1	225.2	202.8	1863.4	38	1970	2008
Highest daily rainfall (mm) for years 1970 to 2008	137.7	240.5	247.7	212.2	158.4	224.8	198.8	316	101.6	106.4	145.8	149.1	316	38	1970	2008
Date of Highest daily rainfall for years 1970 to 2008	28-Jan-73	10-Feb-92	11-Mar-75	30-Apr-88	18-May-95	11-Jun-91	4-Jul-75	18-Aug-98	14-Sep-93	21-Oct-04	9-Nov-84	9-Dec-70	18-Aug-98	N/A	1970	2008
Mean number of days of rain for years 1800 to 3000	13.8	13.7	14.5	11.2	10.8	9.7	8.5	7.8	9.3	11.4	13.6	13	137.3	38	1970	2008
Mean number of days of rain >= 1 mm for years 1970 to 2008	10.5	10.4	10.8	8.3	7.8	7.1	5.9	5.6	6.7	8.4	10.4	9.1	101	38	1970	2008
Mean number of days of rain >= 10 mm for years 1970 to 2008	3.7	4.2	3.9	2.9	2.9	2.8	1.6	1.5	1.5	2.6	3.3	2.4	33.3	38	1970	2008
Mean number of days of rain >= 25 mm for years 1970 to 2008	1.6	1.7	1.4	1.7	1.3	1.3	0.5	0.6	0.7	1	1.1	0.8	13.7	38	1970	2008
Mean daily wind run (km) for years null to null																
Maximum wind gust speed (km/h) for years 1972 to 1998	97	84	89	126	108	118	131	148	124	111	108	93	148	15	1972	1998
Date of Maximum wind gust speed for years 1972 to 1998	15-Jan-78	9-Feb-96	16-Mar-96	24-Apr-72	4-May-73	11-Jun-95	12-Jul-78	21-Aug-81	27-Sep-81	13-Oct-80	10-Nov-77	16-Dec-80	21-Aug-81	N/A	1972	1998
Mean daily sunshine (hours) for years null to null																
Mean daily solar exposure (MJ/(m*m)) for years 1990 to 2014	22.6	19.5	16.8	13.5	10.1	8.3	9.6	13.3	16.9	19.7	20.6	22.8	16.1	25	1990	2014
Mean number of clear days for years 1970 to 2008	7.1	5.7	7.4	8.7	9.7	9.8	12.6	14.5	10.7	8.3	6.5	6.4	107.4	37	1970	2008
Mean number of cloudy days for years 1970 to 2008	13	12.2	12.5	10.2	11.1	9.7	8	7.2	7.9	10.8	13	12.6	128.2	37	1970	2008
Mean daily evaporation (mm) for years null to null																
Mean 9am temperature (Degrees C) for years 1970 to 2008	22.3	22.2	21.2	19.3	16.6	13.9	13	14.4	16.7	18.7	19.4	21.4	18.3	37	1970	2008
Mean 9am wet bulb temperature (Degrees C) for years 1970 to 2008	18.7	19	17.7	15.5	13.2	10.7	9.5	10.3	12.1	14.2	15.5	17.5	14.5	37	1970	2008
Mean 9am dew point temperature (Degrees C) for years 1972 to 2008	16.2	16.8	15.2	12.2	9.9	7.1	5.3	5.4	7.2	10.1	12.3	14.5	11	36	1972	2008
Mean 9am relative humidity (%) for years 1972 to 2008	70	73	70	65	66	65	62	57	55	60	66	67	65	36	1972	2008
Mean 9am cloud cover (okas) for years 1970 to 2008	4.9	5	4.7	4.1	4	3.9	3.3	3	3.5	4.2	4.8	4.8	4.2	37	1970	2008
Mean 9am wind speed (km/h) for years 1970 to 2008	7	7	7.2	7.7	8.7	11.2	10.9	10.9	11.3	10.5	8.9	8.1	9.1	36	1970	2008
Mean 3pm temperature (Degrees C) for years 1970 to 2008	23.7	23.8	22.8	20.8	18.6	16.3	15.7	16.8	18.3	19.6	20.8	22.9	20	37	1970	2008
Mean 3pm wet bulb temperature (Degrees C) for years 1970 to 2008	19.7	19.9	18.7	16.5	14.3	12.1	11.1	11.7	13.2	15	16.5	18.4	15.6	37	1970	2008
Mean 3pm dew point temperature (Degrees C) for years 1972 to 2008	17.1	17.4	15.7	13.1	10.6	7.7	5.9	6.2	8.1	10.9	13.1	15.1	11.7	36	1972	2008
Mean 3pm relative humidity (%) for years 1972 to 2008	68	69	66	63	62	59	54	52	55	61	64	64	61	36	1972	2008
Mean 3pm cloud cover (oktas) for years 1970 to 2008	4.6	4.8	4.6	4.4	4.3	4.3	3.8	3.4	4	4.4	4.9	4.7	4.4	37	1970	2008
Mean 3pm wind speed (km/h) for years 1970 to 2008	14	13.2	11.8	10.9	9.8	10.8	10.8	12.8	14.2	14.3	14.8	14.6	12.7	36	1970	2008

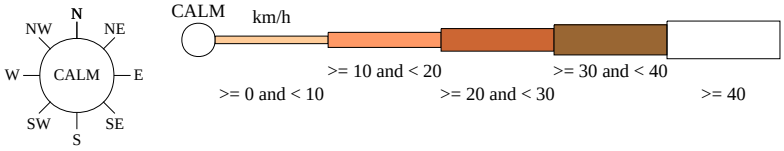
Rose of Wind direction versus Wind speed in km/h (01 Nov 1970 to 05 Jun 2008)

