# APPENDIX 7

Noise Impact Assessment

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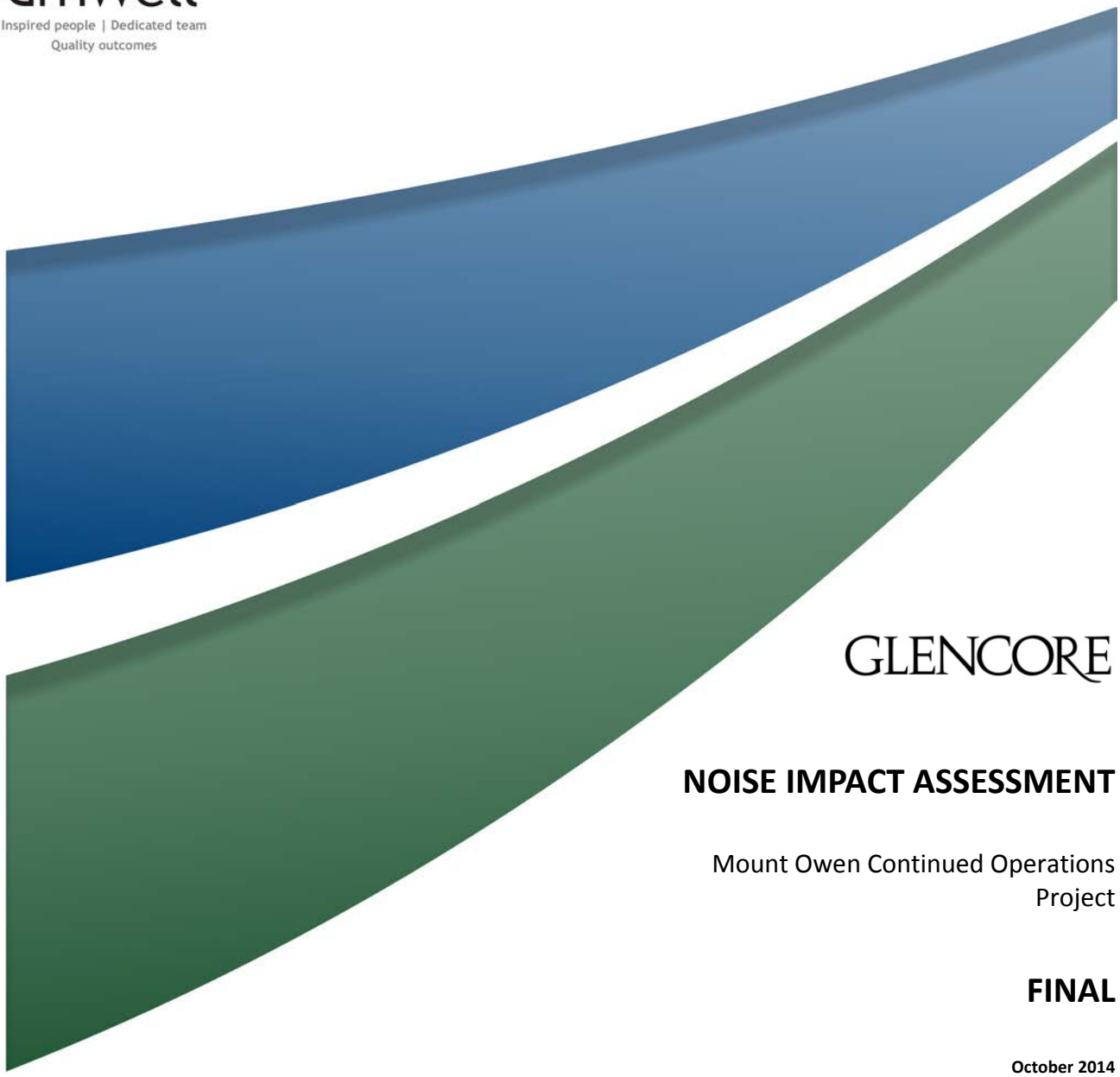

GLENCORE

# NOISE IMPACT ASSESSMENT

Mount Owen Continued Operations Project

## FINAL

**October 2014**

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**October 2014**

Prepared by
Umwelt (Australia) Pty Limited

on behalf of
Mount Owen Pty Limited

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Report No. **3109/R11/FINAL**
Date: **October 2014**

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# 1.0 Introduction

The Mount Owen Complex is located within the Hunter Coalfields in the Upper Hunter Valley of New South Wales (NSW), approximately 20 kilometres north-west of Singleton, 24 kilometres south-east of Muswellbrook and to the north of Camberwell village (refer to **Figure 1.1**).

Mount Owen Pty Limited (Mount Owen), a subsidiary of Glencore Coal Pty Limited (Glencore, formerly Xstrata Coal Pty Limited (Xstrata)) currently owns the three open cut operations in the Mount Owen Complex, Mount Owen (North Pit), Ravensworth East (West Pit) and Glendell (Barrett Pit). The mining operations at the Mount Owen Complex include the integrated use of the Mount Owen coal handling and preparation plant (CHPP), coal stockpiles and the rail load-out facility (refer to **Section 2.0**).

The North Pit has an approved production rate of 10 million tonnes per annum (Mtpa) of run of mine (ROM) coal, and blended with Ravensworth East (4 Mtpa) and Glendell (4.5 Mtpa) ROM coal, feed the Mount Owen CHPP and associated infrastructure which has a total approved processing capacity of 17 Mtpa of ROM coal. Processed coal, both semi soft and thermal, are transported via the Main Northern Rail Line to the Port of Newcastle for export or by rail or conveyor for domestic use as required.

Mount Owen expect, subject to market conditions, that mining will be completed within the currently approved area of the North Pit and the West Pit by 2018 and late 2014 respectively, and Glendell by 2022. Over the last few years, Mount Owen has been reviewing plans for the future of the Mount Owen and Ravensworth East Mines. Mount Owen has undertaken extensive exploration of its mining tenements as part of these plans and identified substantial additional mineable coal tonnes to the south of the currently approved North Pit and within an area currently approved for mining in the northern portion of the Ravensworth East Mine, referred to as the Bayswater North Pit (BNP). The previously proposed Ravensworth East Resource Recovery (RERR) Mining Area (Umwelt 2012) is located immediately east of the West Pit and is proposed to be mined sequentially after mining has been completed in the BNP, commencing in approximately 2022.

Mount Owen is seeking development consent for the Mount Owen Continued Operations Project (the Project); to extract these additional mineable coal tonnes through continued open cut mining methods. The Project proposes to continue the existing mining operations within the North Pit to the south beyond the current approved North Pit mining limit (the North Pit Continuation) in addition to undertaking mining operations within the BNP, sequentially followed by the proposed RERR Mining Area.

The Project design has considered issues raised during extensive stakeholder consultation and outcomes of iterative impact assessment studies resulting in a Project design that reduces potential environment and community impacts. The Project avoids disturbance of Ravensworth State Forest and existing Offset Areas, whilst maximising the use of previously disturbed areas and infrastructure.

The Project seeks to maintain the current approved North Pit extraction rate of 10 Mtpa of ROM coal, extracting approximately 74 million tonnes (Mt) of ROM coal from the North Pit Continuation. The extraction of these additional mineable coal tonnes would continue the North Pit life to approximately 2030 (an additional 12 years). Additionally, the Project seeks to maintain the current approved Ravensworth East extraction rate of 4 Mtpa of ROM coal, and to extract approximately 12 Mt of ROM coal from the BNP. Mining within the BNP area would be undertaken from 2015 to 2022, with the mining in the RERR Mining Area to follow sequentially from 2022 to 2027 and extracting approximately 6 Mt of ROM coal.


FIGURE 1.1

Locality Plan

The Project is also seeking approval to expand the existing product stockpile to manage additional product types in addition to upgrades to the CHPP area including covered storage areas and raw coal processing to improve yields and reduce water use and tailings.

The Project also seeks approval to upgrade and extend the Mount Owen Mine Infrastructure Area (MIA). These upgrades are all proposed within existing operational areas and include:

- on-site infrastructure upgrades including the extension of the existing product stockpile and improvement to the coal handling functionality of the stockpile;
- upgrades to the MIA including increased capacity at the existing heavy vehicle workshop and fuel farm and the replacement of associated site services, such as the raw water system, to meet current standards; and
- upgrades to the CHPP area including covered storage areas and raw coal processing to improve yields and reduce water use and tailings.

To allow for increased efficiencies within the Hunter Valley Coal Chain, the Project is seeking approval for the provision for augmentation of the existing Mount Owen rail line through the construction of an additional rail line and northern turn-out west of the existing rail line). The existing Mount Owen rail line will be used as a siding for parking of Glencore trains and allow them the ability to turn around within the Mount Owen Complex Rail Line and return to Glencore owned mines to the west, thereby reducing unnecessary traffic flow on the Main Northern Rail Line.

The Project is seeking approval upgrade sections of Hebden Road, which is the primary employee and services access to the Mount Owen Complex. The Project seeks approval to construct an overpass over the Main Northern Rail Line that crosses Hebden Road and a new bridge over Bowmans Creek in order to improve road safety for all road users and to minimise traffic delays on Hebden Road that are a result of the existing rail level crossing and single lane Bowmans Creek Bridge.

Mount Owen currently have approval to use the existing Ravensworth East and M-series conveyor to transport ROM coal to the Bayswater and Liddell power stations. The Project is seeking approval to extend the use of this existing infrastructure to cover the transport of ROM coal and crushed gravel to Liddell Coal Operations and the Ravensworth Coal Terminal (RCT). In addition, the Project seeking approval to allow for tailings from Glencore's neighbouring mines to be emplaced within the Mount Owen tailings emplacement areas.

The Project will enable the consolidation of the Mount Owen and Ravensworth East Operations to provide for further operational efficiency by providing a single development consent for the continued operations. The Project does not include any aspect of the ongoing operations at Glendell Mine, which will continue to operate in accordance with its current development consent.

For the purposes of this Noise Impact Assessment (NIA):

- the operations of the approved North Pit are referred to as the approved North Pit*;*
- the combined operations and current and future management of the approved Ravensworth East Mine and the Mount Owen Mine is referred to as the Project;
- the continued operations of the Bayswater North Pit and proposed Ravensworth East Mine (RERR Mining Area) have been assessed as part of the Project, and

- the continued operations of the approved Glendell Mine combined with the approved operations of the Mount Owen and Ravensworth East Mines are referred to as the Mount Owen Complex.

The Project is State Significant Development as defined by the provisions of the State Environmental Planning Policy (State and Regional Development) 2011 and requires development consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Minister for Planning is the consent authority for the Project.

An Environmental Impact Statement (EIS) has been prepared for the Project to accompany a Project Application following Department of Planning and Environment (DP&E) issuing Director-General's Requirements (DGRs) for the Project in March 2013. The following Noise Impact Assessment (NIA) was prepared to meet the Director-General's EIS requirements in relation to Noise issues for the Project

## 1.1 Noise Impact Assessment

This NIA has been prepared by Umwelt (Australia) Pty Limited (Umwelt) as part of the EIS for the Project. The NIA has been undertaken in accordance with the NSW Environmental Protection Authority (EPA) NSW *Industrial Noise Policy* (INP) (EPA 2000) with the objective of addressing the key issues relating to noise as required by the DGRs for the Project.

A glossary of terms and abbreviations used in this report is provided in **Appendix A**.

## 1.2 Director-General's Requirements

The DP&E has issued DGRs for the Project that identify noise impacts as a key issue for consideration in the EIS. The DGRs specify that the EIS must include quantitative assessment of potential:

- construction (refer to **Section 6.3**), operational (refer to **Section 6.1**) and off-site road/rail noise impacts (refer to **Sections 6.4** and **6.5**);

- reasonable and feasible mitigation measures (refer to **Sections 2.1**, **5.2**, **6.1** and **8.1**), including evidence that there are no such measures available other than those proposed (refer to **Section 2.1** and **5.2**); and

- monitoring (refer to **Section 8.3**) and management measures (refer to **Section 8.1**), in particular real-time (refer to **Section 8.2.3.2**), attended noise monitoring (refer to **Section 8.3.1**), and predictive meteorological forecasting (refer to **Section 8.2.3.1**).

The DGRs specify that this assessment should be undertaken in accordance with the following policies and guidelines:

- *NSW Industrial Noise Policy* (INP) (EPA 2000);

- *Environmental Noise Management Manual* (Roads and Traffic Authority 2001);

- *NSW Road Noise Policy* (DECCW 2011); and

- *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* (DECC 2007) (superseded 2013 by EPA Rail *Infrastructure Noise Guideline*).

In addition to the above guidelines and policies, the EPA have identified that this assessment should be undertaken in accordance with the following policies and guidelines:

- *Interim Construction Noise Guideline* (DECC 2009);
- INP Application Notes (as at 2014); and
- *Environmental Criteria for Road Traffic Noise* (EPA 1999) (superseded in 2011 by DECCW *NSW Road Noise Policy*).

Where new policies or guidelines, or one of the policies or guidelines above has been superseded, the most current documents applicable have been used as the primary assessment methodology. The following guideline and policy have been used, in addition to those mentioned above, to undertake the NIA for the Project:

- *Rail Infrastructure Noise Guideline* (EPA 2013); and
- *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) Amendment (Resource Significance)* (Mining SEPP) (2013).

In addition to the requirements above, the Department of Health (Hunter New England Local Health District), noted:

- 'The EIS must demonstrate that there has been community consultation in relation to noise and complaints mechanisms available during both construction and operational phases of the project' (refer to EIS main text Section 4.0 and **Section 8.0** of this report);
- 'Consultation should include discussion of night time activities and possible sleep disturbance' (refer to **Section 6.2** and **Section 8.1**); and
- Noise.... 'impacts as a result of mine traffic can adversely affect the health of local residents and should be addressed in the EIS as part of the proposed traffic assessment.' (refer to **Section 6.4**).

## 1.3 Assessment Requirements

The DGRs issued by the Director-General of DP&E require the proposal be assessed in accordance with the INP. Section 10 – *Applying the policy to existing industrial premises* of the INP outlines a methodology for the assessment of a project where a company proposes to upgrade or modify its existing operations. This methodology is also applicable to a proposal for the continuation of an existing operation. As outlined in **Section 1.1**, the NIA includes both the proposed continuation of operations at Mount Owen Mine and also the Ravensworth East Mine (BNP and RERR Mining Area).

The INP identifies four triggers for the application of Section 10. These are:

1. the site becomes the subject of serious and persistent noise complaints;
2. there is a proposal to upgrade and/or expand the site;
3. the site has no formal consent or licence conditions and management wish to clarify their position; and
4. management chooses to initiate a noise reduction program.

Using theses triggers as a guide, the methodology for the preparation of the NIA has taken into account:

1. The Project is not the subject of serious and persistent noise complaints from the community or EPA.

2. An EIS and supporting studies will be required to enable the continuation of the operations for a period of 21 years (refer to **Section 2.0**). While the operations will remain substantially the same the Project will include continuation of mining in an area to the south of the current approved mining area and changes in operational aspects, equipment selection and upgrades to road and rail infrastructure.

3. The original development consent for Mount Owen Mine was granted in 1991 prior to the publishing of the Industrial Noise Policy in 2000. In the Mount Owen Operations Project Noise Impact Assessment (Advitech 2003) for the Mount Owen Operations Project Environmental Impact Assessment (Umwelt 2004) the proposed development was assessed in accordance with Section 10 of the INP. The 2004 Project Approval (DA 14-1-2004) resulted in the establishment of contemporary noise criteria for the site in accordance with the INP. As noted in Point 2 above, the Project will include continuation of mining in an area to the south of the current approved mining area. As a result, it will be necessary to establish new, achievable project-specific noise goals for the Project.

4. As an existing development approved under the INP, the expectation of the INP is that new consent or licence noise limits obtained for an upgrade or expansion of an existing operation would reconcile the application of feasible and reasonable noise control measures with the economic, social and environmental considerations of the Project. The performance based approach to adaptive noise management adopted by Mount Owen since 2004 incorporates the application of new and proven noise control measures/technologies in concert with the management of economic, social and environmental impacts. Given the success of this performance based approach to noise management, there is not a need for Mount Owen to implement a noise reduction program as a part of the Project to address non-compliance with project-specific noise goals. This approach to management of noise impacts is a proven and effective tool to minimising noise impacts from operations and has formed the basis for the detailed design process for the Project (refer to **Section 2.0**) and the identification of reasonable and feasible noise mitigation measures for the Project (refer to **Section 8.0**).

The noise environment surrounding the Project Area has undergone a range of changes since the existing approval in 2004, in relation to both land ownership and also the cessation and commencement of a number of mining operations. Accordingly, a comprehensive assessment of the existing noise environment and identification of current noise impact assessment goals has been undertaken as part of the NIA in order to assess the Project in accordance with contemporary requirements and expectations.

Section 10 of the INP notes that in establishing revised project-specific noise levels (PSNL) for the Project:

- the PSNLs are not applied as mandatory noise limits;

- the PSNLs supply the initial target levels and drive the process of assessing all feasible and reasonable control measures;

- achievable project-specific noise goals result from applying all feasible and reasonable noise control measures; and

- for sites with limited mitigation measures, the achievable project-specific noise goals may sometimes be above the PSNLs.

Further details on the requirements of the INP and the noise impact assessment methodology used to address these requirements are discussed in **Section 3.0**.

## 1.4 Peer Review

A technical peer review of the NIA has been conducted by Katie Teyhan, Associate - Acoustics & Vibration, SLR Consulting (Australia) Pty Ltd at the request of Glencore. The review has been conducted with reference to the DGRs and the relevant noise policies and guidelines referred to within the DGRs. The peer review has consisted of review meetings between the relevant acoustic consultants; SLR and Umwelt and the proponent as well as a review of the final draft NIA report.

Details of the outcomes of the peer review are provided in **Appendix K**.

# 2.0 Project Description

The Project aims to maintain the utilisation of the existing Mount Owen Complex's infrastructure and to maximise the recovery of mineable coal tonnes from within the existing Glencore mining tenements.

A key Project design consideration has been to maximise the efficient use of the existing infrastructure and areas previously approved for disturbance and as a result, minimise the overall surface disturbance area required for the Project as far as practicable.

The key features of the Project are outlined in **Table 2.1**. **Figure 2.1** shows the general layout of the Project. For a detailed description of the existing approved operations and the Project refer to Section 2.0 of the EIS.

**Table 2.1 – Key Proposed Features of the Project**

| Key Feature | Proposed Operations |
|---|---|
| **Mine Life** | • Consent will be sought for 21 years (from date of Project Approval) to provide for mining until approximately 2030 and contingency for other activities such as rehabilitation and capping of tailings emplacement areas. |
| **Limits on Extraction** | No change in approved extraction rates.<br>• North Pit – up to 10 Mtpa ROM.<br>• Ravensworth East – up to 4 Mtpa ROM. |
| **Mine Extent** | • Continuation of the North Pit footprint to the south of current approved North Pit mining limit.<br>• Mining within the approved BNP, followed sequentially by mining within the RERR Mining Area within the Ravensworth East Mine.<br>• Mining depths to approximately 300 m (North Pit).<br>• Total additional mineable coal tonnes of approximately 92 Mt ROM (comprising 74 Mt ROM (North Pit Continuation), 12 Mt ROM (BNP) and 6 Mt ROM (RERR) Mining Area). |
| **Operating Hours** | • No change proposed - 24 hours per day, 7 days per week. |
| **Workforce Numbers** | • No significant change to workforce numbers is required. Current workforce required to operate North Pit and CHPP fluctuates and peaks at about 660 and the Ravensworth East development consent allows for a workforce of up to 260 to operate Ravensworth East operations.<br>• Addition of approximately 330 personnel for construction phase for proposed infrastructure works (approximately 18 months). |
| **Mining Methods** | • No change to mining methods proposed. |
| **Mount Owen CHPP and MIA** | • No change to existing approved CHPP capacity of 17 Mtpa ROM.<br>• product stockpile extension;<br>• CHPP improvements (including operational efficiencies) to increase processing capacity and tailings management;<br>• MIA extensions and improvements; |
| **Existing Mine Infrastructure** | • Continued utilisation of all existing mining infrastructure, including the existing crushing plant for the crushing of overburden. |

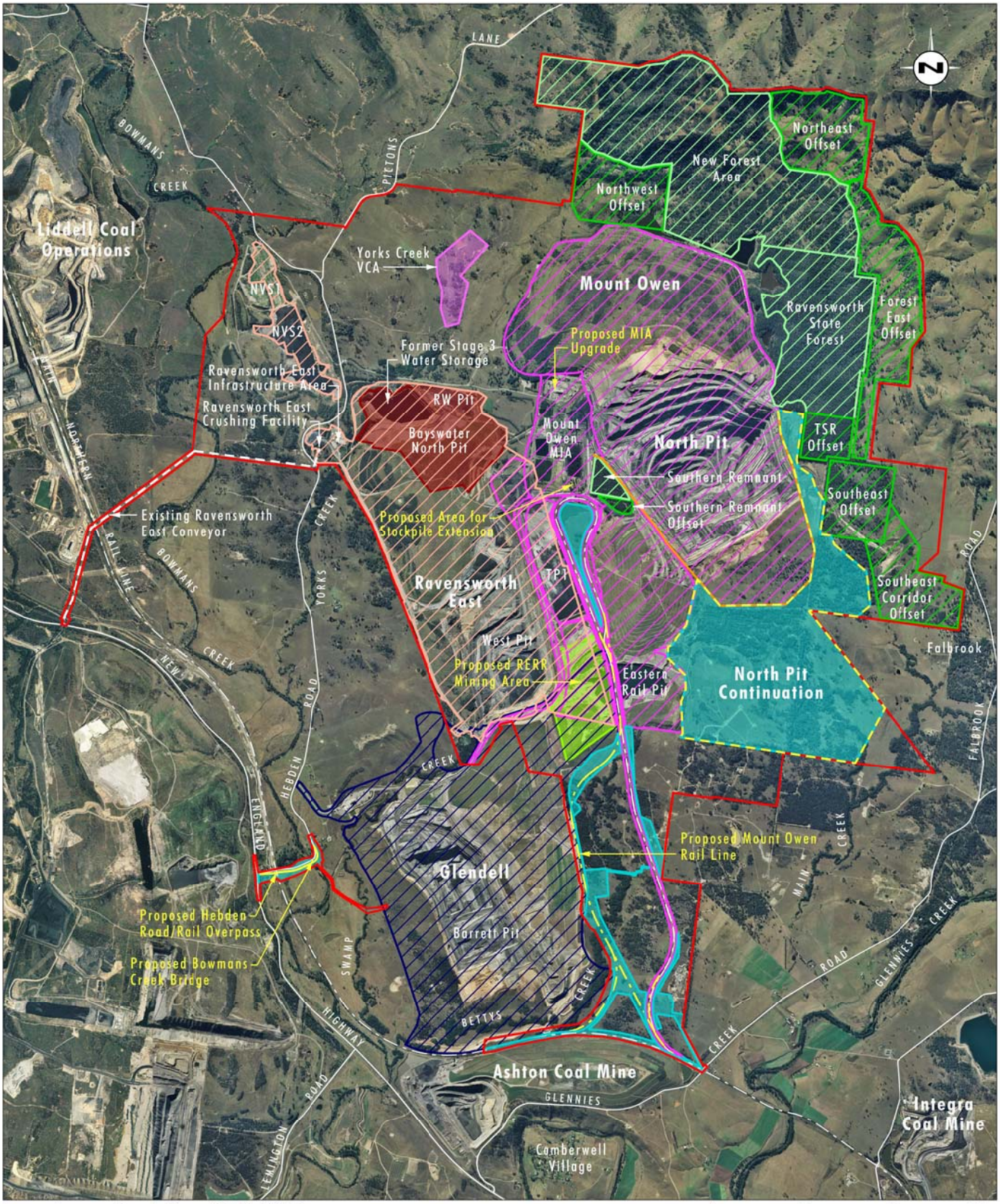


Image Source: Mount Owen (2012-2013)
Data Source: Mount Owen (2014)

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## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Proposed Disturbance Area
- Proposed RERR Mining Area
- Yorks Creek VCA
- Bayswater North Pit
- Mount Owen Operational Area
- Glendell Operational Area
- Ravensworth East Operational Area
- Existing Biodiversity Offset Area
- Ravensworth State Forest

FIGURE 2.1

**Proposed Mount Owen Continued Operations Project**

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**Table 2.1 – Key Proposed Features of the Project (cont.)**

| Key Feature | Proposed Operations |
|---|---|
| **Infrastructure Construction Activities** | • Infrastructure upgrades including:<br>▪ provision for a northern rail line turn-out and additional Mount Owen rail line; Hebden Road overpass over Main Northern Rail Line; and<br>▪ New Hebden Road bridge crossing over Bowmans Creek. |
| **Tailings and Coarse Emplacement** | • Continued use of the Ravensworth East voids for tailings emplacement and co-disposal of coarse reject and overburden within the North Pit Continuation, the West Pit / BNP and the RERR Mining Area as mining progresses.<br>• Tailings cells may be constructed and filled within the North Pit Continuation area as required to allow time for consolidation and drying of tailings in the West Pit and the RERR Mining Area.<br>• Allowance for the receipt of tailings from other mines. |
| **Coal Transportation** | • No change to current export coal transportation with the exception of the use of the proposed additional rail line.<br>• No change to capacity of 17 Mtpa ROM coal.<br>• Use of existing rail line for Glencore train park up.<br>• Transportation of up to 2 Mtpa ROM coal and crushed gravel on an as required basis via the existing overland conveyor to Liddell Coal Operations and the RCT in addition to maintaining the current approval to transport ROM coal to Bayswater and Liddell power stations. |

## 2.1 Project Design Process to Minimise Noise Impacts

Potential noise impacts associated with the Project were a key consideration in the design of the Project. Comprehensive noise modelling was completed on an iterative basis throughout the design of the Project to develop a mine plan that would, as far as practicable, minimise noise impacts associated with the Project. There was extensive consideration of Project alternatives during the iterative project design, noise modelling and assessment process including:

- Alternate mine plan layouts for the North Pit Continuation that investigated haul road orientations and locations, dump layouts and access to the various levels of the mining areas and dumps:

  - The final design for the Project takes into consideration the geology of the mine, the need for efficient access into and out of the active mining area and the design objective to minimise noise impacts. Early mine plan designs had in-pit haul roads located on the eastern side of the North Pit Continuation to reduce haul distances to the overburden emplacement area and improve the overall efficiencies in mining operations. The majority of the nearest private residents, specifically those in the Falbrook and Middle Falbrook area, are located to the east, south-east and to the south of the Project Area. As the North Pit Continuation progresses south, the distance to the local residents in these areas reduces. To reduce the potential air quality and noise impact associated with the Project, the option of locating these haul roads to the western side of the North Pit Continuation was investigated. Through this investigation it was determined that the in-pit haul roads could be located on the western side of the North Pit Continuation, which allowed for a substantial increase in the distance (approximately 1.5 kilometres) between the haul roads and the nearest local residents.

- As part of the original design, the haul roads that were located on the eastern edge of the North Pit Continuation were at natural surface level and thus machines operating on those haul roads would be in exposed locations whilst hauling. This is consistent with the current operational design used at the existing North Pit. The revised mine design considered locating the haul roads, for as far as practical, within the North Pit Continuation mining area and below the natural surface of the local topography. The design goal was to use the active mining area highwall and surrounding topography as a 'shield' to reduce potential noise impacts. This design goal was achieved with the key haul roads being located below the natural surface extending to the surface when dumping activities were further to the north or where they meet the northern haul roads to the ROM stockpile.

- Noise bunds were investigated for longer, more permanent haul roads within the North Pit Continuation. The potential location for bunds was investigated in areas where haul roads were aligned generally perpendicular to the dominant wind direction (from the north-west) to provide additional 'shielding' for the operational equipment. The preliminary quantitative review of the effectiveness of these bunds identified that, when located appropriately they do assist in the reduction of predicted noise emissions. Accordingly, the inclusion of bunds in strategic locations along some haul roads has been included in the Project, and modelling has shown benefits.

- Ramps to the dumps were designed such that a noise bund could, when practical, be run along the south eastern side of the ramps shielding trucks and equipment on exposed sections of the ramps.

- The dumps were configured such that there are options to remove machines from the higher dumps during periods associated with adverse meteorological conditions.

- The barrier attenuation available from the low-walls within the active mining area was investigated. This included the orientation of the low-walls and the practicality of double benching in more exposed locations. Due to the complex geological conditions in North Pit, double benching is not possible and the barrier attenuation offered by the low-walls where the dip of the coal seams is approximately 12° is minimal.

- Alternate mine plan layouts for BNP and the RERR Mining Area focussed on a range of overburden emplacement options including locations and availability (during adverse meteorological conditions) during the proposed stages of the Project:

  - The BNP overburden emplacement area to the north west of BNP was designed to enable day/night dumping alternatives.

  - When exposed, the overburden emplacement areas (including in the current West Pit) incorporated noise bunds in strategic locations, to reduce the line of sight to potential noise receptors.

- Sensitivity analysis on the rate of production and corresponding fleet requirements:

  - The production schedule for the Project takes into consideration the likely machine availability based on equipment age, maintenance requirements and active working room within the active mining area. A number of production schedules were investigated for the Project to consider the effect the production rate/fleet numbers would have on the noise impacts. The analysis investigated the difference in the noise impacts between operating two, three or four waste excavators in the North Pit Continuation and how this would impact the predicted noise levels and production capability of the Project. Based on the production schedule to achieve a viable

Project, the fleet composition based around three large waste excavators in the North Pit Continuation was considered the most suitable for the Project.

- The sequential mining of the BNP and RERR Mining Area was based on the continued use of the current West Pit equipment. The predicted noise levels and production capability of the Project considered the noise impacts associated with the concurrent mining of the North Pit and the BNP and RERR Mining Area.

- The North Pit and West Pit are currently truck and excavator operations. In order to maintain high equipment productivities and efficiencies, attenuated haul trucks have been matched to excavators to allow for efficient loading and cycle times. Consideration was given to an alternate mobile fleet composition for the Project; however given the complex geological conditions in North Pit Continuation and the proposed sequential mining of the BNP and RERR Mining Area, the current fleet composition is considered the most suitable.

- The age of existing fleet was reviewed with a view to understanding the timing of likely fleet replacements and the impact of extending the life of key components of the fleet to meet production schedule and how this could impact predicted noise levels during the later stages of the Project.

- Operational scenarios were investigated within the RERR Mining Area that considered different machine utilisation levels between day and night times that would achieve the Project production schedule and minimise noise impacts during the night-time period. During the later stages of the mining operations, this included the option to shut down a portion of the mining fleet during adverse meteorological conditions or reducing production rates during winter night-times (ie June, July and August 6.00 pm to 7.00 am) from the RERR Mining Area. The implementation of such strategies would be based on the outcomes of the adaptive noise management process used at Mount Owen.

This process sought to minimise the extent of potential noise affectation on private properties and residences, and to enable consideration of all reasonable and feasible noise control measures in the project design and optimisation process.

In addition to the identification of appropriate noise controls incorporated into Project design, this assessment process also recognises the effectiveness of the adaptive noise management approach (refer to **Section 8.0**) used by Mount Owen that focuses on implementing appropriate operational controls and management strategies to proactively manage potential noise impacts associated with the operation. As outlined in **Section 8.0**, in addition to the extensive noise controls factored into the noise model (refer to **Section 5.0**), Mount Owen is committed to an adaptive approach to noise management as this is an effective and proactive management tool to minimise potential noise impacts over the life of the Project.

# 3.0 Methodology

## 3.1 Objectives of the Industrial Noise Policy

The INP provides a framework and methodology for deriving limit conditions for consent and licence conditions. Using this policy the EPA regulates premises that are scheduled under the *Protection of the Environment Operations Act 1997* (POEO Act).

The specific INP objectives are:

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

The INP is designed for large and complex industrial sources and outlines processes designed to strike a feasible and reasonable balance between the operation of industrial activities and the protection of the community from noise levels that are intrusive or unpleasant.

Where the PSNLs are predicted to be exceeded, Section 1 of the INP notes, under the title 'Decision-making process' that:

> Where project-specific noise levels are exceeded, proponent assesses the level of impact by comparing resultant noise levels against the project-specific noise levels (for example, noise exceeds project-specific noise levels by X dB, number of people affected, likely impacts on activities, % of time impact occurs) and factoring-in economic and social benefits from the development.

In order to 'weigh up' the benefit of the development against the social and environmental costs resulting from the noise impacts, the NIA has presented the noise impacts in terms of the '% of time impact occurs'. The approach taken requires the determination of the noise levels at sensitive receiver locations under a detailed set of meteorological conditions representative of the meteorological conditions that would occur during each of the respective seasons and time periods. The resulting noise probability contours have been used to satisfy one of the underlying principles of the noise criteria in the INP, in that:

> The criteria in this document (Section 2 of the INP) have been selected to protect at least 90 per cent of the population living in the vicinity of industrial noise sources from the adverse effects of noise for at least 90 per cent of the time. Provided the criteria in this document are achieved, then it is unlikely that most people would consider the resultant noise levels excessive.

## 3.2 Overview of the INP Assessment Methodology

The DGRs (refer to **Section 1.3**) require the proposal be assessed in accordance with the INP. To achieve this, the NIA has:

- identified the noise sensitive locations, such as residential properties, likely to be affected by activities associated with the Project and determined existing background noise levels at the respective noise sensitive locations (refer to **Section 4.0** and **Appendix C**);

- determined PSNLs from intrusiveness and amenity based measurement of the existing background and ambient noise levels. As per the INP requirements for an existing industrial operation, the ambient noise levels that form the basis of the PSNLs have been determined excluding noise from the source under investigation (refer to **Section 4.0** and **Appendix C**);

- identified all noise sources from the Project, including both construction and operational phases, and determined the expected noise levels and noise characteristics (e.g. tonality and impulsiveness) likely to be generated from the noise sources (refer to **Section 5.0**);

- identified the times of operation for the construction and operational phases of the development and for all noise producing activities (refer to **Sections 2.0** and **5.0**);

- considered the influence of existing meteorological conditions such as wind and temperature inversions in the prediction models so as to provide a true representation of actual noise levels (refer to **Sections 4.0** and **5.0**). This has been achieved by:

  - determining the noise levels at the most sensitive locations under all meteorological conditions. To achieve this, the noise levels at each receiver location were determined for a complete range of possible combinations of wind speed, wind direction and temperature gradient. The proportion of time each of these combinations applies have been combined with the resulting noise level in a cumulative probability analysis of the noise impacts (refer to **Section 6.0**); and

  - providing probability contours for day-time, evening and night-time periods predicted under all meteorological conditions except extreme wind conditions (typically wind speeds greater than 5 m/s). The objective is to satisfy the INP requirement and identify where the PSNL would be achieved for at least 90 per cent of each respective time period and where this requirement may not be achieved (refer to **Section 6.0** and **Appendices G** and **H**);

- assessed the effect of relevant noise mitigation measures incorporated into the predictive modelling. **Section 2.0** discusses the project alternatives and noise control measures that were investigated, **Section 5.0** outlines those measures that were incorporated into the noise model of the Project and **Section 8.0** discusses the noise management and monitoring practices that will be incorporated into the Project;

- compared the predicted noise levels with the appropriate PSNLs for the phase of development or activity being considered (refer to **Section 6.1**);

- discussed the findings from the predictive modelling and, where relevant PSNLs have not been met, recommend additional mitigation measures (refer to **Section 6.1**);

- quantified the residual level of noise impact where relevant noise criteria cannot be met after application of all feasible and reasonable (i.e.: cost effective) mitigation measures, where relevant (refer to **Section 9.5**);

- determined the most appropriate noise mitigation measures including both noise controls and management of impacts. This included equipment selection, noise barriers, location of equipment and plant, scheduling of activities, community consultation, and complaints handling (refer to **Sections 2.0**, **5.0** and **8.0**); and

- provided details of a noise monitoring program with monitoring to be undertaken at noise sensitive locations subject to the agreement of the owners/occupiers of those properties (refer to **Section 8.0**).

The NIA has been completed in accordance with the INP and application notes applicable at the time of writing. The application notes prepared by the EPA that support, explain or are supplementary to the INP are reproduced in **Appendix B**.

## 3.3 Determination of Project-specific Noise Levels

### 3.3.1 Background Noise Determination

Prior to determining the assessment criteria, an evaluation of the background noise levels in the vicinity of the Project is undertaken. Noise levels are measured continuously for a period of time at selected localities that are representative of the background noise environment at the nearest potentially affected noise sensitive receivers. The recorded noise levels are analysed in accordance with Section 3 of the INP and the Assessment Background Levels (ABL) are determined. ABLs are the single figure background noise levels representing, in each 24 hours of continuous noise monitoring, the day, and evening and night time periods.

Once the ABLs have been determined, the ABLs are combined into single figure noise levels representing the background noise levels, or Rating Background Level (RBL), for the combined day, evening and night time periods of continuous noise monitoring. The RBL is the median of the ABLs measured for each period. Where the RBL is found to be less than 30 dB(A), the RBL is set at 30 dB(A) in accordance with the INP.

### 3.3.2 Assessment Criteria

The focus of the INP is on the noise emitted from industrial sites and how this may affect nearby receivers. The INP has two components for the assessment of industrial noise sources:

- controlling intrusive noise impacts in the short term for residences; and

- maintaining noise level amenity for particular land uses.

When assessing the noise impact of industrial sources, both intrusive and amenity components are considered for residential receivers. For commercial and industrial noise receivers only the amenity component is applied.

The criteria derived to assess intrusive and amenity noise impacts are:

- **the intrusive noise criterion**, which is based on the background noise level (RBL) plus 5 dB; and

- **the noise amenity criterion**, which is based on the recommended acceptable noise levels in the INP for prescribed land use. The recommended acceptable and maximum ambient noise levels and the requirements for developments where the existing noise

level from industrial noise sources is close to the acceptable noise level (ANL) are outlined in INP (refer to **Section 3.3.4**).

### 3.3.3 Intrusiveness Criteria

The intrusive noise criterion is based on the background noise level plus 5 dB, where the background noise level is defined in the INP as the RBL. Where the measured RBL is found to be at or below 30 dB(A) the corresponding Intrusiveness Criteria is set be 35 dB(A). This is the minimum possible Intrusiveness Criterion under the INP. The EPA has also provided an application note (refer to **Appendix B**) for the assessment of the Intrusiveness Criteria such that the level for night-time is no greater than the evening and evening is no greater than the day-time level (EPA June 2013).

### 3.3.4 Amenity Criteria

The relevant tables in Section 2 of the INP relating to the Amenity Criteria relevant to the Project are presented in **Tables 3.1** and **3.2**.

**Table 3.1 – Amenity Criteria – Recommended $L_{Aeq}$ Noise Levels from Industrial Noise Sources**

| Type of Receiver | Indicative Noise Amenity Area | Time of Day [1] | Recommended $L_{Aeq}$ Noise Level | |
|---|---|---|---|---|
| | | | Acceptable | Recommended Maximum |
| Residence | Rural | Day | 50 | 55 |
| | | Evening | 45 | 50 |
| | | Night | 40 | 45 |
| | Suburban | Day | 55 | 60 |
| | | Evening | 45 | 50 |
| | | Night | 40 | 45 |
| | Urban | Day | 60 | 65 |
| | | Evening | 50 | 55 |
| | | Night | 45 | 50 |
| | Urban/Industrial Interface - for existing situations only | Day | 65 | 70 |
| | | Evening | 55 | 60 |
| | | Night | 50 | 55 |
| School classroom | All – Internal | Noisiest 1hr period when in use | 35 | 40 |
| Place of worship - internal | All – Internal | When in use | 40 | 45 |
| Area specifically reserved for passive recreation | All | When in use | 50 | 55 |
| Active recreation area (School playground) | All | When in use | 55 | 60 |
| Commercial premises | All | When in use | 65 | 70 |
| Industrial premises | All | When in use | 70 | 75 |

Source: Table 2.1, INP

Note 1: When referring to the time of day or 'period' the INP defines day-time as 7.00 am - 6.00 pm, evening as 6.00 pm - 10.00 pm and night-time as 10.00 pm - 7.00 am Monday to Saturday. On Sundays and Public Holidays, day-time is 8.00 am - 6.00 pm, evening 6.00 pm - 10.00 pm and night-time 10.00 pm - 8.00 am.

The INP notes that the maximum noise levels from industrial sources should not normally exceed the recommended Acceptable Noise Level (ANL) specified in **Table 3.1**. By meeting the relevant ANL for a receiver or land use type, the noise from industrial sources should not result in speech interference, community annoyance and sleep disturbance.

Where the existing industrial noise levels are close to or exceed the ANL for an area, then noise levels from new industries or changes to existing industries need to be designed so that the cumulative effect does not produce noise levels that would exceed the ANL. **Table 3.2** outlines the process to modify the acceptable noise level from new industries to account for existing levels of industrial noise.

**Table 3.2 – Modification to Acceptable Noise Level to Account for Existing Levels of Industrial Noise**

| **Total Existing $L_{Aeq}$ Noise Level from Industrial Noise Sources** | **Maximum $L_{Aeq}$ Noise Level for Noise from New Sources Alone, dB** |
|---|---|
| ≥ Acceptable noise level plus 2 dB | If existing noise level is likely to decrease in future acceptable noise level minus 10 dB.<br>If existing noise level is unlikely to decrease in future existing noise level minus 10 dB. |
| Acceptable noise level plus 1 dB | Acceptable noise level minus 8 dB |
| Acceptable noise level | Acceptable noise level minus 8 dB |
| Acceptable noise level minus 1 dB | Acceptable noise level minus 6 dB |
| Acceptable noise level minus 2 dB | Acceptable noise level minus 4 dB |
| Acceptable noise level minus 3 dB | Acceptable noise level minus 3 dB |
| Acceptable noise level minus 4 dB | Acceptable noise level minus 2 dB |
| Acceptable noise level minus 5 dB | Acceptable noise level minus 2 dB |
| Acceptable noise level minus 6 dB | Acceptable noise level minus 1 dB |
| < Acceptable noise level minus 6 dB | Acceptable noise level |

Source: Table 2.2, INP
Note 1: ANL is the recommended acceptable LAeq noise level for the specific receiver.

The non-discretionary development standard for noise in the Mining SEPP (2013) states for cumulative noise for private dwellings should not be greater than the acceptable noise levels determined in accordance with Table 2.1 of the INP. Accordingly the ANL levels referred to in **Table 3.1** represent the cumulative noise criteria for private dwellings in the region surrounding the Project.

### 3.3.5 Project-Specific Noise Levels

In assessing the noise impacts from industrial sources at residential receivers both the Intrusiveness and Amenity Criteria are considered. For each period (day, evening and night) the PSNL for a project reflects the most stringent noise levels derived from both the Intrusiveness and Amenity Criteria. Where the Intrusiveness Criteria is less than or equal to the Amenity Criteria, the Intrusiveness Criteria is applied as the limiting criterion and forms the PSNL for the industrial source as it is more stringent due to being determined over a much shorter period of time. In accordance with Section 2 of the INP, where the Amenity Criteria is lower than the Intrusiveness Criteria, both the Intrusiveness Criteria and Amenity Criteria become the limiting criteria and form the PSNL for the industrial source. The PSNLs set the benchmark against which noise impacts and the need for noise mitigation are assessed.

### 3.3.6 Assessing Areas of High Traffic Noise

The EPA has provided an application note (refer to **Appendix B**) for the assessment of the Amenity Criteria in areas with high traffic noise (EPA June 2013). Where high traffic noise levels are a feature of the noise environment, the ANL can be set relative to the level of the traffic noise. For this to occur, the noise levels from the industrial source would likely be inaudible or difficult to measure due to road traffic noise. For this situation to be applicable the $L_{Aeq, (period)}$, traffic noise level would need to be more than 10 dB above the respective ANL.

### 3.3.7 Assessing Sleep Disturbance

The EPA notes that the INP does not specifically address sleep disturbance from high noise level events and has provided an application note (refer to **Appendix B**) for the assessment of sleep disturbance (EPA June 2013). According to the EPA, although not ideal as a criterion, the current approach for nominating a sleep disturbance criterion is based on the $L_{A1, 1 minute}$ from an industrial noise source not exceeding the $L_{A90, 15 minute}$ by more than 15 dB.