Custom times selected, refer to attached note for details

WOLLONGONG UNIVERSITY

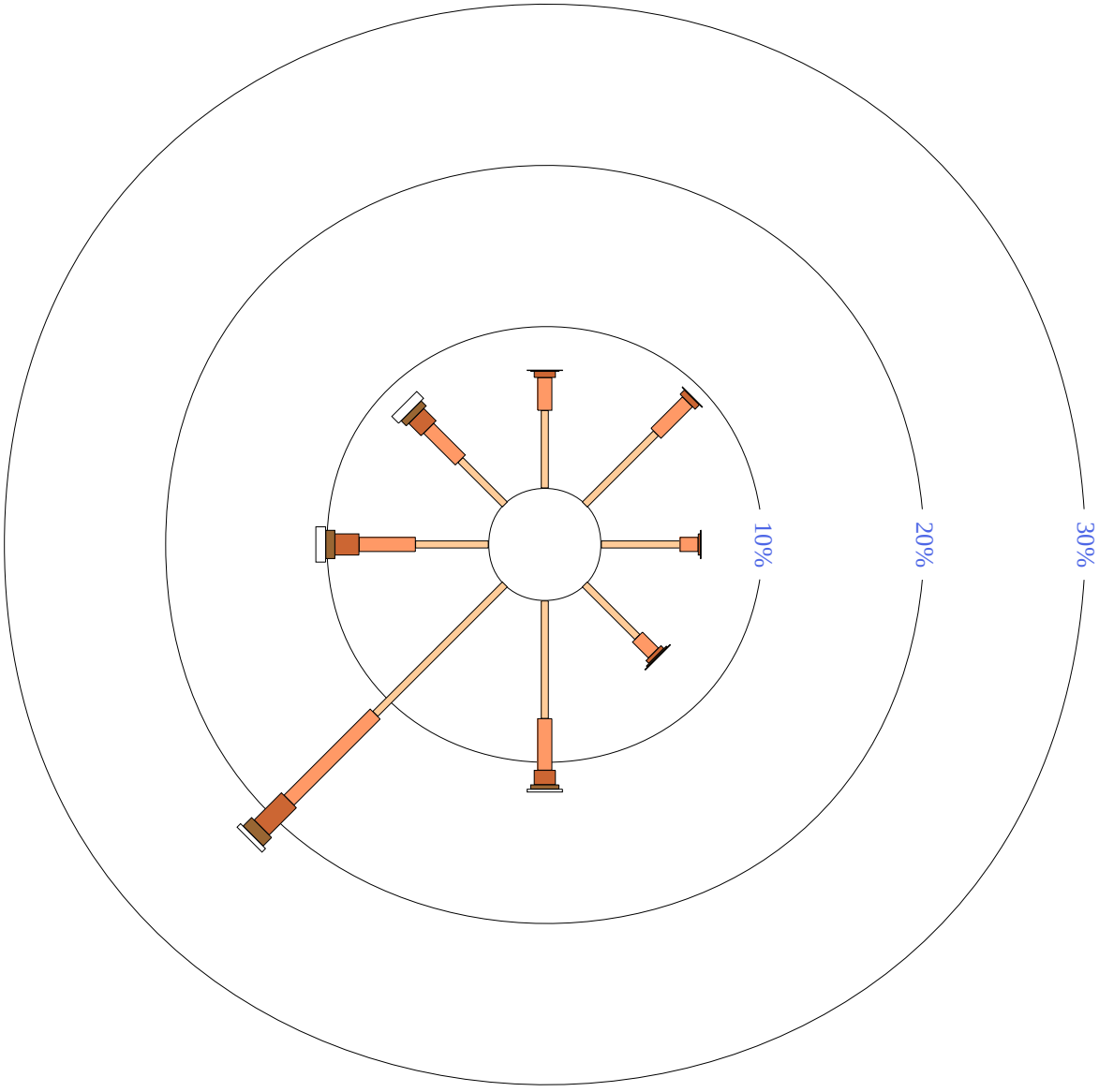
Site No: 068188 • Opened Jan 1970 • Closed Jun 2008 • Latitude: -34.403° • Longitude: 150.8795° • Elevation 25m

An asterisk (*) indicates that calm is less than 0.5%.
Other important info about this analysis is available in the accompanying notes.



9 am
13075 Total Observations

Calm 17%



Rose of Wind direction versus Wind speed in km/h (01 Nov 1970 to 05 Jun 2008)

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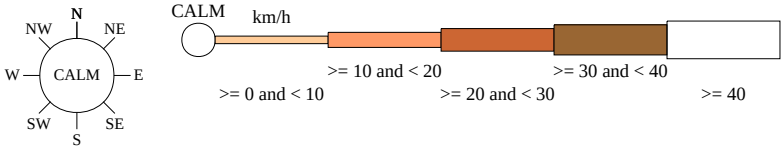
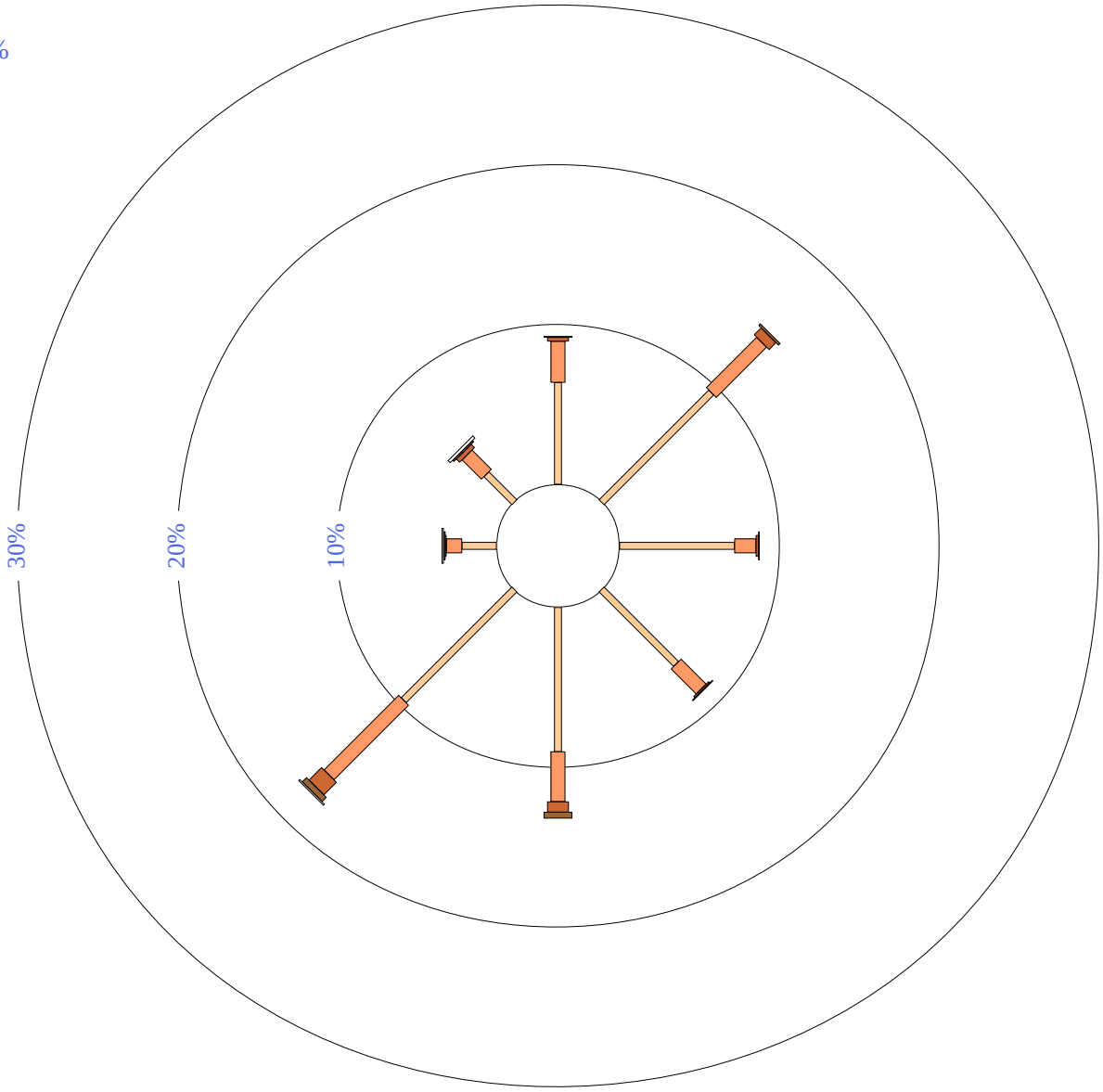


9 am Jan
1092 Total Observations

Calm 19%



Rose of Wind direction versus Wind speed in km/h (01 Nov 1970 to 05 Jun 2008)

Custom times selected, refer to attached note for details

WOLLONGONG UNIVERSITY

Site No: 068188 • Opened Jan 1970 • Closed Jun 2008 • Latitude: -34.403° • Longitude: 150.8795° • Elevation 25m