### 3.3.8 Assessing Low Frequency Noise

Section 4 of the INP provides for the assessment of low frequency noise through the addition of 'Modifying Factor' adjustments to the predicted noise levels at a receiver before comparison with the PSNL. The test set out by the INP for low frequency noise is to compare the difference between the C-weighted and A-weighted noise levels. The INP requires that if the difference between the C-weighted and A-weighted noise levels is greater than 15 dB, a 'modifying factor' of 5 dB is added to the predicted noise level.

However, research into the annoyance of low frequency noise (Broner 2011), suggests that this approach may overstate the level of perceived annoyance. DP&E have suggested in a *Draft Guideline: Mining. Noise Monitoring Application Note* (DP&I 2013) that a more appropriate criterion, based on the work of Broner (2011), of 65 dB(C) during the daytime or evening and 60 dB(C) during the night be adopted. This approach has been accepted by DP&E and EPA for a number of recently approved mining developments located in the Hunter Valley.

Both the INP and Broner (2011) approaches to low frequency noise impact determination have been considered in this assessment.

## 3.4 Noise Modelling Methodology

### 3.4.1 Predicting Operational Noise Levels

Section 6 of the INP requires the prediction of noise levels to take into account all possible noise sources that may reasonably be expected when the plant or facility in question is fully operational. The objective is to accurately predict the noise impact for the Project for comparison against the PSNL. The methodology outlined by the INP includes:

- identifying all possible source, site and receiver parameters so that noise can be adequately predicted;
- predicting noise levels from the source at receiver locations, taking into account all important parameters including the source noise levels and locations, operating times, receiver locations, weather conditions applicable to the site, site features and topography, as well as the PSNL; and

- comparing the predicted noise level with the PSNL to determine the noise impact.

When quantifying the potential effect on receivers, the INP specifically notes that the noise levels predicted should correspond to the noise descriptor of the PSNL applicable to the Project, i.e. 15 minutes for PSNL based on the Intrusiveness Criteria and day, evening and/or night for PSNL based on the Amenity Criteria.

### 3.4.2 Meteorological Conditions

Section 5 of the INP requires the prediction of the noise impacts to take into consideration weather conditions that would be expected to occur at a particular site for a significant period of time.

The INP notes that there are two approaches for the assessment of meteorological effects, such as gradient winds and temperature inversions, on propagating the noise from the source to the receiver. The simple method is to use default conditions outlined in the INP. Alternatively, the 'detailed approach' outlined in Section 5 of the INP involves analysing the meteorological data to determine whether inversion and/or wind effects are significant features of the region and warrant inclusion in the assessment.

A third approach has been developed that considers a detailed set of meteorological conditions that are representative of the meteorological conditions that would be expected during the life of the Project. This approach involves analysing the meteorological data to determine the percentage of occurrence of inversions and/or wind effects. The noise impacts are then modelled for each set of meteorological conditions identified. The approach takes account of the influence of local meteorological conditions on the propagation of the noise from the Project to the entire region surrounding the Project Area. It is understood the EPA has previously accepted noise predictions based on this approach to modelling the noise emissions as it presents a more detailed level of analysis than that required under the INP.

The detailed analysis of the meteorological conditions in **Section 5.6** provides the information required to determine the likelihood of the noise levels exceeding the nominated PSNL at sensitive receiver locations under all meteorological conditions expected to occur at a particular site for each respective season and time period. The approach taken for modelling inversion conditions is based on stability class where a stability class relates to a range of lapse rates when applied to the modelling software.

### 3.4.3 Computer-based Modelling Software

The computer-based modelling software package Environmental Noise Model (ENM), developed by RTA Technology Pty Ltd, was used to predict the noise levels produced by the Project within the surrounding environment. ENM is recognised and accepted by the EPA as a computer modelling program suited to predicting noise impacts from industrial noise sources.

The ENM noise models were based on machine and plant sound power level (SWL) data provided by Mount Owen or collected by Umwelt from the existing North Pit or other Glencore operations, digital terrain maps of the region surrounding the Project Area prepared by Umwelt and mine plans provided by Mount Owen, which include the number and type of machines and representative positioning based on each mine plan.

The details of the noise sources, mine plans and receiver locations are presented in **Section 5.0**.

The NIA is based on the noise levels predicted by the ENM model of the proposed operations for the Project. The assessment of the predicted noise levels against the PSNL was then undertaken in accordance with the INP (refer to **Section 6.0**).

The objective of the INP is to ensure that the criterion will be achieved for at least 90 per cent of the time. To assess the likelihood of the mining operation exceeding specified noise levels during the day-time, evening and night-time periods, a sensitivity analysis was performed for nominal periods (years) of the Project using local climatic data.

The noise levels at each receiver location was determined using ENM's single point calculation for 172 combinations of wind speed divided into ten intervals, wind direction based on eight compass intervals and temperature gradients representing A to D class stability conditions, and E class, F class and G class stability conditions (refer to **Section 5.6** and **Appendix F**). The proportion of time each of these combinations applies was combined with the resulting noise level in a cumulative probability distribution chart. As an example **Figure 3.1** presents predicted noise impact for a range of applicable meteorological conditions. In this example the theoretical PSNL is 36 dB(A) and is predicted to be exceeded 23 per cent of the time. On the basis of this example, the 10$^{th}$ percentile noise level of 37 dB(A) in **Figure 3.1** is the noise level that is likely to be exceeded 10 per cent of the time. This is referred to statistically as the 90$^{th}$ percentile, i.e. 90 per cent of the results will be below this noise level.

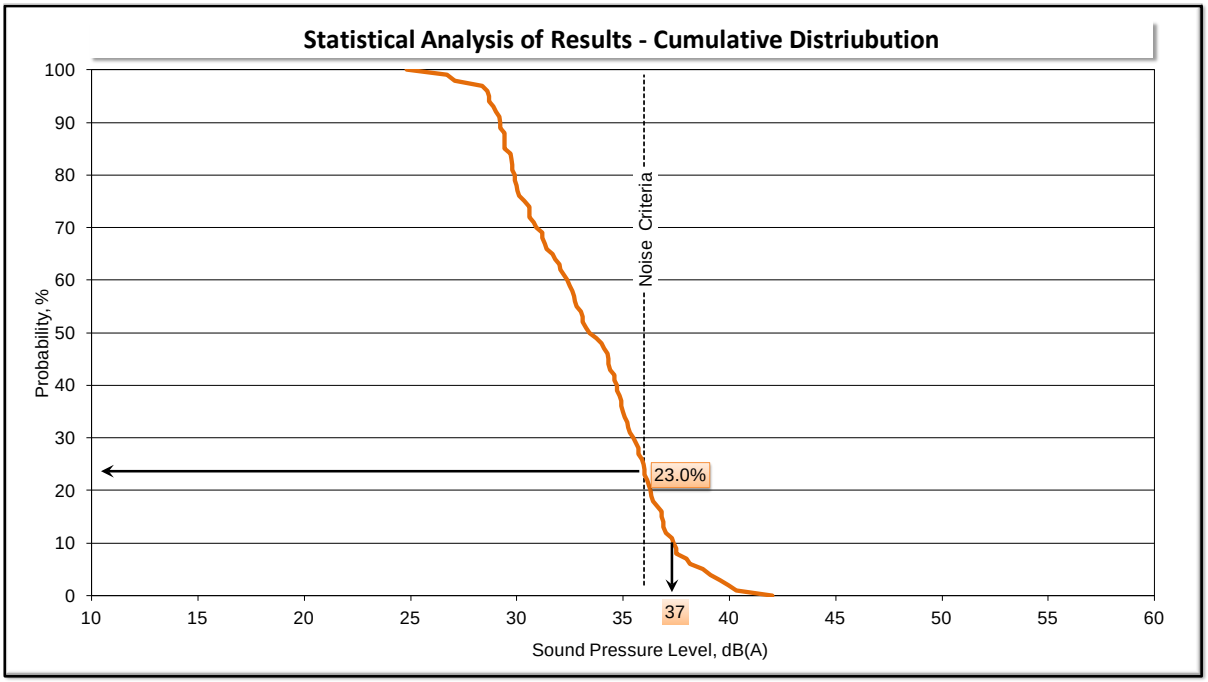



**Figure 3.1 – Predicted Probability versus Noise Levels**

The results of noise modelling and analysis of the predicted noise impacts are presented in **Section 6.0**. The results are not referred to in the statistical sense, but are referred to as the noise levels that could be exceeded 10 per cent of the time (i.e. not as the criterion that will be achieved at least 90 per cent of the time but the criterion that could be exceeded 10 per cent of the time).

### 3.4.4 Modifying Factors

Where the noise source contains annoying characteristics such as prominent tonal components, impulsiveness, intermittency, irregularity or dominant low frequencies, the INP requires modifying factors to be applied to the predicted noise levels.

The assessment of modifying factors is discussed in **Section 6.0** and **Appendix J**.

### 3.4.5 Prediction of Sleep Disturbance Noise Levels

The noise modelling methodology discussed above was also used for the prediction of noise levels that could lead to sleep disturbance. However, the modelling was based on the worst case prevailing meteorological conditions rather than the percentage of occurrence of inversions and/or wind effects. The worst case prevailing meteorological conditions were determined in accordance with the 'detailed approach' as presented in Section 5 of the INP.

Noise sources that could lead to sleep disturbance are typically transient noises and often have tonal characteristics. The prediction of noise levels from activities that could lead to sleep disturbance are modelled as discrete singular events.

The details of the noise sources that could lead to sleep disturbance are presented in **Section 5.0**.

### 3.4.6 Prediction of Construction Noise Levels

The noise modelling methodology discussed above was also used for the prediction of construction noise levels. As with the assessment of sleep disturbance, the modelling was based on the worst case prevailing meteorological conditions determined in accordance with the 'detailed approach' presented in Section 5 of the INP.

The prediction of construction noise levels takes into account the noise sources that may reasonably be expected to be in use during the construction activities. The assessment of the construction noise does not include construction activities related to the establishment of the mining activities as these are covered in the operational noise model.

The details of the noise sources used during non-mining related construction activities, which includes the construction of a two-lane bridge over Bowmans Creek and additional rail infrastructure, are presented in **Section 5.0**.

## 3.5 Assessment against Project Criterion

### 3.5.1 Determination of Impacts

The INP requires the predicted noise levels to be compared with the appropriate PSNLs and the identification of additional mitigation measures where relevant PSNLs have not been met. As discussed in **Section 1.0**, the Project will include continuation of mining in an area to the south of the current approved North Pit mining limit in addition to the BNP and RERR Mining Area. As a result, new PSNLs will be established for the Project.

### 3.5.2 Mitigating Noise Impacts

Section 7 of the INP notes: *when predicted noise levels exceed the PSNLs, a range of strategies should be considered to reduce the noise impact on offsite receivers*. Specifically, the DGRs require evidence that there are no additional reasonable and feasible mitigation

measures available for inclusion as a part of the Project. The three main strategies used to identify reasonable and feasible noise control and mitigation strategies are:

- **Controlling noise at the source** – There are three approaches to controlling noise generated by the source: source elimination; Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA).

- **Controlling the transmission of noise** – There are two approaches: the use of barriers and land-use controls which attenuate noise by increasing the distance between source and receiver.

- **Controlling noise at the receiver** – There are two approaches: negotiating an agreement with the landholder and acoustic treatment of dwellings to control noise.

As outlined in **Section 5.0**, a detailed assessment was undertaken of the reasonable and feasible control measures that that could be incorporated into the Project. No additional measures were identified from those investigated during the design phase of the Project (refer to **Sections 2.0**, **5.0** and **8.0**).

### 3.5.3 Impact Assessment

If unacceptable noise impacts from a development persist after consideration of all reasonable and feasible noise reduction measures, Section 8 and Section 9 of the INP provide a process for negotiating an agreement between the proponent and the affected party(s). **Table 3.3** presents the methodology for assessing noise levels which may exceed the PSNLs.

**Table 3.3 – Noise Impact Assessment Methodology**

| Assessment Criterion | PSNL | Noise Management Zone | Noise Affectation Zone |
|---|---|---|---|
| Intrusiveness | Rating background level plus 5 dB | ≤ 5 dB above PSNL | > 5 dB above PSNL |
| Amenity | Based on existing industrial level | ≤ 5 dB above PSNL | > 5 dB above PSNL |

The objectives of the project-specific noise level, Noise Management Zone and Noise Affectation Zone and assessment methodology are detailed below.

**Project-specific Noise Level (PSNL)**

The objective of the PSNL is to provide a noise emission level that most people in the broader community would find acceptable when exposed to industrial noise at that level (or less) for approximately 90 per cent of the time.

**Noise Management Zone**

The noise management zone in this NIA is applicable where the predicted noise levels exceed the project-specific criteria by up to and including 5 dB. The noise impacts in this zone range from minor (up to and including 2 dB above) to moderate (greater than 2 up to and including 5 dB). The current Mount Owen Operations Project Approval (DA 14-1-2004) identifies a Noise Management Zone where the noise levels at nominated residences were predicted to exceed the project-specific criteria by greater than 2 dB and up to and including 5 dB.

On this basis, it is proposed to maintain a Noise Management Zone that relates to residences that are predicted to exceed the relevant PSNL by greater than 2 dB and up to and including 5 dB throughout the life of the Project.

Management procedures that can be implemented in the Noise Management Zone include:

- prompt response to any issues of concern raised by community;
- noise monitoring on-site and within the community;
- refinement of on-site noise mitigation measures and plant operating procedures where practical; and
- up front advice to property owners that they have rights to request the following:
  - consideration of acoustic mitigation at receivers; and
  - the negotiation of private agreements with property owners.

**Noise Affectation Zone**

The Noise Affectation Zone in this NIA is applicable where the predicted noise levels are greater than 5 dB above the project-specific criteria. Noise emissions at this level are considered likely to be unacceptable by property owners and implementation of the following measures may be required:

- discussions with relevant property owners to assess concerns and provide solutions;
- implementation of acoustic mitigation at receivers or other negotiated agreement; and
- up front advice to property owners that they have rights to request acquisition in accordance with terms of any development consent.

This approach is consistent with the current Mount Owen Operations Project Approval (DA 14-1-2004), which nominates the Noise Affectation Zone is where the noise levels at nominated residences were predicted to exceed 40 dB(A), i.e. more than 5 dB above the project-specific noise levels identified at that time.

### 3.5.4 Residual Level of Impact

Section 8 of the INP notes: *the noise assessment should quantify any remaining or residual impacts that exceed the PSNL, after applying feasible and reasonable mitigation strategies*. The INP notes that the acceptability of the residual noise impacts should be evaluated by taking into consideration the following factors:

- **Characteristics of the area and receivers likely to be affected** – The INP outlines a list of attributes that should be considered when assessing the area and/or receivers likely to be affected by the Project.
- **Characteristics of the proposal and its noise or vibrations** – This includes the circumstances and times when the PSNLs are likely to be exceeded and the extent of the likely exceedance.
- **The feasibility of additional mitigation or management measures** – The DGRs specifically require evidence that there are no additional reasonable and feasible mitigation measures other than those proposed that could be included in the Project.

- **Equity issues** – The assessment of the Project should identify where there are costs borne by others as a result of the Project, if the Project results in an increase in cumulative noise levels, and if those adversely affected by the Project should be compensated.

## 3.6 Overview Noise Impact Assessment

The following sections provide the outcomes of the application of the process, methods and assessment approach, described above, in accordance with the INP:

- **Section 4.0** identifies the noise sensitive locations and determines the relevant noise assessment criteria based on the noise monitoring of the existing background noise levels in the region surrounding the Project Area.

- **Section 5.0** identifies all the construction and operational phase noise sources likely used by the Project, the times of operation and the meteorological conditions relevant to the Project.

- **Section 5.0** also identifies the noise control measures that were investigated for and implemented as part of the Project.

- **Section 6.0** presents the predicted noise impacts associated with the Project.

- **Section 7.0** presents the cumulative noise impact assessment associated with the Project.

- **Section 8.0** provides details of the noise management of a noise monitoring program.

- **Section 9.0** presents details of the peer review, a summary of the residual impacts in accordance with Section 8 of the INP.

# 4.0 Existing Acoustic Environment and Assessment Criteria

## 4.1 Existing Background Noise Levels

An assessment of the existing noise environment in the area surrounding the Project Area was undertaken using monitoring data from the Mount Owen Complex continuous monitoring network and two mobile continuous noise monitors. An attended noise monitoring program was used to provide supplementary data in areas not covered by the continuous noise monitors and to confirm source identification at the continuous noise monitor locations. The analysed noise monitoring dataset includes data from all four seasons and has been sourced from both long term noise monitoring stations in addition to noise monitoring stations setup specifically for the Project.

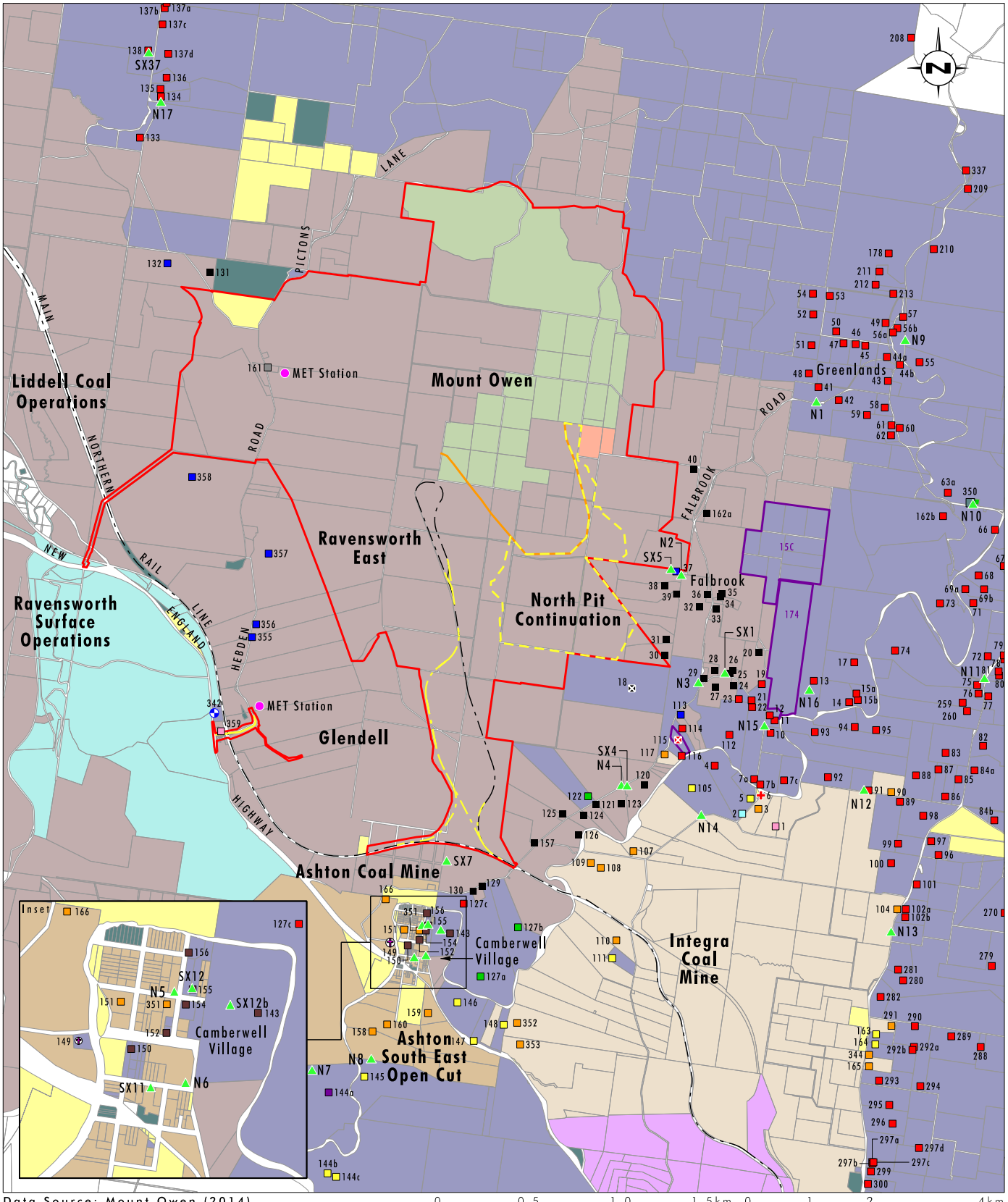
### 4.1.1 Monitoring Program

The locations of the monitoring sites are shown on **Figure 4.1**. The details of the background noise monitoring program using the continuous noise monitors are provided in **Table 4.1**. The details of the background noise monitoring program using attended noise monitoring are provided in **Table 4.2**.

**Table 4.1 – Continuous Noise Monitoring Program**

| Monitoring Location | Description | Monitoring Period |
|---|---|---|
| SX1 | SentineX 1 – Middle Falbrook (R026) | 00:00MN 12/3/2013 to 00:00MN 2/6/2014 |
| SX4 | SentineX 4 – Glennies Creek (R120) | 00:00MN 12/3/2013 to 00:00MN 2/6/2014 |
| SX5 | SentineX 5 – Falbrook (R037) | 00:00MN 12/3/2013 to 00:00MN 2/6/2014 |
| SX11 | SentineX 11 –Camberwell Village (Central) | 00:00MN 12/3/2013 to 06:45 13/2/2014 |
| SX12a | SentineX 12 – Camberwell Village (R155) | 00:00MN 12/3/2013 to 23:45 27/11/2013 |
| SX12b | SentineX 6 – Camberwell Village (R143)<br>SentineX 12 – Camberwell Village (R143) | 20:15 20/8/2013 to 06:45 20/12/2013<br>07:00 17/01/2014 to 00:00MN 2/6/2014 |
| SX37 | SentineX 37 – Hebden Road | 00:00MN 12/3/2013 to 00:00MN 2/6/2014 |
| C1 | Receiver – R013 | 14:45 17/6/2013 to 09:15 6/8/2013 |
| C2 | Receiver – R010 | 09:00 7/8/2013 to 17:455 20/8/2013 |
| C3 | Receiver – R007 | 12:00 1/3/2013 to 13:15 17/6/2013 |
| C4 | Receiver – R091 | 15:15 11/6/2013 to 05:45 16/7/2013 |
| C5 | Receiver – R095 | 07:00 30/7/2013 to 05:45 7/8/2013 |
| C6 | Receiver – R017A | 11:15 6/8/2013 to 00:00MN 2/6/2014 |
| C7 | Receiver – R048 | 13:15 21/1/2014 to 00:00MN 2/6/2014 |

The continuous noise monitors SentineX 1, 4 and 5 were established following granting of the 2004 Mount Owen Operations Project Approval. SentineX 11 and 12 were added to the Mount Owen Complex continuous monitoring network in 2007. During February 2014 SentineX 11 was retired from service. SentineX 12 was relocated from Property R155 (Sx12a) to Property R143 (SX12b) in December 2014. Prior to the relocation of SentineX 12 a mobile unit (SentineX 6) was located at Property R143 for the period August 2013 to December 2013. The analysis of monitoring data from the continuous monitoring network has used data from autumn 2013 through to autumn 2014 to provide a broad range of




Data Source: Mount Owen (2014), Department of Lands (2009)

Inset Scale 1:30 000 (0, 0.5, 1.0, 1.5 km)

Main Scale 1:90 000 (0, 1, 2, 4 km)

## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
- Macquarie Generation
- Integra Coal
- Glencore
- Private
- Rixs Creek Mine
- State Forest
- Minister for Education
- Noise Monitoring Location
- MET Station Location
- Church
- Community Hall
- Daracon Site Office
- Glennies Creek Fire Brigade
- Mt Pleasant Primary School
- Former Hebden Public School
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Currently Subject to Acquisition Rights - Dairy
- SEOC Acquisition
- Private Residence
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Private No Dwelling

FIGURE 4.1

**Sensitive Receivers and Noise Monitoring Locations**

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meteorological conditions including periods where the increased occurrence of noise propagating meteorological conditions are present.

The two mobile continuous noise monitors were used to provide background noise monitoring data within the Middle Falbrook locality and Greenlands locality at monitoring locations C1 to C7 (refer to **Figure 4.1** and **Table 4.1**) over the corresponding period.

Existing attended noise monitoring locations N1 to N8 shown on **Figure 4.1** and described in **Table 4.2** were established as a part of the Mount Owen Complex Noise Monitoring Program to assess compliance with the 2004 Mount Owen Operations Project Approval (DA 14-1-2004) and EPL 4460 and to verify the monitoring data from the continuous noise monitoring network. The continuous noise monitoring locations and the attended noise monitoring locations were selected as being representative of the nearest and/or most potentially affected residences to the east, south-east and south of Mount Owen Complex.

**Table 4.2 – Attended Noise Monitoring Program**

| Monitoring Location | Description |
|---|---|
| N1 | Falbrook Road Greenlands west of Bridgman Road (R042) proximity of C1 |
| N2 | Falbrook south of Shadlows Lane (R037) adjacent to SX5 |
| N3 | Corner of Falbrook and Middle Falbrook Roads (R027) adjacent to SX1 |
| N4 | Glennies Creek Road (R120) adjacent to SX4 |
| N5 | Camberwell Village – Northern (R154) adjacent to SX12 |
| N6 | Camberwell Village – Central Dyrring St adjacent to SX11 |
| N8 | Camberwell Village – Southern (R145) |
| N9 | Goorangoola Road north of Falbrook Road (R056b) |
| N10 | Mount Pleasant School, Bridgman Road (R350) |
| N11 | Bridgman Road (R075) |
| N12 | Thomas Lane (R091) adjacent to C4 |
| N13 | Stoney Creek Road/Bridgman Road (R102b) |
| N14 | Middle Falbrook Road west of Stoney Creek Road (R105b) |
| N15 | Middle Falbrook Road north of Glennies Creek bridge (R010) adjacent to C2 |
| N16 | Middle Falbrook (R013) adjacent to C1 |

Supplementary attended noise monitoring locations N9 to N16 are representative of the residences to the north east, east and south-east that could potentially be affected by the Project. Targeted noise monitoring was undertaken at these locations between December 2012 and August 2013.

The monitoring data from the continuous monitoring network and from the attended monitoring program includes, but is not limited to:

- ambient background and statistical noise levels for each 15 minute interval recorded as $L_{A1,15\ minute}$, $L_{A10,15\ minute}$, $L_{Aeq,15\ minute}$ and $L_{A90,15\ minute}$.

The noise monitoring results have been used to determine the ABLs, RBLs and mean $L_{Aeq,\ period}$ (where 'period' equals day, evening or night) noise levels surrounding the Project Area. Depending on operational conditions within the Project Area as well as the surrounding mining operations and the meteorological conditions at the time of monitoring, the continuous and attended noise monitoring results include noise contributions from a number of mining, road and rail noise sources as well as the Mount Owen and Ravensworth East Mines. In accordance with the Section 3 of the INP, the assessment of the background noise

environment has, where practical, excluded the noise impact from Mount Owen and Ravensworth East Mines from the analysis.

### 4.1.2 Monitoring Results

The assessment of the existing noise environment using the continuous noise monitoring results, reported as the underlying RBL and the measured Mean $L_{Aeq, period}$ (where 'period' equals day, evening or night) are presented in **Table 4.3**. The ABLs, RBLs, Mean $L_{Aeq, period}$ noise levels and evaluation of the estimated industrial noise source contribution to the Mean $L_{Aeq, period}$, and supporting monitoring data are provided in **Appendix C**.

During the monitoring program, data affected by rain or wind speeds in excess of 5 m/s was excluded in accordance with Section 3.4 of the INP. Meteorological data for this purpose was obtained from the Mount Owen Complex continuous monitoring network weather stations SentineX 8 and 13.

The location of the weather stations is shown on **Figure 4.1**.

The results of the attended noise monitoring program, indicating the variability of the background $L_{A90,15\ minute}$ and $L_{Aeq,15\ minute}$ noise levels and the dominant noise sources are presented in **Table 4.4**. Sample run charts from the attended noise monitoring program are provided in **Appendix C**.

During the attended noise monitoring program, the contribution from the approved North Pit was quantified. The observations from the attended noise monitoring program have been used to establish the measured $L_{Aeq, 15\ minute}$ noise levels excluding the contribution from the approved North Pit. The $L_{Aeq, 15\ minute}$ noise levels from other industrial sources is presented in **Table 4.4**.

The observations from the attended noise monitoring program have also been used to validate the measured Mean $L_{Aeq, 15\ minute}$ noise levels recorded by the continuous noise monitoring units excluding the contribution from the approved North Pit. The $L_{Aeq, 15\ minute}$ noise levels from other industrial sources recorded by the continuous noise monitoring units is presented in **Table 4.3**.

**Table 4.3 – Continuous Monitoring Results, RBL and Mean $L_{Aeq, period}$, dB(A)**

| Monitoring Location | Time Period | RBL [1] | Mean $L_{Aeq, period}$ | |
|---|---|---|---|---|
| | | | **Total Measured** (All Sources) | **Estimated Industrial** (excludes Mount Owen Mine and Ravensworth East) |
| SX1 – SentineX 1 Middle Falbrook | Day | 30 (29.6) | 48.3 | 31 |
| | Evening | 32.0 | 43.2 | 31 |
| | Night | 30.4 | 42.7 | 31 |
| SX4 – SentineX 4 Glennies Creek | Day | 34.0 | 47.2 | 36 |
| | Evening | 34.9 | 45.8 | 36 |
| | Night | 34.7 | 44.8 | 37 |
| SX5 – SentineX 5 Falbrook | Day | 30 (27.9) | 47.7 | 32 |
| | Evening | 30 (28.5) | 40.6 | 32 |
| | Night | 30 (27.5) | 38.1 | 33 |

## Table 4.3 – Continuous Monitoring Results, RBL and Mean $L_{Aeq, period}$, dB(A) (cont.)

| Monitoring Location | Time Period | RBL [1] | Mean $L_{Aeq, period}$ | |
|---|---|---|---|---|
| | | | **Total Measured** (All Sources) | **Estimated Industrial** (excludes Mount Owen Mine and Ravensworth East) |
| SX11 – SentineX 11 Central Camberwell Village | Day | 44.7 | 55.4 | 31 |
| | Evening | 42.6 | 54.9 | 36 |
| | Night | 37.7 | 53.3 | 36 |
| SX12a – SentineX 12 Northern Camberwell Village (R155) | Day | 35.5 | 46.4 | 37 |
| | Evening | 38.8 | 46.9 | 37 |
| | Night | 37.2 | 48.6 | 38 |
| SX12b – SentineX 6 and 12 Northern Camberwell Village (R143) | Day | 31.1 | 47.1 | 37 |
| | Evening | 34.6 | 46.0 | 37 |
| | Night | 30 (29.7) | 42.2 | 36 |
| SX37 – SentineX 37 Hebden Road | Day | 30 (26.5) | 45.1 | 35 |
| | Evening | 30 (29.1) | 42.1 | 35 |
| | Night | 30 (28.4) | 38.8 | 35 |
| C1 – Receiver R013 | Day | 30.1 | 44.3 | 37 |
| | Evening | 34.1 | 42.8 | 37 |
| | Night | 32.2 | 39.8 | 34 |
| C2 – Receiver R010 | Day | 34.5 | 42.5 | 37 |
| | Evening | 31.6 | 42.0 | 38 |
| | Night | 30.6 | 39.1 | 35 |
| C3 – Receiver R007 | Day | 32.4 | 50.8 | 38 |
| | Evening | 35.7 | 46.1 | 37 |
| | Night | 33.1 | 41.9 | 36 |
| C4 – Receiver R091 | Day | 30 (27.3) | 42.8 | 34 |
| | Evening | 31.7 | 37.5 | 33 |
| | Night | 30 (29.5) | 35.7 | 31 |
| C5 – Receiver R095 | Day | 31.5 | 42.6 | 35 |
| | Evening | 35.3 | 39.6 | 34 |
| | Night | 33.6 | 37.6 | 31 |
| C6 – Receiver R017A | Day | 30 (27.9) | 44.9 | 36 |
| | Evening | 30 (29.6) | 46.9 | 37 |
| | Night | 30 (26.8) | 37.2 | 30 |
| C7 – Receiver R048 | Day | 30 (27.5) | 41.7 | < 30 |
| | Evening | 30 (28.3) | 38.3 | < 30 |
| | Night | 30 (23.5) | 35.9 | < 30 |

Note 1: Where the RBL is less than 30 dB(A) the RBL is set at 30 dB(A). The values in the parentheses are the actual RBL determined from the monitoring data.

### 4.1.3 Camberwell Village

Prior to mid January 2014 the noise levels recorded at Property R143 (SX12b) showed a consistent contribution from traffic noise and cumulative industrial noise. Since mid January 2014 the noise levels have decreased in each of the metrics used to describe the existing acoustic environment. Specifically, the background noise levels during the night-time have reduced by, on average, 9 to 10 dB. It is considered that the change in the noise environment at Camberwell Village can be attributed to:

- a reduction in traffic on the New England Highway due to the down turn in the coal industry;
- road works during the 2014 period on the New England Highway in the immediate vicinity of Camberwell Village slowing traffic speeds; and
- a reduction in the cumulative industrial noise levels including the closure of the Integra operation to the east of the monitoring location in June 2014.

The shift in the existing acoustic environment at Property R143 (SX12b) pre and post January 2014 is summarised in **Table 4.4**.

**Table 4.4 – Continuous Monitoring Results at Property R143 (SX12b), RBL and Mean $L_{Aeq, period}$, dB(A)**

| Monitoring Period | Time Period | RBL [1] | Mean $L_{Aeq, period}$ | |
|---|---|---|---|---|
| | | | **Total Measured** (All Sources) | **Estimated Industrial** (excludes Mount Owen Mine and Ravensworth East) |
| All data<br>from: 20:15 20/8/2013<br>to: 00:00MN 2/6/2014 | Day | 31.1 | 47.1 | 37 |
| | Evening | 34.6 | 46.0 | 37 |
| | Night | 30 (29.7) | 42.2 | 36 |
| Pre mid January 2014<br>from: 20:15MN 20/8/2013<br>to: mid January 2014 | Day | 33.6 | 49.0 | 37 |
| | Evening | 37.2 | 44.6 | 37 |
| | Night | 35.6 | 45.0 | 38 |
| Post mid January 2014<br>from: mid January 2014<br>to: 00:00MN 2/6/2014 | Day | (30) 27.8 | 61.8 | 37 |
| | Evening | 30.3 | 46.6 | 37 |
| | Night | (30) 26.0 | 35.8 | 36 |

These results have been used in the assessment of the existing acoustic environment and the determination of the PSNLs for the Project in this locality.

## 4.2 Intrusiveness and Amenity Criteria

### 4.2.1 Intrusiveness Criteria

The results from the background noise monitoring program presented in **Table 4.5** and **Appendix C** show that the RBL in the rural areas surrounding the Project Area are generally between 30 to 35 dB(A) during the day-time, 30 to 37 dB(A) during the evening and less than 30 to 38 dB(A) during the night-time. Monitoring in Camberwell village and in proximity to the New England Highway show the influence of road traffic noise on the New England Highway with the RBLs ranging from 37 to 45 dB(A) depending on the time of day and proximity to the highway.

## Table 4.5 –Summary of Attended Noise Monitoring Results, dB(A)

| Monitoring Location | Range in Measured Noise Levels | | | Estimated Noise Level excluding Mount Owen Mine and Ravensworth East Contribution | | Source Identification |
|---|---|---|---|---|---|---|
| | **LA90,15min** | **LAeq,15min** from all sources | **LA1,1min** [1] for sleep disturbance[1] | **LA90,15min** Background | **LAeq,15min** other sources | |
| **Day-time Period** | | | | | | |
| **N1** | < 30 to 47 | 35 to 54 | - | < 30 to 47 | 34 to 54 | Passing local road traffic noise; local rural noise sources; wind. |
| **N2** | < 30 to 48 | 36 to 58 | - | 28 to 48 | 33 to 58 | Passing local road traffic noise; local rural noise sources; Mining noise continuum from the approved North Pit and from the South. |
| **N3** | 31 to 52 | 48 to 62 | - | 31 to 52 | 48 to 62 | Local rural noise sources; Passing road traffic; Mining noise continuum from the approved North Pit. |
| **N4** | <30 to 40 | 52 to 61 | - | < 30 to 40 | 52 to 61 | Local rural noise sources; Passing local road traffic; Mine noise continuum & low-frequency impacts from the SSE; Mining noise continuum from Glendell Mine & the WSW. |
| **N5** | 34 to 48 | 39 to 55 | - | 33.9 to 48 | 39 to 55 | Local rural noise sources; Passing traffic on the New England Highway; Local traffic; Residential noise; Overhead aircraft; Mine noise continuum from the ESE. |
| **N6** | 38 to 51 | 41 to 56 | - | 38 to 51 | 40 to 56 | Traffic on the New England Highway; Passing local traffic; Residential noise; Mine noise continuum from the E & NW to NNW. |
| **N8** | 32 to 43 | 36 to 49 | - | 31 to 43 | 36 to 49 | Traffic on the New England Highway; Local rural noise sources; Mine noise continuum from the NE to E. |

## Table 4.5 – Summary of Attended Noise Monitoring Results, dB(A) (cont.)

| Monitoring Location | Range in Measured Noise Levels | | | Estimated Noise Level excluding Mount Owen Mine and Ravensworth East Contribution | | Source Identification |
|---|---|---|---|---|---|---|
| | **LA90,15min** | **LAeq,15min** from all sources | **LA1,1min** [1] for sleep disturbance[1] | **LA90,15min** Background | **LAeq,15min** other sources | |
| **Evening Period** | | | | | | |
| **N1** | < 30 to 40 | 32 to 58 | - | < 30 to 40 | < 30 to 58 | Local rural noise sources; passing road traffic noise; mine noise from the WSW. |
| **N2** | 30 to 41 | 32 to 50 | - | 30 to 41 | 31 to 50 | Local rural noise sources; mine activity noise from the SSE; Passing local road traffic noise; mining noise continuum from the approved North Pit. |
| **N3** | 30 to 39 | 32 to 55 | - | 30 to 39 | < 30 to 55 | Local rural noise sources; Mining noise from the SSE; Passing road traffic noise; Mine noise from the approved North Pit and Glendell Mine. |
| **N4** | 33 to 45 | 36 to 54 | - | 33 to 45 | 36 to 54 | Local rural noise sources; Drilling activity to the N and S; Mine noise from the SE, SW, &SSE; Train noise from the Main Northern Rail Line. |
| **N5** | 36 to 43 | 43 to 50 | - | 36 to 43 | 43 to 50 | Traffic on the New England Highway; Local rural noise sources; Mining noise from Glendell Mine; Trains on the Main Northern Rail Line; Residential noise; Low-frequency continuum from the North. |
| **N6** | 35 to 51 | 42 to 55 | - | 35 to 51 | 42 to 55 | Traffic on the New England Highway; Trains on the Main Northern Rail Line; Mining activity noise from Glendell Mine; Local rural noise sources. |
| **N8** | 35 to 43 | 38 to 49 | - | 35 to 43 | 38 to 49 | Traffic on the New England Highway; Local rural noise sources; Trains on the Main Northern Rail Line; Mining noise from the W to WNW. |
| **N9** | 31 to 31 | 59 to 59 | - | 31 to 31 | 59 to 59 | Local rural noise sources. |
| **N10** | 31 to 52 | 54 to 61 | - | 31 to 52 | 54 to 61 | Local rural noise sources; Running water in Glennies Creek. |

## Table 4.5 – Summary of Attended Noise Monitoring Results, dB(A) (cont.)

| Monitoring Location | Range in Measured Noise Levels | | | Estimated Noise Level excluding Mount Owen Mine and Ravensworth East Contribution | | Source Identification |
|---|---|---|---|---|---|---|
| | **LA90,15min** | **LAeq,15min** from all sources | **LA1,1min** [1] for sleep disturbance[1] | **LA90,15min** Background | **LAeq,15min** other sources | |
| **N11** | 32 to 44 | 54 to 57 | - | 32 to 44 | 54 to 57 | Local rural noise sources; passing local traffic. |
| **N12** | 34 to 36 | 39 to 41 | - | 34 to 36 | 39 to 41 | Local rural noise sources; Mining noise continuum from the SW. |
| **N13** | 38 to 39 | 54 to 54 | - | 39 to 39 | 54 to 54 | Local rural noise sources. |
| **N14** | 36 to 37 | 41 to 42 | - | 36 to 37 | 41 to 42 | Local rural noise sources. |
| **N15** | 37 to 42 | 41 to 50 | - | 37 to 42 | 41 to 51 | Local rural noise sources; Trains on the Main Northern Rail Line. |
| **N16** | 31 to 51 | 34 to 54 | - | 31 to 51 | 34 to 54 | Local rural noise sources. |
| **Night-time Period** | | | | | | |
| **N1** | < 30 to 43 | 10 to 50 | 40 to 74 | < 30 to 42 | < 30 to 50 | Local rural noise sources; mine noise continuum, excavator noise & haul trucks from the approved North Pit; jet aircraft noise; passing local road traffic noise. |
| **N2** | 30 to 40 | 33 to 47 | 42 to 53 | 30 to 40 | < 30 to 47 | Local rural noise sources; Mining noise continuum from Mount Owen Mine and Glendell Mine. |
| **N3** | 32 to 40 | 36 to 53 | 44 to 78 | < 30 to 38 | 35 to 53 | Local rural noise sources; drilling rig operations to the WSW; Mining noise continuums from the approved North Pit and Glendell Mine; Passing road traffic noise on Falbrook Road. |
| **N4** | 34 to 41 | 37 to 54 | 44 to 75 | < 30 to 41 | 36 to 55 | Local rural noise sources; Mining noise from the SSW, W, WSW, the approved North Pit and Glendell Mine; Drilling activity from the N and SW; Electricity transfer station to the SSE. |

## Table 4.5 – Summary of Attended Noise Monitoring Results, dB(A) (cont.)

| Monitoring Location | Range in Measured Noise Levels | | | Estimated Noise Level excluding Mount Owen Mine and Ravensworth East Contribution | | Source Identification |
|---|---|---|---|---|---|---|
| | **LA90,15min** | **LAeq,15min** from all sources | **LA1,1min** [1] for sleep disturbance[1] | **LA90,15min** Background | **LAeq,15min** other sources | |
| **N5** | 37 to 43 | 43 to 57 | 52 to 78 | 37 to 43 | 43 to 57 | Traffic on the New England Highway; Local rural noise sources; Mine noise from Glendell Mine, E to ESE & NNW. |
| **N6** | 37 to 43 | 46 to 53 | 54 to 64 | 37 to 43 | 46 to 53 | Traffic on the New England Highway; Local rural noise sources; Train noise on the Main Northern Rail Line; Mine noise from Glendell Mine, E & ESE. |
| **N8** | < 30 to 45 | 38 to 57 | 45 to 57 | < 30 to 44 | 38 to 57 | Traffic on the New England Highway; Local rural noise sources; Mine noise from the N, NW, W, E, WNW & ENE. |
| **N9** | < 30 to 31 | 47 to 48 | 73 to 74 | < 30 to 31 | 47 to 48 | Low-frequency mining noise continuum from the approved North Pit as well as local rural noise sources including horses, dogs, insects and wind. |
| **N10** | < 30 to 36 | 32 to 38 | 44 to 46 | < 30 to 36 | 32 to 38 | Local rural noise sources; Running water in Glennies Creek; Mine noise from the S to SW. |
| **N11** | 31 to 38 | 33 to 47 | 43 to 67 | 31 to 38 | 33 to 47 | Local rural noise sources; Mine noise from the SSW. |
| **N12** | 33 to 38 | 36 to 4 | 43 to 50 | 33 to 37 | 36 to 41 | Local rural noise sources; Mine noise from the SW. |
| **N13** | 34 to 36 | 44 to 50 | 59 to 68 | 34 to 36 | 44 to 50 | Local rural noise sources; Mining noise continuum from the approved North Pit & the SW. |
| **N14** | 36 to 36 | 54 to 59 | 78 to 79 | 36 to 36 | 54 to 59 | Local rural noise sources; noise from a coal handling processing plant to the SW; passing local traffic. |
| **N15** | 34 to 37 | 37 to 41 | 50 to 55 | 34 to 37 | 37 to 41 | Local rural noise sources; coal handling processing plant; mine noise from the approved North Pit. |
| **N16** | 33 to 43 | 36 to 45 | 45 to 51 | 33 to 43 | 36 to 45 | Local rural noise sources; low-frequency mining noise continuing from the approved North Pit and the SSE. |

Note 1: The INP application notes specifically note that the sleep disturbance criteria is normally applicable to the night time period only

The intrusiveness of an industrial noise source is generally considered acceptable if the noise from the source (represented by $L_{Aeq, 15minute}$), does not exceed the RBL by more than 5 dB. **Table 4.6** details the Intrusiveness Criteria for each of the continuous noise monitoring locations.

**Table 4.6 – Intrusiveness Criteria, dB(A)**

| Monitoring Location | Time Period | Rating [1] Background Noise Level | Intrusiveness Criteria $L_{Aeq, 15\ minute}$ |
|---|---|---|---|
| SX1 – SentineX 1 Middle Falbrook | Day | 30 (29.6) | 35 |
| | Evening | 32.0 | 35 (37) [2] |
| | Night | 30.4 | 35 |
| SX4 – SentineX 4 Glennies Creek | Day | 34.0 | 39 |
| | Evening | 34.9 | 39 (40) [2] |
| | Night | 34.7 | 39 (40) [3] |
| SX5 – SentineX 5 Falbrook | Day | 30 (27.9) | 35 |
| | Evening | 30 (28.5) | 35 |
| | Night | 30 (27.5) | 35 |
| SX11 – SentineX 11 Central Camberwell Village | Day | 44.7 | 50 |
| | Evening | 42.6 | 48 |
| | Night | 37.7 | 43 |
| SX12a – SentineX 12 Northern Camberwell Village (R155) | Day | 35.5 | 41 |
| | Evening | 38.8 | 41 (44) [2] |
| | Night | 37.2 | 41 (42) [3] |
| SX12b – SentineX 6 and 12 Northern Camberwell Village (R143) | Day | 31.1 | 36 |
| | Evening | 34.6 | 36 (40) [2] |
| | Night | 30 (29.7) | 35 |
| SX37 – SentineX 37 Hebden Road | Day | 30 (26.5) | 35 |
| | Evening | 30 (29.1) | 35 |
| | Night | 30 (28.4) | 35 |
| C1 – Receiver R013 | Day | 30.1 | 35 |
| | Evening | 34.1 | 35 (39) [2] |
| | Night | 32.2 | 35 (37) [3] |
| C2 – Receiver R010 | Day | 34.5 | 40 |
| | Evening | 31.6 | 37 |
| | Night | 30.6 | 36 |
| C3 – Receiver R007 | Day | 32.4 | 37 |
| | Evening | 35.7 | 37 (41) [2] |
| | Night | 33.1 | 37 (38) [3] |
| C4 – Receiver R091 | Day | 30 (27.3) | 35 |
| | Evening | 31.7 | 35 (37) [2] |
| | Night | 30 (29.5) | 35 |
| C5 – Receiver R095 | Day | 31.5 | 36 |
| | Evening | 35.3 | 36 (40) [2] |
| | Night | 33.6 | 36 (39) [3] |
| C6 – Receiver R017A | Day | 30 (27.9) | 35 |
| | Evening | 30 (29.6) | 35 |
| | Night | 30 (26.8) | 35 |

**Table 4.6 – Intrusiveness Criteria, dB(A) (cont.)**

| Monitoring Location | Time Period | Rating [1] Background Noise Level | Intrusiveness Criteria $L_{Aeq, 15\ minute}$ |
|---|---|---|---|
| C7 – Receiver R048 | Day | 30 (27.5) | 35 |
| | Evening | 30 (28.3) | 35 |
| | Night | 30 (23.5) | 35 |

Note 1: Where the measured RBL in the region surrounding the Project Area is at or below 30 dB(A) the corresponding Intrusiveness Criteria has been set be 35 dB(A). This is the minimum possible Intrusiveness Criterion under the INP (refer to **Section 3.3.3** for more detail.

Note 2: Where the day time is quieter than the evening set the evening at the daytime level.

Note 3: Where the evening is quieter than the night time set the night time at the evening level.

The assessment of the night-time and evening RBL take into consideration the recommendations of the EPA Application Note for the assessment of the Intrusiveness Criteria (refer to **Section 3.3.2** and **Appendix B**).

### 4.2.2 Amenity Criteria

The Amenity Criteria is determined by comparing the existing ambient noise levels resulting from industrial noise sources with the recommended acceptable ambient noise levels for the respective noise amenity areas (refer to **Table 3.1**). The ambient noise levels in the region surrounding the Project Area are dependent on the proximity of the respective properties to existing industrial activities and to other features such as the Main Northern Rail Line and the New England Highway. The ambient noise level is also affected by insects, birds and local traffic.

Based on the descriptions outlined in the Section 2 of the INP the acoustic environment in the vicinity of the Project Area is typically rural and therefore the rural assessment criteria has been adopted for those receivers nearest the Project Area including those residences within the northern section of Camberwell village. However, it was found that the noise environment in the central section of Camberwell village is heavily influenced by noise from the New England Highway. Due to the influence of the highway traffic the recommended acceptable $L_{Aeq}$ noise levels for the Project in the central section of Camberwell village are based on the acceptable suburban levels from **Table 3.1**.

The assessment of Amenity Criteria also takes into account the recommendations of the EPA Application Note for the assessment of the Amenity Criteria in high traffic noise areas (refer to **Section 3.3.5** and **Appendix B**).

**Table 4.7** details the Amenity Criteria developed for each of the continuous noise monitoring locations.

## Table 4.7 – Determination of the Amenity Criteria, dB(A)

| Monitoring Location | Type of [1] Receiver | Time Period | Recommended Acceptable Noise Level | Mean $L_{Aeq}$, period (excludes Mount Owen and Ravensworth East Mines) | Modification [2] to ANL due to existing industrial noise | Amenity Criteria [3] $L_{Aeq, period}$ |
|---|---|---|---|---|---|---|
| SX1 – SentineX 1 Middle Falbrook | Rural | Day | 50 | 31 | nil | 50 |
| | | Evening | 45 | 31 | nil | 45 |
| | | Night | 40 | 31 | nil | 40 |
| SX4 – SentineX 4 Glennies Creek | Rural | Day | 50 | 36 | nil | 50 |
| | | Evening | 45 | 36 | nil | 45 |
| | | Night | 40 | 37 | ANL – 3 | 37 |
| SX5 – SentineX 5 Falbrook | Rural | Day | 50 | 32 | nil | 50 |
| | | Evening | 45 | 32 | nil | 45 |
| | | Night | 40 | 33 | nil | 40 |
| SX11 – SentineX 11 Central Camberwell Village | Suburban | Day | 55 | 31 | nil | 55 |
| | | Evening | 45 | 36 | nil | 45 |
| | | Night | 40 | 36 | ANL - 2 | 38 |
| SX12a – SentineX 12 Northern Camberwell Village (R155) | Rural | Day | 50 | 37 | nil | 50 |
| | | Evening | 45 | 37 | nil | 45 |
| | | Night | 40 | 38 | ANL - 4 | 36 |
| SX12b – SentineX 6 and 12 Northern Camberwell Village (R143) | Rural | Day | 50 | 37 | nil | 50 |
| | | Evening | 45 | 37 | nil | 45 |
| | | Night | 40 | 36 | ANL - 2 | 38 |
| SX37 – SentineX 37 Hebden Road | Rural | Day | 50 | 35 | nil | 50 |
| | | Evening | 45 | 35 | nil | 45 |
| | | Night | 40 | 35 | ANL - 2 | 38 |
| C1 – Receiver R013 | Rural | Day | 50 | 37 | nil | 50 |
| | | Evening | 45 | 37 | nil | 45 |
| | | Night | 40 | 34 | nil | 40 |

## Table 4.7 – Determination of the Amenity Criteria, dB(A) (cont.)

| Monitoring Location | Type of [1] Receiver | Time Period | Recommended Acceptable Noise Level | Mean $L_{Aeq}$, period (excludes Mount Owen and Ravensworth East Mines) | Modification [2] to ANL due to existing industrial noise | Amenity Criteria [3] $L_{Aeq, period}$ |
|---|---|---|---|---|---|---|
| C2 – Receiver R010 | Rural | Day | 50 | 37 | nil | 50 |
| | | Evening | 45 | 38 | nil | 45 |
| | | Night | 40 | 35 | ANL - 2 | 38 |
| C3 – Receiver R007 | Rural | Day | 50 | 38 | nil | 50 |
| | | Evening | 45 | 37 | nil | 45 |
| | | Night | 40 | 36 | ANL - 2 | 38 |
| C4 – Receiver R091 | Rural | Day | 50 | 34 | nil | 50 |
| | | Evening | 45 | 33 | nil | 45 |
| | | Night | 40 | 31 | nil | 40 |
| C5 – Receiver R095 | Rural | Day | 50 | 35 | nil | 50 |
| | | Evening | 45 | 34 | nil | 45 |
| | | Night | 40 | 31 | nil | 40 |
| C6 – Receiver R017A | Rural | Day | 50 | 36 | nil | 50 |
| | | Evening | 45 | 37 | nil | 45 |
| | | Night | 40 | 30 | nil | 40 |
| C7 – Receiver R048 | Rural | Day | 50 | < 30 | nil | 50 |
| | | Evening | 45 | < 30 | nil | 45 |
| | | Night | 40 | < 30 | nil | 40 |

Note 1: Rural areas have an acoustic environment that is dominated by natural sounds, having little or no road traffic (INP). Suburban areas include local traffic or some limited commerce or industry (in this the case the New England Highway).

Note 2: Modification to ANL to account for existing level of industrial noise to give maximum $L_{Aeq}$ noise levels for noise from new sources alone, as per Table 2.2 of the INP.

Note 3: Where there is no existing industrial noise influence and the high traffic noise criteria is not triggered at the receiver location, the Amenity Criteria is set to the Recommended Acceptable Noise Level (INP). Where the measured mean $L_{Aeq, period}$ noise levels is affected by industrial noise sources the acceptable noise level is modified in accordance with Table 2.2 of the INP.

## 4.3 Project-specific Noise Levels

### 4.3.1 Determination of Project-specific Noise Levels

Evaluation of the noise levels monitored in the rural environment surrounding the Project Area and in Camberwell village has resulted in PSNLs that are based on a combination of the Intrusiveness and Amenity Criteria. The day-time, evening and night-time PSNLs for each monitoring locations are presented in **Table 4.8**. The assessment criteria for each sensitive receiver are detailed in **Appendix D**.

**Table 4.8 – Project-specific Noise Levels, dB(A)**

| Monitoring Location | Time Period | Intrusiveness Criteria $L_{Aeq,\ 15\ minute}$ | Amenity Criteria $L_{Aeq,\ period}$ | PSNL |
|---|---|---|---|---|
| SX1 – SentineX 1 Middle Falbrook | Day | 35 | 50 | 35 $L_{Aeq,15min}$ |
| | Evening | 35 | 45 | 35 $L_{Aeq,15min}$ |
| | Night | 35 | 40 | 35 $L_{Aeq,15min}$ |
| SX4 – SentineX 4 Glennies Creek | Day | 39 | 50 | 39 $L_{Aeq,15min}$ |
| | Evening | 39 | 45 | 39 $L_{Aeq,15min}$ |
| | Night | 39 | 37 | 39 $L_{Aeq,15min}$<br>37 $L_{Aeq,\ night}$ |
| SX5 – SentineX 5 Falbrook | Day | 35 | 50 | 35 $L_{Aeq,15min}$ |
| | Evening | 35 | 45 | 35 $L_{Aeq,15min}$ |
| | Night | 35 | 40 | 35 $L_{Aeq,15min}$ |
| SX11 – SentineX 11 Central Camberwell Village | Day | 50 | 55 | 50 $L_{Aeq,15min}$ |
| | Evening | 48 | 45 | 48 $L_{Aeq,15min}$<br>45 $L_{Aeq,\ evening}$ |
| | Night | 43 | 38 | 43 $L_{Aeq,15min}$<br>38 $L_{Aeq,\ night}$ |
| SX12a – SentineX 12 Northern Camberwell Village (R155) | Day | 41 | 50 | 41 $L_{Aeq,15min}$ |
| | Evening | 41 | 45 | 41 $L_{Aeq,15min}$ |
| | Night | 41 | 36 | 41 $L_{Aeq,15min}$<br>36 $L_{Aeq,\ night}$ |
| SX12b – SentineX 6 and12 Northern Camberwell Village (R143) | Day | 36 | 50 | 36 $L_{Aeq,15min}$ |
| | Evening | 36 | 45 | 36 $L_{Aeq,15min}$ |
| | Night | 35 | 38 | 35 $L_{Aeq,\ night}$ |
| SX37 – SentineX 37 Hebden Road | Day | 35 | 50 | 35 $L_{Aeq,15min}$ |
| | Evening | 35 | 45 | 35 $L_{Aeq,15min}$ |
| | Night | 35 | 38 | 35 $L_{Aeq,15min}$ |
| C1 – Receiver R013 | Day | 35 | 50 | 35 $L_{Aeq,15min}$ |
| | Evening | 35 | 45 | 35 $L_{Aeq,15min}$ |
| | Night | 35 | 40 | 35 $L_{Aeq,15min}$ |
| C2 – Receiver R010 | Day | 40 | 50 | 40 $L_{Aeq,15min}$ |
| | Evening | 37 | 45 | 37 $L_{Aeq,15min}$ |
| | Night | 36 | 38 | 36 $L_{Aeq,15min}$ |
| C3 – Receiver R007 | Day | 37 | 50 | 37 $L_{Aeq,15min}$ |
| | Evening | 37 | 45 | 37 $L_{Aeq,15min}$ |
| | Night | 37 | 38 | 37 $L_{Aeq,15min}$ |

**Table 4.8 – Project-specific Noise Levels, dB(A) (cont.)**

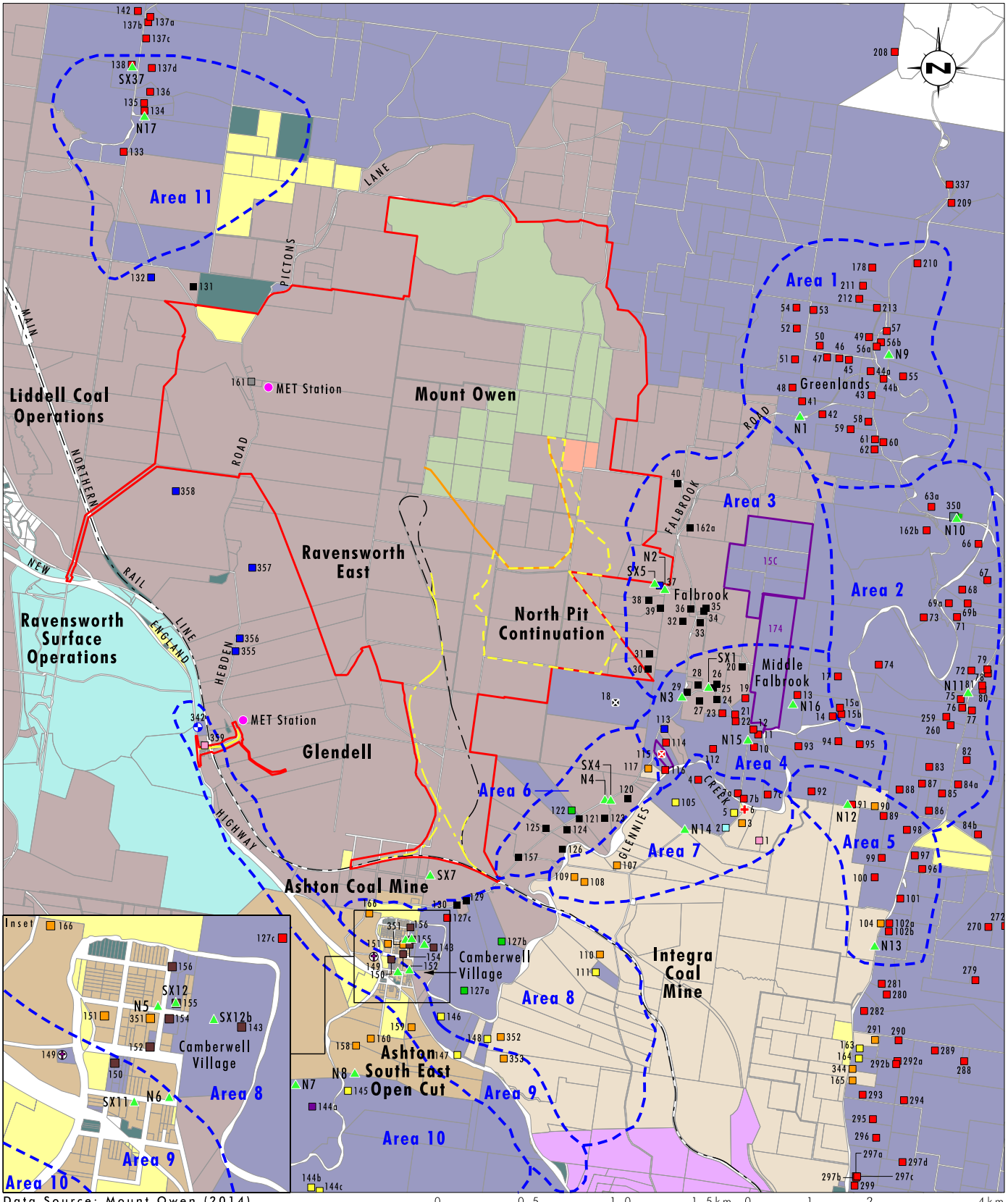
| Monitoring Location | Time Period | Intrusiveness Criteria LAeq, 15 minute | Amenity Criteria LAeq, period | PSNL |
|---|---|---|---|---|
| C4 – Receiver R091 | Day | 35 | 50 | 35 $L_{Aeq,15min}$ |
| | Evening | 35 | 45 | 35 $L_{Aeq,15min}$ |
| | Night | 35 | 40 | 35 $L_{Aeq,15min}$ |
| C5 – Receiver R095 | Day | 36 | 50 | 36 $L_{Aeq,15min}$ |
| | Evening | 36 | 45 | 36 $L_{Aeq,15min}$ |
| | Night | 36 | 40 | 36 $L_{Aeq,15min}$ |
| C6 – Receiver R017A | Day | 35 | 50 | 35 $L_{Aeq,15min}$ |
| | Evening | 35 | 45 | 35 $L_{Aeq,15min}$ |
| | Night | 35 | 40 | 35 $L_{Aeq,15min}$ |
| C7 – Receiver R048 | Day | 35 | 50 | 35 $L_{Aeq,15min}$ |
| | Evening | 35 | 45 | 35 $L_{Aeq,15min}$ |
| | Night | 35 | 40 | 35 $L_{Aeq,15min}$ |

### 4.3.2 Residential Receivers

110 residences in the region surrounding the Project Area have been grouped into localities or areas that have similar representative background noise levels. These areas have been defined giving consideration to topographical features that may enhance or attenuate the transmission of noise and the relative location of other noise sources (such as industrial, train and road traffic). The defined areas are presented in **Figure 4.2** and discussed below. The PSNLs, noise management level and noise affectation level, determined for each defined area in the region surrounding the Project Area are presented in **Table 4.9** and are discussed below.

**Table 4.9 – Residential Receiver PSNL, dB(A)**

| Receiver Description | Time Period | PSNL [1] | Noise Management Level | Noise Affectation Level |
|---|---|---|---|---|
| Area 1 – Falbrook Road and Goorangoola | Day | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| | Evening | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| | Night | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| Area 2 – Bridgman Road | Day | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| | Evening | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| | Night | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| Area 3 – Falbrook | Day | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| | Evening | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| | Night | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| Area 4 – Middle Falbrook[1] | Day | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| | Evening | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| | Night | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |




Data Source: Mount Owen (2014), Department of Lands (2009)

**Legend**

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Defined Receiver Areas (Project-specific Noise Level)
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
- Macquarie Generation
- Integra Coal
- Glencore
- Private
- Rixs Creek Mine
- State Forest
- Minister for Education
- Noise Monitoring Location
- MET Station Location
- Church
- Daracon Site Office
- Glennies Creek Fire Brigade
- Mt Pleasant Primary School
- Former Hebden Public School
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Currently Subject to Acquisition Rights - Dairy
- SEOC Acquisition
- Private No Dwelling
- Private Residence
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Community Hall

FIGURE 4.2

**Sensitive Receivers and Allocation of PSNL**

File Name (A4): R11/3109_655.dgn
20141024 16.46

**Table 4.9 – Residential Receiver PSNL, dB(A) (cont.)**

| Receiver Description | Time Period | PSNL [1] | Noise Management Level | Noise Affectation Level |
|---|---|---|---|---|
| Area 5 – Thomas Lane/Bridgman Road | Day | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| | Evening | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| | Night | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| Area 6 – Glennies Creek Road | Day | 39 $L_{Aeq,15min}$ | > 41 $L_{Aeq,15min}$ | > 44 $L_{Aeq,15min}$ |
| | Evening | 39 $L_{Aeq,15min}$ | > 41 $L_{Aeq,15min}$ | > 44 $L_{Aeq,15min}$ |
| | Night | 39 $L_{Aeq,15min}$<br>37 $L_{Aeq, night}$ | > 41 $L_{Aeq,15min}$<br>39 $L_{Aeq, night}$ | > 44 $L_{Aeq,15min}$<br>42 $L_{Aeq, night}$ |
| Area 7 – Middle Falbrook Road/Stoney Creek Road | Day | 37 $L_{Aeq,15min}$ | > 39 $L_{Aeq,15min}$ | > 42 $L_{Aeq,15min}$ |
| | Evening | 37 $L_{Aeq,15min}$ | > 39 $L_{Aeq,15min}$ | > 42 $L_{Aeq,15min}$ |
| | Night | 37 $L_{Aeq,15min}$ | > 39 $L_{Aeq,15min}$ | > 42 $L_{Aeq,15min}$ |
| Area 8 – Northern Camberwell Village | Day | 36 $L_{Aeq,15min}$ | > 38 $L_{Aeq,15min}$ | > 41 $L_{Aeq,15min}$ |
| | Evening | 36 $L_{Aeq,15min}$ | > 38 $L_{Aeq,15min}$ | > 41 $L_{Aeq,15min}$ |
| | Night | 35 $L_{Aeq,15min}$ | 37 $L_{Aeq, night}$ | 40 $L_{Aeq, night}$ |
| Area 9 – Central Camberwell Village | Day | 50 $L_{Aeq,15min}$ | > 52 $L_{Aeq,15min}$ | > 55 $L_{Aeq,15min}$ |
| | Evening | 48 $L_{Aeq,15min}$<br>45 $L_{Aeq, evening}$ | > 50 $L_{Aeq,15min}$<br>47 $L_{Aeq, evening}$ | > 53 $L_{Aeq,15min}$<br>50 $L_{Aeq, evening}$ |
| | Night | 43 $L_{Aeq,15min}$<br>38 $L_{Aeq, night}$ | > 45 $L_{Aeq,15min}$<br>40 $L_{Aeq ,night}$ | > 48 $L_{Aeq,15min}$<br>43 $L_{Aeq, night}$ |
| Area 10 – South of New England Highway | Day | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| | Evening | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| | Night | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| Area 11 – Hebden | Day | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| | Evening | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |
| | Night | 35 $L_{Aeq,15min}$ | > 37 $L_{Aeq,15min}$ | > 40 $L_{Aeq,15min}$ |

Note 1: PSNL is set in accordance with the relevant Application Note (refer to Appendix B).

The rural residential properties along Falbrook Road and Goorangoola Road to the north-east of the Project Area, shown as Area 1 on **Figure 4.2**, are in the region represented by the results from attended noise monitoring locations N1 and N9 (refer to **Table 4.5**). The noise monitoring results show background noise levels of 30 dB(A) or less, with no influence from industrial noise sources other than the existing Mount Owen. Therefore, the PSNLs in Area 1 are based around the Intrusiveness Criteria (refer to **Table 4.9**).

The rural residential properties along Bridgman Road to the east north-east of the Project Area, shown as Area 2 on **Figure 4.2**, are in the region represented by the results from attended noise monitoring locations N10 and N11 (refer to **Table 4.5**). The results from monitoring locations N10 and N11 show some minor influence of industrial noise from the Mount Owen Complex to the west and mining operations to the south. The attended monitoring results show background noise levels of 30 dB(A) or less and indicates the existing $L_{Aeq}$ noise level from industrial noise sources excluding the Project Area is typically less than 30 dB(A). Therefore, the PSNLs in Area 2 are based around the Intrusiveness Criteria (refer to **Table 4.9**).

The rural residential properties along Falbrook Road to the east of the Project Area, shown as Area 3 on **Figure 4.2**, are represented by the results from continuous noise monitoring location SX5 and attended noise monitoring location N2. Two privately owned parcels of vacant land (R018 and R015c) are located within Area 3. The PSNLs used to assess the impact on vacant land in Area 3 is based around the Intrusiveness Criteria (refer to **Table 4.9**).

The rural residential properties of Middle Falbrook to the east of the Falbrook Road/Middle Falbrook Road intersection and the western section of Thomas Lane, east of the Project Area, shown as Area 4 on **Figure 4.2**, are represented by the results from continuous noise monitoring locations SX1, C1, C2 and attended noise monitoring locations N3, N15 and N16. The results from these monitoring locations show the influence of industrial noise from the Mount Owen Complex to the west and mining operations to the south and south-west. Rail noise from the Main Northern Rail Line is also audible at the monitoring locations. The monitoring results shows the background noise levels range from less than of 30 dB(A) up to 50 dB(A) with the rating background noise levels ranging from 30 to 35 dB(A). The existing mean $L_{Aeq}$ noise level from industrial noise sources excluding Mount Owen and Ravensworth East mines range from 31 dB(A) during the night time up to 38 dB(A) due to mining operations to the south of the Middle Falbrook locality. Given the variability of the monitoring results in **Tables 4.3** and **4.5** and the requirements of the EPA Application Notes for the nomination of day/evening/night criteria, the most conservative of the monitoring results has been used to establish the PSNLs for Area 4 (refer to **Table 4.9**). As a result, the Intrusiveness Criteria forms the basis of the PSNLs for Area 4.

The rural residential properties in the region of Thomas Lane and Bridgeman Road, located to the east of Glennies Creek and the Project Area, is shown as Area 5 on **Figure 4.2**. The residences to the east of Glennies Creek, including the section of Bridgman Road to the east of Thomas Lane, are in the region represented by the results from continuous noise monitoring location C4 and attended noise monitoring locations N12 and N13. This area shows the influence of industrial noise from mining operations to the south and south-west. Mining operations within the Project Area is audible at times to the west. Railway noise is also audible at the monitoring locations. The monitoring results show a rating background noise level of 30 dB(A) and an existing mean $L_{Aeq}$ noise level from industrial noise sources excluding the Mount Owen Complex of 31 to 34 dB(A). The Intrusiveness Criteria forms the basis of the PSNLs for Area 5 (refer to **Table 4.9**).

The rural residential properties along Glennies Creek Road to the south east of the Mount Owen Complex, shown as Area 6 on **Figure 4.2**, are in the region represented by the results from continuous noise monitoring location SX4 and attended noise monitoring location N4. This area shows the influence of industrial noise from mining operations to the south-east, south and to the west. Mining operations within the Project Area are audible at times to the north-west. Railway noise is a dominant noise source at the monitoring locations. The monitoring results show rating background noise levels of 34 to 35 dB(A) and an existing mean $L_{Aeq}$ noise level from industrial noise sources excluding the Project Area is between 36 and 37 dB(A). During the day and evening the Intrusiveness Criteria forms the basis of the PSNL. During the night, the Amenity Criteria is 2 dB less than the Intrusiveness Criteria, therefore both need to be considered in the assessment of the impact from the Project Area on Area 6 (refer to **Table 4.9**).

The rural residential properties along Middle Falbrook Road around Glennies Creek to the south east of the Mount Owen Complex, shown as Area 7 on **Figure 4.2**, are in the region represented by the results from continuous noise monitoring location C3 and attended noise monitoring location N14. This area shows the influence of industrial noise from mining operations to the south and to the south-west. Mining operations within the Project Area are audible at times to the north-west. Railway noise is an audible noise source at the

monitoring locations. The monitoring results show background noise levels of 33 to 36 dB(A) and an existing mean $L_{Aeq}$ noise level from industrial noise sources excluding the Project Area of 36 dB(A) during the night and up to 38 dB(A) during the day. Due to the presence and variability of the noise sources in the region, the Intrusiveness Criteria forms the basis of the PSNLs for Area 7 (refer to **Table 4.9**).

The monitoring results at continuous noise monitoring locations SX11, SX12a and SX12b and attended noise monitoring locations N5 and N6 in Camberwell village show the influence of road traffic noise from the New England Highway. The noise environment in Camberwell village also shows the influence of industrial noise from mining operations to the east, west and north-west. The monitoring results show the background noise levels and existing mean $L_{Aeq}$ noise levels vary according to the distance from the New England Highway.

The assessment methodology for Amenity Criteria in high traffic noise areas was investigated for the central section of Camberwell village (shown as Area 9 on **Figure 4.2**). It was found that the noise levels did not trigger the high traffic noise assessment methodology. Although the high traffic noise methodology does not apply to Camberwell village, the existing noise levels are typically above the recommended acceptable noise levels (refer to **Table 4.6**).

Due to the variability of the traffic flow on the New England Highway, the PSNLs in northern and central sections of Camberwell village (shown as Areas 8 and 9 respectively on **Figure 4.2**) are primarily based around the Intrusiveness Criteria. During the night, the Amenity Criteria for central section of Camberwell village are is 5 dB less than the Intrusiveness Criteria due to the influence of traffic on the New England Highway. Therefore, during the night time period, the Amenity Criteria forms the basis of the night time PSNL for Area 9 (refer to **Table 4.9**).

The rural residential properties to the south of the New England Highway and the south of the Mount Owen Complex, shown as Area 10 on **Figure 4.2**, are in the region represented by the results from attended noise monitoring location N8 and historically at N7. The monitoring results show background noise levels of less than 30 dB(A) to 45 dB(A) and an existing mean $L_{Aeq}$ noise level from background sources, including industrial noise sources (excluding the Mount Owen and Ravensworth East Mines) of up to 57 dB(A), which is primarily due to road traffic noise from the New England Highway. Due to the variability of the road traffic noise and limited influence of the underlying industrial noise from mining operations in the surrounding region, the Intrusiveness Criteria forms the basis of the PSNLs for Area 10 (refer to **Table 4.9**).

The rural residential properties along Hebden Road to the north-west of the Project Area, shown as Area 11 on **Figure 4.2**, are in the region represented by the results from continuous noise monitoring location SX37. The monitoring results show background noise levels of 30 dB(A) or less and an existing mean $L_{Aeq}$ noise level from industrial noise sources (excluding the Mount Owen and Ravensworth East Mines) is typically 35 dB(A) during the day, evening and night periods. Therefore, the PSNLs in Area 11 are based around the Intrusiveness Criteria (refer to **Table 4.9**).

### 4.3.3 Non-residential Receivers

The PSNL of non-residential receivers are determined by the acceptable Amenity Criteria as outlined in the INP (refer **Table 2.2**). The PSNL of the non-residential receivers in the region surrounding the Project Area are presented below in **Table 4.10**.

**Table 4.10 – Non-Residential Receiver PSNL, dB(A)**

| Description | Receiver Type | Time Period | PSNL $L_{Aeq, period}$ |
|---|---|---|---|
| R350 - Mount Pleasant Public School | Classroom Playground | When in use | 35<br>Internal 45<br>External 55 [1] |
| R002 - Glennies Creek Community Hall – External | Active Recreation Area | When in use | 55 |
| R149 - St Clement's Anglican Church – Internal | Place of Worship | When in use | 40<br>External 50 [2] |
| R006 - Glennies Creek Rural Fire Service – External | Active Recreation Area | When in use | 55 |
| All other existing Industrial zoned premises | Industrial | When in use | 70 |

Note 1: The external noise level for the playground has been assessed as Active Recreation Area with a limit of 55 dB(A). Whereas the external noise level applicable for a class room is based on a 10 dB difference between the internal and external noise level. That is, the external noise level for when the classroom is in use is typically set at 55 dB(A).

Note 2: The external noise level applicable to a Place of Worship is based on a 10 dB difference between the internal and external noise level. That is, the external noise level for when a Place of Worship is in use is typically set at 50 dB(A).

## 4.4 Sleep Disturbance Criteria

The Sleep Disturbance Criteria are based on the criteria from the INP Application Notes (refer to **Appendix C**), which reference the review of research on sleep disturbance published in the NSW Road Noise Policy (DECCW 2011). The INP Application Notes suggests that to prevent sleep disturbance, the $L_{A1,1\ minute}$ or $L_{A\ max}$ level of a noise source should not exceed the $L_{A90}$ background noise level by more than 15 dB when measured outside the bedroom window. The INP Application Notes further explains that other factors are also important in assessing the extent of impact on sleep and, 'that where the criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis is required'.

The INP Application Notes state that the sleep disturbance criteria is normally assessable for the night time period only (10.00 pm to 7.00 am). As some of the residents that live in the region surrounding the development are shift workers, the assessment of sleep disturbance for the Project has also considered the day and evening assessment periods. The Sleep Disturbance Criteria for all the representative noise sensitive locations is presented in **Table 4.11**.

**Table 4.11 – Sleep Disturbance Criteria, dB(A)**

| Receiver Description | Sleep Disturbance Criteria, $L_{A1,1\ minute}$ | | |
|---|---|---|---|
| | Day | Evening | Night |
| Area 1 – Falbrook Road and Goorangoola | 45 | 45 | 45 |
| Area 2 – Bridgman Road | 45 | 45 | 45 |
| Area 3 – Falbrook | 45 | 45 | 45 |
| Area 4 – Middle Falbrook | 45 | 45 | 45 |
| Area 5 – Thomas Lane /Bridgman Road | 45 | 45 | 45 |
| Area 6 – Glennies Creek Road | 49 | 49 | 49 |
| Area 7 – Middle Falbrook Rd/Stoney Creek Rd | 47 | 47 | 47 |

**Table 4.11 – Sleep Disturbance Criteria, dB(A) (cont.)**

| Receiver Description | Sleep Disturbance Criteria, $L_{A1,1\ minute}$ | | |
|---|---|---|---|
| | Day | Evening | Night |
| Area 8 – Northern Camberwell Village | 46 | 46 | 45 |
| Area 9 – Central Camberwell Village | 60 | 58 | 53 |
| Area 10 – South of New England Highway | 45 | 45 | 45 |
| Area 11 – Hebden | 45 | 45 | 45 |

## 4.5 Cumulative Noise Criteria

The INP addresses potential cumulative noise impacts from existing and proposed developments in an area by ensuring that appropriate noise emission criteria and consent limits are established with a view to maintaining acceptable amenity noise levels for residential receivers (refer to **Table 3.1**). The INP objective is that the combined noise levels from industrial noise sources should not exceed the specified 'acceptable' noise levels appropriate for the locality and land use. The Mining SEPP (2013) states that the cumulative noise at private dwellings from mining related noise sources should not be greater than the ANLs, as determined in accordance with Table 2.1 of the INP.

The cumulative noise level is measured as the as the $L_{Aeq,\ period}$ noise level from industrial noise sources.

### 4.5.1 Rural Land Use

In relation to industrial noise sources, the acceptable cumulative industrial noise criteria applying to the rural areas in the region surrounding the Project Area from the combined operation of the Project and the open cut and underground mines in the region surrounding the Project Area are outlined in **Table 4.12**.

**Table 4.12 – Cumulative Noise Goals based on Amenity Level, dB(A)**

| Period | Acceptable Cumulative Noise Level $L_{Aeq}$ period | Maximum Cumulative Noise Level $L_{Aeq}$ period |
|---|---|---|
| Day | 50 | 55 |
| Evening | 45 | 50 |
| Night | 40 | 45 |

Within the rural areas to the east and south-east of the Project Area the most stringent of the criteria is 40 dB(A) $L_{Aeq,\ night}$. This reflects the need to protect the night-time amenity noise levels as this is the primary period when cumulative noise levels from industrial operations have the potential to impact on the amenity noise level of the surrounding region.

Most of the surrounding industrial activities, including Ravensworth Surface Operations, Ravensworth Underground Mine, Ravensworth Coal Terminal, Ravensworth CHPP, Ashton Underground Mine, Ashton Coal CHPP, Integra Underground Mine, Integra CHPP, Glennies Creek Power Station and Liddell Coal Operations are 24 hour per day operations, with the exception of the Integra North Pit which only operates during the day time and evening. Achieving the night-time PSNL criteria would ensure day-time and evening criteria are achieved. In addition to this, during the day-time and evening periods, noise from sources such as local traffic, domestic activities, the natural environment and road noise from the

New England Highway, mask the noise from the surrounding mining operations. Therefore, the assessment of cumulative noise levels focuses on the night-time period (refer to **Section 7.0**).

### 4.5.2 Camberwell Village

Within Camberwell village, traffic noise from the New England Highway is observed to have a masking effect making industrial noise sources appear quieter. The analysis of the noise levels for Camberwell village (refer to **Tables 4.3** and **4.5**) at continuous noise monitoring locations SX11, SX12a (R155) and SX12b (R143) and attended noise monitoring locations N5 and N6 shows that the amenity noise levels (measured as the mean $L_{Aeq,period}$) for the day, evening and night time periods are heavily influenced by traffic noise. The noise levels from existing industrial noise sources are between 10 to 20 dB below the total ambient mean $L_{Aeq,period}$. The cumulative noise criteria within Camberwell village for the component of the noise generated by industrial operations are presented in **Table 4.13**.

**Table 4.13 – Camberwell Village Cumulative Noise Goals, dB(A)**

| Location (Noise amenity category) | Monitoring Unit | Time Period | Measured Mean $L_{Aeq, period}$ | Cumulative Noise Goal $L_{Aeq, period}$ |
|---|---|---|---|---|
| Area 8 – Northern Camberwell Village (Rural) | SentineX 12 | Day | 47.1 | 50 |
| | | Evening | 46.0 | 45 |
| | | Night | 42.2 | 40 |
| Area 9 – Central Camberwell Village (Suburban) | SentineX 11 | Day | 55.4 | 55 |
| | | Evening | 54.9 | 45 |
| | | Night | 53.3 | 40 |

## 4.6 Construction Noise Criteria

The EPA recognises that construction activities could potentially generate higher noise levels than those of an industrial operation. The Department of Environment and Climate Change (DECC) (now EPA) Interim Construction Noise Guideline (ICNG) (DECC 2009) provides noise management criteria for construction activities. The criteria, presented in **Table 4.14**, are intended to guide the need for and the selection of feasible and reasonable work practices to minimise construction noise impacts.

**Table 4.14 – Construction Noise Management Levels at Residences, dB(A)**

| Construction Time | Management Level $L_{Aeq, 15 minute}$ |
|---|---|
| **Recommended standard hours**<br>Monday to Friday 7.00 am to 6.00 pm<br>Saturday 8.00 am to 1.00 pm<br>No work on Sundays or public holidays | Noise Affected:<br>Rating Background Noise Level + 10 dB |
| | Highly Noise Affected:<br>75 dB(A) |
| **Outside recommended standard hours** | Noise Affected:<br>Rating Background Noise Level + 5 dB |

Source: Interim Construction Noise Guideline (DECC 2009)

The construction phase of the Project includes:

1. the construction of a new dual lane bridge over Bowmans Creek and rail overpass on Hebden Road; and

2. the construction of an additional rail line and northern turn-out west of the existing Mount Owen Complex rail line.

Other construction activities such as upgrades and modifications to the Mine Infrastructure Area (MIA), Product Stockpile Pad and Water Management System (WMS) are considered to generate minor noise impacts that are consistent with general activities considered in the operational noise assessment.

The activities required to construct the proposed Bowmans Creek Bridge, construct the Hebden Road rail overpass and construct a northern rail turn-out and proposed Mount Owen Rail Line will occur mostly during 'recommended standard hours' as defined by the ICNG (refer to **Table 4.14**). Section 2.3 of the ICNG allows for construction activities to be undertaken 'outside recommended standard hours' when there is a "*requirement to sustain the operational integrity of public infrastructure".* Limited activities, such as track work involving the Main Northern Rail Line will be undertaken when required outside of the ICNG 'recommended standard hours'. The construction noise management levels for the representative residential receivers surrounding the Project Area are detailed below in **Table 4.15**.

**Table 4.15 – Construction Noise Management Levels, dB(A)**

| **Receiver Description** | **Management Level $L_{Aeq, 15\ minute}$** | |
|---|---|---|
| | **Recommended Standard hours** (based on day-time RBL) | **Outside Recommended Standard Hours** (based on night-time RBL) |
| Area 1 – Falbrook Road and Goorangoola | 40 | 35 |
| Area 2 – Bridgman Road | 40 | 35 |
| Area 3 – Falbrook | 40 | 35 |
| Area 4 – Middle Falbrook | 40 | 35 |
| Area 5 – Thomas Lane/Bridgman Road | 40 | 35 |
| Area 6 – Glennies Creek Road | 44 | 39 |
| Area 7 – Middle Falbrook Rd/Stoney Creek Rd | 42 | 37 |
| Area 8 – Northern Camberwell Village | 41 | 35 |
| Area 9 – Central Camberwell Village | 55 | 43 |
| Area 10 – South of New England Highway | 40 | 35 |
| Area 11 – Hebden | 40 | 35 |

The construction noise management levels for other non-sensitive receivers such as industrial operations is 75 dB(A).

## 4.7 Road Traffic Noise Criteria

The Department of Environment, Climate Change and Water (DECCW) (now EPA's) NSW Road Noise Policy (RNP) (DECCW 2011) sets out criteria for road traffic noise through the provision of a framework that addresses traffic noise issues associated with new developments, new or upgraded road developments or planned building developments.

Road traffic volumes for the operational stage of the Project will remain unchanged from present operational road traffic volumes. Road traffic volumes will increase during the construction phase of the Project (refer to **Section 5.4**).

The primary access route to the Project Area will be from the south along Hebden Road and the New England Highway. Some traffic may travel north along Hebden Road and access the New England Highway to the west of Lake Liddell, however traffic volumes and associated impacts are likely to be minimal. Glennies Creek Road will be utilised for a limited time by construction related traffic during activities associated with the construction of a new northern turn-out and rail line. **Table 4.16** outlines the road traffic noise criteria for the Project along the New England Highway, Hebden Road and Glennies Creek Road. Under the road category definitions provided in Table 2 of the RNP, the New England Highway is considered an arterial road. Hebden Road and Glennies Creek Road are defined as sub-arterial roads by the RNP as these roads support non-local traffic serving major traffic-generating developments.

**Table 4.16 – Road Noise Criteria, dB(A)**

| Road Category | Type of Project/Land Use | Assessment Criteria dB(A) | |
|---|---|---|---|
| | | **Day (7.00 am – 10.00 pm)** | **Night (10.00 pm – 7.00 am)** |
| Freeway/arterial/ sub-arterial roads | Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments | $L_{Aeq,\ 15\ hour}$ 60 (external) | $L_{Aeq,\ 9\ hour}$ 55 (external) |

Source: NSW Road Noise Policy (DECCW 2011)

Section 3.4 of the RNP notes that when assessing noise impacts and the effectiveness of feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

## 4.8 Rail Noise Criteria

Australian Rail Track Corporation (ARTC) operates the Main Northern Rail Line providing transport infrastructure for the movement of coal produced in the Hunter Coalfields to the Port of Newcastle. The Main Northern Rail Line is located along the southern boundary of the Mount Owen Complex. The Mount Owen Complex is connected to the Main Northern Rail Line via a dedicated rail line and loop. The Mount Owen Complex rail line/loop is privately owned and forms part of the mining infrastructure that makes up the Mount Owen Complex. In accordance with Appendix 3 of the EPA Rail Infrastructure Noise Guideline (RING) 2013, the rail loading and rail movements on the Mount Owen Complex rail line are assessed as a part of the industrial noise associated with the Project. Given the increased efficiencies of larger train sizes used for coal haulage from the Mount Owen Complex, anticipated train movements associated with the Project will not increase beyond the number of train movements currently approved (refer to **Section 5.5**).