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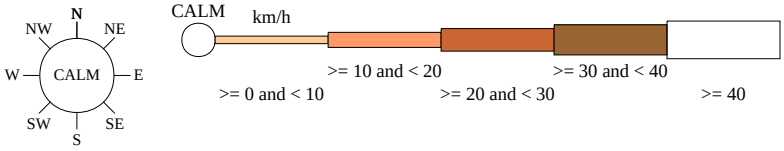
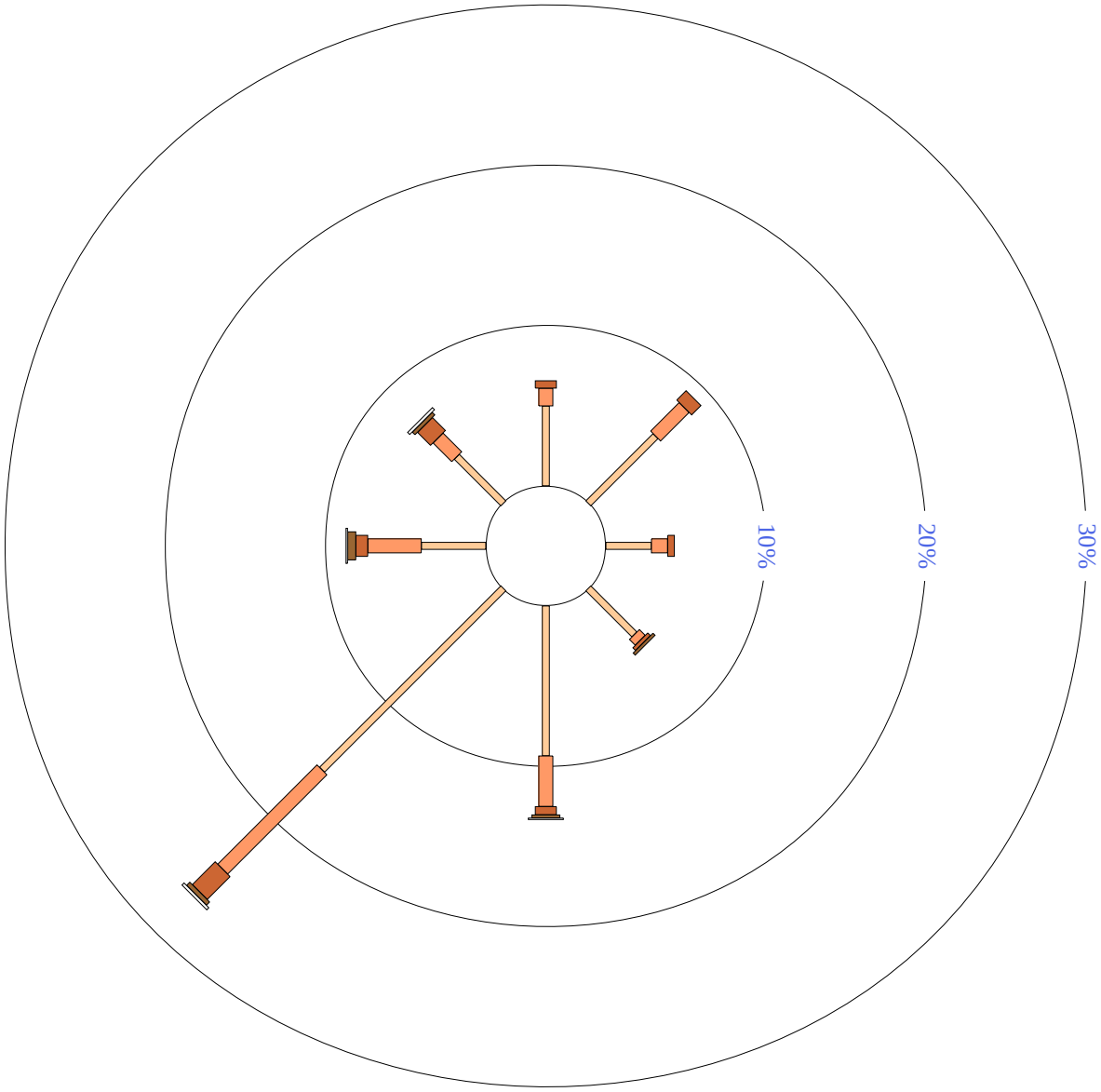


9 am Apr
1097 Total Observations

Calm 19%



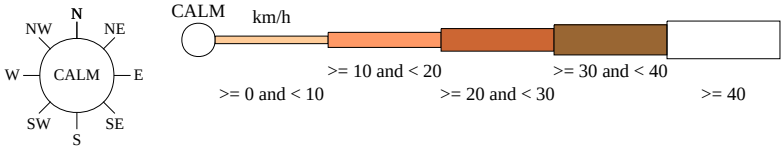
Rose of Wind direction versus Wind speed in km/h (01 Nov 1970 to 05 Jun 2008)

Custom times selected, refer to attached note for details

WOLLONGONG UNIVERSITY

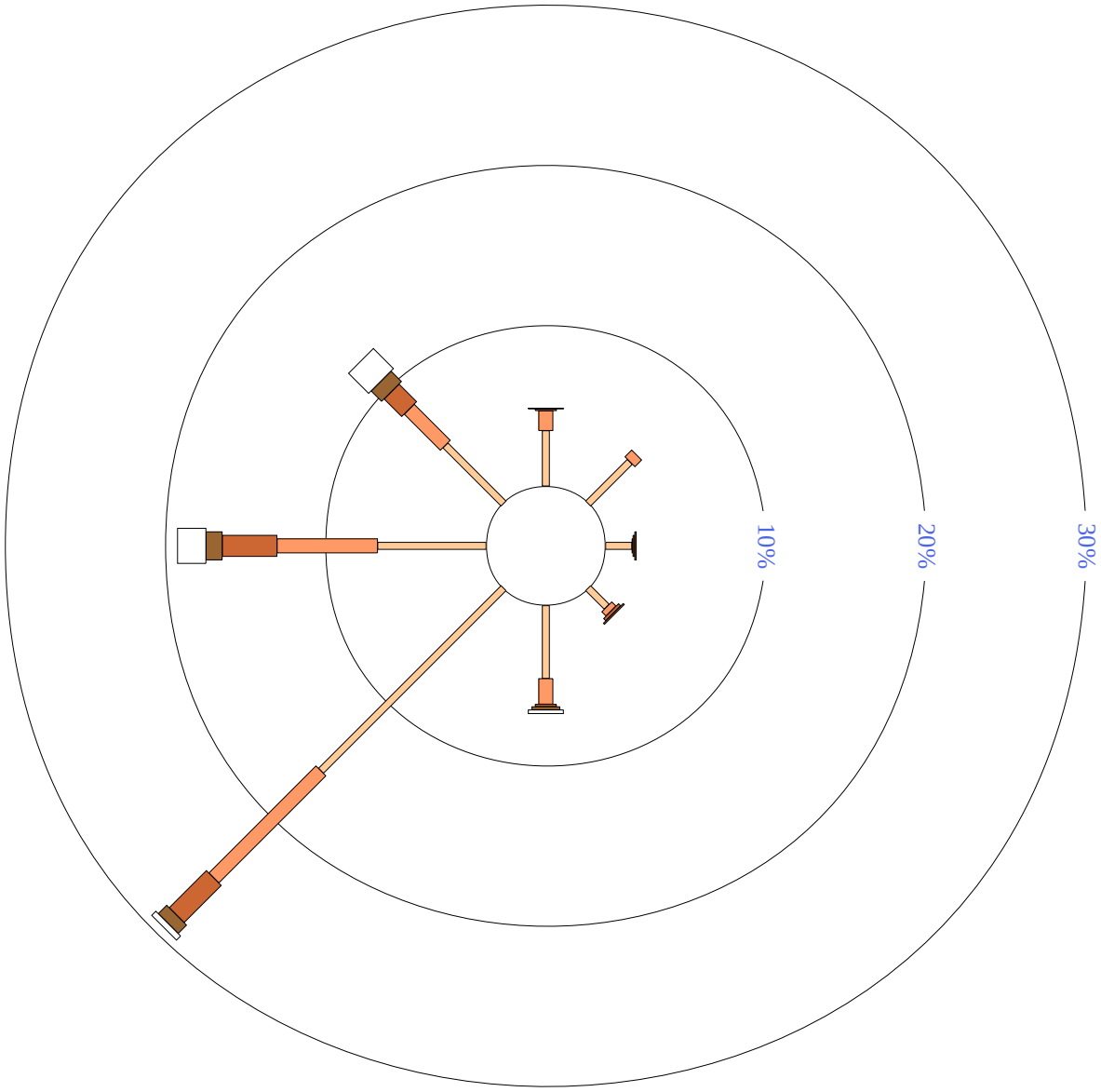
Site No: 068188 • Opened Jan 1970 • Closed Jun 2008 • Latitude: -34.403° • Longitude: 150.8795° • Elevation 25m