Noise emissions from the Main Northern Rail Line are regulated via ARTC's EPL (EPL 3142). Section L6 of EPL 3142 does not nominate specific environmental noise limits but notes that:

> It is an objective of this License to progressively reduce noise levels to the goals of 65 dB(A) $L_{Aeq, day\text{-}time}$, 60 dB(A) $L_{Aeq, night\text{-}time}$ and 85 dB(A) (24hr) maximum pass-by noise, at one metre from the façade of affected residential properties through the implementation of the Pollution Reduction Programs (PRPs).

Appendix B of the RING specifies similar rail noise assessment trigger levels for rail traffic generating developments (refer to **Table 4.17**).

**Table 4.17 – Noise Criteria for Rail Traffic due to the Project on the Main Northern Rail Line, dB(A)**

| **Type of Development** | **Noise trigger levels dB(A) External**[1] | |
|---|---|---|
| | **Day (7 am - 10 pm)** | **Night (10 pm - 7 am)** |
| Rail traffic-generating development | Development increases existing LAeq, period rail noise levels by greater than 0.5 dB<br>***and***<br>predicted rail noise levels exceed: | |
| | 65 LAeq, day-time 15 hour<br>OR<br>85 LAmax | 60 LAeq, night-time 9 hour<br>OR<br>85 LAmax |

Note 1: Refer to RING technical notes for further definition of terms

# 5.0 Noise Modelling Parameters

## 5.1 Noise Modelling

Section 6 of the INP requires noise level predictions to take into account all significant noise sources that may reasonably be expected when the plant or facility in question is fully operational. As discussed in **Section 3.4**, the computer-based modelling software package ENM was used to predict the contributed noise levels from the Project at the nearest potentially affected receivers. These predictions were undertaken for three conceptual stages of mine development, namely Years 1, 5 and 10 as they are considered to represent indicative key features of the proposed mining progression for the Project.

Year 1

- mining activities (primarily pre strip operations) would be undertaken south of the currently approved North Pit mining limit during Year 1; and
- mining activity within the BNP .

Year 5

- continued mining activity within the BNP;
- mining has progressed in the North Pit Continuation in a southerly direction; and
- North Pit Continuation is at its maximum production rate (up to 10 Mtpa ROM) and maximum equipment numbers for the Project.

Year 10

- mining activity within the RERR Mining Area;
- southern most extent of the North Pit Continuation mining limit; and
- longest haul distances to the ROM stockpiles and the Mount Owen CHPP.

ENM calculates noise levels at either specified receiver locations (single point calculation) or generates noise level contours over a defined area (contour calculation). The single point calculation feature of ENM was used to model the noise impacts of the Project (refer to **Section 3.4**). Modelled noise impacts predicted by ENM considered the proposed equipment fleets (refer to **Section 5.2**), and 172 combinations of wind speed, wind direction and temperature gradients representative of the meteorological conditions of the region (refer to **Section 5.6**).

As a 24 hour 7 day per week operation, activities associated with the Project would be essentially the same during the day-time, evening and night-time. That is, the location and number of machines operating are independent of the time of day and the day of the week. Therefore, under normal operating conditions, achieving the night-time PSNLs would normally result in the day-time and evening PSNLs also being achieved. However, due to differences in the influence of meteorological conditions depending on time of day and season, the probability analysis methodology investigates the potential noise impacts during the day-time, evening and night-time periods on a seasonal basis.
The results presented in **Section 6.0** represent the likely contributed noise levels for each of the three conceptual years modelled, per receiver derived from the comprehensive data set containing predicted results per season, per time period (day, evening and night), for a full

range of meteorological conditions (Pasquill-Gifford Stability Categories A to D, E, F and G) and wind speeds. Probability calculations have been used to determine the 10$^{th}$ percentile probability contour and the potential likelihood of exceeding the PSNLs under all applicable meteorological conditions for the day-time, evening and night-time periods of each season.

## 5.2 Operational Noise Levels

### 5.2.1 Modelling Scenarios

ENM noise models were run for Years 1, 5 and 10 of the conceptual mine development. The conceptual mine plans and equipment locations used in the noise models are shown in **Appendix E**.

The assumptions used in modelling the operational phase of the Project include the following:

- all acoustically significant plant and equipment operating simultaneously in accordance with the conceptual mining and production schedule;
- mobile noise sources, such as front-end loaders, excavators and haul trucks modelled at typical locations and assumed to operate in repetitive cycles; and
- rail loading and rail movements on the Mount Owen Complex rail loop.

Details of the type and location of the mobile equipment in each model are presented in **Appendix E**. The level of equipment attenuation, as indicated by the SWLs presented in **Appendix E**, are considered indicative rather than mandatory. The actual performance of the mining operation will be determined by monitoring the environmental noise levels over the life of the Project. While **Section 6.3** provides a guide to equipment selection, the actual performance of the mine as a whole will dictate equipment selection criteria.

The construction activities not covered by the ICNG (refer to **Sections 4.6** and **5.3**) were incorporated into the operational scenario noise models of the Project. Proposed mine related construction activities likely to occur during Year 1 of the Project include:

- proposed product stockpile extension within previously disturbed areas;
- upgrades to the MIA (including heavy vehicle workshop, fuel farm and fuel delivery area, raw water system) and CHPP; and
- WMS upgrades.

### 5.2.2 Operational Noise Sources

Noise source models representative of the acoustically significant plant and equipment proposed for use in each of the conceptual mine stages were developed for ENM. Representative SWLs for the plant and equipment were sourced from Mount Owen or collected by Umwelt from the North Pit or other Glencore operations.

It is anticipated that during the life of the Project, equipment replacement programmes will result in a progressive improvement in the SWLs of the respective equipment. The indicative SWLs of the mining equipment and associated mining infrastructure modelled for Years 1, 5 and 10 of the Project are presented in **Appendix E**.

### 5.2.3 Control Measures

As discussed in **Section 2.0**, there was extensive consideration of project alternatives during the iterative project design and assessment process. This included investigations into alternate mine plans, production schedule and fleet requirements with the objective of reducing or managing the noise impacts from the Project.

Prior to the finalisation of the Project design, production schedule and fleet requirements, a range of options were investigated to eliminate, control or manage the noise impacts from the Project. In establishing the feasible and reasonable noise control measures that could be incorporated into the Project, a comprehensive range of noise control measures were considered for the management of operational activities under particular operational scenarios and meteorological conditions, in order to achieve specific noise outcomes. This included:

- investigating operational alternatives for the BNP and RERR Mining Area, including limiting operations under adverse meteorological conditions and restricting activities on dumps and exposed locations;
- the management of mobile machines during the adverse weather conditions on dumps and exposed locations; and
- identifying activities that could be restricted during times of adverse noise propagating meteorological conditions.

Those controls that were found to be reasonable and feasible in relation to providing an effective control of potential impacts have been incorporated into the Project design and specifically assessed as part of the NIA. Control measures that have been considered as a standard part of the Project are discussed in detail in **Section 8.0**. The specific control measures that have been incorporated into the Project and considered in the development of the noise models include:

- regular inspection and maintenance of noise attenuation systems;
- implementation of a process for periodic review of noise performance of the equipment fleet;
- management of the operation of the RERR Mining Area during periods when the weather conditions enhance the noise impacts, such as inversion conditions during some winter night-times. Consequently, the results for Year 10 in **Table 6.1** do not include operations in the RERR Mining Area under adverse weather conditions during winter-night times (estimated to be approximately 20 to 30 evening/nights during the June to August winter period) but include the operation's contribution from within the RERR Mining Area during non-winter nights, non-winter evenings and all season day time predicted noise levels;
- management of mobile machines during adverse weather conditions when wind conditions or inversion conditions enhance noise propagation towards sensitive receiver locations. In order to control/eliminate noise impacts this would likely include:
    - providing alternative dumping locations; and
    - moving parts of the fleet to locations deeper in the pit;

- management of a number of activities during adverse meteorological conditions, such as those which may occur during winter night-times (ie June, July and August from 6.00 pm to 7.00 am), including:
  - limiting a portion of the coaling fleet during the later stages of the mine life;
  - reducing bulldozer activity on exposed rehabilitation areas; and
  - managing top-soil and pre-strip during the later stage of the mine life;
- inclusion of bunds in strategic locations along key haul roads, where practicable, along the south eastern side of the ramps in the North Pit Continuation to shield trucks and equipment on exposed sections of the ramps;
- locating key haul roads within the North Pit Continuation below ground surface to maximise topographical shielding to surrounding receiver areas; and
- inclusion of bunds in strategic locations to shield trucks and equipment operating in exposed locations in the BNP and RERR Mining Areas.

These noise control measures have been incorporated into the SWLs used in the ENM models of the Project.

## 5.3 Construction Activities

### 5.3.1 Modelling Scenarios

The schedule of activities that would be covered by the ICNG includes:

- the construction of a new dual lane bridge over Bowmans Creek and rail overpass on Hebden Road; and
- the construction of an additional rail line and northern turn-out west of the existing Mount Owen Complex Rail Line.

The noise impacts at the nearest residential receivers were predicted using ENM for these activities using the SWLs in **Section 5.3.2**.

### 5.3.2 Construction Noise Sources

Two ENM noise source models were prepared to assess the impacts of construction noise associated with:

1. the construction of a new dual lane bridge over Bowmans Creek and rail overpass on Hebden Road; and
2. the construction of an additional rail line and northern turn-out west of the existing Mount Owen Complex Rail Line.

In addition, to account for variability in construction noise levels and location of construction machinery during the construction of the additional rail line, two construction scenarios were modelled to represent:

a) the worst case scenario where all rail construction activities are occurring at the southern most end of the new rail line, closest to the nearest receivers; and

b) the scenario in which the construction equipment have moved further north away from the nearest receivers.

Noise sources representative of the acoustically significant plant and equipment proposed for use in the construction activities associated with the Project are described in **Table 5.1**.

**Table 5.1 – Construction Equipment SWL, dB(A) & dB(Lin)**

| Equipment Description | Sound Power Level | |
|---|---|---|
| | dB(A) | dB(Lin) |
| **Dual lane bridge over Bowmans Creek and rail overpass, Hebden Road** | | |
| Excavator | 95 | 107 |
| Frontend Loader | 105 | 113 |
| Reversing Beeper | 121 | 125 |
| Generator | 103 | 107 |
| Pump | 104 | 111 |
| Truck | 108 | 120 |
| Concrete Truck | 111 | 114 |
| Pile Driver | 120 | 123 |
| **Additional rail line and northern turn-out** | | |
| Excavator | 95 | 107 |
| Dozer | 111 | 112 |
| Truck | 108 | 120 |
| Reversing Beeper | 121 | 125 |
| Generator | 103 | 107 |
| Pump | 104 | 111 |
| Concrete Truck | 111 | 114 |
| Ballast Tamper | 115 | 118 |
| Pile Driver | 120 | 123 |

Two broad construction scenarios were modelled to provide an indication of the expected noise levels from construction activities associated with the Project. It is anticipated the majority of the construction will occur during 'recommended standard hours' (Monday to Friday 7.00 am to 6.00 pm and Saturday morning from 8.00 am to 1.00 pm) as defined by the ICNG. To assess worst case noise impacts the construction noise levels were based on full utilisation of the construction equipment excluding the pile diving or pile driving with some support equipment. This equated to a total SWL of 122 dB(A).

Construction of the major items associated with the Project may occur during 'outside recommended standard hours' as defined by the ICNG. The construction scenario for the majority of work 'outside recommended standard hours' (evening/night-times from 6.00 pm to 7.00 am, Saturdays before 8.00 am or after 1.00 pm and any time on Sundays) would likely include equipment typically required for the site preparation prior to construction activities that would occur during 'recommended standard hours'. For the majority of construction work it is not anticipated that the construction activities will be continuous over a 24 hour period, but that it may commence prior to the commencement of 'recommended standard hours' and may not be completed until after the completion of 'recommended standard hours'.

However, limited activities (such as track work involving the Main Northern Rail Line) will be required to be undertaken during outage windows (periods of no or highly restricted rail activity on the Main Northern Rail Line) where construction activities will likely need to be continuous over a 24 hour period or more. Prior to activities occurring during outage windows, Mount Owen will consult with any residents that may be potentially affected by construction noise in accordance with the requirements of the ICNG.

## 5.4 Road Traffic Noise

### 5.4.1 Modelling Scenarios

The road noise impacts associated with traffic movements generated by the Project were modelled using the *US Federal Highway Administration (FHWA) Traffic Noise Model (TNM) Version 2.5 Look-Up Tables* (U.S. Department of Transportation 2004). TNM is a highway traffic noise prediction and analysis model used to analyse highway geometries including vehicle speeds, vehicle type, setback distances and the effectiveness of barriers.

Road traffic volumes for the operational stage of the Project will remain unchanged from present operational road traffic volumes. Road traffic volumes will increase during the construction phase of the Project. The Project involves a range of construction activities including:

- the construction of a rail overpass adjacent to the existing Hebden Road level crossing;
- the construction of a new dual lane bridge over Bowmans Creek on Hebden Road;
- the construction of a new northern turn-out and rail line for accessing the Mount Owen Complex rail loop;
- proposed product stockpile extension within previously disturbed areas;
- upgrades to the mine infrastructure area (MIA) (including heavy vehicle workshop, fuel farm and fuel delivery area, raw water system) and CHPP; and
- water management system (WMS) upgrades.

The additional construction traffic will access the various construction sites via both Hebden Road and Glennies Creek Road. The set back distances (distance from the centre line of the road to the building facade) for the nearest private residence to the roads that could be affected by the changes in the traffic levels are presented in **Table 5.2**.

**Table 5.2 – Assessed Camberwell Properties**

| Receiver Location | Set Back Distance[1] |
|---|---|
| St Clement's Anglican Church | 210m from the New England Highway |
| R146 | 260 m from the New England Highway |
| R147 | 60 m from the New England Highway |
| R150 | 298 m from the New England Highway |
| R127c | 110m from Glennies Creek Road |
| R133 | 210m from Antiene Road/Hebden Road |
| Lake Liddell Recreation Park | 40m from Antiene Road/ Hebden Road[2] |

Note 1: Set back distance is defined as the distance between the centre line of the road and the building facade.

Note 2: Set back distance based on set back distance from road to park managers residence.

### 5.4.2 Traffic Noise Sources

Construction traffic volumes are expected to peak early in the Project. The traffic volumes in the traffic study undertaken for the Project (TAUP 2014) have been used as the basis for the road traffic noise assessment. The following information was used in the assessment of the road traffic noise:

- the greatest road traffic noise impacts will be experienced by receivers in Camberwell and immediately south of Camberwell along the New England Highway (NEH);
- construction heavy vehicle movements will be evenly distributed throughout the day while light vehicle movements will be concentrated during peak AM and PM periods;
- approximately 6.2% of total traffic on the New England Highway comprises of medium to heavy vehicles (TAUP 2014);
- the existing and the Project construction phase road traffic noise impacts have been modelled;
- AM and PM peak traffic volumes were used to estimate noise impacts;
- a maximum of 10% of existing traffic and predicted construction phase traffic accessing the Project Area via Hebden Road will do so via Antiene Road/Hebden Road;
- the peak AM period is considered to be between 6.00 am and 7.00 am while the peak PM period is considered to be between 4.45 pm and 5.45 pm; and
- the predictions are based on an average speed on the New England Highway at Camberwell of 100 km/hr and an average speed on Hebden Road and Glennies Creek Road of 80 km/hr.

The predicted road traffic noise impacts are based on the traffic volumes in **Table 5.3**.

**Table 5.3 – Peak Two-way Traffic Volumes**

| Vehicle classification | Current Traffic Volumes | | Predicted Total Traffic including Construction Phase Traffic | |
|---|---|---|---|---|
| | AM | PM | AM | PM |
| New England Highway Camberwell Village | | | | |
| Light | 911 | 825 | 955 | 869 |
| Heavy | 60 | 54 | 62 | 56 |
| Total | 971 | 879 | 1,017 | 925 |
| Glennies Creek Road | | | | |
| Total | 84 | 51 | 146 | 113 |
| Hebden Road | | | | |
| Total | 189 | 104 | 353 | 288 |

Source: TAUP 2014 Figures 4 and 5

## 5.5 Rail Noise

The Project will maintain the existing CHPP processing and load out capacity of 17 million tonnes per annum (Mtpa). As a result, no changes are proposed rail load-out operations and transport of coal on the Main Northern Railway Line. The current Project Approval allows for 1,636 train movements per annum.

Glencore is seeking approval for the provision of an additional rail line and northern turn-out west of the existing Mount Owen Complex rail line. The construction of the additional rail line and northern turn-out will allow empty Glencore trains the ability to turn around within the Mount Owen balloon loop and return to Glencore owned mines to the west of Mount Owen. At present, these trains travel to the Port of Newcastle to turn around before returning to Glencore owned mines. This will increase capacity along the Main Northern Rail Line by providing additional train paths between Mount Owen and the Port, which would otherwise have been taken by empty trains.

Noise impacts associated with rail traffic movements and parking within the Mount Owen Complex rail line have been assessed separately as part of operational noise, under the INP (refer to **Section 5.2**). While noise impacts associated with rail traffic on the Main Northern Rail Line are the responsibility of the ARTC under EPL 3142 (refer to **Section 4.8**), the estimated change in noise levels have been assessed in **Section 6.5**.

## 5.6 Meteorological Conditions

The modelling approach taken with respect to meteorology (refer to **Section 3.4**) was to analyse representative meteorological data for the region surrounding the Project Area and determine the percentage of occurrence of inversions and/or wind effects. The noise impacts were then modelled for 172 meteorological conditions considered representative of the local meteorological conditions. This included ten wind speed intervals, wind direction based on eight compass intervals and temperature gradients representative of A to D class stability conditions, and E class, F class and G class stability conditions. This approach takes account of the influence of local meteorological conditions on the propagation of the noise from the Project to the entire region surrounding the Project Area.

Meteorological data was sourced from the Mount Owen Complex continuous monitoring network weather stations, SentineX 8 and 13, to produce a composite data set representative of the region surrounding the Project Area. The data used for modelling consists of the 12 month period from 1 September 2011 to 21 August 2012 which was found to be consistent with the period of record for SentineX 8 and 13 weather stations of January 2009 to August 2012. The analysis of the meteorological data from the Mount Owen Complex continuous monitoring network weather stations is presented in **Appendix F**.

### 5.6.1 Wind

As noted in the INP, wind has the potential to increase the noise impacts upon a receiver when it is light and stable and blows from the direction of the noise source towards the receiver. As the strength of the wind increases, the noise produced by the wind begins to obscure the noise from most industrial and transport sources. Adverse meteorological conditions created by wind speeds above 5 m/s can also skew the noise predictions. The cut off wind speed is based around the principles documented in the INP. That is, cut off wind speed would be when the noise produced by the wind begins to obscure the noise from the Project.

As a result, when considering the wind effects on the Project, wind speeds above 5 m/s were excluded from the analysis. The percentage occurrence of evening and night time wind speeds above 5 m/s is typically less than 10 per cent of the time depending on the time period and season.

### 5.6.2 Temperature Inversion

Temperature inversions are generally determined based on the occurrence of atmospheric stability classes, with moderate to strong inversions corresponding to atmospheric stability categories E, F and G respectively. The probability analysis of the noise impacts includes all meteorological conditions of atmospheric stability categories E, F and G, i.e. those that correspond to temperature inversions.

Based on the analysis of the meteorological data presented in **Appendix F**, temperature inversions are a significant characteristic of the area occurring for more than 30 per cent of the total night-time (i.e. the evening and night-time periods) during winter. To account for this, the meteorological scenarios included in the noise probability modelling included temperature inversions with lapse rates corresponding to atmospheric stability categories E, F and G.

## 5.7 Receiver Locations

The privately owned residential/rural receivers that could potentially be affected by the Project are shown on **Figure 4.1**. The description of each receiver location used for the Single Point Calculations in ENM and the applicable project-specific noise levels are presented in **Appendix D**.

Non-residential receivers where the PSNL derived from the background noise monitoring is not applicable include:

- Mount Pleasant Public School;
- Glennies Creek Community Hall;
- St Clement's Anglican Church;
- Glennies Creek Rural Fire Service; and
- Daracon Mining compound.

The acceptable amenity criteria presented in the INP has been applied to these non-residential receivers.

The construction noise goals in **Appendix D** apply to the non-mining related construction activities during non-standard and standard hours referred to in **Section 4.6**. The mining related construction activities are assessed against the PSNLs, outlined in **Appendix D**.

# 6.0 Noise Predictions

## 6.1 Operational Noise Levels

### 6.1.1 Predicted Operational Noise Levels

ENM's Single Point calculation feature was used to determine noise levels from the Project at the nearest residential receiver locations identified in **Section 5.6**, under the meteorological conditions described in **Section 5.5** for the indicative schedule of equipment (or their equivalent) that Mount Owen proposes to use 7 days per week 24 hours per day described in **Section 5.0** and **Appendix E**. The predicted operational noise levels for the three operational years modelled, Years 1, 5 and 10 are presented in detail in **Appendices G** and **H**.

The Project proposes to continue to operate continuously 7 days per week 24 hours per day. As a result, the most stringent noise criteria the mining operation will need to achieve is likely to be the night-time PSNL. **Table 6.1** presents a summary of the 10$^{th}$ percentile predicted operational noise levels for Years 1, 5 and 10 where the predicted noise levels during the likely worst case season/period of winter night-time (June, July and August 6.00 pm to 7.00 am) exceed 35 dB(A), where 35 dB(A) is the lowest PSNL for the Project. In addition, predicted operational noise levels are also presented for the other acoustically significant time periods being:

- non-winter nights (September to end of June 10.00 pm to 7.00 am);
- non-winter evenings (September to end of June 6.00 pm to 10.00 am); and
- all seasons day (7.00 am to 6.00 pm).

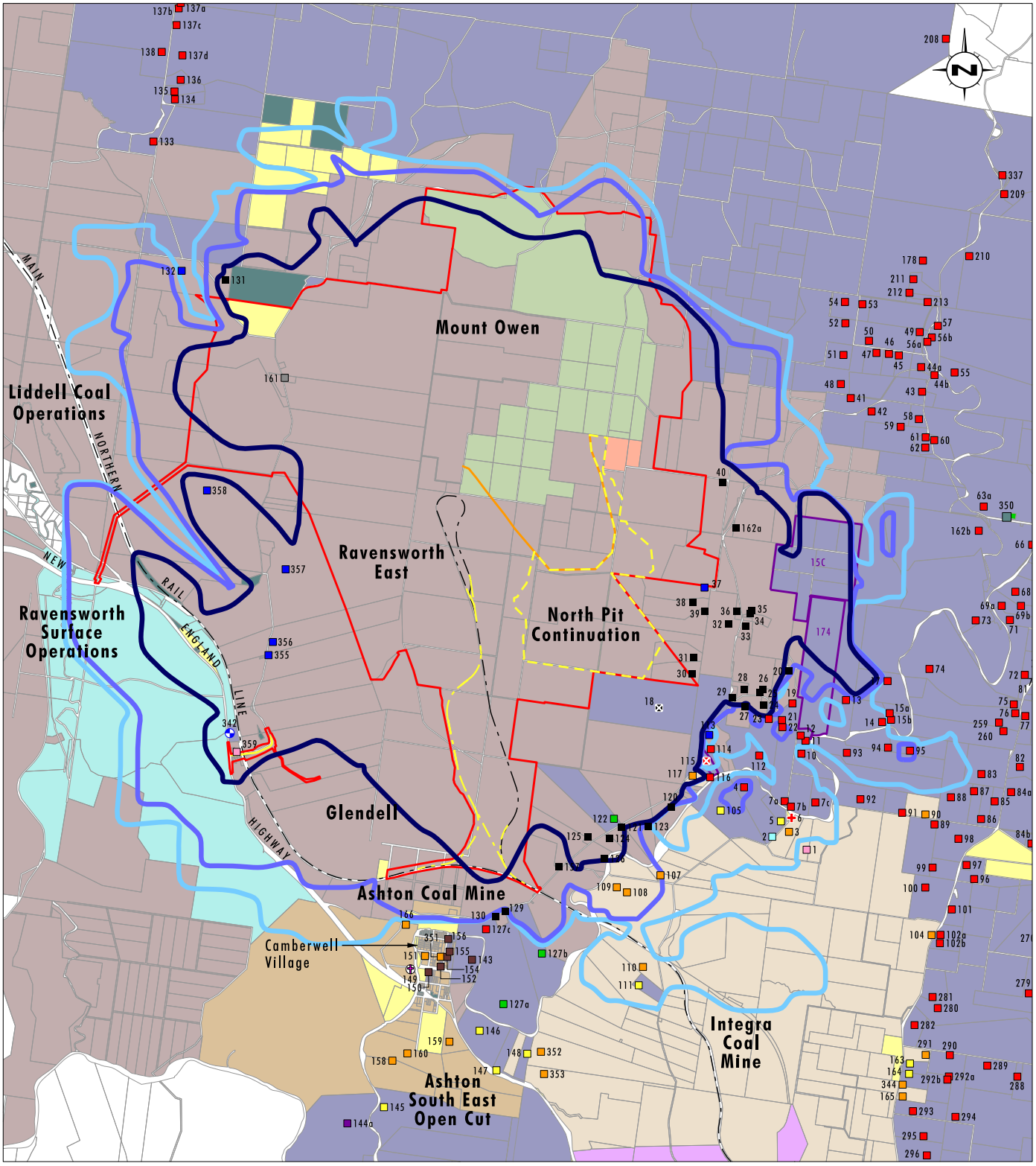
**Appendix G** presents the 10$^{th}$ percentile predicted operational noise levels at all the residential receiver locations identified in **Section 5.6** for Years 1, 5 and 10 for winter night-time, non-winter night-time, non-winter evenings and all seasons day-time. **Appendix G** also presents the percentage of time the predicted operational noise levels are likely to exceed the PSNLs at the residential receiver identified in **Table 6.1**.

**Figures 6.1**, **6.2** and **6.3** presents the 10$^{th}$ percentile noise level contours predicted under the likely worst case season/period of winter night-time for Years 1, 5 and 10 respectively. **Appendix H** presents the 10$^{th}$ percentile noise level contours for Years 1, 5 and 10 for winter night-time, non-winter night-time, non-winter evenings and all seasons day-time.

The predicted noise levels for Year 1 of the Project are consistent with the noise levels predicted for Year 10 of the currently approved Mount Owen Operations Project (DA 14-1-2004). This is because the mine plans and the machine SWL levels for Year 1 of the Project are similar to the approved mine plans for the Mount Owen Operations Project.

### 6.1.2 Predicted Operational Noise Levels

An analysis of the predicted noise level results for the inclusion of 'modifying factors' including an analysis of low frequency impacts was conducted (refer to **Appendix J**) in accordance with Section 4 of the INP (EPA 2000), the INP application notes (refer to **Appendix B**) and the low frequency noise criteria suggested by DP&I (2013) and Broner (2011). Tonal noise, impulsive noise, intermittent noise during the night time and single event duration noise were found to not require the application of modifying factors to the predicted noise levels.




Data Source: Mount Owen (2014), Department of Lands (2009)

0 1 2 4 km

Scale 1:90 000

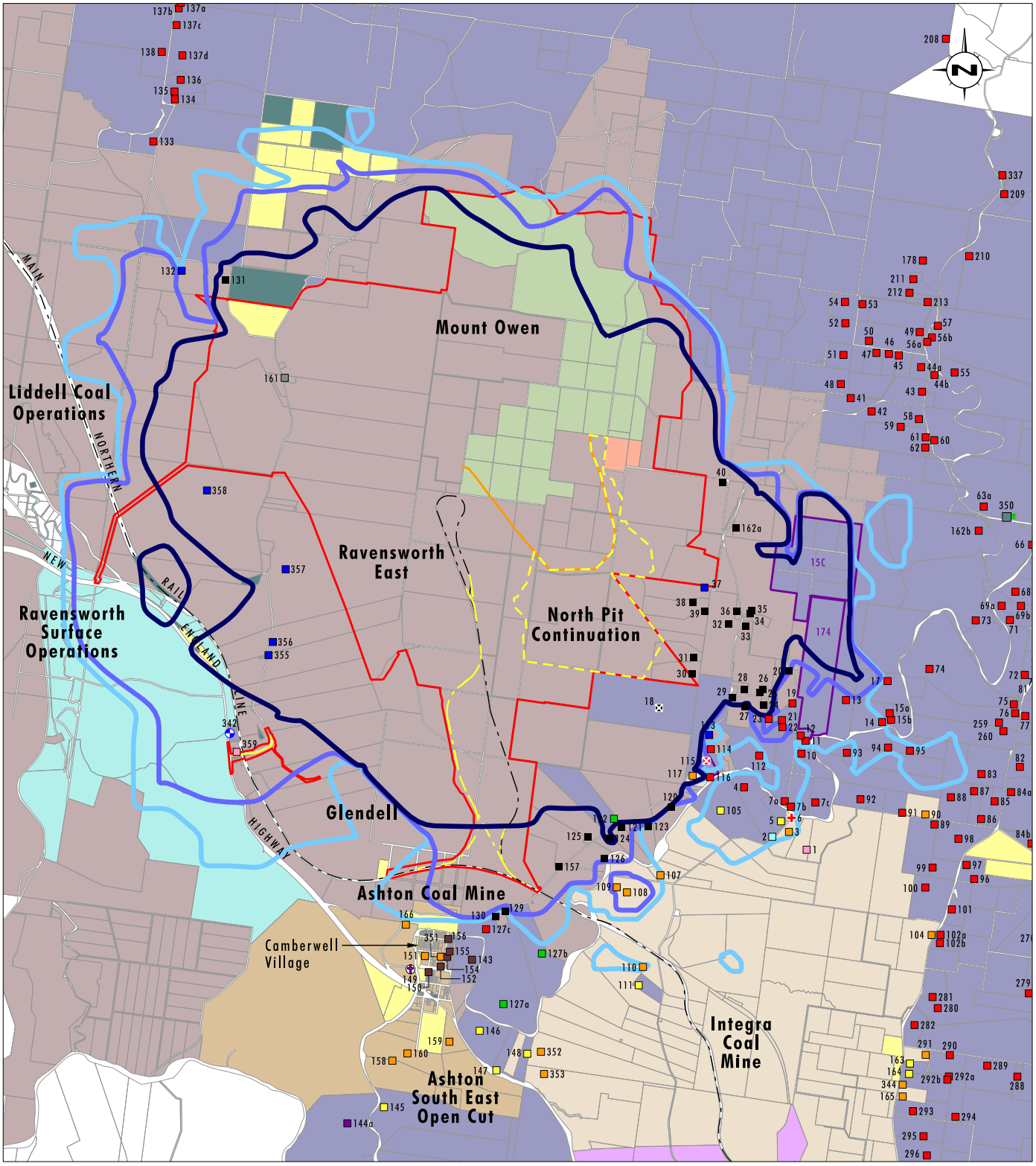
## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
- Integra Coal
- Macquarie Generation
- Glencore
- Private
- Rixs Creek Mine
- State Forest
- Minister for Education
- 35 dB(A) 10th Percentile Exceedence
- 37 dB(A) 10th Percentile Exceedence
- 40 dB(A) 10th Percentile Exceedence
- Mt Pleasant Primary School
- Currently Subject to Acquisition Rights - Dairy
- SEOC Acquisition
- Private Residence
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Community Hall
- Private No Dwelling
- Church
- Daracon Site Office
- Glennies Creek Fire Brigade
- Former Hebden Public School

FIGURE 6.1

**Year 1 Winter Nights Noise Contours**

File Name (A4): R11/3109_630.dgn
20141009 9.43




Data Source: Mount Owen (2014), Department of Lands (2009)

0 1 2 4 km

Scale 1:90 000

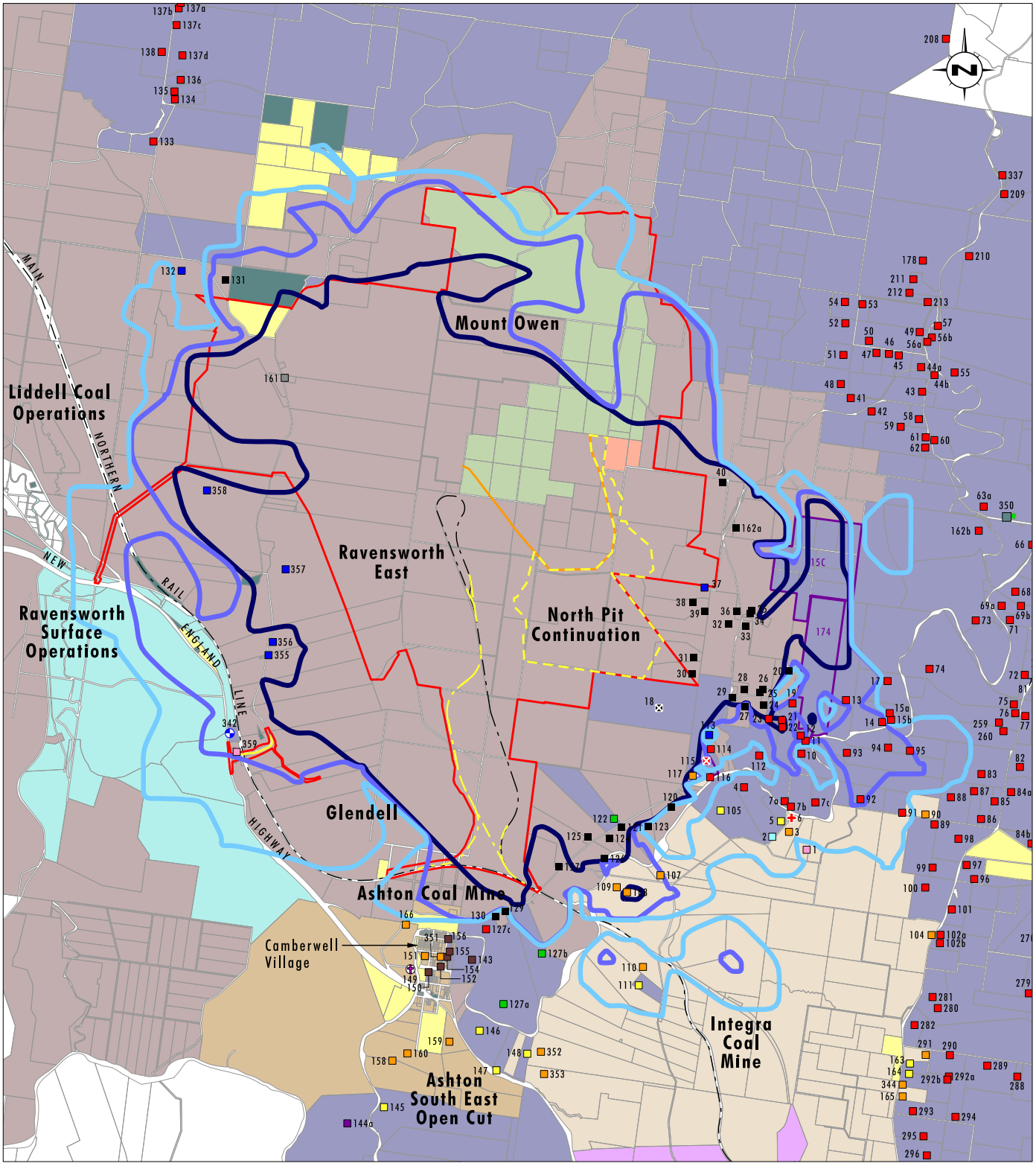
## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
- Integra Coal
- Macquarie Generation
- Glencore
- Private
- Rixs Creek Mine
- State Forest
- Minister for Education
- 35 dB(A) 10th Percentile Exceedence
- 37 dB(A) 10th Percentile Exceedence
- 40 dB(A) 10th Percentile Exceedence
- Mt Pleasant Primary School
- Currently Subject to Acquisition Rights - Dairy
- SEOC Acquisition
- Private Residence
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Community Hall
- Private No Dwelling
- Church
- Daracon Site Office
- Glennies Creek Fire Brigade
- Former Hebden Public School

FIGURE 6.2

Year 5 Winter Nights Noise Contours

File Name (A4): R11/3109_631.dgn
20141009 9.44




Data Source: Mount Owen (2014), Department of Lands (2009)

0 1 2 4 km

Scale 1:90 000

## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
- Integra Coal
- Macquarie Generation
- Glencore
- Private
- Rixs Creek Mine
- State Forest
- Minister for Education
- 35 dB(A) 10th Percentile Exceedence
- 37 dB(A) 10th Percentile Exceedence
- 40 dB(A) 10th Percentile Exceedence
- Mt Pleasant Primary School
- Currently Subject to Acquisition Rights - Dairy
- SEOC Acquisition
- Private Residence
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Community Hall
- Private No Dwelling
- Church
- Daracon Site Office
- Glennies Creek Fire Brigade
- Former Hebden Public School

FIGURE 6.3

**Year 10 Winter Nights Noise Contours**

File Name (A4): R11/3109_632.dgn
20141009 9.45

## Table 6.1 – 10th Percentile Predicted Operational Noise Level, dB(A)

(Results presented are for predicted levels above PSNL)

| Receiver Location | Period | PSNL[1] | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 1 - R041 | Day | 35 | - | - | - | 36 | - | - | - | - | - | - | - | - |
| Area 1 - R048 | Day | 35 | - | - | - | 36 | - | - | - | - | - | - | - | - |
| Area 3 - R015c (vacant land) | Day | 35 | - | - | - | 44 | - | - | - | 43 | - | - | - | 43 |
| | Evening | 35 | - | - | 38 | - | - | - | 37 | - | - | - | - | - |
| | Night | 35 | 44 | 41 | - | - | 43 | 40 | - | - | 41 | 38 | - | - |
| Area 3 - R018 (vacant land) | Day | 35 | - | - | - | 44 | - | - | - | 44 | - | - | - | 47 |
| | Evening | 35 | - | - | 40 | - | - | - | 39 | - | - | - | 40 | - |
| | Night | 35 | 46 | 41 | - | - | 46 | 41 | - | - | 44 | 42 | - | - |
| Area 3 – R174 (vacant land) | Day | 35 | - | - | - | 42 | - | - | - | 42 | - | - | - | 43 |
| | Evening | 35 | - | - | 38 | - | - | - | 37 | - | - | - | 36 | - |
| | Night | 35 | 44 | 41 | - | - | 44 | 41 | - | - | 43 | 39 | - | - |
| Area 4 - R010 | Night | 35 | - | - | - | - | - | - | - | - | - | 37 | - | - |
| Area 4 - R011 | Day | 35 | - | - | - | 36 | - | - | - | 36 | - | - | - | 37 |
| | Night | 35 | 37 | - | - | - | 36 | - | - | - | 37 | 37 | - | - |
| Area 4 - R012 | Day | 35 | - | - | - | - | - | - | - | 36 | - | - | - | 36 |
| | Evening | 35 | - | - | - | - | - | - | - | - | - | - | 36 | - |
| | Night | 35 | 36 | - | - | - | 36 | - | - | - | - | 38 | - | - |
| Area 4 - R013 | Day | 35 | - | - | - | 36 | - | - | - | 36 | - | - | - | 38 |
| | Night | 35 | 37 | - | - | - | 37 | - | - | - | 38 | 37 | - | - |
| Area 4 - R014 | Day | 35 | - | - | - | 36 | - | - | - | - | - | - | - | 37 |
| | Night | 35 | 37 | - | - | - | 36 | - | - | - | 37 | - | - | - |
| Area 4 - R019 | Day | 35 | - | - | - | 36 | - | - | - | 36 | - | - | - | 38 |
| | Night | 35 | 37 | - | - | - | 37 | - | - | - | 39 | 38 | - | - |

## Table 6.1 – 10th Percentile Predicted Operational Noise Level, dB(A) (cont.)

(Results presented are for predicted levels above PSNL)

| Receiver Location | Period | PSNL[1] | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 4 - R021 | Day | 35 | - | - | - | 36 | - | - | - | 36 | - | - | - | 39 |
| | Evening | 35 | - | - | - | - | - | - | - | - | - | - | 37 | - |
| | Night | 35 | 37 | - | - | - | 37 | - | - | - | 41 | 39 | - | - |
| Area 4 - R022 | Day | 35 | - | - | - | 37 | - | - | - | 38 | - | - | - | 40 |
| | Evening | 35 | - | - | - | - | - | - | - | - | - | - | 37 | - |
| | Night | 35 | 38 | - | - | - | 38 | - | - | - | 41 | 39 | - | - |
| Area 4 - R023 | Day | 35 | - | - | - | 36 | - | - | - | 36 | - | - | - | 38 |
| | Evening | 35 | - | - | - | - | - | - | - | - | - | - | 38 | - |
| | Night | 35 | 36 | - | - | - | 36 | - | - | - | 41 | 39 | - | - |
| Area 4 - R093 | Day | 35 | - | - | - | - | - | - | - | - | - | - | - | 38 |
| | Night | 35 | 36 | - | - | - | - | - | - | - | 40 | 36 | - | - |
| Area 4 - R094 | Day | 35 | - | - | - | - | - | - | - | - | - | - | - | 37 |
| | Night | 35 | - | - | - | - | - | - | - | - | 38 | 36 | - | - |
| Area 4 - R095 | Day | 35 | - | - | - | 38 | - | - | - | - | - | - | - | 37 |
| | Night | 35 | 38 | 36 | - | - | 36 | - | - | - | 37 | - | - | - |
| Area 4 - R112 | Night | 35 | - | - | - | - | - | - | - | - | - | 38 | - | - |
| Area 4 - R114 | Day | 35 | - | - | - | - | - | - | - | - | - | - | - | 37 |
| | Night | 35 | - | - | - | - | 36 | - | - | - | 36 | - | - | - |
| Area 4 - R115 | Day | 35 | - | - | - | 36 | - | - | - | 36 | - | - | - | 37 |
| | Night | 35 | 37 | - | - | - | 37 | - | - | - | 37 | 36 | - | - |
| Area 5 - R091 | Day | 35 | - | - | - | - | - | - | - | - | - | - | - | 36 |
| | Night | 35 | - | - | - | - | - | - | - | - | 36 | - | - | - |
| Area 5 - R092 | Day | 35 | - | - | - | - | - | - | - | - | - | - | - | 37 |
| | Night | 35 | - | - | - | - | - | - | - | - | 37 | 36 | - | - |

## Table 6.1 – 10th Percentile Predicted Operational Noise Level, dB(A) (cont.)

(Results presented are for predicted levels above PSNL)

| Receiver Location | Period | PSNL[1] | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 6 - R122 [2] | Day | 39 | - | - | - | 40 | - | - | - | - | - | - | - | 42 |
| | Evening | 39 | - | - | - | - | - | - | - | - | - | - | 42 | - |
| | Night | 39/37 [3] | 42 | 39 | - | - | 41 | - | - | - | 42 | 42 | - | - |
| Area 7 - R004 | Day | 37 | - | - | - | - | - | - | - | - | - | - | - | 38 |
| Area 8 – R111 | Night | 35 | 36 | - | - | - | - | - | - | - | - | 36 | - | - |

Note 1: PSNL based on intrusiveness $L_{Aeq,15minute}$ criteria unless otherwise noted.

Note 2: Predicted noise levels are at the residence.

Note 3: Criteria 39 dB(A) $L_{Aeq,15minute}$ and 37 dB(A) $L_{Aeq,night}$.

However, it was found that a strict application of Section 4 of the INP (EPA 2000) may require the addition of a low frequency noise modifying factor at some receivers under noise enhancing meteorology. The analysis in **Appendix J** found that the predicted low frequency noise levels for the Project were below the DP&I (2013) 60 dB(C) night time criteria. In addition, the predicted low frequency noise levels were found to be generally close to the threshold of hearing and therefore unlikely to be intrusive or cause annoyance. Based on the assessment in **Appendix J**, no low frequency modifying factors have been applied to the predicted noise levels.

### 6.1.3 Summary of Findings

The number of potential exceedances of the project-specific noise levels for the Project (refer to **Tables 6.1** and **Appendix G**) is summarised in **Table 6.2**. The potential exceedances identified in **Table 6.2** are inclusive of the control measures discussed in **Section 5.0**.