An asterisk (*) indicates that calm is less than 0.5%.
Other important info about this analysis is available in the accompanying notes.



9 am Jul
1102 Total Observations

Calm 19%



Rose of Wind direction versus Wind speed in km/h (01 Nov 1970 to 05 Jun 2008)

Custom times selected, refer to attached note for details

WOLLONGONG UNIVERSITY

Site No: 068188 • Opened Jan 1970 • Closed Jun 2008 • Latitude: -34.403° • Longitude: 150.8795° • Elevation 25m

An asterisk (*) indicates that calm is less than 0.5%.
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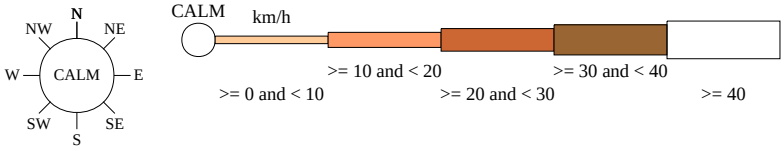
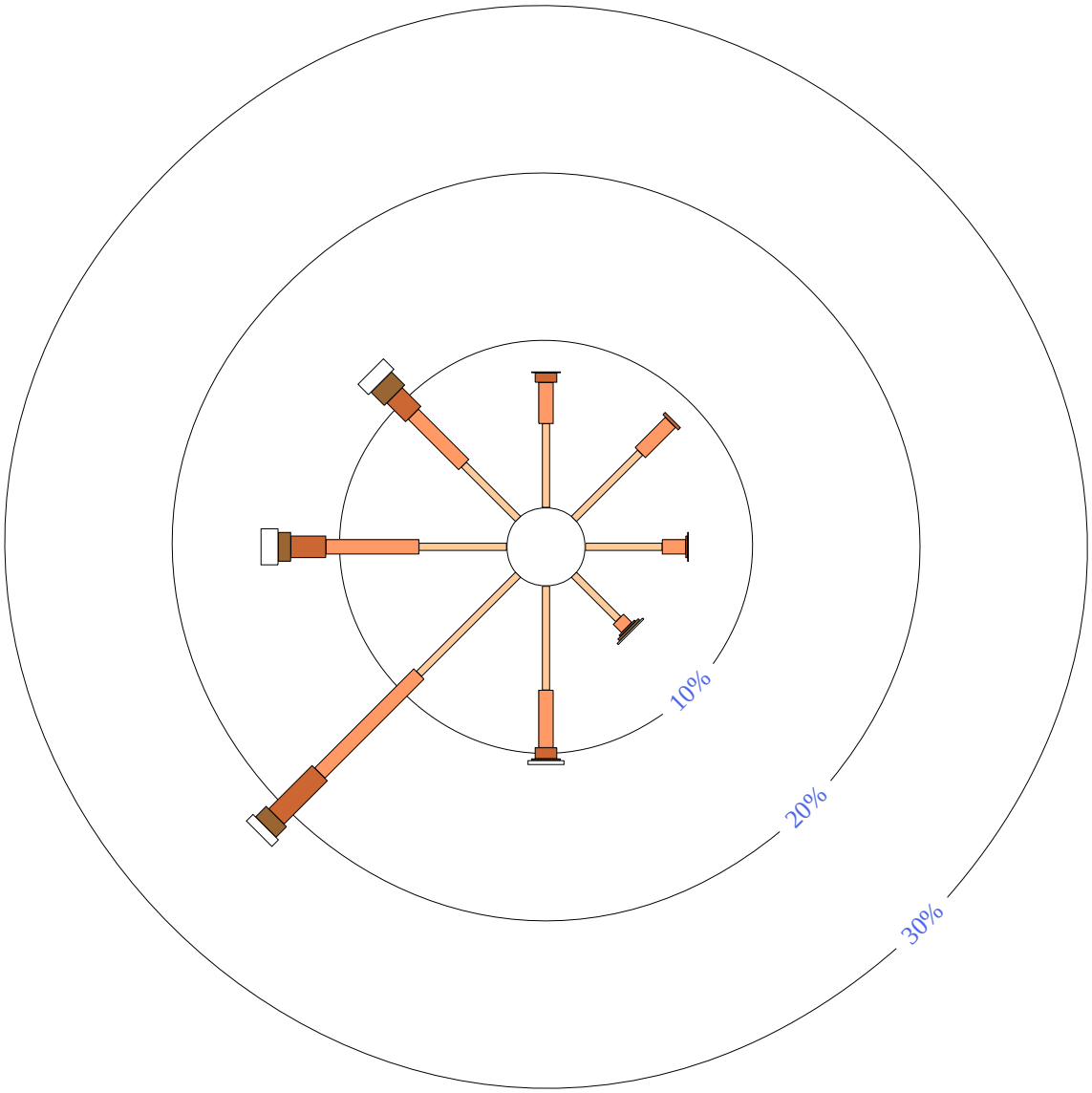