**Table 6.2 – Summary of Predicted Noise Impacts [1]**

| Season/Period | Year 1 | Year 5 | Year 10- |
|---|---|---|---|
| **Winter Night-time** | | | |
| No. Properties > PSNL to PSNL+2 | 11 | 10 | 7 |
| No. Properties > PSNL+2 to PSNL+5 | 2 | 1 | 4 |
| No. Properties > PSNL+5 | 4 | 4 | 7 |
| Maximum Noise Level | 46 | 46 | 44 |
| **Non-winter Night-time** | | | |
| No. Properties > PSNL to PSNL+2 | 1 | 1 | 9 |
| No. Properties > PSNL+2 to PSNL+5 | 1 | 1 | 8 |
| No. Properties > PSNL+5 | 3 | 2 | 2 |
| Maximum Noise Level | 41 | 41 | 42 |
| **Non-winter Evenings** | | | |
| No. Properties > PSNL to PSNL+2 | 1 | 2 | 4 |
| No. Properties > PSNL+2 to PSNL+5 | 3 | 1 | 3 |
| No. Properties > PSNL+5 | - | - | - |
| Maximum Noise Level | 40 | 39 | 42 |
| **All Seasons Day-time** | | | |
| No. Properties > PSNL to PSNL+2 | 10 | 8 | 10 |
| No. Properties > PSNL+2 to PSNL+5 | 2 | 1 | 7 |
| No. Properties > PSNL+5 | 3 | 3 | 3 |
| Maximum Noise Level | 44 | 45 | 47 |

The residential properties in the Noise Affectation Zone where the predicted 10$^{th}$ percentile noise level exceeds the PSNL by more than 5 dB are:

- Area 4 - R021: Where the predicted 10$^{th}$ percentile noise level during the Year 10 Winter nights is 41 dB(A).
- Area 4 - R022: Where the predicted 10$^{th}$ percentile noise level during the Year 10 Winter nights is 41 dB(A).
- Area 4 - R023: Where the predicted 10$^{th}$ percentile noise level during the Year 10 Winter nights is 41 dB(A).

The residential properties in the Noise Management Zone where the predicted 10th percentile noise levels exceed the PSNL by greater than 2 dB, up to 5 dB above the PSNL are:

- Area 4: R012; R013; R019; R093; R094; R095; and R112; and
- Area 6: R122.

Residential properties where the predicted 10th percentile noise levels exceed the PSNL by up to and including 2 dB are:

- Area 1: R041 and R048;
- Area 4: R010; R011; R014; and R114;
- Area 5: R091 and R092;
- Area 7: R004; and
- Area 8: R111.

Based on the above summary, the total number of affected residential properties is presented in **Table 6.3**.

**Table 6.3 – Number of Affected Residential Properties**

| **Assessment Criterion** | **up to 2 dB above the PSNL** | **Noise Management Zone** > PSNL +2 to ≤ PSNL + 5 | **Noise Affectation Zone** > PSNL + 5 |
|---|---|---|---|
| Number of affected Properties | 10 | 8 | 3 |

**Vacant Land Assessment**

Vacant land where the predicted 10th percentile noise level exceeds the PSNL by more than 5 dB are:

- Area 3 - R018: A vacant parcel of land to the west of Falbrook Road where the noise levels are predicted to exceed 40 dB(A) over greater than 25 per cent of the land area . This vacant parcel of land is subject to acquisition under the current Mount Owen Operations project approval.
- Area 4 - R015c: Currently a vacant parcel of land east of Falbrook Road and is the western allotment linked to property R015a. The noise levels are predicted to exceed 40 dB(A) over greater than 25 per cent of the land area.
- Area 3/4 - R174: Currently a vacant parcel of land north of Middle Falbrook Road where the noise levels are predicted to exceed 40 dB(A) over greater than 25 per cent of the land area.

Vacant land where the predicted 10th percentile noise levels exceed the PSNL by up to and including 2 dB is:

- Area 4: R115 (a vacant parcel of land to the east of Falbrook Road).

## 6.2 Sleep Disturbance

Noise sources that could lead to sleep disturbance are typically transient noises and often have tonal characteristics. Mining activities occurring within the night-time that could lead to sleep disturbance include:

- an excavator bucket striking the ground;
- heavy objects (rocks) being dropped into a truck tray;
- air horns used to control truck movement;
- reversing beepers; and
- track clatter from bulldozers.

ENM's Single Point Calculation feature was used to determine noise levels at the nearest residential receiver locations under three meteorological conditions: calm neutral; F Class Stability with accompanying drainage flow from the north to north-west; and a north-west at 3 m/s. The predicted received $L_{A1,\ 1\ minute}$ noise levels associated with these activities that could result in sleep disturbance during the day evening or night-time are presented in **Appendix G**.

The number of potential exceedances of the sleep disturbance criterion for the Project (refer to **Appendix G**) is summarised in **Table 6.4**.

**Table 6.4 – Summary of Predicted Noise Impacts**

| Season/Period | Year 1 | Year 5 | Year 10 |
|---|---|---|---|
| **Calm Neutral** | | | |
| No. Properties greater-than Criteria | - | - | - |
| Maximum Noise Level | < 30 | < 30 | < 30 |
| **F-Class Stability and 2m/s NW Drainage Flow (Night Only)** | | | |
| No. Properties greater-than Criteria | - | - | 1 |
| Maximum Noise Level | 37 | 36 | 46 |
| **3 m/s NW Wind** | | | |
| No. Properties greater-than Criteria | - | - | 1 |
| Maximum Noise Level | 35 | 37 | 47 |

The only property where the predicted $L_{A1,\ 1\ minute}$ noise levels associated with the Project could result in sleep disturbance sleep is R018 which is currently a vacant parcel of land and subject to acquisition under the current Mount Owen Operations project approval.

## 6.3 Construction Noise Levels

ENM's Single Point Calculation feature was used to determine the construction noise levels at the nearest residential receiver locations under worst-case meteorological conditions of source to receiver winds of 3 m/s. The predicted $L_{Aeq,15minute}$ noise levels at associated with the construction activities are presented in **Appendix G**.

The number of potential exceedances of the construction noise management level at private residential properties in the vicinity of the construction activities associated with the Project are presented in **Appendix G** and summarised in **Tables 6.5**.

**Table 6.5 – Summary of Predicted Construction Noise Impacts, dB(A)**

| Season/Period | Calm Neutral | 3 m/s NW Wind | 3 m/s SE Wind |
|---|---|---|---|
| **Dual lane bridge over Bowmans Creek, Hebden Road** | | | |
| No. Properties greater-than Criteria | - | - | - |
| Maximum Noise Level (all properties) | < 30 | 31 | < 30 |
| **Additional rail line and northern turn-out** | | | |
| No. Properties greater-than Criteria | - | 1 (+2dB at R111) | - |
| Maximum Noise Level (all properties) | 41 | 44 | 39 |

The results in **Table 6.5** indicate the noise levels associated with the construction of the additional railway line will not exceed the recommended standard hour construction noise management level presented in **Table 4.11** for all residential receivers excluding R111. The results in **Appendix G** predict worst case construction noise levels of 43 dB(A) at receiver R111, 2 dB above the construction noise management levels in **Table 4.15**, for a short period of time while construction works are occurring in the southern section of the railway alignment. When construction of the rail line moves further north the predicted construction noise levels fall below the construction noise management level. Residence R111 is subject to acquisition by other mining operations not related to Mount Owen.

The construction noise model predicts a potential exceedance of the construction noise management levels outside recommended standard hours at Residence R111 and Residence R122 (currently subject to acquisition rights) during the time when proposed rail line is linked to Main North Railway Line. The predicted worst case noise impact would be approximately 5 dB above the “outside recommended standard hours” criteria.

## 6.4 Road Traffic Noise Assessment

The predicted road traffic noise impacts at closest receivers and the relevant assessment criteria are presented in **Table 6.6**.

**Table 6.6 – Predicted Noise Impacts, dB(A)**

| Receiver Location | Existing | | Construction Phase | | Criteria | |
|---|---|---|---|---|---|---|
| | Peak AM | Peak PM | Peak AM | Peak PM | AM [1] | PM [2] |
| St Clement's Anglican Church | 50.9 | 50.4 | 51.0 | 50.6 | 50 [3] | 50 [3] |
| R146 | 48.5 | 48.1 | 48.7 | 48.2 | 55 | 60 |
| R147 | 61.2 | 60.7 | 61.4 | 60.9 | 55 | 60 |
| R150 | 47.6 | 47.1 | 47.7 | 47.3 | 55 | 60 |
| R127c | 38.4 | 38.6 | 41.8 | 41.9 | 55 | 60 |
| R133 | 35.6 | 34.3 | 38.3 | 37.7 | 55 | 60 |
| Lake Liddell Recreation Park | 48.1 | 46.8 | 50.9 | 50.2 | 55 | 55 [4] |

Note 1: Night time criteria, NSW Road Noise Policy, OEH 2011
Note 2: Day time criteria, NSW Road Noise Policy, OEH 2011
Note 3: Internal noise criteria of 40 dB(A) (OEH 2011), assume 10 dB(A) drop from external noise level (NSW Industrial Noise Policy, EPA 2000)
Note 4: Open Space (passive use) criteria, NSW Road Noise Policy, OEH 2011

The predicted existing and construction phase road traffic noise impacts presented in **Table 6.6** for private residences R146, R150, R127c and R133, and the Lake Liddell Recreation Park are below the relevant road traffic noise criteria. The predicted existing and construction phase road traffic noise impacts for the St Clement's Anglican Church and property R147 are both above the relevant road traffic noise criteria and therefore the relative increase criteria of 2 dB need to be considered. Relative increases in the road traffic noise levels associated with the construction phase of the Project at St Clement's Anglican Church and property R147 are negligible at 0.2 dB and 0.3 dB respectively.

## 6.5 Rail Noise Assessment

### 6.5.1 Mount Owen Complex Rail Line

In accordance with Appendix 3 of the RING, the operation of the Mount Owen Complex rail line and the proposed additional rail line and northern turn-out were assessed as part of the Project's industrial noise sources in **Section 6.1**.

### 6.5.2 Main Northern Rail Line

With respect to the prediction of the $L_{Amax}$ levels at residences from passing trains, there will be no change in the sound power level of the trains servicing the Project. Therefore there will be no increase in the $L_{Amax}$ pass-by noise levels as a result of the Project.

The ARTC 2013-2022 Hunter Valley Corridor Capacity Strategy, June 2013 indicates the contract coal tonnage in 2013 due to all coal haulage on the Main Northern Rail Line between the Mount Owen junction and Camberwell junction is 110 Mtpa. The predicted contract coal tonnage in 2022 on the Main Northern Rail Line between the Mount Owen junction and Camberwell junction is 200 Mtpa. This would represent a 2.6 dB increase in the noise level associated with contracted coal train movements on the Main Northern Rail Line between Mount Owen junction and Camberwell junction.

Mount Owen's current coal train movements on the Main Northern Rail Line contribute 0.5 dB to the noise levels generated by coal train movements on the Main Northern Rail Line between Mount Owen junction and Camberwell junction. At ARTC's proposed contracted coal train movement rate of 200 Mtpa by 2022, Mount Owen's coal train movements on the Main Northern Rail Line would contribute 0.2 dB to the noise levels generated by coal train movements on the Main Northern Rail Line between Mount Owen junction and Camberwell junction. Based on the guidelines in the RING, Mount Owen's contribution to the overall train related noise levels from the Main Northern Rail Line is unlikely to be audibly perceptible at any of the current train noise setback distances.

# 7.0 Cumulative Noise Impact Assessment

## 7.1 Assessment Criteria

### 7.1.1 Intrusiveness and Amenity Noise Levels

The INP addresses potential cumulative noise impacts from existing and subsequent developments in an area by ensuring that appropriate noise emission criteria and consent limits are established with a view to maintaining acceptable noise amenity levels for residents. This is consistent with the Mining SEPP (2013) which notes that cumulative noise level should not exceed the acceptable noise levels as defined in Table 2.1 of the INP.

In order to assess potential cumulative noise impacts it is important to note the difference between the objectives of the INP's intrusiveness and amenity noise criteria:

- **Intrusiveness Criteria** – the EPA's first objective is that the intrusive noise emission from any single source does not exceed the background level by more than 5 dB. This relates to individual developments and single noise sources and is generally specified in Development Consent conditions and/or EPA Licences. There is no established procedure for determining the cumulative intrusive $L_{Aeq,\ 15\ minute}$ noise criterion in relation to the simultaneous operation of a number of existing developments.

- **Amenity Criteria** – the EPA's second objective is that the $L_{Aeq}$ amenity level does not exceed the specified 'acceptable' level appropriate for the particular locality and land use and is aimed at restricting the potential cumulative increase in noise amenity levels (otherwise known as background creep).

Within the rural environment surrounding a mining operation, the noise descriptor of the PSNLs is typically based on the intrusiveness criteria which is based around a 15 minute time period. The modelling predictions are therefore an estimate of the intrusive noise level from the mining operation being assessed. The corresponding contribution of the mining operation to the amenity noise levels is less than the predicted intrusive noise level. Estimates of the difference between the intrusive and amenity noise level descriptors range up to 3 dB. The application of a correction factor to provide an estimate of the predicted amenity noise level based on the predicted intrusive noise level is generally dependent on the modelling methodology used in the NIA.

The modelling methodology used for the Project includes SWLs representative of each activity performed by each item of equipment and the duration the activity occurs. The outcome of the modelling process for the Project is a prediction of the $L_{Aeq,\ 15\ minute}$ noise level taking into account all significant noise sources associated with the proposed operations.

### 7.1.2 Cumulative $L_{Aeq,\ period}$ Noise Criteria

In accordance with the INP, whilst an individual operation should not exceed its respective PSNL, the cumulative $L_{Aeq,\ Period}$ noise levels from multiple industrial noise sources should not exceed the recommended acceptable noise levels appropriate for the locality and land use. The acceptable $L_{Aeq}$ noise amenity levels in relation to the simultaneous operation of mining and industrial operations in the region surrounding the Project Area are outlined in **Section 5.4**. Within the rural area, the cumulative daytime, evening and night time noise levels should not exceed 50 dB(A), 45 dB(A) and 40 dB(A) respectively (refer to **Table 5.10**). Within Camberwell village the cumulative $L_{Aeq,period}$ noise criteria impact takes into consideration the impact of traffic noise from the New England Highway (refer to **Table 5.11**).

## 7.2 Cumulative Impact Assessment

The assessment of the cumulative $L_{Aeq, Period}$ noise levels from multiple industrial noise sources can be undertaken by:

1. modelling all the significant industrial noise sources that surround or are adjacent to a receiver and compare this with the relevant criteria; or

2. summing the predicted noise levels from all the significant industrial noise sources that surround or are adjacent to a receiver and compare this with the relevant criteria; or

3. assuming the Project will achieve the project-specific noise goals relevant to the development and then monitor the performance of the contributing noise sources and then assess the cumulative noise effects on a case-by-case basis.

The use of each option in predicting cumulative noise impacts associated with the Project is discussed further in the following sections.

### 7.2.1 Option 1 – Modelling

The noise environment in the region surrounding the Project Area is affected by a range of industrial/mining activities. Cumulative noise impact assessments based on published noise emission limits or predicted noise impacts extrapolated from modelling and monitoring results do not account for actual operational variability or the staged modelling of the operational scenarios considered by a proponent, meteorological conditions and inconsistencies in the data format or differences in monitoring locations.

The preferred method for assessing the cumulative noise impact would involve the preparation of a large-scale regional noise model that would include all the surrounding sources of industrial noise including those associated with the Project. This would require the cooperation from all surrounding operations in order to be able to accurately model activities, including equipment details and mine plan information.

Given the varied ownership of all the industrial/mining activities in the region surrounding the Project Area the complexity of this option makes it impractical at this stage. Notwithstanding this, common ownership of the Mount Owen Complex enables the cumulative noise impact of the Mount Owen Complex to be assessed.

It should be noted that even where common ownership enables a cumulative noise model to be prepared there are still discrepancies in the alignment of the stage models (or year) of the operational scenarios used for each operation. **Appendix I** provides the cumulative noise predictions for the Mount Owen Complex for Year 1 and Year 5 of the Project. The results are presented as $10^{th}$ percentile 40 dB(A) and 45 dB(A) probability contours.

Year 1 of the Project coincides approximately with Year 9 of the approved Glendell Mine. Year 5 of the Project coincides approximately with Year 12 of the approved Glendell Mine, as described in Umwelt (2007).

The results presented in **Appendix I** for the Mount Owen Complex indicate that the $10^{th}$ percentile 40 dB(A) contour to the north-west and the south-east of the Project Area from the Mount Owen Complex is approximately the same as the $10^{th}$ percentile 40 dB(A) from the Project. In the region around Camberwell village, the $10^{th}$ percentile 40 dB(A) contour from the Mount Owen Complex is consistent with the predicted noise levels from the approved Glendell Mine. The predicted noise levels from the Project are typically 5 to 10 dB less than the predicted noise levels from the approved Glendell Mine. That is, the cumulative noise

impacts at Camberwell village, from the Mount Owen Complex, are governed by activities at the approved Glendell Mine and are not materially affected by the Project.

### 7.2.2 Option 2 – Summation of Noise Impacts

Option 2 relies on all the surrounding sources of industrial noise publishing noise emission limits or predicted noise impacts in a consistent format, with both limits and predictions presented as day, evening and night-time $L_{Aeq,\ period}$ noise levels at each of the potentially affected receiver locations.

This approach to the cumulative assessment has limitations because it does not account for the variability of a mining operation or situations where the wind enhances the propagation of noise from one source and hinders the propagation of noise from other sources.

The Environmental Assessment for the Ravensworth Operations Project (Umwelt 2010) investigated the cumulative noise impacts in the region of Camberwell village. The results presented in the EA indicated that the currently approved Mount Owen operations provide minimal contribution to the cumulative noise impacts in the region of Camberwell village. The modelling results for the Project indicate the contribution from the Project to the cumulative noise impacts in the region of Camberwell village is anticipated to increase but will remain a minor contributor to the cumulative noise levels in this area.

To the north-west of the Project Area, two mining operations will contribute to the cumulative noise levels in this area: Liddell Coal Operations and the Project. The *Liddell Coal Operations Environmental Assessment (Liddell EA) - Proposed Modification to DA 305-11-01* (SLR 2013) presents predicted $L_{Aeq,\ 15\ minute}$ noise levels for highest noise levels at each receptor for the various prevailing meteorological conditions considered in the Liddell EA. The highest predicted noise levels at each receptor for the various prevailing meteorological conditions were provided in the Liddell EA. For the consideration of Liddell Coal Operations and the Project, the meteorological conditions of greatest interest are gradient winds from the south-east. **Appendix I** provides an estimate of the contribution of the Project to the closest privately owned residential receivers to the north-west of the Project Area and the estimated cumulative noise levels from both operations. The results indicate cumulative noise impacts associated with the Project to the north-west of the Project Area do not exceed the cumulative $L_{Aeq,\ Period}$ criteria.

To the south-east of the Project Area, four mining operations will contribute to the cumulative noise levels in this area: Vale Coal (Integra) surface and underground operations, Ashton Coal surface and underground operations (including the Ashton South East Open Cut); Glendell Mine and the Project. The *Integra Mine Complex Modification 2 (Integra EA) – Environmental Assessment* (EMM 2012) presents predicted $L_{Aeq,\ 15\ minute}$ noise levels for two coal haulage alternatives and 'full-pit operations' For consideration of these operations and the Project the meteorological conditions are of interest is F-class stability conditions with supporting drainage flow. **Appendix I** provides an estimate of the contribution of the Project to privately owned residential receivers to the south-east of the Project Area and the estimated cumulative noise levels from the four operations contributing to the predicted cumulative noise levels. The results indicate cumulative noise impacts associated with the Project to the south-east of the Project Area do not exceed the cumulative $L_{Aeq,\ Period}$ criteria.

### 7.2.3 Option 3 – Performance Monitoring

Option 3 relies on the implementation of a suitable performance monitoring system that is able to distinguish the contribution of a Project from the local noise environment. The estimation of the cumulative noise levels in the area surrounding the Project Area (refer to Option 2 above and **Appendix I**) indicates that the cumulative noise impacts will not exceed the criteria due to the Project. However, Mount Owen is only able to manage the Project's contribution to the cumulative noise level and does not have operational control of the other industrial noise sources in the region. To assess the contribution of the Project to the cumulative noise levels continuous noise monitoring units with directional capabilities can be used to discern the contribution the Project makes to the cumulative noise level. Noise levels recorded above the cumulative noise criteria would need to be investigated on a case-by-case basis (refer to **Section 8.0**).

### 7.2.4 Mount Owen Continued Operations Project's Approach

As discussed in **Section 7.2.1**, the implementation of Option 1 is not practical at this stage. As discussed in **Section 7.2.2**, Option 2 relies on all the surrounding sources of industrial noise publishing noise emission limits or predicted noise impacts in a consistent format. Based on the available information, the cumulative noise impact assessment for the areas surrounding the Project Area indicates that the cumulative noise impacts assessment criteria will not be exceeded due to the Project and noise contribution from the relevant surrounding mining operations. Notwithstanding this, Mount Owen proposes to implement Option 3 and maintain a continuous noise monitoring program that is capable of discerning the contribution the Project makes to the cumulative noise level. Noise levels that are recorded above the cumulative noise impacts assessment criteria by the continuous noise monitoring system(s) will be investigated on a case-by-case basis. When required, attended noise monitoring will be undertaken to confirm the noise source(s) contributing to the cumulative noise levels. This approach to noise performance management of the cumulative noise impacts has been implemented at Mount Owen since 2004. The use of the continuous noise monitoring system to assess the noise impact of the Project is outlined further in **Section 8.0**.

# 8.0 Management and Monitoring Framework

## 8.1 Management of Operational Noise Levels

As outlined in **Section 2.0**, the identification and assessment of reasonable and feasible noise controls have been considered through the project design process and incorporated into detailed noise modelling (refer to **Section 5.0**). The incorporation of these reasonable and feasible controls has reduced the noise affectation area and related noise impacts associated with the Project as far as practicable. Mount Owen commits to the implementation of the following reasonable and feasible controls over the life of the Project, which have been factored into the noise model:

- Management of the operation of the RERR Mining Area during periods when the weather conditions enhance the noise impacts, such as during inversion conditions during winter night times. Consequently, the results for Year 10 in **Section 6.0** do not include operations in the RERR Mining Area during winter night-times (estimated to be approximately 20 to 30 nights during the June to August winter period) but include the operations contribution from within the RERR Mining Area during non-winter nights, non-winter evenings and all season day-time predicted noise levels.

- The management of mobile machines during adverse weather conditions when wind conditions or inversion conditions enhance noise propagation towards sensitive receiver locations. In order to control/eliminate noise impacts this would likely include:
    - providing alternative dumping locations; and
    - moving parts of the fleet to locations deeper in the pit.

- Managing a number of activities to not occur during adverse meteorological conditions, such as those which may occur during winter night-times, including:
    - limiting a portion of the coaling fleet during the later stages of the mine life;
    - reducing bulldozer activity on exposed rehabilitation areas; and
    - managing top-soil and pre-strip during the later stage of the mine life.
- The inclusion of bunds in strategic locations along some haul roads, and where practicable, along the side of the ramps shielding trucks and equipment on exposed sections of the ramps.

- In the later years of the Project, locating the primary coal haul road to the Mount Owen CHPP on the western side of the North Pit Continuation.

- Location and orientation of haul roads to be not aligned with prevailing source to receiver winds where practicable.

- Location of key haul roads within the North Pit Continuation below ground surface to maximise topographical shielding to surrounding receiver areas.

- Incorporation of reasonable and feasible noise attenuation on key plant and equipment as detailed in **Section 5.0**.

Mount Owen intends to achieve the predicted noise levels associated with the Project presented in **Section 6.0** through the continued implementation of an adaptive management approach, focused on implementing appropriate operational controls and management strategies to minimise noise impacts (refer to **Section 8.2.2**). The approach will vary during different mine stages and weather conditions, and will consider evolving technology and associated equipment noise levels. A range of controls and strategies that may be adopted as required to meet noise performance requirements for the Project include:

- Dozer operations:
  - using a low gear when reversing;
  - remaining in gear when reversing down the stockpiles;
  - moving track dozer operations off elevated locations during adverse weather conditions;
  - using rubber tyred dozers on elevated or exposed dump locations during adverse weather conditions; and
  - re-scheduling topsoil pre-strip prior to adverse weather conditions.
- Waste haulage:
  - the use of high dumping locations may be restricted during periods when the weather conditions can potentially enhance the noise impacts; and
  - creating sheltered dumping locations that can be used during adverse weather conditions, where practical.
- Excavator operations:
  - using ‘silent horns’ to communicate with trucks; and
  - managing the drop of the first load into truck bodies to minimise impact noise from the material.
- Drilling operations:
  - re-scheduling drilling in exposed locations for periods when the weather conditions do not enhance the noise impacts.

In addition to the implementation of noise mitigation strategies during periods of adverse weather conditions, Mount Owen will implement the following general noise mitigation measures as part of the Project:

- use smart broadband ‘Quacker' reversing alarms;
- regularly inspect and maintain noise attenuation systems;
- implement a process for periodic review of noise performance of the equipment fleet;
- implement work area specific controls for high risk areas; and
- offer reasonable and feasible noise mitigation measures such as double glazing, insulation and/or air conditioning to landowners with predicted noise levels greater than 2 dB above relevant PSNLs.

The implementation of these controls to meet the predicted noise levels over the life of the Project will be detailed as part of the preparation of a Noise Management Plan for the Project (refer to **Section 8.2**). Central to the management of noise impacts is the implementation of an extensive continuous noise monitoring system to enable proactive and real time management of operations during noise propagating conditions (refer to **Section 8.2.2**). The use of a continuous noise monitoring system to proactively inform operational noise management has been implemented at Mount Owen since 2004 and will be revised and continued as part of the Project (refer to **Section 8.3**).

In addition to the above, Glencore's approach to effective noise management at sites they operate and/or manage include:

- identification of effective noise management controls during the mine planning, assessment and operational phases;
- minimum requirements to be implemented for effective noise management to reduce the potential for impacts, including the implementation of activity specific noise controls and site-wide management systems and procedures;
- use of automated systems for early identification of adverse meteorological conditions which are likely to result in noise impacts, i.e. gradient winds and temperature inversions;
- monitoring and reporting requirements for noise management; and
- requirements for the implementation of noise awareness training for employees to facilitate effective noise management.

The approach taken by Glencore is not designed to replace or override environmental legislation or external requirements but to maintain a minimum standard for the implementation of the noise control measures required for effective noise management at all Glencore sites.

The recommended approach to managing the noise impacts associated with the Project, as outlined below, is a combination of statutory requirements, likely Project Approval conditions and EPL requirements, Glencore's approach to effective noise management and best practice.

## 8.2 Noise Management Plan

Mount Owen will develop and implement a Noise Management Plan (NMP) in accordance with the Project Approval and EPL. The NMP will detail the implementation of noise management controls to be utilised to manage potential noise impacts associated with site operations. The NMP will, at a minimum, include:

- noise objectives and targets consistent with the Project Approval and EPL;
- noise mitigation measures, referencing relevant operating procedures with documented controls and automated monitoring systems. The suitability of the noise management controls is to be assessed on an annual basis as part of ongoing review of operational risks to the Project;
- consultation processes/procedures to minimise the potential for cumulative noise with neighbouring mining/industrial operations;

- provision of general noise awareness training for operational staff, which identifies site specific objectives and targets for noise management, potential noise impacts, environmental commitments for Mount Owen and obligations in respect of noise management;

- noise monitoring processes to be implemented over the life of the Project to provide for ongoing noise performance monitoring and determination of compliance with relevant noise criteria provided in the Project Approval and EPL (refer to **Section 8.3**);

- mechanisms for stakeholder consultation;

- complaint handling processes including maintenance of a Community Response Line which will be in operation 24 hours per day, seven days a week; and

- a roles and responsibilities matrix, with responsibilities being clearly defined through all levels within the operation.

### 8.2.1 Construction Noise Management

The ICNG notes that where the noise management levels cannot be met, all feasible and reasonable work practices should be implemented to meet the construction noise management level. Sections 5.2 and 6 of the ICNG provide a checklist of potential management measures that should be addressed within the Noise Management Plan for the Project to demonstrate that all reasonable and feasible work practices have been considered. Relevant management measures as defined in Section 5.2 and 6 of the ICNG will be incorporated into the Noise Management Plan.

The NMP will detail relevant work practices and controls that will be implemented as part of the construction activities associated with the Project. These controls will include a notification and consultation processes for undertaking construction works, as defined by the ICNG, associated with the proposed construction works along the Main Northern Rail Line and for work undertaken outside of standard construction hours. Prior to construction activities occurring in the southern section of the rail turnout during outage windows, Mount Owen will consult with the property owner of R111 and R122 as per the requirements of the ICNG.

### 8.2.2 Proactive Noise Management

#### 8.2.3.1 Predictive Forecasting/Adverse Weather Conditions

During adverse weather conditions, Mount Owen will initiate changes to operations to mitigate potential noise impacts. Mount Owen will use predictive forecasting of adverse weather conditions to identify when and where management measures are likely to be required as a result of an adverse weather event. The NMP will outline the procedural requirement for the predictive forecasting of adverse weather conditions. A typical response to the prediction of an adverse weather event would include:

- environmental personnel alerting the Open Cut Examiner (or relevant operational supervisor) that operations may need to be modified to avoid noise impact at residential receivers;

- monitoring the noise levels recorded by the real-time noise monitoring network (refer to **Section 8.3**) to assess when the noise levels are approaching predefined noise conditions and the modification of operations to adapt to the situation as required;

- temporarily ceasing or modifying part of the operations, if required, to ensure noise criteria are not exceeded; and

- recording the actions taken when management measures are implemented.

The meteorological monitoring system (refer to **Section 8.3**) is linked to the real time monitoring system allowing access to real time weather conditions and the effective management of operations during periods of adverse weather.

#### 8.2.3.2 Continuous Monitoring Network

Mount Owen will maintain a continuous monitoring network consisting of fixed and mobile continuous noise monitoring units and two weather stations. The details of the continuous noise monitoring network are provided in **Section 8.3**.

**Continuous Noise Monitoring Data**

The continuous (real time) noise monitoring network is currently used by Mount Owen as a proactive way to manage operational noise performance. The continuous noise monitors allow noise levels and local meteorological data to be analysed and compared against the approved predictions in the EIS, providing information on the ongoing performance of the Project. The recommended minimum requirements for the continuous noise monitoring network include:

- SMS alarming to key operational personnel if a trigger noise condition has been reached. The SMS alert should be triggered based on predefined monitoring conditions which relate to relevant statutory noise criterion.

- Following an alarm, a review of operations and current meteorological conditions will be undertaken by site personnel in order to identify if the site operations are contributing to the recorded noise levels. This process will be undertaken in accordance with the NMP.

- In the event that site operational personnel receive notification of elevated noise levels at a residential receiver (i.e. approaching or at the relevant noise criteria), Mount Owen will undertake a review of the current mining activities to determine whether any modification is required to reduce the potential for noise related impacts and non-compliance. If elevated noise levels are deemed to be as a result of site activities, mitigation measures will be undertaken to achieve compliance. This may include modification of operations, such as alternative dumping locations.

- Data collected by the continuous noise monitoring units will be reviewed on a regular basis to establish any correlation between meteorological conditions and elevated noise levels from Mount Owen. This data can then be used to proactively manage noise impacts and mitigate the potential for noise enhancement as a result of meteorological conditions. Specifically, the data will be reviewed to identify if the recorded noise levels are trending towards a non-compliance with site noise criteria.

### 8.2.3 Change Management Process

During the operational phase of the Project, a change management process will be implemented in order to assess the potential noise impacts associated with operational changes at Mount Owen. The change management process will be implemented at a minimum, in the following instances:

- when significant changes are made to the number of equipment or type of equipment utilised on site providing for evolving technology and equipment changes, to ensure the potential risk of noise criteria being exceeded is minimised; and

- prior to the purchase or rental of equipment which through either size or volume of equipment has the potential to result in exceedances of noise criteria.

The change management process is to consider the existing noise performance at Mount Owen and is to include a review of the existing noise performance of the operation. Where considered necessary, noise modelling of the predicted noise emissions from the operation may be undertaken to confirm that compliance with the relevant statutory approval will be maintained following the proposed change.

### 8.2.4 Incident Investigation and Response

In the event that an exceedance of the noise impact assessment criteria is identified, Mount Owen will:

- initiate an investigation into the source and impact of the noise;

- prepare suitable documentation with the Mount Owen corrective/preventative action system;

- notify the relevant government agencies and report within the statutory timeframes in accordance with the Project Approval; and

- where appropriate, liaise with any affected landowner(s).

## 8.3 Monitoring Requirements

### 8.3.1 Noise Monitoring Program

The existing noise monitoring program at Mount Owen is a combination of unattended continuous noise monitoring and attended noise monitoring. The continuous monitoring network consists of four fixed and two mobile continuous noise monitoring units. The monitoring units:

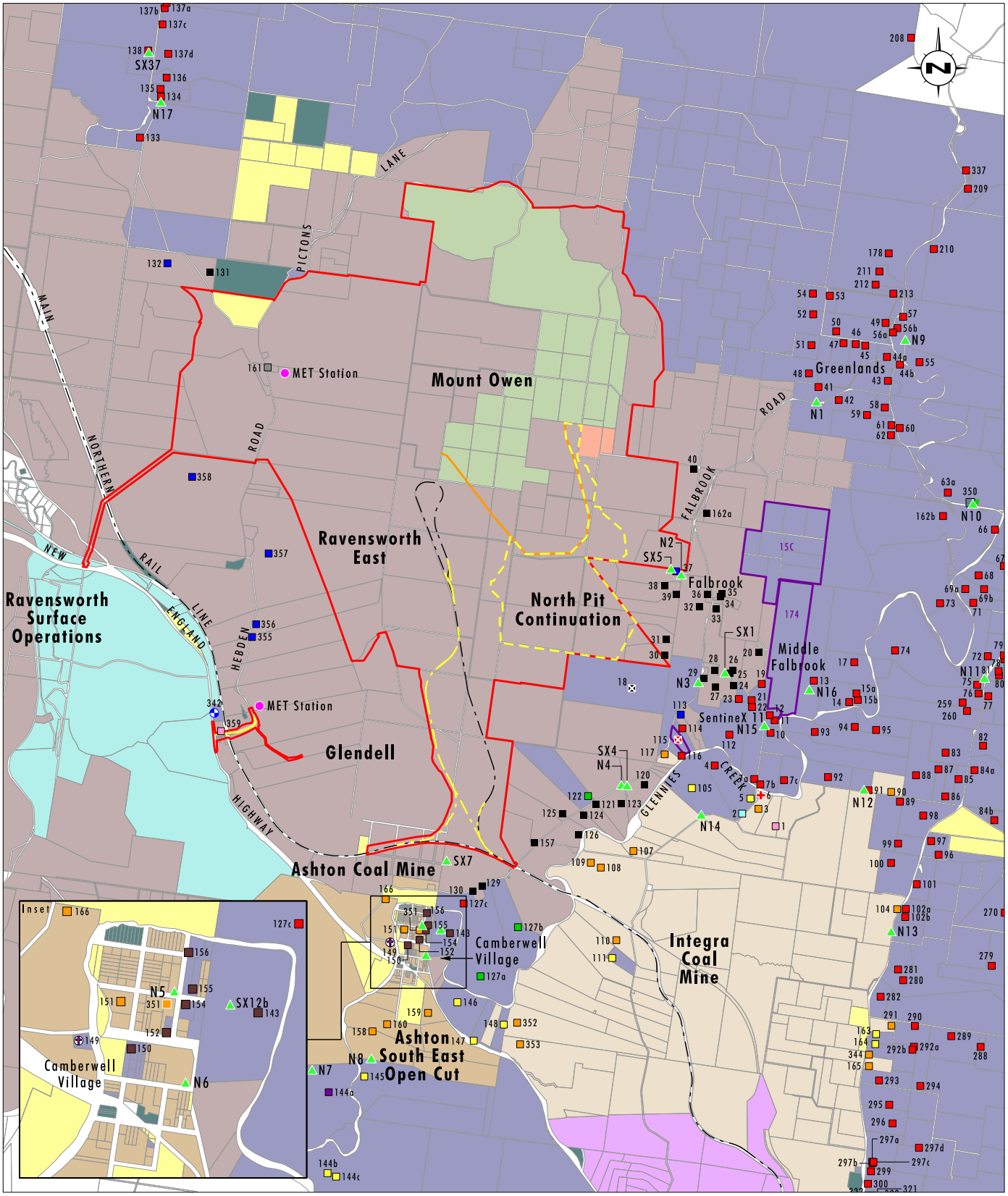
- specifically assess operational performance against the intrusiveness criteria using a $L_{Aeq,\ 15\ minute}$ descriptor;

- measure and assess the environmental noise levels due to industrial noise sources using the amenity assessment descriptor of $L_{Aeq,\ Period}$; and

- measure and assess the transient noise levels due to industrial noise sources using the $L_{A1,\ 1\ minute}$ sleep disturbance criteria descriptor.

The continuous monitoring network also includes two 10 metre tower weather stations.

To achieve the ongoing requirements of the monitoring program for the life of the Project the location of the continuous noise monitors will need to be systematically reviewed. The current continuous noise monitoring units and likely future monitoring locations are outlined in **Table 8.1** and shown on **Figure 8.1**.




Data Source: Mount Owen (2014), Department of Lands (2009)

Inset Scale 1:30 000 (0, 0.5, 1.0, 1.5 km)

Main Scale 1:90 000 (0, 1, 2, 4 km)

## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
- Macquarie Generation
- Integra Coal
- Glencore
- Private
- Rixs Creek Mine
- State Forest
- Minister for Education
- Noise Monitoring Location
- MET Station Location
- Church
- Community Hall
- Daracon Site Office
- Glennies Creek Fire Brigade
- Mt Pleasant Primary School
- Former Hebden Public School
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Currently Subject to Acquisition Rights - Dairy
- SEOC Acquisition
- Private Residence
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Private No Dwelling

FIGURE 8.1

**Recommended Noise Monitoring Locations**

File Name (A4): R11/3109_650.dgn
20141009 9.46

**Table 8.1 – Continuous Noise Monitoring Program**

| Monitoring Unit | Current Monitoring Location | Proposed Monitoring Location |
|---|---|---|
| SentineX 1 | Middle Falbrook<br>Receiver R026 | Retain at Middle Falbrook Receiver R026 (or equivalent) up to Year 5 when a unit is located further east along Middle Falbrook |
| SentineX 4 | Glennies Creek<br>Receiver R120 | Retain at Glennies Creek<br>but relocate to Receiver R122 |
| SentineX 5 | Reference Logger Falbrook<br>Receiver R037 | Retain at Falbrook but relocate as necessary as mining operations progress to the south east |
| SentineX 6 | Mobile unit | Mobile Unit |
| SentineX 7 | Mobile unit<br>Reference Logger for Glendell<br>Glennies Creek Road | Retain at Glennies Creek Road |
| | | |
| SentineX 12 | Camberwell Village (North)<br>Relocated from Receiver R155 to Receiver 143 in December 2013 | Retain at Camberwell Village (North)<br>Receiver 143 |
| New<br>by Year 5 | - | Area 4 - Middle Falbrook<br>Receiver - R010, R011, R012 or R013 |
| New<br>by Year 10 | - | Area 7 -Middle Falbrook/Stoney Creek Rd<br>Receiver - R010, R011 or R012 |

By Year 5, it is recommended that continuous noise monitoring be undertaken in the region of Middle Falbrook at one of the receivers in Area 4 (Receivers R010, R011, R012 or R013). By Year 10 it is recommended that continuous noise monitoring be undertaken in the region of Middle Falbrook and Stoney Creek Roads at one of the receivers in Area 7 (Receivers R004, R005, R007 or R105b) due to the progression of mining operations.

**Table 8.2** describes the attended noise monitoring locations and the recommended frequency of monitoring required to assess ongoing compliance with relevant noise impact assessment criteria and to validate the information obtained from the continuous noise monitoring units. Due to the number of monitoring locations, the frequency of monitoring at each location will be based on an evaluation of the risk posed to the community by the noise impacts at the respective monitoring locations. The risk based selection process will take into consideration:

- the meteorological conditions that enhance the propagation of noise towards the sensitive receiver locations;
- the validity of undertaking the monitoring during the day time an evening versus monitoring during the night time when calm or enhance meteorological conditions are more likely;
- the noise levels recorded at the continuous noise monitoring units;
- the location and level of mining activities at the North Pit Continuation; and
- the location and level of mining activities at other mining operations.

**Table 8.2 – Attended Noise Monitoring Program**

| Monitoring Location | Description | Frequency and Use |
|---|---|---|
| N1 | Falbrook Road Greenlands west of Bridgman Road (R042) proximity of C1 | Routine compliance assessment in Greenlands locality |
| N2 | Falbrook south of Shaldows Lane (R037) adjacent to SX5 | Routine monitoring to validate SentineX 5 monitoring results |
| N3 | Corner of Falbrook and Middle Falbrook Roads (R027) adjacent to SX1 | Risk based |
| N4 | Glennies Creek Road (R120) adjacent to SX4 | Routine compliance assessment and validate SentineX 4 monitoring results |
| N5 | Camberwell Village – Northern (R154) adjacent to SX12 | Routine compliance assessment and validate SentineX 12 monitoring results |
| N6 | Camberwell Village – Central (R150) adjacent to SX11 | Risk based |
| N7 | Ravensworth south west of Camberwell Village (R144a) | Risk based |
| N8 | Camberwell Village – Southern (R145) | Risk based |
| N9 | Goorangoola Road north of Falbrook Road (R056b) | Risk based |
| N10 | Mount Pleasant School, Bridgman Road (R350) | Risk based |
| N11 | Bridgman Road (R075) | Risk based |
| N12 | Thomas Lane (R091) adjacent to C4 | Risk based |
| N13 | Stoney Creek Road/Bridgman Road (R102b) | Risk based |
| N14 | Middle Falbrook Road west of Stoney Creek Road (R105b) | Risk based |
| N15 | Middle Falbrook Road north of Glennies Creek bridge (R010) adjacent to C2 | Routine compliance assessment and validate continuous monitoring results when relocated to Middle Falbrook |
| N16 | Middle Falbrook (R013) adjacent to C1 | Risk based |
| N17 | Hebden Road | New site to the north-west: Risk - based |

The assessment methodology will be based on the procedures currently in place for assessing the impact of Mount Owen on the surrounding noise environments.

**Meteorological Data**

The existing weather stations have been installed and operate in accordance with the requirements of *Australian Standard AS2922-1987 Ambient Air – Guide for the siting of sampling units*. The weather stations record the following meteorological data at 15-minute intervals:

- wind speed, wind direction and sigma-theta;
- temperature at 2 metres and 10 metres;
- humidity; and
- rainfall.

Mount Owen should maintain the current meteorological monitoring program in order to assess the occurrence of noise enhancing conditions as part of the noise monitoring program. Based on current EPA expectations (refer to *Discussion Paper - Validation of Inversion Strength Estimation* (March, 2014)), where the noise impacts are predicted based on stability class rather than lapse rate, a 10 metre tower is suitable for measuring stability class based on sigma theta. As a result, the current 10 metre tower weather stations used by Mount Owen are suitable for assessing the presence of inversion conditions that could lead to the enhancement of noise impacts.

### 8.3.2 Compliance Assessment

The methodology for assessing compliance with the likely requirements of the Project Approval and EPL would utilise the following components:

- undertake attended noise monitoring to measure ambient noise levels in the surrounding region and determination of the mine's contribution to measured noise levels as outlined in **Section 8.2.1**; and

- compare the attended noise monitoring results with predicted noise levels from the Project noise models under similar meteorological conditions.

When comparing the predicted noise levels with the relevant noise impact assessment criteria it should be noted that the NIA is reporting noise levels that are likely to be exceeded 10 per cent of the time, not maximum noise levels.

The monitoring program would also be used to assess the performance of all mining machinery as a whole. Equipment selection will be governed by the noise performance of the mine, not necessarily on individual items of equipment.

### 8.3.3 Noise Performance Monitoring

To ensure ongoing compliance with the noise criteria, Mount Owen will actively manage the operations by controlling the placement and use of mining equipment, particularly during unfavourable meteorological conditions, as detailed in the NMP (refer to **Section 8.2.3**). Worst-case weather conditions would be associated with winds from the north-west and during winter inversion conditions with drainage flow from the north-west.

To assess the effectiveness of the control measures and when they should be implemented, Mount Owen will maintain the current performance monitoring program. The performance monitoring program is based around continuous noise monitors identified in **Table 8.1** and includes:

- measurement and reporting against Project criteria using the $L_{Aeq,\ 15\ minute}$ descriptor and when appropriate the $L_{Aeq,\ period}$ descriptor;

- measurement and reporting against the cumulative industrial noise level criteria using the $L_{Aeq,\ period}$ as the descriptor;

- identification and reporting of transient impact noise levels against the $L_{A1,\ 1\ minute}$ sleep disturbance descriptor; and

- the establishment and regular review of alarms triggers for each of the descriptors.

The response of Mount Owen to reports and alarms from the continuous noise monitors will be documented in the NMP (refer to **Section 8.2**).

### 8.3.4 Reporting

The monitoring results will be periodically reviewed to assess compliance with the NIA predictions and criteria outlined in the Project Approval and EPL. The results will be reported in accordance with the requirements of the Project Approval and EPL.

A summary of the noise monitoring results will be reported in the Annual Review for the operation and be placed on the Mount Owen Complex website.

# 9.0 Conclusion

In accordance with Section 6 of the INP, the proposed methodology used for predicting the noise levels has 'been the subject of peer review' by an experienced noise consultant from SLR. A peer review has been conducted and confirms that the methodology and approach to the assessment is robust and in accordance with relevant requirements, giving confidence in the reliability of the assessment that leads to the following conclusions.

## 9.1 Operational Noise Levels

### 9.1.1 Overview

Umwelt has undertaken a NIA to assess the potential noise impacts associated with the Project. The NIA included a detailed assessment of the existing noise environment surrounding the Project Area, assessment of the local meteorological conditions, modelling of three stages of mine development and modelling of the construction activities associated with Hebden Road and the rail works. The assessment of the noise impacts was undertaken in accordance with the INP, (EPA 2000).

### 9.1.2 Predicted Impacts from Operational Noise Levels

The 10$^{th}$ percentile noise levels are predicted to be up to 5 dB above respective PSNLs at three private residences to the south-east. The affected private residences are R021, R022, and R023. Vacant land where the predicted 10$^{th}$ percentile noise level exceeds the PSNL by more than 5 dB are R018 (currently a vacant parcel of land which has existing acquisition rights from Mount Owen), R015c and R174. The maximum number of exceedances is predicted to occur over winter night-times in Year 10 of the Project. The maximum exceedance of 47 dB(A) is predicted to occur during the day time in Year 10 at private property R018.

The noise modelling predicts that eight private residences could experience 10$^{th}$ percentile noise levels of greater than 2 dB and up to 5 dB above the relevant PSNLs. The affected residences are R012; R013; R019; R093; R094; R095; R112 and R122 (which has acquisition rights from Glencore's Glendell Mine).

The noise modelling predicts that 10 private residences could experience 10$^{th}$ percentile noise levels of up to and including 2 dB above the relevant PSNL. The affected residences are R004; R010; R011; R014; R041; R048; R091; R092; R111; and R114. The noise modelling also predicts that private property R115, which is a vacant parcel of land, could experience 10$^{th}$ percentile noise levels that exceed the PSNL by up to and including 2 dB over a portion of the land area.

The results of the NIA indicate that the operational noise levels from the Project are expected to be less than the day, evening and night-time PSNLs for receivers within Camberwell village.

### 9.1.3 Low Frequency Assessment

The NIA included an analysis of the predicted noise level results for the inclusion of 'modifying factors'. It was found that a strict application of Section 4 of the INP (EPA 2000) could require the addition of a low frequency noise modifying factor at some receivers under noise enhancing meteorology. However, the analysis found that the predicted low frequency noise levels for the Project were below the DP&E (2013) 60 dB(C) night time criteria and generally close to the threshold of hearing, i.e. unlikely to be intrusive or cause annoyance.

Therefore, no low frequency modifying factors have been applied to the predicted noise levels.

### 9.1.4 Sleep Disturbance Assessment

Based on the modelling of the typically transient noises, the calculated $L_{A1,\ 1\ minute}$ noise levels from the Project comply with the recommended sleep disturbance noise goals at all residential receivers under worst case weather conditions of a 3 m/s north-west wind and F-class stability conditions with 2 m/s drainage flow from the north-west. The private property where the predicted $L_{A1,\ 1\ minute}$ noise levels associated with the Project could result in sleep disturbance sleep is currently a vacant parcel of land (property R018).

### 9.1.5 Cumulative Noise

The cumulative noise impact assessment for the areas surrounding the Project indicates that the cumulative noise impacts assessment criteria will not be exceeded based on the Project and the relevant surrounding mining operations (refer to **Section 7.0**). Mount Owen proposes to maintain a continuous noise monitoring unit between the Project and potentially affected privately owned residential receivers that are capable of discerning the contribution the Project makes to the cumulative noise level. This approach to performance based adaptive noise management has been implemented at Mount Owen since 2004 (refer to **Section 8.0**).

## 9.2 Construction Noise Levels

The proposed construction activities will include site preparation, civil works and construction activities associated with the upgrade of Hebden Road and the rail turnout linked to the Mount Owen Complex Rail Line. The construction activities are expected to take place over a period of up to 18 months. The construction management noise levels for 'recommended standard hours' at the closest receivers ranges from 40 to 46 dB(A). The predict worst case construction noise levels at receiver R111 could exceed the relevant construction noise management levels by 2 dB for a short period of time while construction works are occurring in the southern section of the proposed railway. When construction of the rail line moves further north the predicted construction noise levels fall below the applicable construction noise management level. The ICNG notes that where the noise management level cannot be met, all feasible and reasonable work practices should be implemented to meet the construction noise management level.

Based on the modelling of the construction activities, the construction noise levels will not result in any discernible impact on surrounding receivers and will comply with the ICNG construction noise criteria at all but two of the residential receiver locations. The construction noise model predicts an exceedance of the relevant noise criteria at Receiver R111 (which has existing acquisition rights) and Residence R122 (which has existing acquisition rights from Glencore's Glendell Mine) under worst case meteorological conditions during the linkage of the southern section of the rail line to the Main Northern Railway Line.

Limited activities (such as track work involving the Main Northern Rail Line) will be required to be undertaken during outage windows (periods of no or highly restricted rail activity on the Main Northern Rail Line) where construction activities may need to be continuous over a 24 hour period or more. However, Section 2.3 of the ICNG allows for construction activities to be undertaken 'outside recommended standard hours' when there is a "*requirement to sustain the operational integrity of public infrastructure".*

Prior to construction activities occurring either in the southern section of rail turnout during outage windows, Mount Owen will consult with any potentially affected residents as per the requirements of the ICNG.

## 9.3 Road Traffic Noise

The predicted existing and construction phase road traffic noise impacts presented in **Table 6.6** for private residences R146, R150, R127c and R133, and the Lake Liddell Recreation Park are below the road traffic noise criteria. The predicted existing and construction phase road traffic noise impacts for the St Clement's Anglican Church and property R147 are both above the relevant road traffic noise criteria and therefore the relative increase criteria of 2 dB was considered. The relative increases in the predicted noise levels at St Clement's Anglican Church and property R147 are 0.2 dB and 0.3 dB respectively, well below the 2 dB trigger nominated in the NSW Road Noise Policy (DECCW 2011).

## 9.4 Rail Noise

In accordance with Appendix 3 of the RING, the Mount Owen Complex rail line and the proposed additional rail line and northern turn-out were assessed as industrial noise sources in **Section 6.1**.

With respect to the prediction of the maximum noise level associated with train movements on the Main Northern Rail Line, there will be no increase in the $L_{Amax}$ pass-by noise levels as a result of the Project.

The ARTC 2013-2022 Hunter Valley Corridor Capacity Strategy, June 2013 indicates the contract coal tonnage will increase from 110 Mtpa in 2013 on the Main Northern Rail Line between the Mount Owen junction and Camberwell junction to 200 Mtpa by 2022. Mount Owen's coal train movements from the Main Northern Rail Line contribute approximately 0.2 to 0.5 dB to the noise levels generated by coal train movements on the Main Northern Rail Line between Mount Owen junction and Camberwell junction. Based on the guidelines in the RING, Mount Owen's contribution to the overall train related noise levels from the Main Northern Rail Line is unlikely to be audibly perceptible at any of the current train noise setback distances (refer to **Section 4.8**).

## 9.5 Residual Impacts

Section 8.2.1 of the INP, 'Residual level of impact: checklist', outlines four factors to be taken into consideration when determining the acceptability of the residual noise impacts of a Project. The acceptability factors for residual noise impacts are listed below, with specific comment made regarding how each factor has been considered specifically within the noise assessment for the Project.

1. Characteristics of the area and receivers likely to be affected

A description of the Project Area and existing environment has been provided throughout the NIA, particularly in **Section 4.0** where the existing environment has been outlined in relation to the specific issue being discussed. Furthermore, the NIA has provided details of the existing noise environment and relevant noise receivers.

The existing Project already forms a dominant part of the existing land use for this locality, and whilst there is an extensive area of mine-owned land around and within the Project Area, existing operations are audible at some surrounding private residences.

2. Characteristics of the proposal and its noise or vibrations

A description of the Project has been provided in **Section 2.0**. Detail on noise modelling parameters (i.e. noise sources, receiver locations, meteorological conditions) and noise impact predictions based on the modelled parameters is provided in **Sections 5.0** and **6.0** of the NIA. The Project essentially involves continuation of mining and associated operations, which are consistent with the characteristics of the existing and approved operations, both in their nature, and potential noise sources. The NIA identified that the PSNL could be exceeded to the south-east of the Project Area during the later stages of the Project.

3. The feasibility of additional mitigation or management measures

Alternatives considered as part of the conceptual design phase of the Project have been discussed in **Sections 2.0**, **5.0** and **8.0** of the NIA. The three main strategies identified in the INP for the assessment of reasonable and feasible noise control/mitigation strategies are:

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

The noise management and mitigation commitments for the Project, are considered consistent with the reasonable and feasible noise mitigation controls for the Project.

With the noise management and mitigation commitments in place, the NIA has identified that operation noise levels for the Project could still exceed the respective PSNL at 21 private residence (refer to **Tables 6.2** and **6.3**) surrounding the Project Area over the life of the Project. During the time when the predicted noise levels could exceed the PSNL, the noise impact would not result in noise levels that exceed the sleep disturbance criteria or exceed the amenity criteria for the region surrounding the Project Area.

4. Equity issues

The NIA has identified that the PSNLs could be exceeded at a number of private residences. As discussed above, 21 private residences are predicted to experience noise levels above the relevant PSNL. Eight of these residences are predicted to experience noise levels up to 5 dB above the respective PSNL and would likely have noise management rights under any project approval. Three residences are predicted to experience noise levels greater than 5 dB about the relevant PSNL and would have acquisition rights under any project approval. In addition to the above private residence three parcels of vacant land are predicted to experience noise levels greater than 5 dB about the relevant PSNL over a portion of the land area. One additional parcel of vacant land is predicted to experience noise levels up to 2 dB above the respective PSNL. As a part of the ongoing noise monitoring program, targeted monitoring will be undertaken to assess the effectiveness of the control measures that will be implemented to mitigate potential impacts.

Where PSNLs cannot be achieved, Mount Owen will initiate and/or continue to consult with potentially affected landholders to establish appropriate agreements to cover noise mitigation and monitoring at the property, in relation to the Project noise impacts, and/or as relevant, to investigate property acquisition at the request of the landholder. Any property purchases will be undertaken in accordance with the relevant procedures set by DP&E in the Project Approval.

Cumulative noise issues are applicable to the Project as there are a number of other mining operations in the surrounding region. As a part of the ongoing noise monitoring program, discussed in **Section 8.3**, specific noise monitoring will be undertaken using the continuous noise monitoring network to assess the cumulative noise level from all industrial noise sources. Where the amenity criteria is exceeded as a result of the Project, noise control measures will be implemented to mitigate potential noise impacts.

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# APPENDIX A

Glossary of Terms and Abbreviations

# Appendix A – Glossary of Terms and Abbreviations

| | |
|---|---|
| 1/3 Octave | Single octave bands divided into three parts. |
| Octave | A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit. |
| ABL | Assessment background level - A single-figure background noise level representing each assessment period – day, evening and night (that is, three assessment background levels are determined for each 24 hr period of the monitoring period). It is determined by taking the lowest 10th percentile of the $L_{90}$ level for each assessment period. |
| Ambient Noise | The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant. |
| A Weighting | A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise. |
| dB(A), dBA | Decibels A-weighted. |
| dB(Z), dB(L) | Decibels Linear or decibels Z-weighted. |
| Day | The period from 0700 and 1800 Monday to Saturday and 0800 to 1800 Sundays and Public Holidays. |
| Decibel (dB) | The units of sound level and noise exposure measurement where a step of 10 dB is a ten-fold increase in intensity or sound energy and actually sounds a little more than twice as loud. |
| Evening | The period from 1800 to 2200 7 days per week. |
| Hertz (Hz) | The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz. |
| $L_{A10}$ | The percentile sound pressure level exceeded for 10 per cent of the measurement period with 'A' frequency weighting calculated by statistical analysis. Typically used to assess the impact of an existing operation on a receiver area and is referred to as the cumulative noise levels at the receiver attributable to the noise source. |
| $L_{A90}$ | Background Noise Level. The percentile sound pressure level exceeded for 90 per cent of the measurement period with 'A' frequency weighting calculated by statistical analysis. |
| $L_{Amax}$ | The maximum of the sound pressure levels recorded over an interval of 1 second. |
| $L_{A1,1minute}$ | The measure of the short duration high-level noises that cause sleep arousal. The noise level is measured as the percentile sound pressure level that is exceeded 1 per cent of measurement period with 'A' frequency weighting calculated by statistical analysis during a measurement time interval of 1 minute. |

| | |
|---|---|
| $L_{Aeq,t}$ | Equivalent continuous sound pressure level - The value of the sound pressure level of a continuous steady noise that, a measurement interval of time (t), has the same mean square sound pressure as the sound under consideration whose level varies with time. Usually measured in dB with 'A' weighting. |
| $L_{An}$ | Percentile level - A measure of the fluctuation of the sound pressure level which is exceeded 'n' per cent of the observation time. |
| Night | The period from 2200 to 0700 Monday to Saturday and 2200 to 0800 Sundays and Public Holidays. |
| PSNL | Project-specific noise levels - The target noise levels for a particular noise generating facility based on the most stringent of the intrusive criteria or amenity criteria. |
| RBL | Rating background level - The overall single figure background level representing each assessment period over the whole monitoring period determined by taking the median of the ABLs found for each assessment period. |
| SPL (dBA) | Noise: Sound pressure level - The basic measure of noise loudness. The level of the root-mean-square sound pressure in decibels given by:<br>$SPL = 10.\log10\ (p/po)^2$<br>where p is the rms sound pressure in pascals and po is the sound reference pressure at 20 μPa. decibels. |
| SWL | Sound power level - a measure of the energy emitted from a source as sound and is given by:<br>$SWL = 10.\log10\ (W/W_o)$<br>where W is the sound power in watts and $W_o$ is the sound reference power at $10^{-12}$ watts. |
| Winter Night | The night-time period for determining inversion frequency 1 hour before sunset to 1 hour after sunrise, taken as 1800 to 0700 Monday to Sunday inclusive of June, July and August. |

# APPENDIX B

Industrial Noise Policy -
Application Notes

# Appendix B – Industrial Noise Policy - Application Notes

The EPA has provided a number of application notes to assist industry and acoustical consultants with interpretation and use of the NSW Industrial Noise Policy (INP) (EPA 2000). The application notes below are reproduced from the EPA web site during July 2014. The EPA web site is:

http://www.epa.nsw.gov.au/noise/applicnotesindustnoise.htm

**Identifying the existing level of noise from industry**
(see INP Section 2.2 and 3.2)

Table 2.1 Amenity Criteria (INP p. 16) sets out recommended cumulative noise levels for industry. In assessing the amenity effects of noise from a new development, it is essential to determine the level of noise already present.

Where the ambient noise levels are below the Acceptable Noise Level (ANL), then ideally the measurement of the existing level of noise should include only noise from industrial sources. In these situations, however, it may be acceptable to include noise from other sources (for example, roads, neighbourhoods). The reasons for this are that:

- including noise from other sources typically results in assessing the worst case for impacts on amenity; and

- strictly excluding noise from sources other than industry can be difficult and costly and may not be necessary if the development meets the criteria.

However, where ambient noise levels are above the ANL then noise from other sources should be excluded in establishing existing levels of industrial noise. Where the level of road traffic noise is high enough to make noise from an industrial source inaudible for the majority of the time or difficult to measure directly, it may be necessary to consider applying the assessment for areas of high traffic noise. (Application Note Amenity criteria in high traffic noise areas provides further guidance on this).

**Assessing Noise at Industrial/Commercial Receivers**
(see INP Section 2.2)

The INP does not require that intrusive noise be assessed at industrial or commercial premises. For industrial/commercial receivers, only the amenity criteria apply. Amenity noise levels should be assessed at the most affected point on or within the property boundary. This approach also applies to other non-residential receivers, such as educational facilities, hospitals and places of worship.

**When to Apply the Urban/Industrial Interface Amenity Category**
(see INP Section 2.2.1)

The urban/industrial interface category in the INP recognises that the availability of noise mitigation measures might be limited for existing premises where residences are close to existing industries.

The urban/industrial interface amenity category applies only for existing situations (that is, an existing receiver near an existing industry) and only for those receivers in the immediate area surrounding the existing industry, that is, the region that extends from the boundary of the existing industry to the point where the noise level of the existing industry (measured at its boundary) has fallen by 5 decibels.

Beyond the interface region (that is, beyond the point where noise has fallen by 5 decibels) the receiver category that most describes the area (rural, suburban or urban) would apply. (Note: the wording on pages 18 and 67 of the INP does not fully clarify this and the word 'urban' should be deleted and replaced with the word 'applicable' on page 18 at line 6 of the 'Urban/industrial interface' category and on page 67 at line 9 of the first paragraph).

For new developments of a limited nature (such as an extension to existing process or plant or when replacing part of an existing process or plant with new technology) on existing sites (where the urban/industrial amenity category applies) then the urban/industrial amenity category is the appropriate amenity category for the new development. However, where a new development on an existing site is of a substantial nature (such as demolition of the existing plant and replacement with current technology or different type of plant) and where replacement of the existing plant has a realistic potential to significantly reduce receiver noise levels through using feasible and reasonable noise mitigation (i.e. where the existing plant is the dominant or a significant contributor to receiver noise levels) then the applicable noise criteria for the new development is the appropriate (rural, suburban or urban) amenity criteria for the location.

In most cases the situation will be apparent but in some cases careful judgement will be required to determine whether the new development is of sufficient magnitude to effectively replace the existing plant. In situations where no clear conclusion on the magnitude of change created by the new development is possible then the urban/industrial amenity category should apply.

**Identifying the Appropriate Receiver Amenity Category**
(see INP Section 2.2.2)

Amenity criteria in Table 2.1 of the INP vary depending on the type of receiver. INP Section 2.2.2 provides guidance on identifying the appropriate receiver type. Where there is doubt or debate over which receiver category is appropriate, the proponent needs to seek the views of the relevant land use manager (e.g. Council or Department of Planning and Infrastructure). Once the land use manager has identified the land use (e.g. zone, allowable density of development and land use patterns), the appropriate amenity criteria can be assigned.

**Amenity Criteria in High Traffic Noise Areas**
(see INP Section 2.2.3)

In areas where traffic flow is continuous and noise from industrial sources is inaudible or difficult to measure due to a high level of road traffic noise, and where the $L_{Aeq}$, (period), traffic noise level is more than 10 dB above the ANL presented in Table 2.1, the ANL is replaced by $L_{Aeq}$, (period), traffic minus 10 dB. This becomes the new ANL for the receiver area.

Once the new ANL is determined, the project-specific amenity criterion can be determined by following the modification process given in Table 2.2.

**Example**: An industrial development is proposed adjacent to several existing industrial facilities. The measured ambient night-time $L_{Aeq}$ noise level is 60 dB(A) at a receiver potentially affected by noise from the proposed industrial development. The residential receiving area of the assessment location has been identified as 'urban'. A nearby road dominates the night-time acoustic environment at the receiver and there are no other environmental or extraneous local noise sources. In these circumstances, the measured ambient $L_{Aeq}$ noise level of 60 dB(A) can be taken to represent the $L_{Aeq}$, (period), traffic. The night-time noise contribution from existing industry is estimated to be 46 dB(A). What is the project-specific amenity (night-time) noise criterion for the proposed industrial development?

**Solution**: The $L_{Aeq}$, (period), traffic minus 10 dB is greater than the night time ANL of 45 dB(A) as determined from Table 2.1 for urban areas not significantly affected by traffic noise. Therefore, the approach described in Section 2.2.3 of the INP can be applied and the new ANL becomes $L_{Aeq}$, (period), traffic minus 10 dB. As the $L_{Aeq}$, (period), traffic is 60 dB(A), then the new ANL becomes 50 dB(A). This is the amenity noise criterion for the total industry $L_{Aeq}$ noise in the area. The project-specific amenity (night-time) noise criterion for the proposed industrial development is then determined by comparing the existing industry $L_{Aeq}$ of 46 dB(A) to the new ANL of 50 dB(A) with respect to the modification process given in Table 2.2. This gives the project-specific amenity (night-time) noise criterion of 48 dB(A), that is, new ANL minus 2 dB(A).

**Dealing With Cumulative Noise from Multiple Developments**
(see INP Section 2.2.4)

The intrusive and amenity criteria outlined in Section 2 of the INP were established primarily to deal with individual development applications for industrial sites in the vicinity of existing sensitive receivers with stable background noise levels. In Section 2.2.4 the INP recognises that for multiple developments, such as a new industrial area, a strategic approach can be implemented to ensure the amenity objectives are not compromised and an equitable share of the remaining available allocation of amenity-related noise for each industrial development is achieved.

**Identifying Which of the Amenity or Intrusive Criteria Apply**
(see INP Section 2.4)

The INP notes that the Project-Specific Noise Levels (PSNL) are the more stringent of either the amenity or intrusive criteria. This is not necessarily just a matter of comparing the magnitude of the amenity criteria to the intrusive criteria because different time periods apply (intrusive criteria uses 15 minutes while the amenity criteria are over the day, evening or night period).

For example, where the same number applies to both the amenity and intrusive criteria, the intrusive criteria would typically be more stringent because it is determined over a much shorter period.

Where the predicted amenity noise level is lower than the intrusive level for the proposed development, the proponent needs to ensure that both levels will be satisfied. In this situation, noise limits specified in the licence conditions will include both the intrusive and amenity noise levels predicted to be achieved by the proposal to ensure that the community is protected from intrusive noise impacts at all times.

**Assessing Background Noise Levels**
(see INP Section 3.1)

To determine the Rating Background Level (RBL) and existing industry-contributed $L_{Aeq}$, the measurement of ambient noise levels should be undertaken in the absence of noise from the development under consideration.

**When the RBL for Evening or Night is higher than the RBL for Daytime**
(see INP Section 3.1)

The results of long term unattended background noise monitoring can sometimes determine that the calculated Rating Background Level (RBL) for the evening or night period is higher than the RBL for the daytime period. These situations can often arise due to increased noise from, for example, insects or frogs during the evening and night in the warmer months or due to temperature inversion conditions during winter. The objective of carrying out long-term background noise monitoring at a location is to determine existing background noise levels that are indicative of the entire year.

In determining project-specific noise levels from the RBLs, the community's expectations also need to be considered. The community generally expects greater control of noise during the more sensitive evening and night-time periods than the less sensitive daytime period. Therefore, in determining project-specific noise levels for a particular development, it is generally recommended that the intrusive noise level for evening be set at no greater than the intrusive noise level for daytime. The intrusive noise level for night-time should be no greater than the intrusive noise level for day or evening. Alternative approaches to these recommendations may be adopted if appropriately justified.

**Maximum Noise Levels during Shoulder Periods**
(see INP Section 3.3)

Noise levels in limit conditions for sleep disturbance would typically be set as a maximum noise level. The approach noted in the INP for developing intrusive criteria for the shoulder period is not appropriate for determining maximum noise levels for the shoulder period. That is, assigning a background noise level based on averaging daytime and night-time RBLs may be appropriate for determining intrusive criteria but it is not appropriate for assigning maximum noise levels. The reason for this is that the day or night RBL is based around the 90th percentile of LA90s, which is quite different to an RBL based on an average. (Additionally, setting maximum noise levels for the shoulder period based on the lowest $L_{A90}$ during the period is not practical as it can result in the maximum noise limit being set lower than the intrusive noise limit).

In order to generate a statistically valid data set to derive the 90th percentile of LA90s for the shoulder period, a much larger sampling time (than the one week typically applied) would be required, with associated cost and practicality implications. Therefore, a statistical approach to calculating the RBL for shoulder periods is not required by the INP.

It is the intention of the INP that appropriate noise targets for the shoulder period be negotiated with the regulatory/consent authority on a case-by-case basis. The focus of the INP is on avoiding or minimising noise of a high level and/or with intrusive characteristics, during the shoulder period, through the use of best practice.

Options available to the proponent for managing maximum noise levels during the shoulder period are to:

- avoid noise events during the shoulder period (or at least during the first half and then to meet RBL(shoulder period) +15 dB(A) during the second half of the shoulder period);

- collect sufficient data to calculate a statistically robust 90th percentile-based RBL for the shoulder period and use this to determine RBL+15 dB(A) as the maximum noise level limit; and

- conduct a detailed analysis of the number and noise level of noise events, and the exceedance of the background noise level, then, present a case comparing the results of the analysis and the research results contained in the NSW Road Noise Policy.

**Tonality - Sliding Scale Test**
(see INP Section 4.2)

The sliding scale test for tonality outlined in Section 4 of the INP uses a linear (z-weighted) spectrum (that is, no frequency weighting on each of the octave or third octave bands).

**Duration Correction**
(see INP Section 4.2)

Section 4 of the INP provides guidance on the use of modifying factors to account for certain characteristics of a noise source. The duration factors in Table 4.2 are intended to increase the criterion that is acceptable, whereas the modifying factor corrections in Table 4.1 are intended to increase the measured or predicted level.

**Determining what Weather Conditions should be used when Predicting Noise**
(see INP Section 5)

Background

The INP intends that the noise levels used in assessing noise impacts at the consent stage include the effects of any weather conditions that are a feature of the area when the development operates. This means that the effects of weather conditions such as temperature inversions and wind on the noise level experienced at sensitive receivers should be adequately assessed at the consent stage.

Wind can enhance noise propagation compared with calm conditions (where there is no wind). When a wind blows, friction causes the air to move more slowly close to the ground than at higher altitudes. This phenomenon of wind speed increasing with height is termed 'wind shear'. The increase in noise occurs because sound waves from the source are bent through this 'wind shear' back towards the ground.

Unlike temperature inversions, wind can enhance propagation during any time of the day, evening or night. Wind does not increase noise in all directions and can also reduce noise. For example, wind blowing from the south to the north (termed a 'southerly' wind) increases noise to the north of an industrial premise and also reduces noise to the south of that premise.

In some instances, where one or more significant weather conditions have been identified as part of a noise assessment, noise levels from the industrial premises under only these significant weather conditions have been assessed, but noise levels under calm conditions have not.

The INP describes in Section 5 when weather is 'significant' (i.e. it occurs more than 30 per cent of the relevant time period) and how to apply this in the noise assessment. This approach may result in noise levels at some receivers being underestimated, as in the southerly prevailing wind scenario described above.

Recommended approach

This application note clarifies that in all cases at each receiver:

- noise levels from the premises under calm conditions as well as any significant weather conditions as defined in the INP should be predicted or measured; and

- the highest of the noise levels from Step 1 is to be used in the assessment for that receiver.

The intent of the INP is not to require that these conditions should be applied exclusively where the significant weather conditions act to reduce noise at a sensitive receiver.

For example, where a significant prevailing wind of speed less than 3 metres per second increases noise levels at a receiver to the north of a development (compared with those predicted under calm conditions), the noise levels predicted under that prevailing wind should be used at that receiver. For receiver(s) to the south of the same development, if the noise levels predicted under calm wind conditions are higher than those predicted under the significant prevailing wind, the noise levels predicted under calm wind conditions should be used at the southern receiver(s).

The EPA has previously accepted (and will accept) noise predictions based on modelling noise emissions using long term weather data, as it can present a higher level of analysis than that required under the INP.

**How Calm is Defined**
(see INP Section 5.1)

In the assessment of wind effects, the INP requires the assessment of wind speeds of up to 3 metres per second where these speeds are a feature of the area (they occur for 30 per cent of the time or more) but does not specify the minimum wind speed that needs to be assessed. The calm condition is typically represented by wind speeds less than or equal to 0.5 metres per second as this is likely to be the lower limit of measurement.

**Presenting Predicted Noise Impacts**
(see INP Section 6.3)

In carrying out noise impact predictions for a particular development, predicted noise levels for calm conditions as well as any significant adverse weather conditions should generally be provided. It is particularly useful to provide predicted noise impacts for calm weather conditions where predicted noise impacts under adverse weather conditions exceed the project-specific noise levels. This allows for a better understanding of potential noise impacts from the development.

**Noise Impact Assessment for the Modification of Existing Industrial Premises**
(see INP Section 10)

Background

Section 10 of the INP outlines the application of the policy to existing industrial premises.

As well as being used to assess noise emissions from new industrial premises, the INP is also applied to situations where existing industrial premises are modified, expanded or upgraded.

Where a modification is proposed, the noise level targets for the premises (termed Project Specific Noise Levels) are to be determined firstly excluding any noise from the subject premises. The noise from the existing premises is then assessed against these targets to determine if there is a need to consider noise mitigation for existing operations. The predicted noise level from the proposed modification is then assessed, both in isolation and in combination with noise from the existing premises.

The total noise emissions from the modified premises should ideally not exceed the Project Specific Noise Levels. If the existing premises cannot achieve these targets, the allowable noise emissions from the proposed modification will be set so that the modification does not significantly increase the existing noise emissions.

Recommended approach

This application note outlines these processes together with the degree of information required to support a proper assessment of modifications to an existing industrial premises.

A noise impact assessment for the modification of existing industrial premises should include, as a minimum:

- existing noise criteria contained in consents, approvals or licences, that are applicable to the premises;

- Project Specific Noise Levels (PSNLs) for the premises determined in accordance with the INP and relevant application notes (see, for example, Appendix A4 of the INP). Note: care should be taken to exclude noise from the existing premises when quantifying background and existing industrial noise levels (further guidance is in the INP in Section 11.1.2);

- where application of the INP results in a PSNL more stringent than existing noise criteria, the PSNL should be adopted for noise assessment purposes. Note: the INP acknowledges that the PSNL is a goal sought to be achieved through the application of feasible and reasonable noise mitigation measures and is not necessarily applied as a statutory limit by default;

- measured or predicted noise levels from the existing premises at noise sensitive receiver locations;

- predicted noise contribution from the proposed modification, in isolation, at noise sensitive receiver locations; and

- cumulative noise levels from the entire premises (i.e. combined level from existing and proposed modification) compared to the PSNL.

Where noise from the existing premises exceeds the PSNL

Where it can be determined that noise from the existing premises alone is currently exceeding the PSNL, a preliminary analysis of potential noise mitigation measures, and conceptual noise reductions, needs to be undertaken for the existing premises. Note: this does not mean that in all circumstances noise mitigation to existing premises will be required as part of a modification. Decisions of this nature will be determined on a case-by-case basis, taking into account various factors, for example, feasible and reasonable mitigation options, the absolute level of noise and existing measures of community impact, including complaints.

Once the conceptual mitigated level of noise performance of the existing premises (i.e. what can be achieved) has been determined, the contribution noise level goal for the modification can be determined. The noise level goal for the modification should be set at least 10 dB below the PSNL, or where it has been determined that the existing premises cannot achieve the PSNL, it should be set at least 10 dB below the conceptual mitigated noise performance of the existing premises.

This approach is designed to ensure that noise from the modification does not become the limiting factor in noise from the entire premises potentially meeting the PSNL.

**Prosecution Guidelines**
(see INP Section 11.1)

EPA's approach to prosecuting offences is described in EPA prosecution guidelines 2012, particularly Sections 2.2.3 to 2.2.7 under 'Discretion' which states that 'not every breach of the criminal law is automatically prosecuted - the laying of charges is discretionary' and 'The EPA has a discretion as to how to proceed in relation to environmental breaches' and 'Each case will be assessed to determine whether prosecution is the appropriate strategic response'. Sections 2.2.8 under 'Factors to be considered' in the Guidelines describe factors that are considered when determining whether prosecution is required, such as 'whether the breach is a continuing or second offence', 'the availability and efficacy of any alternatives to prosecution' and 'the prevalence of the alleged offence and the need for deterrence, both specific and general'.

**Using Appendix D**

Appendix D of the INP provides a rough guide for predicting the increase in noise due to inversion effects. The data provided is based on simple calculations performed using the Environmental Noise Model (ENM), assuming flat ground and no barriers.

The use of this Appendix may underestimate the effects of temperature inversions where a barrier or intervening topography is present. For detailed noise impact assessments, a more thorough analysis of noise impacts under temperature inversions is expected. Where a noise model such as SoundPlan or ENM is used to determine noise impacts from a development under calm conditions or during wind conditions, the model should also be used to determine potential noise impacts under inversion conditions, rather than using Appendix D.

**How to Account for Operations that only occur for part of the Day, Evening or Night**

If a plant operates throughout the day and evening but only part of the night, the assessment and applicable criteria are based on the period that the plant operates. For example, if the night operation occurs between 10.00 pm and 3.00 am the assessment of background noise and existing noise from industry would cover only those 5 hours and the applicable criteria would be derived from this period. The same applies for part operation during the day or evening.

The basic inputs needed to establish the amenity criteria are the existing industrial noise and the ANLs for different types of receivers. The amenity criterion is then obtained by a process that seeks to limit continuing increases in noise levels from industrial sources. The amenity criterion is equally applicable to a development that operates only for a portion of the relevant assessment period.

During the impact prediction phase, determining whether an industrial activity meets the amenity criteria entails assessing the noise level emissions from the activity over the period it takes place. Typically this would correspond to the times during which the industrial operation has approval to operate as specified in a licence or consent.

For example, where an industrial operation commences at 5.00 am, the period during which to assess night-time amenity would be from 5.00 am to 7.00 am. A noise impact assessment should not include the period during which the industrial operation does not operate (the night-time hours of 10.00 pm to 5.00 am).

The basic premise of assessing noise over the period that an activity occurs has and continues to be the standard approach.

The existing industrial noise should be used in conjunction with the appropriate ANL to establish the amenity criteria applicable. The criteria are applicable to the hours the development operates.

If there were a disparity between the approved operating hours and the actual period over which industrial activities take place then the appropriate period to apply to assessing amenity would need to be assigned with the aim of assessing noise over the time in which industrial activities take place. In practice, it is expected that this is unlikely to be a significant issue as most industrial operations conduct industrial activities during their approved operating hours.

In situations where high levels of ambient noise occur the INP provides a mechanism to adjust the applicable noise criteria so as not to impose overly stringent criteria. For example, if an industry operates from 5.00 am to 7.00 am and the receiver premises experience high levels of existing traffic noise at this time, the ANL used to derive the amenity criteria can be adjusted on the basis of the high existing traffic noise. If the existing industrial noise is low, then the traffic-modified ANL becomes the amenity criterion.

**Sleep Disturbance**

Peak noise level events, such as reversing beepers, noise from heavy items being dropped or other high noise level events, have the potential to cause sleep disturbance. The potential for high noise level events at night and effects on sleep should be addressed in noise assessments for both the construction and operational phases of a development. The INP does not specifically address sleep disturbance from high noise level events.

Research on sleep disturbance is reviewed in the NSW Road Noise Policy. This review concluded that the range of results is sufficiently diverse that it was not reasonable to issue new noise criteria for sleep disturbance.

From the research, the EPA recognised that the current sleep disturbance criterion of an $L_{A1}$, (1 minute) not exceeding the $L_{A90}$, (15 minute) by more than 15 dB(A) is not ideal. Nevertheless, as there is insufficient evidence to determine what should replace it, the EPA will continue to use it as a guide to identify the likelihood of sleep disturbance. This means that where the criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis is required.

The detailed analysis should cover the maximum noise level or $L_{A1}$, (1 minute), that is, the extent to which the maximum noise level exceeds the background level and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the NSW Road Noise Policy. Other factors that may be important in assessing the extent of impacts on sleep include:

- how often high noise events will occur;
- time of day (normally between 10.00 pm and 7.00 am); and
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods).

The $L_{A1}$, (1 minute) descriptor is meant to represent a maximum noise level measured under 'fast' time response. The EPA will accept analysis based on either $L_{A1}$, (1 minute) or $L_A$, (Max).

**Addressing Privately Owned Haul Roads**

Noise from privately owned haul roads is to be assessed as an industrial noise source according to the INP. The practice of treating access roads as part of the industrial premises with which they are associated is a long established part of noise management in NSW, which the INP has not changed. The basis for treating vehicles on private access roads as part of an industrial noise source lies in the relationship between the enterprise and the noise, and the community's response to noise from vehicles operating on private roads.

<u>The character of the noise is different to general road traffic noise</u>

Traffic on access roads is solely related to the operation of the site served by the access road and is usually composed almost entirely of heavy vehicles, producing noise of a different character to the typical public roadway where smaller vehicles typically predominate.

<u>Factors that influence community response are different compared to public roads</u>

The distribution of benefits from the operation of a private access road is typically perceived as different than from a public road. Affected members of the public have been reported as questioning the equity of truck noise degrading their amenity for the benefit of others.

The degree of control possible for traffic on a private access road is typically perceived as greater than for a public road. The result is a higher level of expectations that more can and should be done to reduce noise from the private road (than from a public one).

**Determining Noise Limits for Licence Conditions**

Where the proponent predicts that noise levels from the industrial development would be below the project-specific noise levels, then the noise limits specified in the licence/consent conditions should reflect the noise levels that the proponent states would be achieved (that is, the predicted noise levels, however a minimum intrusive criterion of 35 dB(A) still applies). This is for a number of reasons:

- to ensure that the best-management practices and best available technology described in the noise impact assessment report are actually adopted by the proponent;

- to ensure that the level of achievable performance presented by the proponent to the public, though public documentation such as Environmental Impact Statements, is achieved;

- to optimise the opportunity for further industrial development in the area without an unacceptable degradation of the acoustic amenity of the area; and

- to fulfil a general aim of the environmental assessment process to minimise environmental impacts.

It should be noted that noise limits would apply to the contributed noise levels from only the premises or site of concern. In setting noise limits, judgement needs to be made as to whether the predicted noise levels warrant noise limits on the licence/consent. Where the predicted noise levels from the premises of concern are well below the project-specific noise levels, there may be no need for noise limit conditions.

Any tolerances to the predicted noise levels should be addressed in the proponent's assessment of impacts so that the predicted noise levels can be applied in conditions.

# APPENDIX C

Assessment of the Existing Noise Environment

# Appendix C – Assessment of Existing Noise Environment

## Industrial Noise Policy Methodology

### Introduction

The NSW Industrial Noise Policy (INP), (EPA 2000) and supporting Application Notes documents the procedures used to assess the noise from industrial noise sources scheduled under the *Protection of the Environment Operations Act 1997*. The first step in the application of the INP involves:

- Determining the project-specific noise levels for intrusiveness and amenity based on the measurement of the existing background and ambient noise levels.

The methodologies for determining the assessment criteria and the monitoring programs required to provide the necessary data are outlined in the INP and is based around the evaluation of the background noise levels and amenity noise levels.

### Background Noise Levels

The underlying ambient noise level is referred to as the background noise level and is represented by the $L_{A90,\ 15\ minute}$ descriptor. The intrusiveness of an industrial noise source is generally considered acceptable if the predicted $L_{Aeq,\ 15\ minute}$ from the noise source does not exceed the background noise level by more than 5 dB when measured in the absence of the source. The background noise level, or Rating Background Level (RBL), is determined in accordance with Section 3 of the INP and is the median value of the Assessment Background Levels (ABL) determined for the monitoring period. The background noise levels are presented in **Table 4** through **Table 15.** Where there were greater than 50 valid ABL entries per location, the data has been represented with a histogram showing percentage frequency of ABL values as well as the overall RBL value.

### Amenity Noise Levels

To control and/or limit the increase in industrial noise levels, the EPA has identified recommended acceptable and maximum ambient noise levels for typical receiver areas and land uses. The INP represents the existing ambient noise level by the $L_{Aeq,\ period}$ descriptor where the periods is the day, evening and/or night during which the proposed development will operate. The INP suggests a minimum measurement period of one week is required in order to obtain sufficient data to determine the existing $L_{Aeq}$ noise levels. The assessment of the existing $L_{Aeq}$ noise levels is then used to determine the amenity criteria which are designed to control the overall impact from industrial noise sources.

### Transportation Noise Levels

The INP notes that transportation noise should also be included in the assessment of the noise environment when traffic is constant and continuous, and it can be demonstrated that the existing noise is due to transportation-related sources. The INP notes specifically that this is only applicable where the industrial noise level is 10 dB below the existing combined noise level.

### Weather Conditions

The INP notes that noise monitoring data should be excluded when the average wind speeds are greater than 5 m/s or when it is raining.

**Monitoring Period**

The EPA typically require one week's worth of valid data covering the days and times of operation of the proposed development. However the INP also notes that:

- variations due to seasonal changes in weather including the presence and strength of inversions should be considered;
- variations due to wildlife activity and operational activities of other developments should be considered; and
- to meaningfully determine the existing noise environment the duration of monitoring should be determined by taking into account the circumstances of the particular situation.

**Monitoring Program**

The existing noise environment in the area surrounding the Project was assessed using monitoring data from the Mount Owen Complex continuous monitoring network, two mobile continuous noise monitors and attended noise monitoring associated with the routine monitoring program Mt Owen and Glendell Mines.

**Continuous Noise Monitors Network**

Noise monitoring data was obtained from the Mount Owen Complex continuous noise monitoring units SentineX 1, 4, 5 11 and 12. The SentineX units also record site specific meteorological data. The details of the noise monitoring data used in the assessment of the noise environment in Camberwell Village are presented in **Table 1**.

The monitoring data from the SentineX units included the 24 hours per day 7 days per week monitoring of:

- ambient background and statistical noise levels for each 15 minute interval recorded as $L_{A1,\ 15minute}$, $L_{A10,\ 15minute}$, and $L_{A90,\ 15minute}$;
- $L_{AEq,\ 15minute}$ noise levels for every 15 minute interval recorded;
- maximum and minimum noise levels for every 15 minute interval recorded;
- the A-weighted 1/3 octave noise levels at 10 second intervals over every 15 minute measurement period;
- the results of a 1000 Hz low pass filter at 10 second intervals over every 15 minute measurement period;
- the maximum $L_{A1,\ 1\ minute}$ noise level recorded over one of the night time 15 minute measurement period; and
- audio levels as MP3 files every 15 minute measurement period.