9 am Sep
1063 Total Observations

Calm 12%



Rose of Wind direction versus Wind speed in km/h (01 Nov 1970 to 05 Jun 2008)

Custom times selected, refer to attached note for details

WOLLONGONG UNIVERSITY

Site No: 068188 • Opened Jan 1970 • Closed Jun 2008 • Latitude: -34.403° • Longitude: 150.8795° • Elevation 25m

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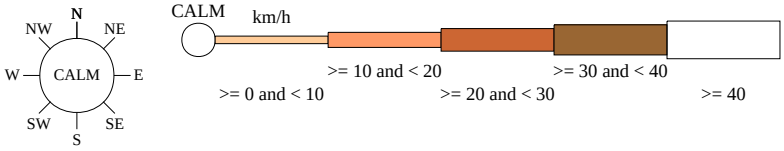
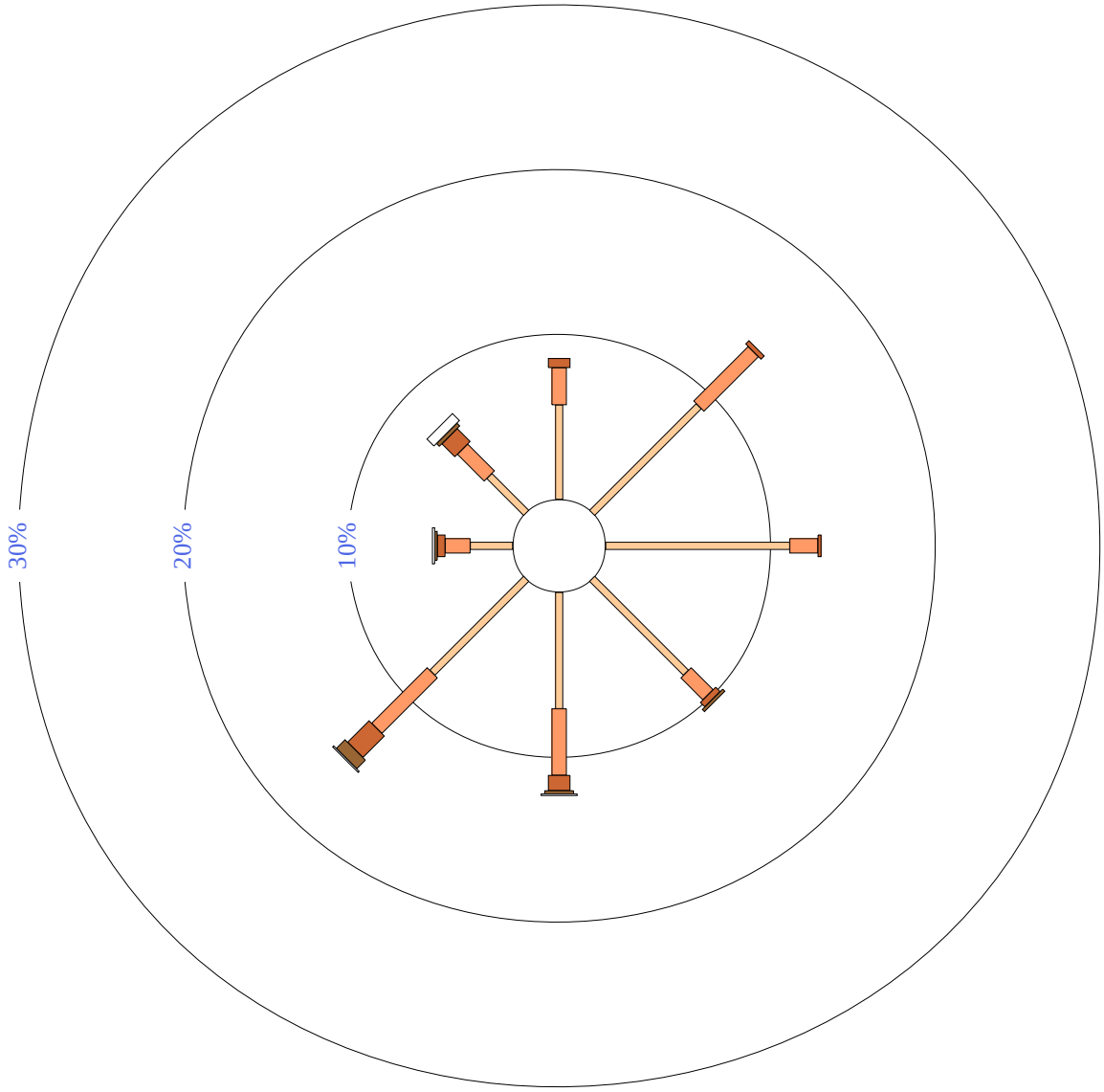
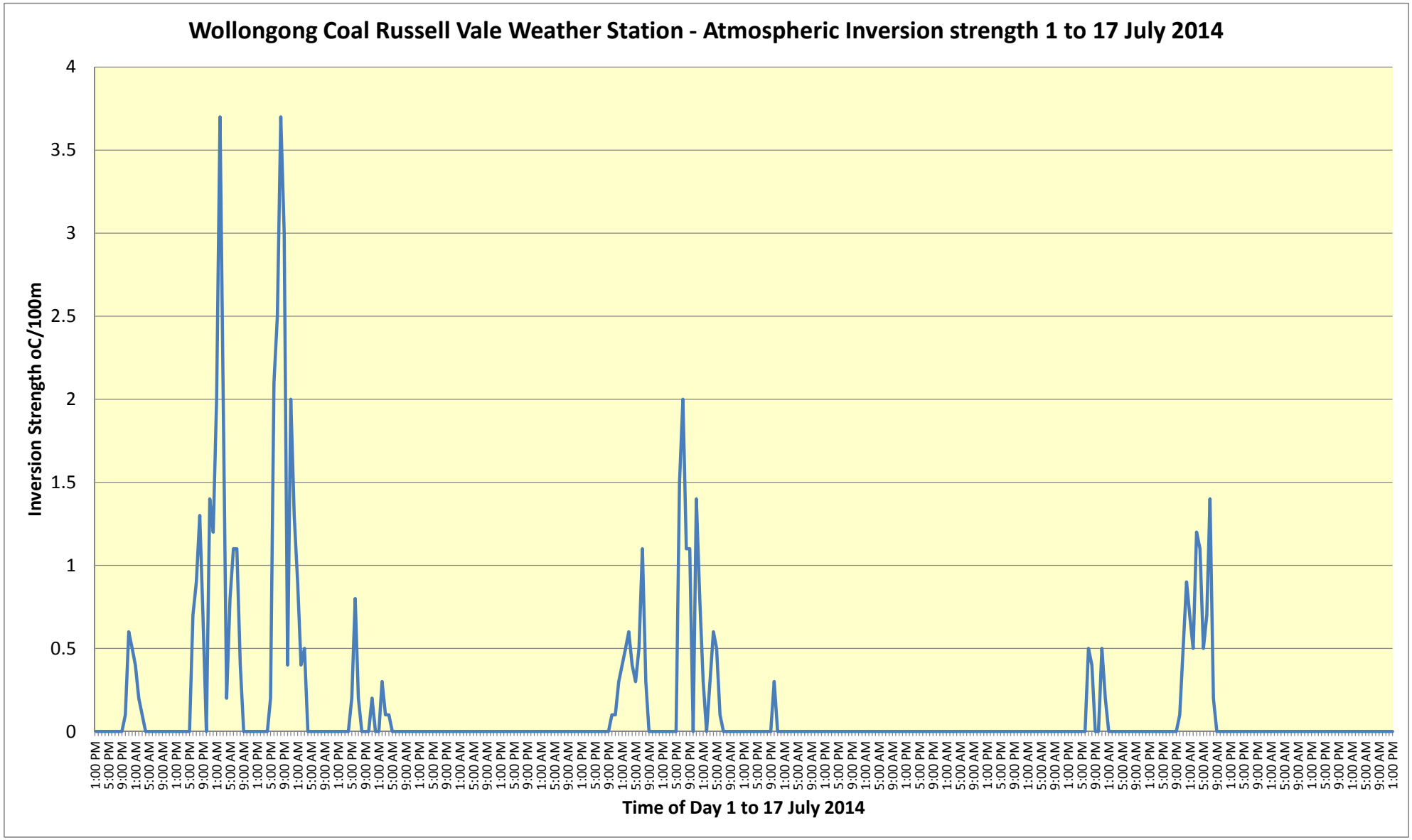