**Table 1 – Details of Mount Owen Complex Continuous Monitoring Network**

| Monitoring Location | Location | Monitoring Unit | Monitoring Period |
|---|---|---|---|
| SX1 | Middle Falbrook (R026) | SentineX 1 | from: 00:00MN 12/3/2013<br>to: 00:00MN 2/6/2014 |
| SX4 | Glennies Creek (R120) | SentineX 4 | from: 00:00MN 12/3/2013<br>to: 00:00MN 2/6/2014 |
| SX5 | Falbrook (R037) | SentineX 5 | from: 00:00MN 12/3/2013<br>to: 00:00MN 2/6/2014 |
| SX11 | Camberwell Dyrring Street | SentineX 11 | from: 00:00MN 12/3/2013<br>to: 06:45 13/02/2014 |
| SX12a | Camberwell (R154) | SentineX 12 | from: 00:00MN 12/3/2013<br>to: 23:45 27/11/2013 |
| SX12b | Camberwell (R143) | SentineX 6<br><br>SentineX 12 | from: 20:15 20/8/2013<br>to: 06:45 20/12/2013<br>from: 07:00 17/01/2014<br>to: 00:00MN 2/6/2014 |
| SX37 | Hebden Road | SentineX 37 | from: 00:00MN 12/3/2013<br>to: 00:00MN 2/6/2014 |

## Mobile Continuous Noise Monitors

Noise monitoring data was obtained from two mobile continuous noise monitoring units. The details of the noise monitoring data obtained from the mobile continuous noise monitoring units used in the assessment of the noise environment in the region surrounding the Project are presented in **Table 2**.

**Table 2 – Details of Mobile Continuous Noise Monitoring Units**

| Monitoring Location | Location | Monitoring Unit | Monitoring Period |
|---|---|---|---|
| C1 | Receiver - R013 | SentineX | from: 14:45 17/06/2013<br>to: 09:15 6/08/2013 |
| C2 | Receiver - R010 | SentineX | from: 09:00 7/08/2013<br>to: 17:45 20/08/2013 |
| C3 | Receiver - R007 | SentineX | from: 12:00 1/03/2013<br>to: 13:15 17/06/2013 |
| C4 | Receiver - R091 | SentineX | from: 15:15 11/06/2013<br>to: 05:45 16/07/2013 |
| C5 | Receiver - R095 | SentineX | from: 07:00 30/07/2013<br>to: 05:45 7/08/2013 |
| C6 | Receiver - R017A | SentineX | from: 11:15 6/08/2013<br>to: 00:00MN 2/6/2014 |

## Attended Noise Monitoring

Attended noise monitoring is undertaken at monitoring locations N1 to N8 on a seasonal basis in order to quantify and describe the ambient noise environment in the region surrounding the Mount Owen Complex. The noise monitoring and reporting requirements for Mount Owen Mine are outlined in the Mount Owen Development Consent DA 14-1-2004 and Environment Protection License (EPL) 4460. Although Ravensworth East mine has separate development consent, the mine (referred to as the West Pit) is operated as an integral part of

the Mount Owen Complex and is included as a part of the Mount Owen Mine with respect to noise. Glendell Mine is also integrated as a part of the Mount Owen Complex operationally. However, the noise monitoring and reporting requirements for Glendell Mine are defined under the Glendell Mine Development Consent (DA 80-952) and EPL 12840.
Supplementary attended noise monitoring was undertaken at eight additional locations (N9 to N16) representative of the residences to the north-east, east and south-east that could potentially be affected by the Project.

The objective of the attended noise monitoring program was to determine the sources of noise contributing to the ambient noise environment and determine the contribution from Mount Owen Mine to the ambient noise levels. This information has been cross correlated with the results from the monitoring data from the Mount Owen Complex continuous monitoring network and the mobile continuous noise monitoring units.

The details of the attended noise monitoring program used to assess the noise environment in the region surrounding Project are presented in **Table 3**. The attended noise monitoring program measurements were undertaken with a Svantek 959 integrating sound level meter, Serial Number 12918. During the attended monitoring surveys the noise meter was calibrated using a Svantek Model SV 30A Noise Meter Calibrator, Serial Number 14162.

**Table 3 - Details of Attended Noise Monitoring Program Used in Assessment**

| Monitoring Location | Description | Monitoring Period |
|---|---|---|
| N1 | Falbrook Road Greenlands west of Bridgeman Road (R042) proximity of C1 | 8/06/2012, 25/07/2012, 16/08/2012, 9/10/2012, 21/11/2012, 27/12/2012, 27/02/2013, 1/05/2013, 17/07/2013 and 21/08/2013 |
| N2 | Falbrook south of Shadlows Lane (R037) adjacent to SX5 | |
| N3 | Corner of Falbrook and Middle Falbrook Roads (R027) adjacent to SX1 | |
| N4 | Glennies Creek Road (R120) adjacent to SX4 | |
| N5 | Camberwell Village – Northern (R154) adjacent to SX12 | |
| N6 | Camberwell Village – Central Dyrring St adjacent to SX11 | |
| N8 | Camberwell Village – Southern (R145) | |
| N9 | Goorangoola Road north of Falbrook Road (R056b) | 27/12/2012 and 21/08/2013 |
| N10 | Mt Pleasant School, Bridgeman Road (R350) | |
| N11 | Bridgeman Road (R075) | |
| N12 | Thomas Lane (R091) adjacent to C4 | |
| N13 | Stoney Creek Road/Bridgeman Road (R102b) | |
| N14 | Middle Falbrook Road west of Stoney Creek Road (R105b) | |
| N15 | Middle Falbrook Road north of Glennies Creek bridge (R010) adjacent to C2 | |
| N16 | Middle Falbrook (R013) adjacent to C1 | |

The data collected during the attended noise monitoring program included:

- the recorded A-weighted 1/3 octave noise levels at 1 second intervals over a 15 minute measurement period;
- the results of a 1000 Hz low pass filter at 1 second intervals over the 15 minute measurement period;
- an assessment of the maximum $L_{A1,1min}$ noise level recorded over the 15 minute measurement period;

- the $L_{Aeq, 15\ minute}$ and $L_{A90, 15minute}$ noise levels for the 15 minute measurement period; and

- ambient background and statistical noise levels for each 15 minute interval recorded as $L_{A1, 15minute}$, $L_{A10, 15minute}$, and $L_{A90, 15minute}$.

### Meteorological Data

Data on meteorological conditions at the time of each monitoring period was collected from the Mount Owen Complex continuous monitoring network weather stations SentineX 8 and 13. The meteorological data included:

- ambient temperature at 2 and 10 metres;

- wind speed; wind direction and stability class (or sigma-theta);

- humidity; and

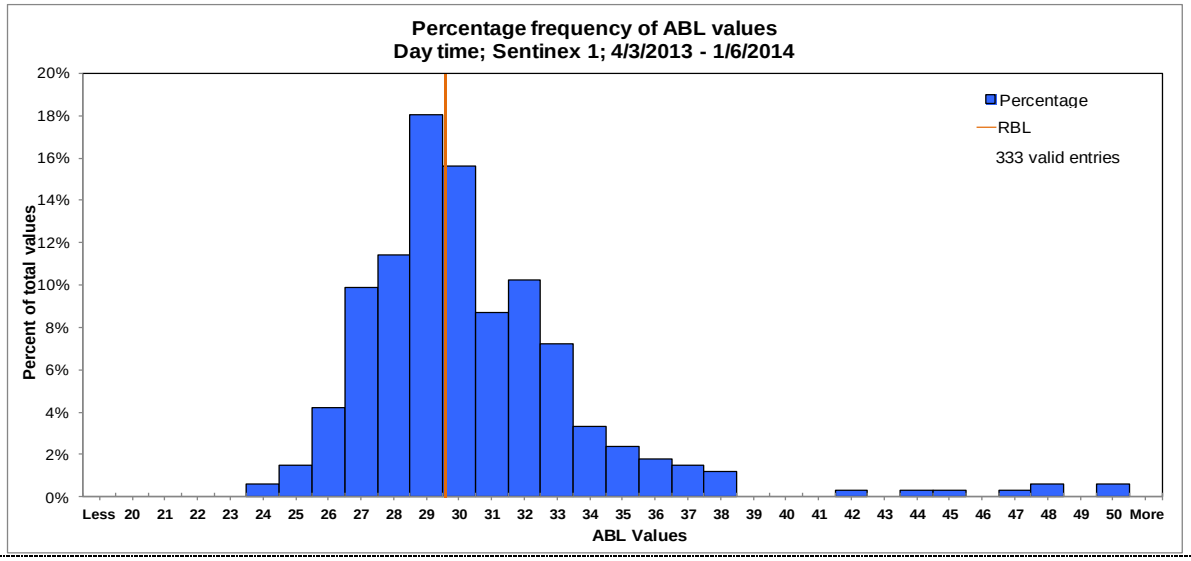
- rainfall.

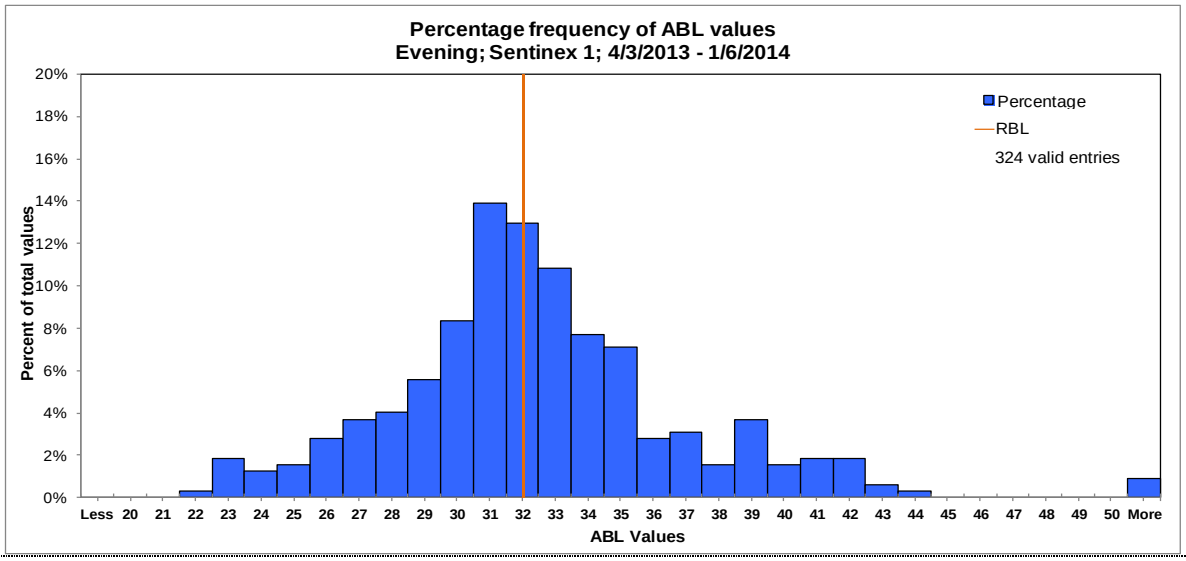
### Summary of Continuous Noise Monitoring Data

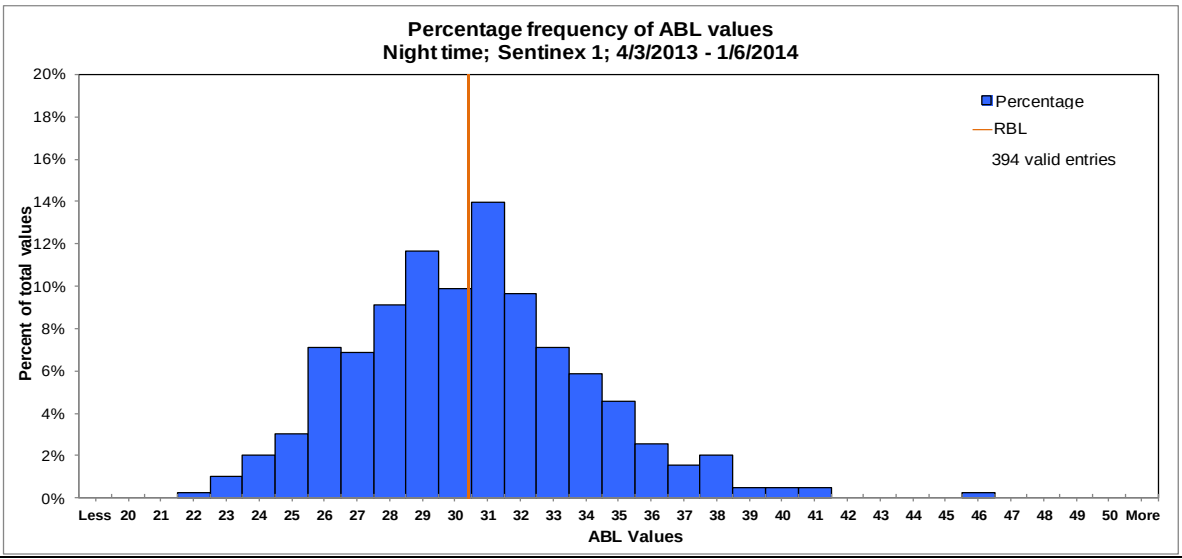
A summary of the continuous noise monitoring data used to determine the existing noise background and amenity noise levels is presented in **Tables 4** to **16**.

**Table 4 – Monitoring Location SX1, RBL and Mean $L_{Aeq}$, dB(A)**

| INP Stats | Day | Evening | Night |
|---|---|---|---|
| **Mean $L_{Aeq}$** | **48.3** | **43.2** | **42.7** |
| **RBL** | **29.6** | **32.0** | **30.4** |





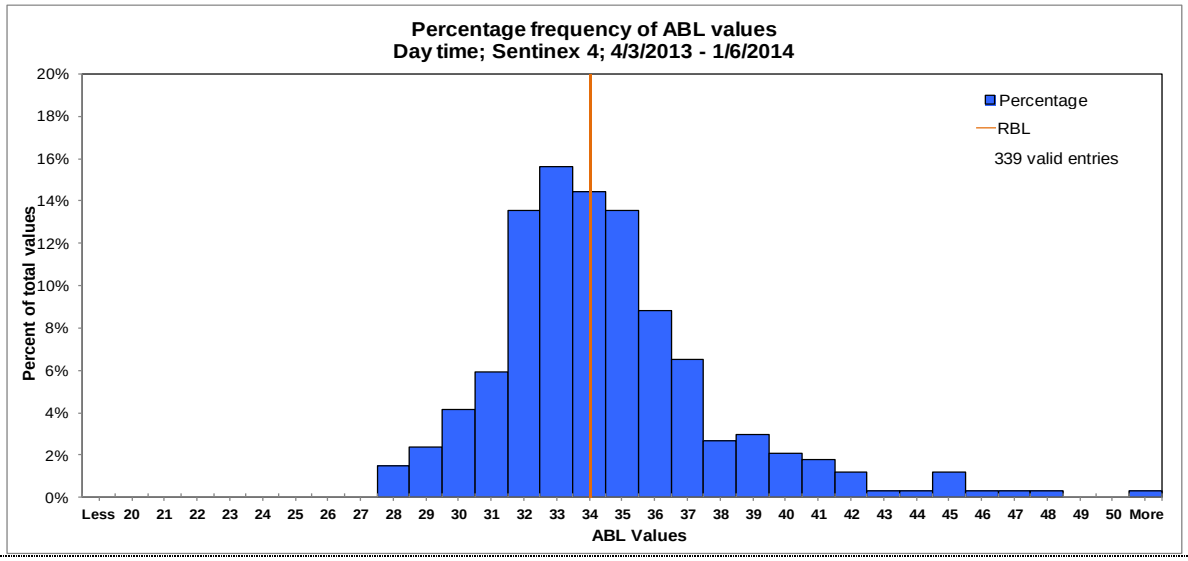



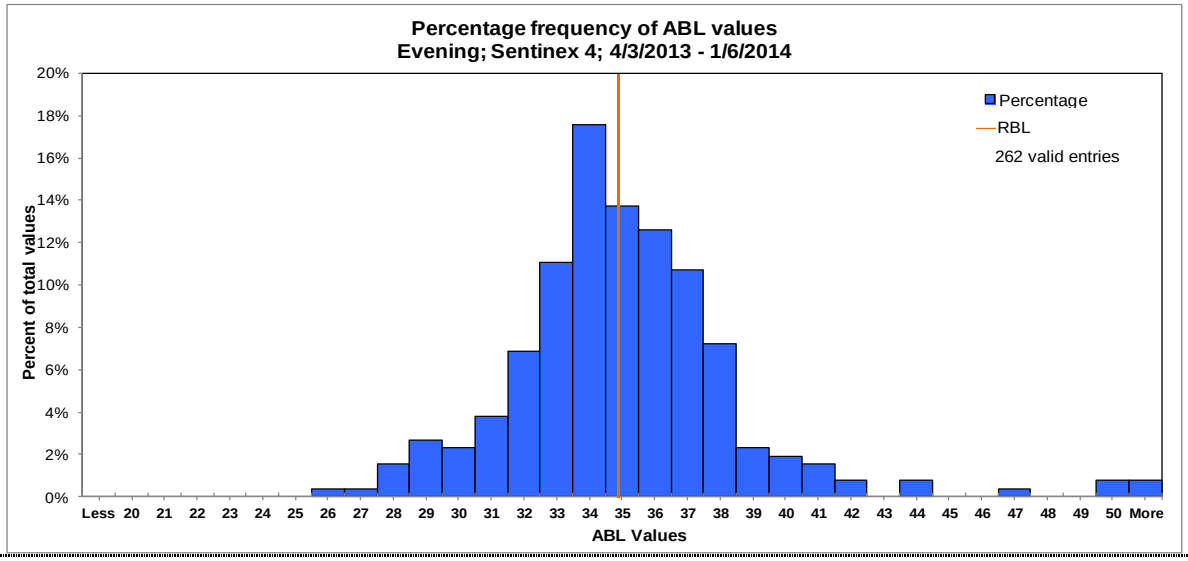

| INP Analysis | | | |
|---|---|---|---|
| **RBL** | **30 (29.6) [1]** | **32.0** | **30.4** |
| **Intrusiveness Criteria** | **35** | **35 (37) [2]** | **35** |
| Recommended $L_{Aeq}$ | 50 | 45 | 40 |
| **Mean Measured $L_{Aeq}$ (All Sources)** | **48.3** | **43.2** | **42.7** |
| Estimated Mean $L_{Aeq}$ (Non-industrial) | 48.1 | 42.6 | 41.9 |
| Estimated Mean $L_{Aeq}$ (All Industrial) | 35 | 35 | 35 |
| Estimated Mean $L_{Aeq}$ (Other Industrial) | 31 | 31 | 31 |
| Mean Industrial $L_{Aeq}$ minus Recommended $L_{Aeq}$ | <-6 | <-6 | <-6 |
| Mod Req'd (INP Table 2.2) to ANL | 0 | 0 | 0 |
| **Amenity Criteria** | **50** | **45** | **40** |
| Day time noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | |
| Evening noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | |
| Night time noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | |
| **Project Specific Noise Level** | **35** | **35** | **35** |

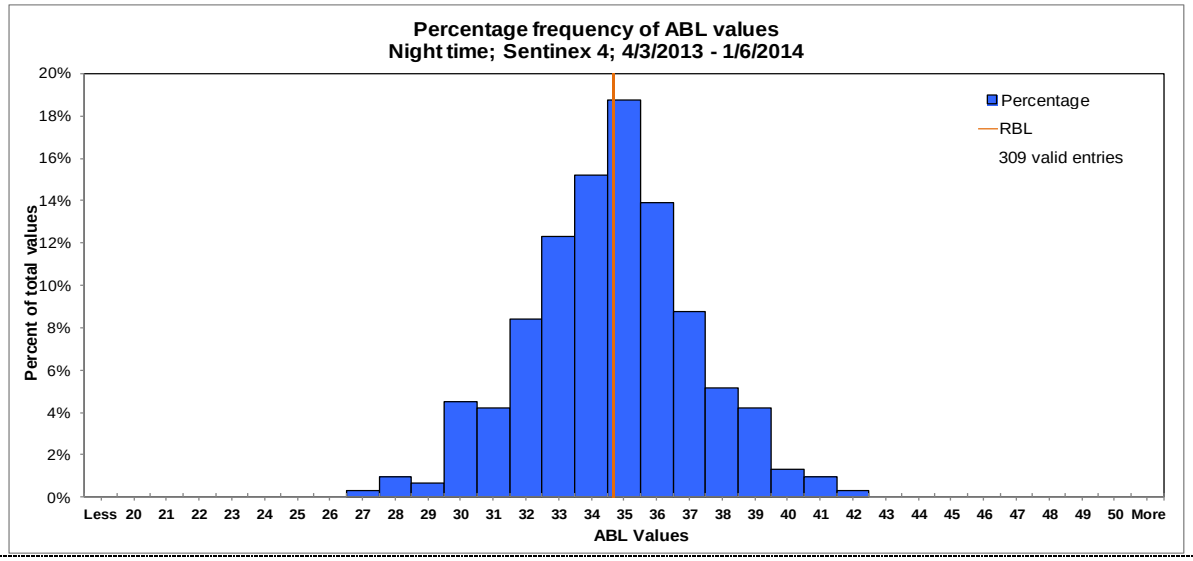
Note: '-' denotes wind or rain effected results excluded in accordance with the INP
Note 1: Where the ABL is less than 30 dB(A) then ABL is set at 30 dB(A)
Note 2: Where the day time is quieter than the evening set the evening at the daytime level

## Table 5 – Monitoring Location SX4, RBL and Mean $L_{Aeq}$, dB(A)

| INP Stats | Day | Evening | Night |
|---|---|---|---|
| **Mean $L_{Aeq}$** | **47.2** | **45.8** | **44.8** |
| **RBL** | **34.0** | **34.9** | **34.7** |



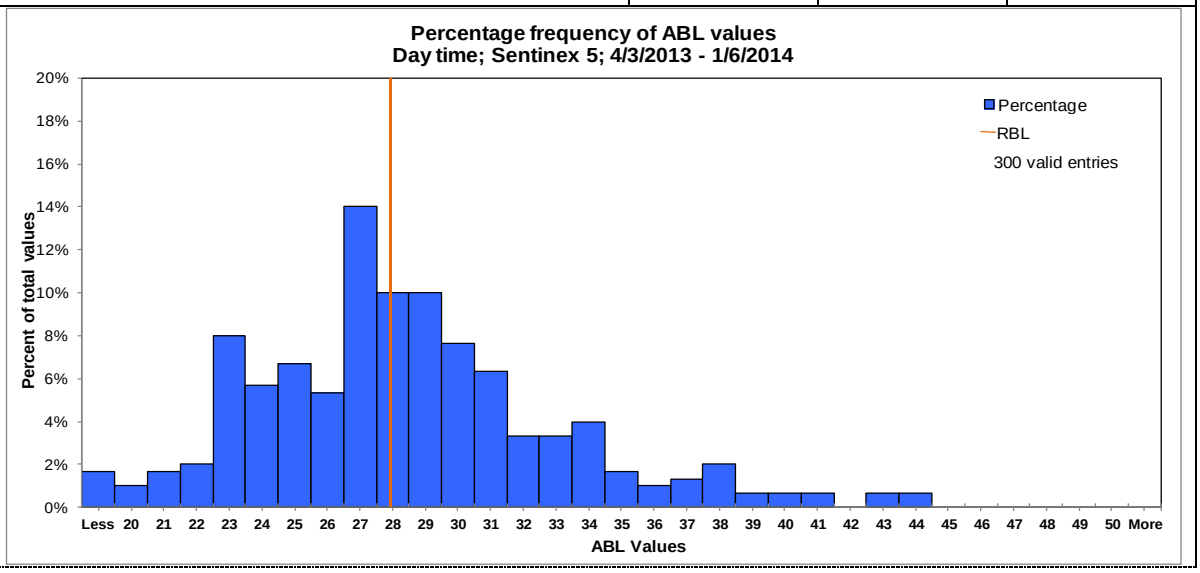



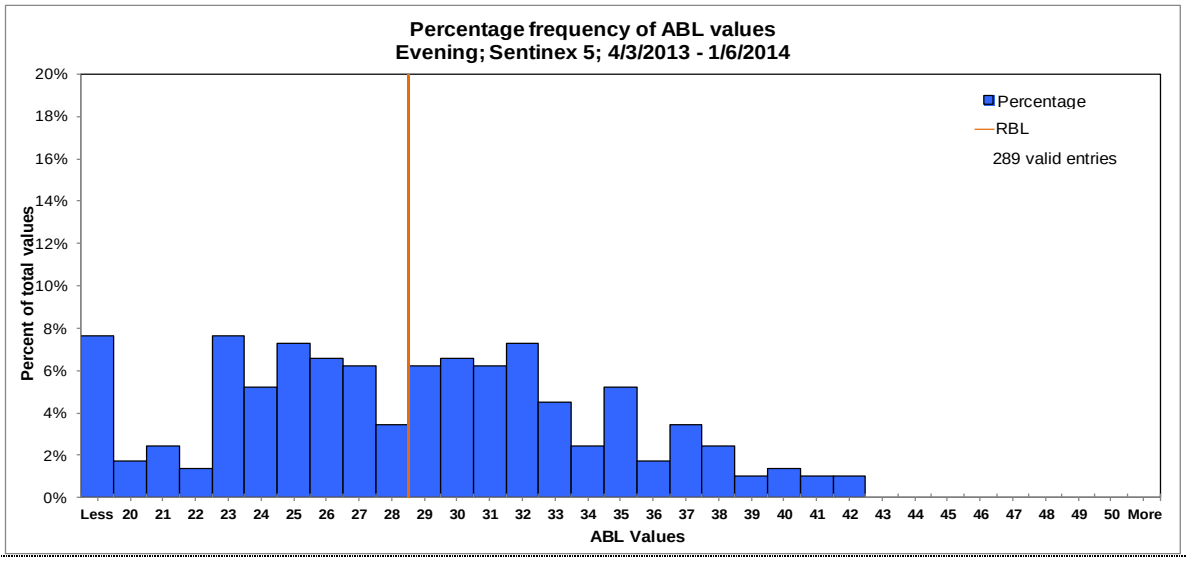
| INP Analysis | | | |
|---|---|---|---|
| **RBL** | **34.0** | **34.9** | **34.7** |
| **Intrusiveness Criteria** | **39** | **39 (40) [1]** | **39 (40) [2]** |
| Recommended $L_{Aeq}$ | 50 | 45 | 40 |
| **Mean Measured $L_{Aeq}$ (All Sources)** | **47.2** | **45.8** | **44.8** |
| Estimated Mean $L_{Aeq}$ (Non-industrial) | 46.9 | 45.3 | 44 |
| Estimated Mean $L_{Aeq}$ (All Industrial) | 36 | 36 | 37 |
| Estimated Mean $L_{Aeq}$ (Other Industrial) | 36 | 36 | 37 |
| Mean Industrial $L_{Aeq}$ minus Recommended $L_{Aeq}$ | <-6 | <-6 | -3 |
| Mod Req'd (INP Table 2.2) to ANL | 0 | 0 | -3 |
| **Amenity Criteria** | **50** | **45** | **37** |
| Day time noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | |
| Evening noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | |
| Night time noise level is 3dB below the recommended level therefore set at the recommended level less 3 dB | | | |
| **Project Specific Noise Level** | **39** | **39** | **37** |

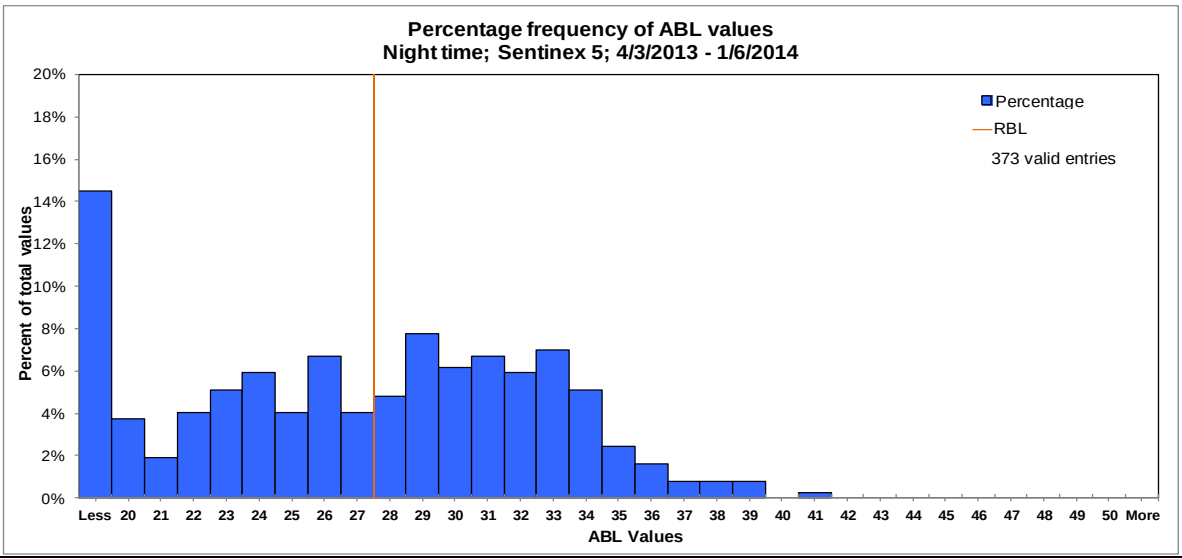
Note: '-' denotes wind or rain effected results excluded in accordance with the INP
Note 1: Where the day time is quieter than the evening set the evening at the daytime level
Note 2: Where the evening is quieter than the night time set the night time at the evening level

## Table 6 – Monitoring Location SX5, RBL and Mean $L_{Aeq}$, dB(A)

| INP Stats | Day | Evening | Night |
|---|---|---|---|
| **Mean $L_{Aeq}$** | **47.7** | **40.6** | **38.1** |
| **RBL** | **27.9** | **28.5** | **27.5** |





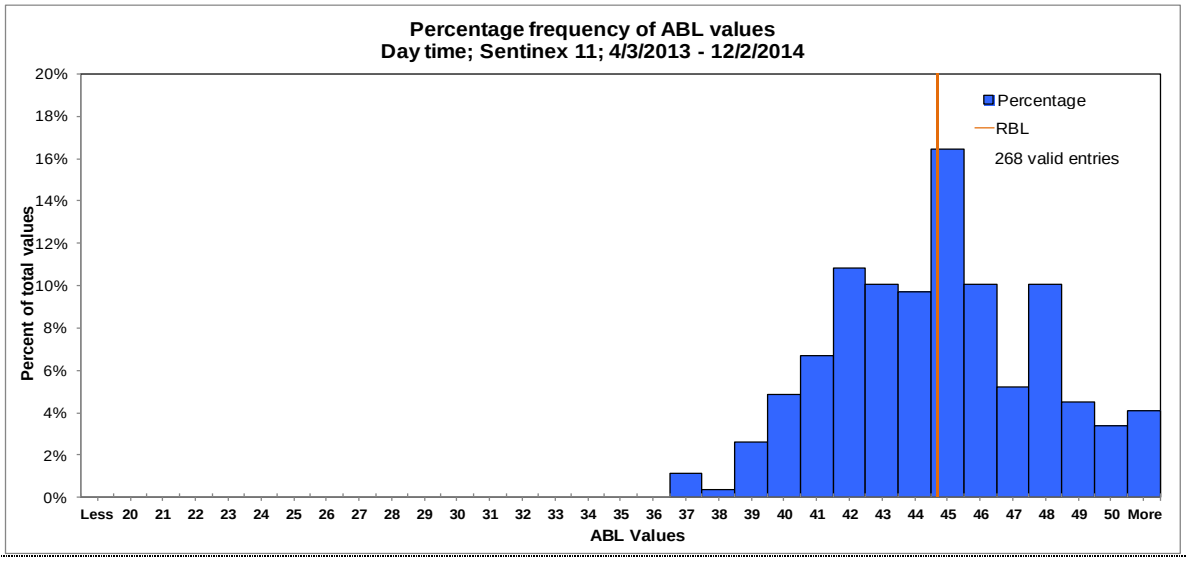



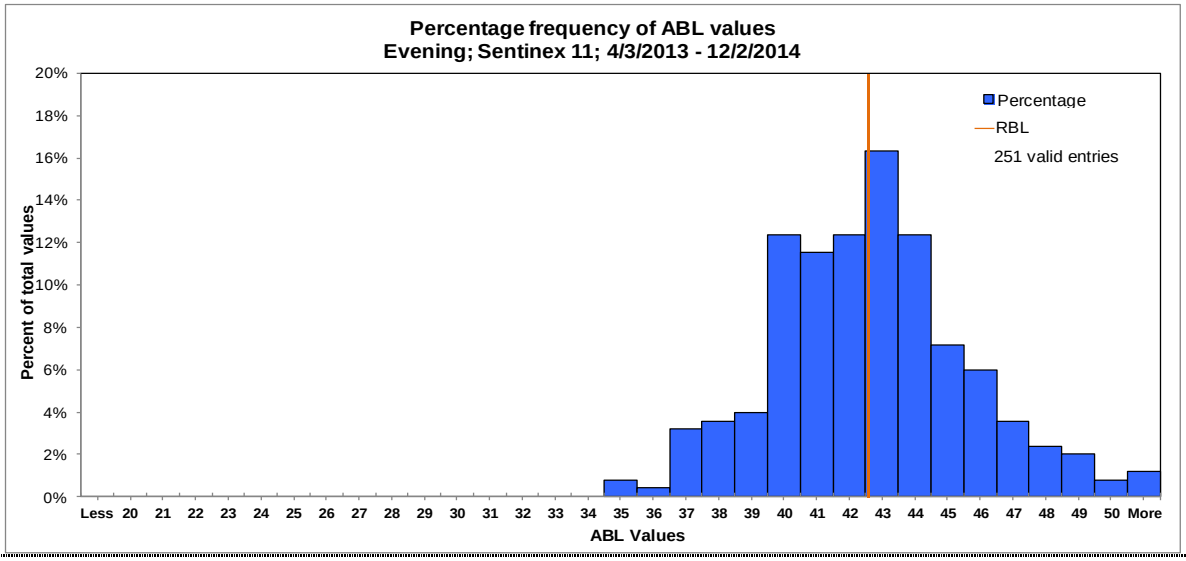

| INP Analysis | | | |
|---|---|---|---|
| **RBL** | **30 (27.9) [1]** | **30 (28.5) [1]** | **30 (27.5) [1]** |
| **Intrusiveness Criteria** | **35** | **35** | **35** |
| Recommended $L_{Aeq}$ | 50 | 45 | 40 |
| **Mean Measured $L_{Aeq}$ (All Sources)** | **47.7** | **40.6** | **38.1** |
| Estimated Mean $L_{Aeq}$ (Non-industrial) | 47 | 38 | 30 |
| Estimated Mean $L_{Aeq}$ (All Industrial) | 37 | 37 | 38 |
| Estimated Mean $L_{Aeq}$ (Other Industrial) | 32 | 32 | 33 |
| Mean Industrial $L_{Aeq}$ minus Recommended $L_{Aeq}$ | <-6 | <-6 | <-6 |
| Mod Req'd (INP Table 2.2) to ANL | 0 | 0 | 0 |
| **Amenity Criteria** | **50** | **45** | **40** |
| Day time noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | |
| Evening noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | |
| Night time noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | |
| **Project Specific Noise Level** | **35** | **35** | **35** |

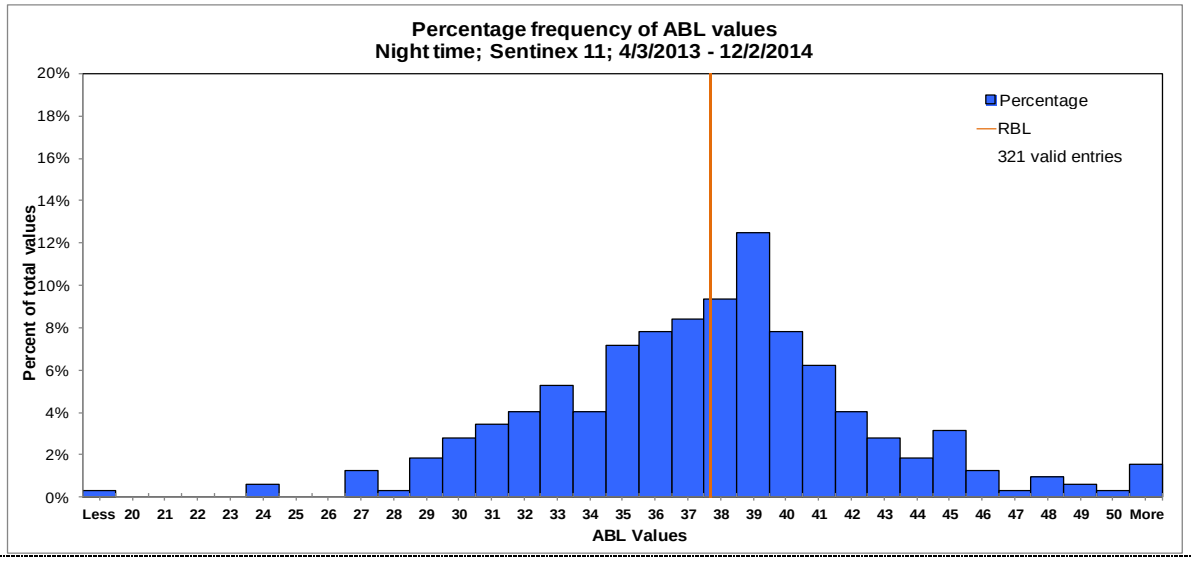
Note: '-' denotes wind or rain effected results excluded in accordance with the INP
Note 1: Where the ABL is less than 30 dB(A) then ABL is set at 30 dB(A

## Table 7 – Monitoring Location SX11, RBL and Mean $L_{Aeq}$, dB(A)

| INP Stats | Day | Evening | Night |
|---|---|---|---|
| **Mean $L_{Aeq}$** | **55.4** | **54.9** | **53.3** |
| **RBL** | **44.7** | **42.6** | **37.7** |



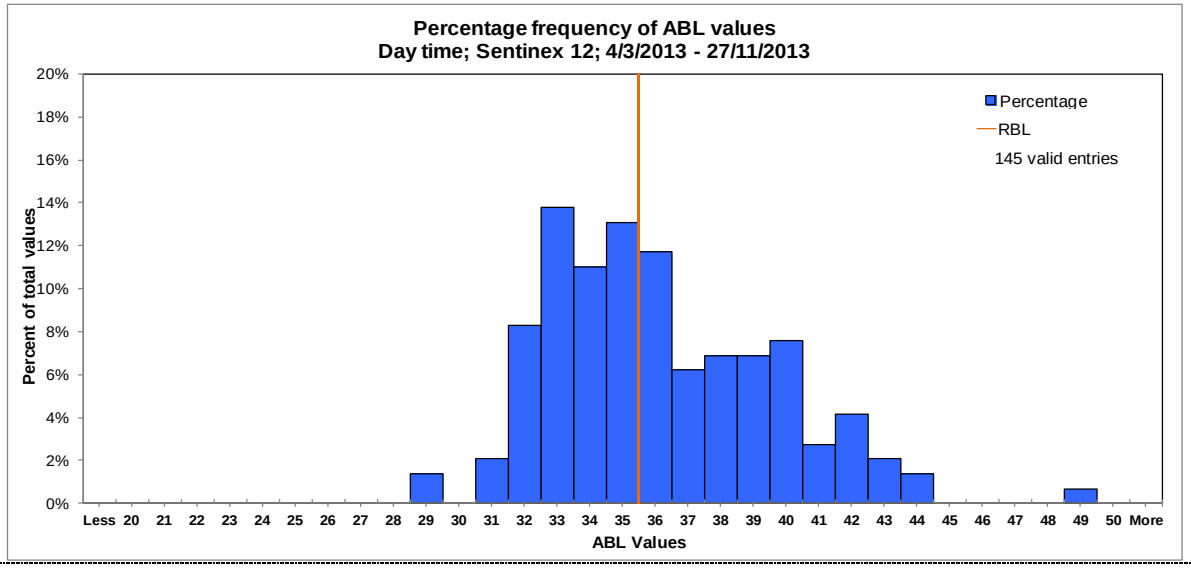



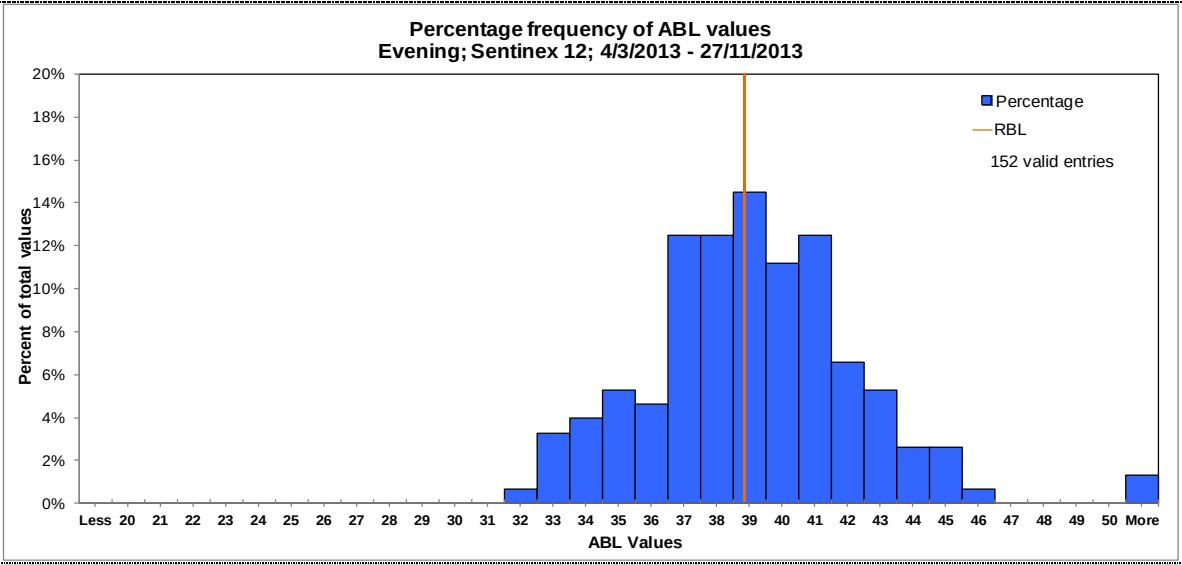
| INP Analysis | | | |
|---|---|---|---|
| **RBL** | **44.7** | **42.6** | **37.7** |
| **Intrusiveness Criteria** | **50** | **48** | **43** |
| Recommended $L_{Aeq}$ | 55 | 45 | 40 |
| **Mean Measured $L_{Aeq}$ (All Sources)** | **55.4** | **54.9** | **53.3** |
| Estimated Mean $L_{Aeq}$ (Non-industrial) | 55 | 55 | 53 |
| Estimated Mean $L_{Aeq}$ (All Industrial) | 31 | 36 | 36 |
| Estimated Mean $L_{Aeq}$ (Other Industrial) | 31 | 36 | 36 |
| Mean Industrial $L_{Aeq}$ minus Recommended $L_{Aeq}$ | <-6 | <-6 | -4 |
| Mod Req'd (INP Table 2.2) to ANL | 0 | 0 | -2 |
| **Amenity Criteria** | **55** | **45** | **38** |
| Day time noise level is more than 6 dB below the recommended level therefore set at the recommended level<br>Evening noise level is more than 6 dB below the recommended level therefore set at the recommended level<br>Night time noise level is 4dB below the recommended level therefore set at the recommended level less 2 dB | | | |
| **Project Specific Noise Level** | **50** | **45** | **37** |

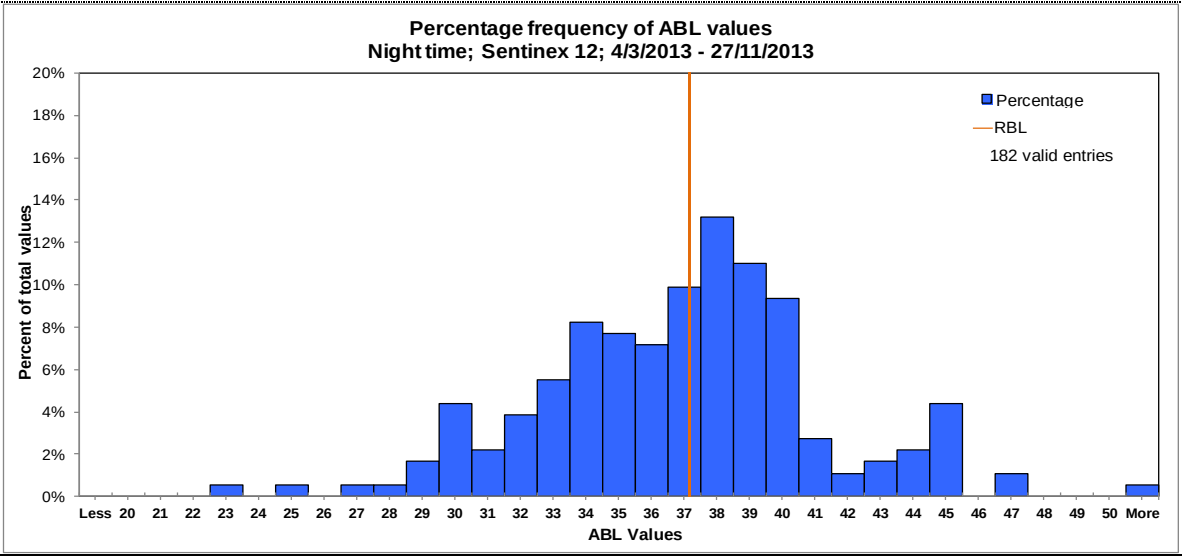
Note: '-' denotes wind or rain effected results excluded in accordance with the INP