9 am Dec
1093 Total Observations

Calm 14%




Wollongong Coal Russell Vale Weather Station - Atmospheric Inversion strength 1 to 17 July 2014
Inversion Strength oC/100m
4
3.5
3
2.5
2
1.5
1
0.5
0
Time of Day 1 to 17 July 2014

Appendix E:

Pages 19 to 21 from:

ERMA (Environmental Resources Management Australia) Report 0079383/Final/ 1 October 2010

And

Bureau of Meteorology data for Bellambi and University of Wollongong weather stations

25 Atchison Street, Wollongong, NSW 2500, Australia
P.O. Box 1501, Wollongong, NSW 2500, Australia
Tel +61 2 4231 7200 ◆ Fax +61 2 4228 0893
ABN 59 008 630 500

APPENDIX D – QUALIFICATIONS OF SUITABLY QUALIFIED AND EXPERIENCED PERSONS)

LEE HUDSON,
BSC (EHEALTH) MAAS, EIA, AIOH
SCIENTIST / ENGINEER

T: +61 2 9437 4611 | Lee.Hudson@rwdi.com

Clients benefit from Lee's more than 35 years' experience in the acoustics field, coupled with demonstrated ability in project planning, team management, client relationships and community relations. She has been involved across a broad spectrum of projects, with specific expertise in architectural acoustics, environmental noise impact assessment for major transportation, mining, construction and industrial projects, land use and Master planning studies, building services noise assessment and control, occupational noise exposure, and environmental noise policy development. Lee has prepared and presented expert evidence at court inquiries and hearings and lectured at both the University of Technology and the University of Western Sydney.

Project Experience

Construction & Industrial

- Advanx East – Lindsey Bennelong / FDC
- Barangaroo South Stage 1B Stormwater Diversion

Architectural

- Australian Soldiers' Chapel, Kapooka
- Rockdale City Aquatic Centre

Environmental

- IKEA Multi-Function Logistics Unit, Marsden Park
- Minto Warehousing & Logistics Hub

Transport

- Bringelly Road Upgrade
- Park Street (East-West) Tunnel

Other

- Atlas-Campaspe Mineral Sands Optimisation Modification
- VIVA Energy Clyde Western Area Remediation Project

Employment History

2020-Present
Associate, RWDI

2015-2020
Associate, Wilkinson Murray

2014-2015
Principal Consultant – Acoustics, Rodney Stevens Acoustics Pty Ltd

1989-2014
SLR Consulting Australia Pty Ltd

Education

Bachelor of Applied Science (Env Health)

Affiliations

Australian Acoustical Society (AAS)

The Environment Institute of Australia

Australian Institute of Occupational Hygienists

Publications

Principle Author, Noise, Vibration & Airblast Control module, Best Practice Environmental Management in Mining series, Environment Australia

Co-Author, "The Practical Solutions of Sound Control", NSW Division of the Australian Institute of Refrigeration Air-Conditioning and Heating

ROMAN HAVERKAMP MAAS

SENIOR ENGINEER

T: 612 94374611 | Roman.Haverkamp@rwdi.com

A senior engineer with almost two decades of professional experience in environmental acoustics, Roman has consulted with a wide range of industries throughout Australia. He has lent his knowledge to numerous projects, routinely project managing and conducting environmental noise impact assessments involving detailed and complex noise models. Roman specializes in industrial, construction and transportation noise and vibration, with a particular focus on mines, collieries, and quarries. His experience in industrial noise stems from extensive involvement in numerous large-scale surface operating mining projects, including Tarrawonga Coal Mine, Vickery Coal Mine, Mount Pleasant Operation, Cadia Valley Operations, Maxwell Project, Maules Creek Coal Mine, and Mount Arthur Coal Mine.

Project Experience

Industry

- Vickery Coal Mine - Noise and Blasting Impact Assessments
- Mount Pleasant Operation - Noise and Blasting Impact Assessments & Noise Management Plan
- Tarrawonga Coal Mine - Noise Impact Assessment
- Cadia Valley Operations - Noise Impact Assessments
- Maxwell Project - Noise and Blasting Impact Assessment
- Maules Creek Coal Mine - Noise Impact Assessment
- Narrabri Mine - Noise Impact Assessments
- Ulan Coal Mine – Noise Impact Assessments
- Marulan South Limestone Mine – Noise and Blasting Impact Assessment
- Russell Vale Colliery - Noise Impact Assessments & Noise Management Plan
- Calga Sand Quarry - Noise Impact Assessments
- SUEZ Advance Waste Treatment Facility – Noise Impact Assessment
- AGL Camden Gas - Noise Impact Assessments

Construction

- Victoria Road Upgrade – Noise Monitoring and Management
- South Sydney Freight Line - Construction Noise and Vibration Impact Statements

Transport

- Cronulla Duplication
- Hume Highway Duplication Project – Operational Noise Impact Statement
- F5, NCA22 – Acoustic Barrier Design
- Pacific Highway, Oxley Highway to Kempsey - Environmental Impact Statement

Employment History

2020-Present
Senior Engineer, RWDI

2012-2020
Senior Engineer, Wilkinson Murray

2006-2012
Project Engineer, Wilkinson Murray

2003-2006
Technical Officer, Wilkinson Murray

Education

BA (Recording Arts) (Hons)

Certificate IV in Multimedia Production

Certificate IV in Audio Engineering

Distance Learning Program for Professional Education in Acoustics (Association of Australasian Acoustical Consultants)

JOHN WASSERMANN,
BE (MECH) MENGSC MIEAUST CPENG MAAS
SENIOR TECHNICAL DIRECTOR

T: +61 2 9437 4611 | John.Wassermann@rwdi.com

A mechanical engineer with over 30 years' experience in the public and private sectors, John specializes in environmental acoustics and air quality. He has considerable experience in NSW environmental, noise and air quality legislation, the Environment Planning and Assessment Act (1979) and the POEO Act (1997). While working for government, John has had substantial involvement in the regulation and assessment of transport and energy related state significant projects and major infrastructure. While working as a consultant, he has been involved in many large infrastructure and industrial projects, including Cross City Tunnel, Mount Arthur Coal Mine and Caltex Refinery Upgrade.

Project Experience

Mines & Quarries

- Vickery Coal Mine (Whitehaven)
- Peppertree Quarry Mod 4 (Boral)

Audit and Review

- WestConnex Stage 2 Independent Technical Advisor
- North Byron Parklands – Splendour in the Grass Audit

Vibration

- Port Kembla Copper Stack Demolition Vibration and Overpressure Monitoring and Analysis
- Rail vibration assessment for the Eastern Suburbs Line (City Rail)

Energy Sector

- Red Sea Coal Fired Power Station – Noise and Air Quality Assessment, (SMEC)
- Chevron Gas Facility, Noise and Air Quality Assessment, Bangladesh, (SMEC)

Air Quality

- Parks Water Quality Facility – Air Quality (Dust and Odour) Assessment
- Barangaroo Excavation – Air Quality (Dust and Odour) Assessment

Transport Sector

- Cronulla Line Duplication (John Holland)
- Epping to Chatswood Rail Link (Thiess)

Employment History

2020-Present
Director, RWDI

2006-2020
Director, Wilkinson Murray

2004-2006
Associate, Wilkinson Murray

2002-2004
Major Infrastructure Assessments Manager, Transport, Dept of Infrastructure, Planning & Natural Resources

1997-2002
Manager Noise Assessments, NSW Environment Protection Authority

Education

Master of Engineering Science

Bachelor of Engineering (Mechanical)

Graduate Diploma (Management)

Affiliations

Member, Australian Acoustical Society (MAAS)

Member, Institution of Engineers Australia (MIEA)

Member, Clean Air Society