## Table 8 – Monitoring Location SX12a, RBL and Mean $L_{Aeq}$, dB(A)

| INP Stats | Day | Evening | Night |
|---|---|---|---|
| **Mean $L_{Aeq}$** | **46.4** | **46.9** | **48.6** |
| **RBL** | **35.5** | **38.8** | **37.2** |





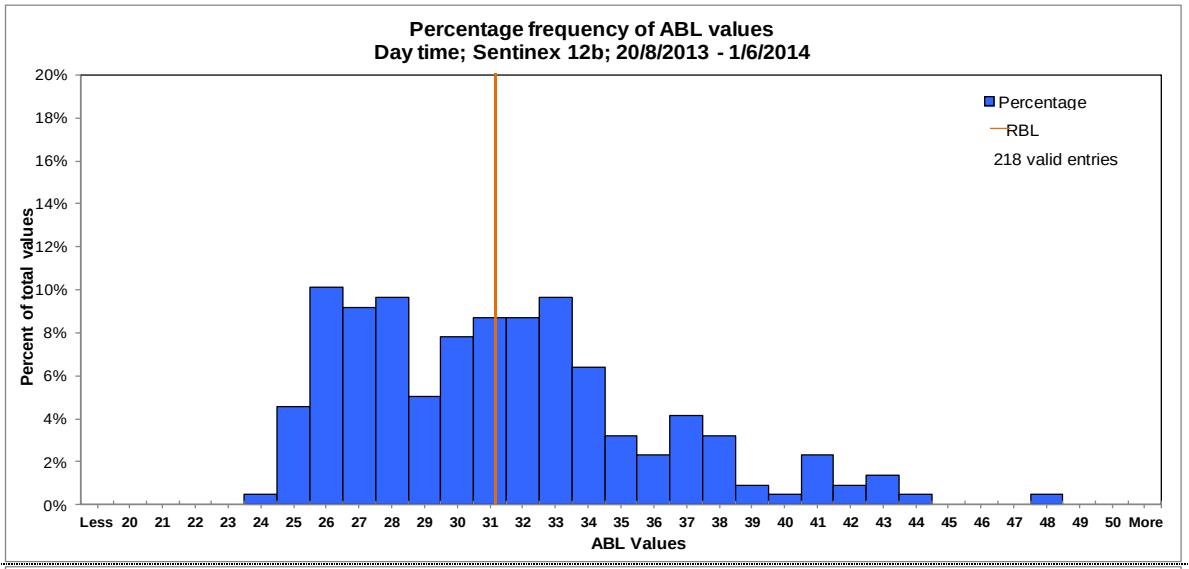

**INP Analysis**

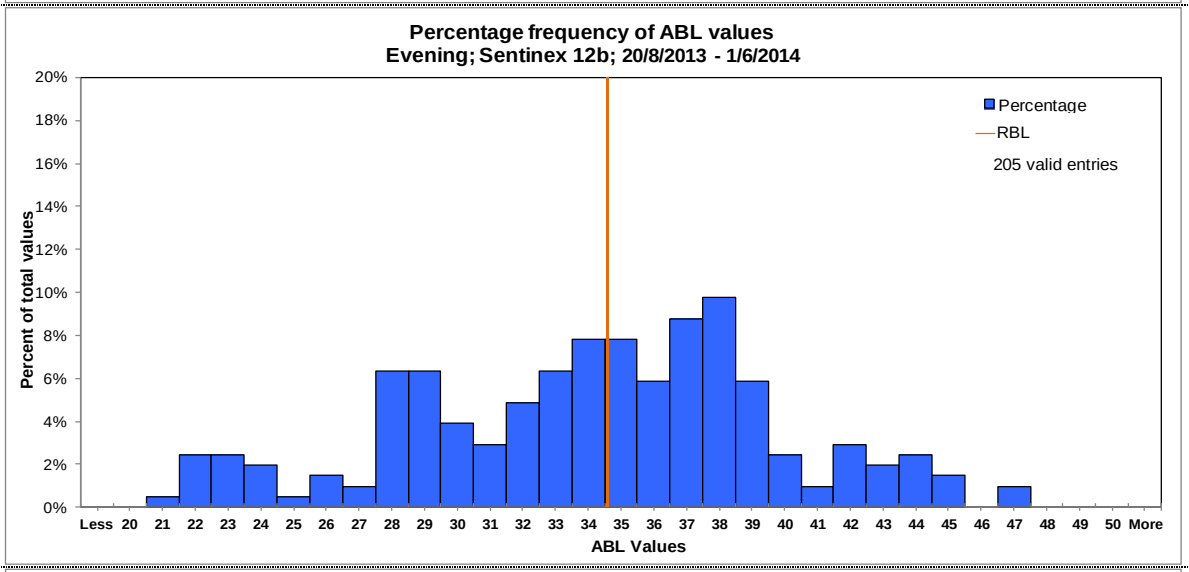
| | | | |
|---|---|---|---|
| **RBL** | **35.5** | **38.8** | **37.2** |
| **Intrusiveness Criteria** | **41** | **41 (44)** [1] | **40 (42)** [2] |
| Recommended $L_{Aeq}$ | 50 | 45 | 40 |
| **Mean Measured $L_{Aeq}$ (All Sources)** | **46.4** | **46.9** | **48.6** |
| Estimated Mean $L_{Aeq}$ (Non-industrial) | 46 | 47 | 48 |
| Estimated Mean $L_{Aeq}$ (All Industrial) | 37 | 37 | 38 |
| Estimated Mean $L_{Aeq}$ (Other Industrial) | 37 | 37 | 38 |
| Mean Industrial $L_{Aeq}$ minus Recommended $L_{Aeq}$ | <-6 | <-6 | -2 |
| Mod Req'd (INP Table 2.2) to ANL | 0 | 0 | -4 |
| **Amenity Criteria** | **50** | **45** | **36** |
| Day time noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | |
| Evening noise level is more than 6 dB below the recommended level therefore at the recommended level | | | |
| Night time noise level is 1.9dB below the recommended level therefore at the recommended level less 6 dB | | | |
| **Project Specific Noise Level** | **41** | **41** | **40/36** [3] |

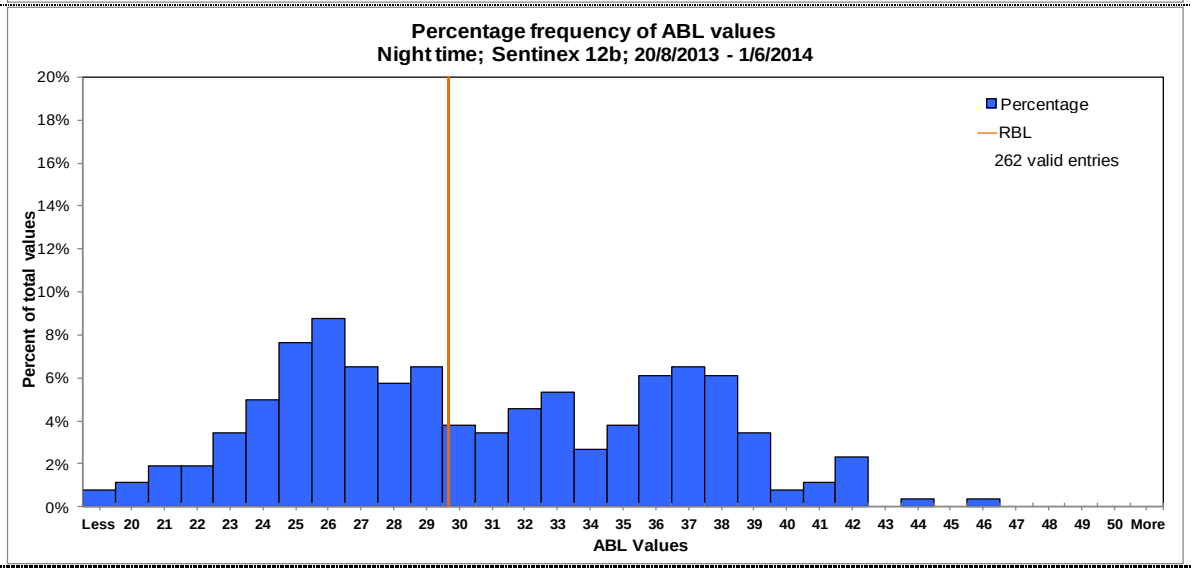
Note: '-' denotes wind or rain effected results excluded in accordance with the INP
Note 1: Where the day time is quieter than the evening set the evening at the daytime level
Note 2: Where the evening is quieter than the night time set the night time at the evening level
Note 3: Criteria 40 dB(A) $L_{Aeq,15minute}$ and 36 dB(A) LAeq,night.

## Table 9 – Monitoring Location SX12b, RBL and Mean $L_{Aeq}$, dB(A)

| INP Stats | Day | Evening | Night |
|---|---|---|---|
| **Mean $L_{Aeq}$** | **47.1** | **46.0** | **42.2** |
| **RBL** | **31.1** | **34.6** | **29.7** |



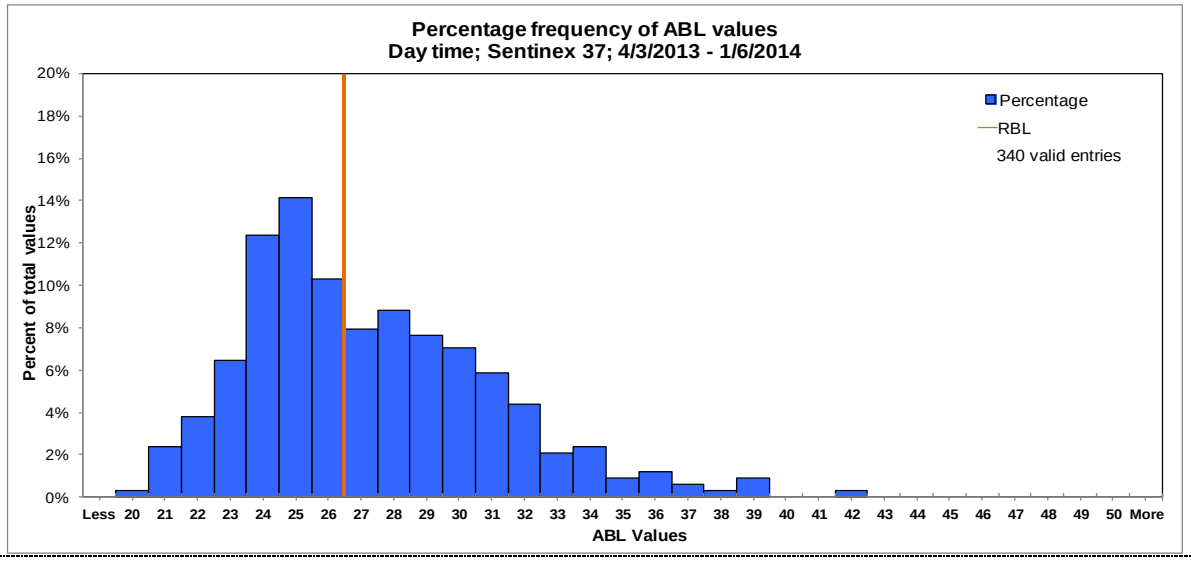



| INP Analysis | | | |
|---|---|---|---|
| **RBL** | **31.1** | **34.6** | **30 (29.7)** |
| **Intrusiveness Criteria** | **36** | **36 (40) [1]** | **35** |
| Recommended $L_{Aeq}$ | 50 | 45 | 40 |
| **Mean Measured $L_{Aeq}$ (All Sources)** | **47.1** | **46.0** | **42.2** |
| Estimated Mean $L_{Aeq}$ (Non-industrial) | 47 | 45 | 41 |
| Estimated Mean $L_{Aeq}$ (All Industrial) | 37 | 37 | 36 |
| Estimated Mean $L_{Aeq}$ (Other Industrial) | 37 | 37 | 36 |
| Mean Industrial $L_{Aeq}$ minus Recommended $L_{Aeq}$ | <-6 | <-6 | -4 |
| Mod Req'd (INP Table 2.2) to ANL | 0 | 0 | -2 |
| **Amenity Criteria** | **50** | **45** | **38** |
| Day time noise level is more than 6 dB below the recommended level therefore set at the recommended level<br>Evening noise level is more than 6 dB below the recommended level therefore at the recommended level<br>Night time noise level is 1.9dB below the recommended level therefore at the recommended level less 6 dB | | | |
| **Project Specific Noise Level** | **36** | **36** | **35** |

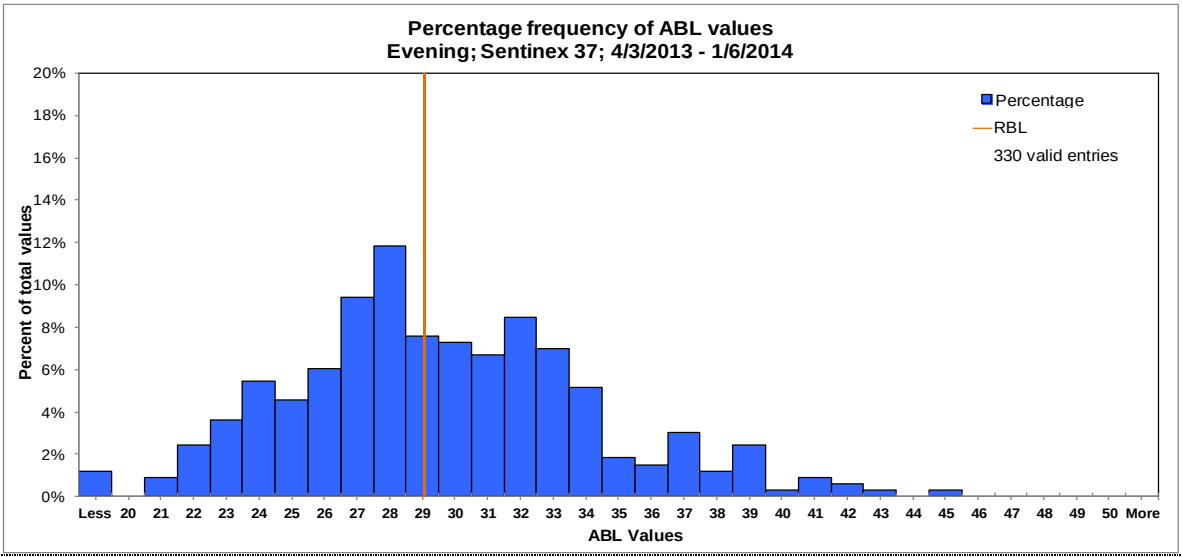
Note: '-' denotes wind or rain effected results excluded in accordance with the INP
Note 1: Where the day time is quieter than the evening set the evening at the daytime level

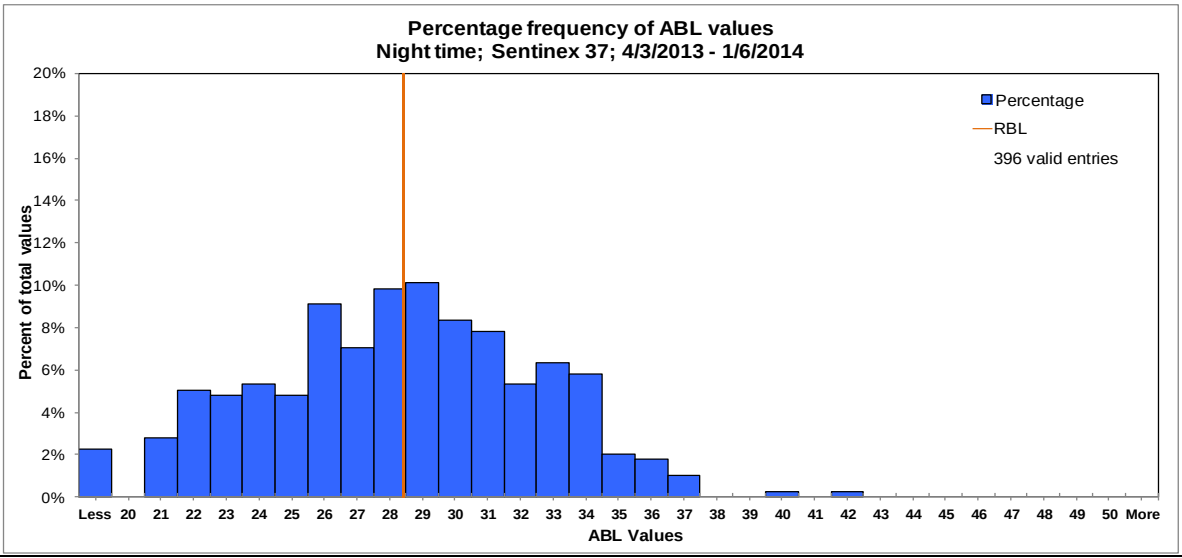
## Table 10 – Monitoring Location SX37, RBL and Mean $L_{Aeq}$, dB(A)

| INP Stats | Day | Evening | Night |
|---|---|---|---|
| **Mean $L_{Aeq}$** | **45.1** | **42.1** | **38.8** |
| **RBL** | **26.5** | **29.1** | **28.4** |



| INP Stats | Day | Evening | Night |
|---|---|---|---|




| INP Analysis | | | |
|---|---|---|---|
| **RBL** | **30 (26.5) [1]** | **30 (29.1) [1]** | **30 (28.4) [1]** |
| **Intrusiveness Criteria** | **35** | **35** | **35** |
| Recommended $L_{Aeq}$ | 50 | 45 | 40 |
| **Mean Measured $L_{Aeq}$ (All Sources)** | **45.1** | **42.1** | **38.8** |
| Estimated Mean $L_{Aeq}$ (Non-industrial) | 44 | 40 | 34 |
| Estimated Mean $L_{Aeq}$ (All Industrial) | 36 | 37 | 37 |
| Estimated Mean $L_{Aeq}$ (Other Industrial) | 35 | 35 | 35 |
| Mean Industrial $L_{Aeq}$ minus Recommended $L_{Aeq}$ | <-6 | <-6 | -5 |
| Mod Req'd (INP Table 2.2) to ANL | 0 | 0 | -2 |
| **Amenity Criteria** | **50** | **45** | **38** |
| Day time noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | |
| Evening noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | |
| Night time noise level is 5dB below the recommended level therefore set at the recommended level less 2 dB | | | |
| **Project Specific Noise Level** | **35** | **35** | **35** |

Note: '-' denotes wind or rain effected results excluded in accordance with the INP
Note 1: Where the ABL is less than 30 dB(A) then ABL is set at 30 dB(A)

## Table 11 – Monitoring Location C1, RBL and Mean $L_{Aeq}$, dB(A)

| INP Stats | | Day | Evening | Night |
|---|---|---|---|---|
| **Mean $L_{Aeq}$** | | **44.3** | **42.8** | **39.8** |
| **RBL** | | **30.1** | **34.1** | **32.2** |
| ABL | 17/06/2013 | 32.4 | 34.7 | 32.1 |
| | 18/06/2013 | 31.7 | 34.2 | 34.6 |
| | 19/06/2013 | 33.5 | 32.6 | 33.5 |
| | 20/06/2013 | 30.8 | 31.8 | 30.7 |
| | 21/06/2013 | 32.0 | 32.9 | 30.0 |
| | 22/06/2013 | 31.6 | 33.1 | 32.4 |
| | 23/06/2013 | 29.2 | 32.6 | 32.1 |
| | 24/06/2013 | 30.9 | 35.3 | 30.9 |
| | 25/06/2013 | 30.4 | 33.4 | 32.7 |
| | 26/06/2013 | 35.4 | 36.5 | 35.5 |
| | 27/06/2013 | 36.3 | 34.1 | 31.5 |
| | 28/06/2013 | 30.1 | - | 28.4 |
| | 29/06/2013 | 29.8 | - | 31.8 |
| | 30/06 – 7/07/2013 | - | - | - |
| | 8/07/2013 | 24.6 | 29.4 | 30.7 |
| | 9/07/2013 | 32.0 | 32.4 | 33.4 |
| | 10/07/2013 | 27.9 | 27.9 | 29.7 |
| | 11/07/2013 | 26.1 | 35.6 | 27.1 |
| | 12/07/2013 | 28.8 | 33.7 | 30.2 |
| | 13/07/2013 | 24.9 | 36.2 | 27.2 |
| | 14/07/2013 | 25.6 | 35.1 | 32.9 |
| | 15/07/2013 | 28.8 | 36.1 | 33.0 |
| | 16/07/2013 | 28.3 | 38.6 | 36.1 |
| | 17/07/2013 | 28.0 | 38.1 | 33.5 |
| | 18/07/2013 | 28.4 | 39.1 | 32.4 |
| | 19/07/2013 | 31.7 | 37.5 | 34.7 |
| | 20/07/2013 | 32.0 | - | - |
| | 21/07/2013 | - | 33.8 | 32.4 |
| | 22/07/2013 | 36.9 | 34.8 | 32.8 |
| | 23/07/2013 | - | 33.4 | 33.6 |
| | 24/07/2013 | 31.6 | 35.1 | 30.8 |
| | 25/07/2013 | 24.9 | 33.9 | 30.7 |
| | 26/07/2013 | 33.6 | 31.5 | 27.0 |
| | 27/07/2013 | 24.2 | 27.4 | 25.8 |
| | 28/07/2013 | 24.0 | 32.2 | 31.7 |
| | 29/07/2013 | 24.9 | 32.7 | 31.4 |
| | 30/07/2013 | 27.1 | 35.6 | 34.2 |
| | 31/07/2013 | 31.6 | 39.2 | 35.6 |
| | 1/08/2013 | 26.9 | 34.8 | 31.4 |
| | 2/08/2013 | 37.1 | 36.5 | 33.2 |
| | 3/08/2013 | - | - | - |
| | 4/08/2013 | - | - | 35.4 |

| INP Stats | Day | Evening | Night |
|---|---|---|---|
| 5/08/2013 | - | - | - |
| **INP Analysis** | | | |
| **RBL** | **30.1** | **34.1** | **32.2** |
| **Intrusiveness Criteria** | **35** | **35 (39) [1]** | **35 (37) [2]** |
| Recommended $L_{Aeq}$ | 50 | 45 | 40 |
| **Mean Measured $L_{Aeq}$ (All Sources)** | **44.3** | **42.8** | **39.8** |
| Estimated Mean $L_{Aeq}$ (Non-industrial) | 43 | 41 | 38 |
| Estimated Mean $L_{Aeq}$ (All Industrial) | 38 | 38 | 35 |
| Estimated Mean $L_{Aeq}$ (Other Industrial) | 37 | 37 | 34 |
| Mean Industrial $L_{Aeq}$ minus Recommended $L_{Aeq}$ | <-6 | <-6 | <-6 |
| Mod Req'd (INP Table 2.2) to ANL | 0 | 0 | 0 |
| **Amenity Criteria** | **50** | **45** | **40** |
| Day time noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | |
| Evening noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | |
| Night time noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | |
| **Project Specific Noise Level** | **35** | **35** | **35** |

Note: '-' denotes wind or rain effected results excluded in accordance with the INP
Note 1: Where the day time is quieter than the evening set the evening at the daytime level
Note 2: Where the evening is quieter than the night time set the night time at the evening level

## Table 12 – Monitoring Location C2, RBL and Mean $L_{Aeq}$, dB(A)

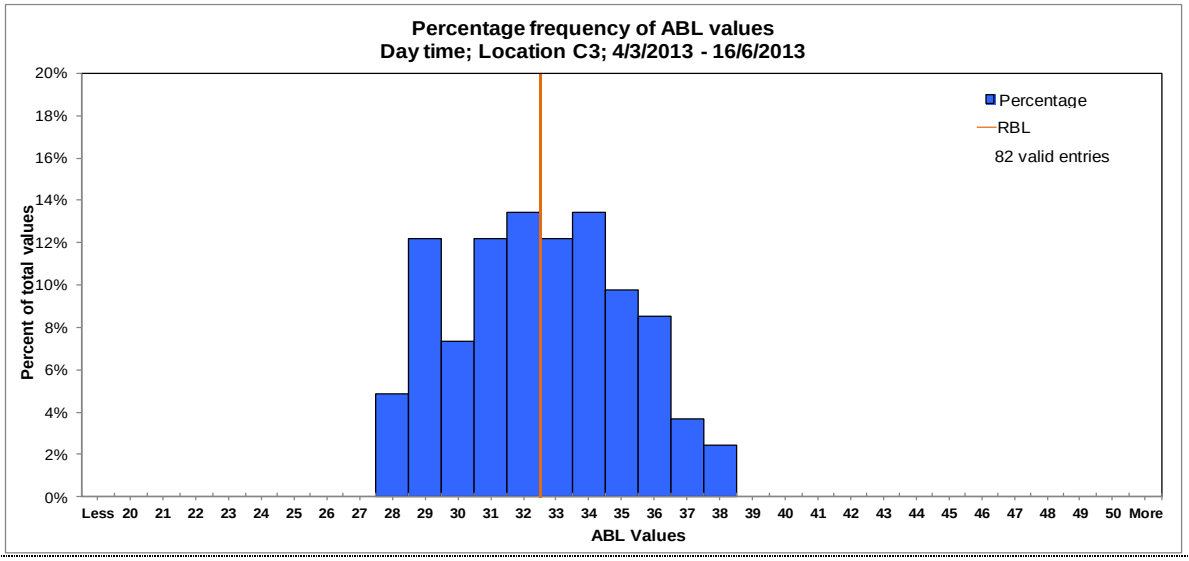
| INP Stats | Day | Evening | Night |
|---|---|---|---|
| **Mean $L_{Aeq}$** | **42.5** | **42.0** | **39.1** |
| **RBL** | **34.5** | **31.6** | **30.6** |
| ABL 7/08/2013 | 31.0 | - | 29.7 |
| 8/08/2013 | - | 34.2 | 31.1 |
| 9/08/2013 | - | - | - |
| 10/08/2013 | - | - | 30.0 |
| 11/08/2013 | 34.4 | 32.0 | 32.3 |
| 12/08/2013 | - | - | - |
| 13/08/2013 | - | 32.1 | 32.0 |
| 14/08/2013 | 35.9 | 31.6 | - |
| 15/08/2013 | - | 23.7 | 27.3 |
| 16/08/2013 | 28.3 | 30.8 | 33.8 |
| 17/08/2013 | 34.6 | - | 26.6 |
| 18/08/2013 | - | 31.6 | 30.6 |
| 19/08/2013 | - | - | - |
| **INP Analysis** | | | |
| **RBL** | **34.5** | **31.6** | **30.6** |
| **Intrusiveness Criteria** | **40** | **37** | **36** |
| Recommended $L_{Aeq}$ | 50 | 45 | 40 |
| **Mean Measured $L_{Aeq}$ (All Sources)** | **42.5** | **42.0** | **39.1** |
| Estimated Mean $L_{Aeq}$ (Non-industrial) | 40 | 39 | 35 |
| Estimated Mean $L_{Aeq}$ (All Industrial) | 38 | 39 | 37 |
| Estimated Mean $L_{Aeq}$ (Other Industrial) | 37 | 38 | 35 |
| Mean Industrial $L_{Aeq}$ minus Recommended $L_{Aeq}$ | <-6 | <-6 | -5 |

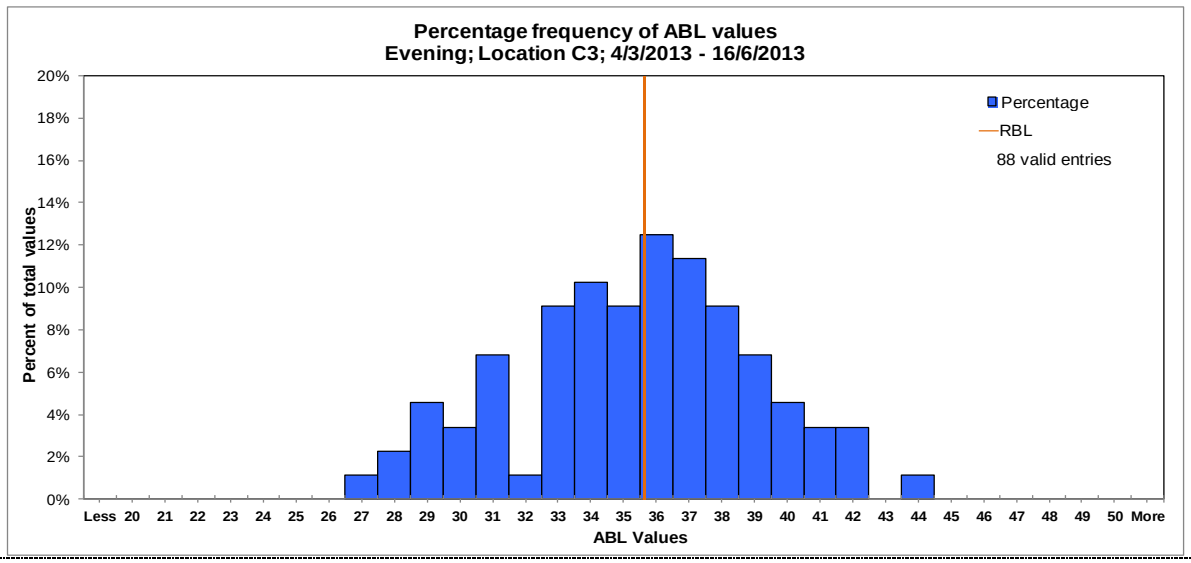
| INP Stats | Day | Evening | Night |
|---|---|---|---|
| Mod Req'd (INP Table 2.2) to ANL | 0 | 0 | -2 |
| **Amenity Criteria** | **50** | **45** | **38** |
| Day time noise level is more than 6 dB below the recommended level therefore set at the recommended level<br>Evening noise level is more than 6 dB below the recommended level therefore set at the recommended level<br>Night time noise level is 5dB below the recommended level therefore set at the recommended level less 2 dB | | | |
| **Project Specific Noise Level** | **40** | **37** | **36** |

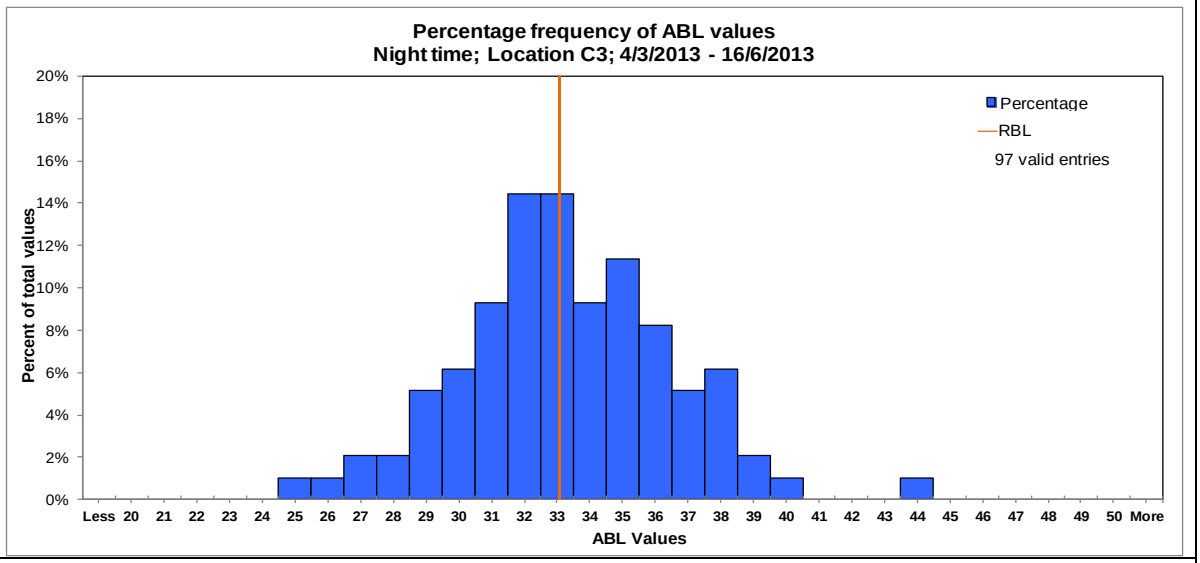
Note: '-' denotes wind or rain effected results excluded in accordance with the INP

## Table 13 – Monitoring Location C3, RBL and Mean $L_{Aeq}$, dB(A)

| INP Stats | Day | Evening | Night |
|---|---|---|---|
| **Mean $L_{Aeq}$** | **50.8** | **46.1** | **41.9** |
| **RBL** | **32.5** | **35.7** | **33.1** |






| INP Analysis | | | |
|---|---|---|---|
| **RBL** | **32.5** | **35.7** | **33.1** |
| **Intrusiveness Criteria** | **37** | **37 (41)** [1] | **37 (38)** [2] |
| Recommended $L_{Aeq}$ | 50 | 45 | 40 |
| **Mean Measured $L_{Aeq}$ (All Sources)** | **50.8** | **46.1** | **41.9** |
| Estimated Mean $L_{Aeq}$ (Non-industrial) | 51 | 45 | 40 |
| Estimated Mean $L_{Aeq}$ (All Industrial) | 39 | 38 | 37 |
| Estimated Mean $L_{Aeq}$ (Other Industrial) | 38 | 37 | 36 |
| Mean Industrial $L_{Aeq}$ minus Recommended $L_{Aeq}$ | <-6 | <-6 | -4 |
| Mod Req'd (INP Table 2.2) to ANL | 0 | 0 | -2 |
| **Amenity Criteria** | **50** | **45** | **38** |
| Day time noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | |
| Evening noise level is more than 6 dB below the recommended level therefore at the recommended level | | | |
| Night time noise level is 3.8dB below the recommended level therefore at the recommended level less 3 dB | | | |
| **Project Specific Noise Level** | **37** | **37** | **37** |

Note: '-' denotes wind or rain effected results excluded in accordance with the INP
Note 1: Where the day time is quieter than the evening set the evening at the daytime level
Note 2: Where the evening is quieter than the night time set the night time at the evening level

## Table 14 – Monitoring Location C4, RBL and Mean $L_{Aeq}$, dB(A)

| INP Stats | | Day | Evening | Night |
|---|---|---|---|---|
| **Mean $L_{Aeq}$** | | **42.8** | **37.5** | **35.7** |
| **RBL** | | **27.3** | **31.7** | **29.5** |
| ABL | 11/06/2013 | 31.5 | 29.9 | 28.4 |
| | 12/06 – 1/07/2013 | - | - | - |
| | 2/07/2013 | 26.3 | 33.1 | 29.8 |
| | 3/07/2013 | 29.8 | 34.0 | 29.5 |
| | 4/07/2013 | - | 35.3 | 33.5 |
| | 5/07/2013 | - | - | 28.7 |
| | 6/07/2013 | - | - | 29.8 |
| | 7/07/2013 | 27.9 | 28.8 | 31.0 |
| | 8/07/2013 | 25.2 | 29.8 | 27.0 |
| | 9/07/2013 | 27.0 | 26.0 | 22.3 |
| | 10/07/2013 | 27.5 | 28.7 | 29.2 |
| | 11/07/2013 | 26.6 | 31.7 | 30.8 |
| | 12/07/2013 | 30.3 | 35.3 | 32.1 |
| | 13/07/2013 | 27.1 | 31.6 | 29.0 |
| | 14/07/2013 | 26.8 | 33.8 | 33.3 |
| | 15/07/2013 | 30.3 | 36.9 | 3.1 |
| | 16/07/2013 | - | - | - |
| **INP Analysis** | | | | |
| **RBL** | | **30 (27.3) [1]** | **31.7** | **30 (29.5) [1]** |
| **Intrusiveness Criteria** | | **35** | **35 (37) [2]** | **35** |
| Recommended $L_{Aeq}$ | | 50 | 45 | 40 |
| **Mean Measured $L_{Aeq}$ (All Sources)** | | **42.8** | **37.5** | **35.7** |
| Estimated Mean $L_{Aeq}$ (Non-industrial) | | 42 | 35 | 33 |
| Estimated Mean $L_{Aeq}$ (All Industrial) | | 35 | 34 | 33 |
| Estimated Mean $L_{Aeq}$ (Other Industrial) | | 34 | 33 | 31 |
| Mean Industrial $L_{Aeq}$ minus Recommended $L_{Aeq}$ | | <-6 | <-6 | <-6 |
| Mod Req'd (INP Table 2.2) to ANL | | 0 | 0 | 0 |
| **Amenity Criteria** | | **50** | **45** | **40** |
| Day time noise level is more than 6 dB below the recommended level therefore set at the recommended level<br>Evening noise level is more than 6 dB below the recommended level therefore set at the recommended level<br>Night time noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | | |
| **Project Specific Noise Level** | | **38** | **38** | **37** |

Note: '-' denotes wind or rain effected results excluded in accordance with the INP
Note 1: Where the ABL is less than 30 dB(A) then ABL is set at 30 dB(A)
Note 2: Where the day time is quieter than the evening set the evening at the daytime level

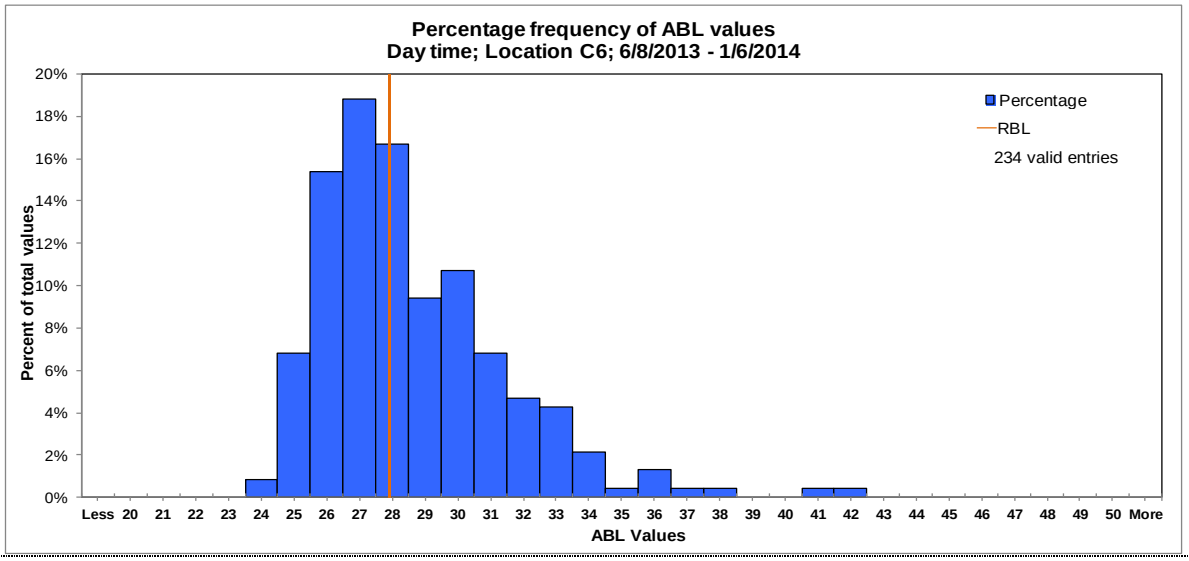
## Table 15 – Monitoring Location C5, RBL and Mean $L_{Aeq}$, dB(A)

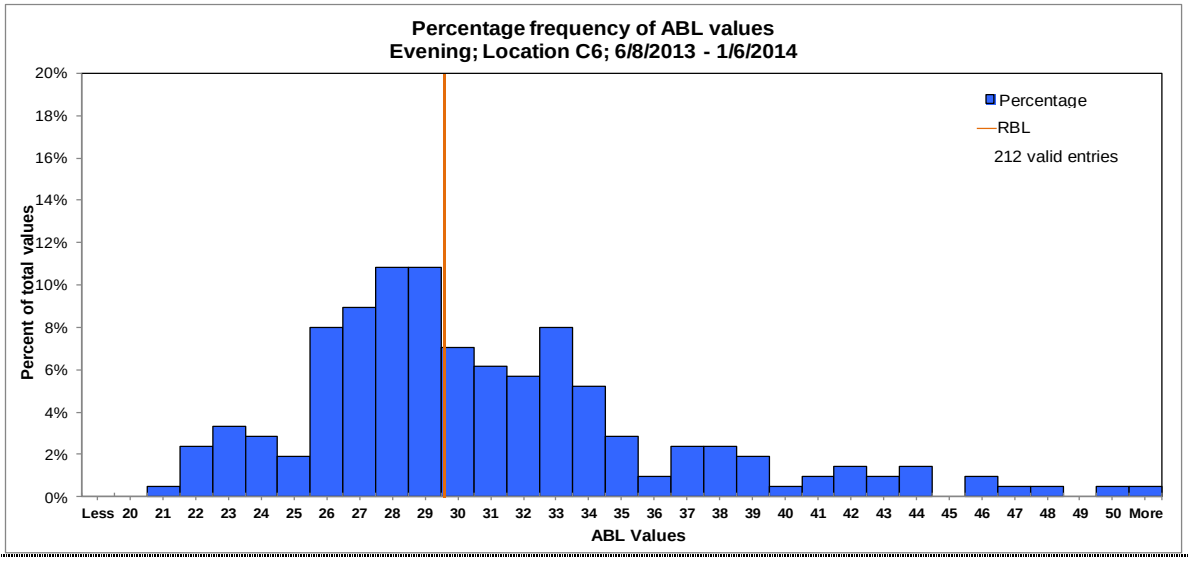
| INP Stats | | Day | Evening | Night |
|---|---|---|---|---|
| **Mean $L_{Aeq}$** | | **42.6** | **39.6** | **37.6** |
| **RBL** | | **31.5** | **35.3** | **33.6** |
| ABL | 30/07/2013 | 29.8 | 35.3 | 34.0 |
| | 31/07/2013 | 33.2 | 37.3 | 35.6 |
| | 1/08/2013 | 27.9 | 33.2 | 31.2 |
| | 2/08/2013 | 36.3 | 37.6 | 33.6 |
| | 3/08/2013 | - | - | - |
| | 4/08/2013 | - | - | 31.5 |
| | 5/08/2013 | - | - | 34.0 |
| | 6/08/2013 | - | 34.1 | 31.8 |
| | 7/08/2013 | - | - | - |
| **INP Analysis** | | | | |
| **RBL** [1] | | **31.5** | **35.3** | **33.6** |
| **Intrusiveness Criteria** | | **37** | **37 (40)** [1] | **37 (39)** [2] |
| Recommended $L_{Aeq}$ | | 50 | 45 | 40 |
| **Mean Measured $L_{Aeq}$ (All Sources)** | | **42.6** | **39.6** | **37.6** |
| Estimated Mean $L_{Aeq}$ (Non-industrial) | | 42 | 38 | 36 |
| Estimated Mean $L_{Aeq}$ (All Industrial) | | 36 | 35 | 33 |
| Estimated Mean $L_{Aeq}$ (Other Industrial) | | 35 | 34 | 31 |
| Mean Industrial $L_{Aeq}$ minus Recommended $LA_{eq}$ | | <-6 | <-6 | <-6 |
| Mod Req'd (INP Table 2.2) to ANL | | 0 | 0 | 0 |
| **Amenity Criteria** | | **50** | **45** | **40** |
| Day time noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | | |
| Evening noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | | |
| Night time noise level is more than 6 dB below the recommended level therefore set at the recommended level | | | | |
| **Project Specific Noise Level** | | **37** | **37** | **37** |

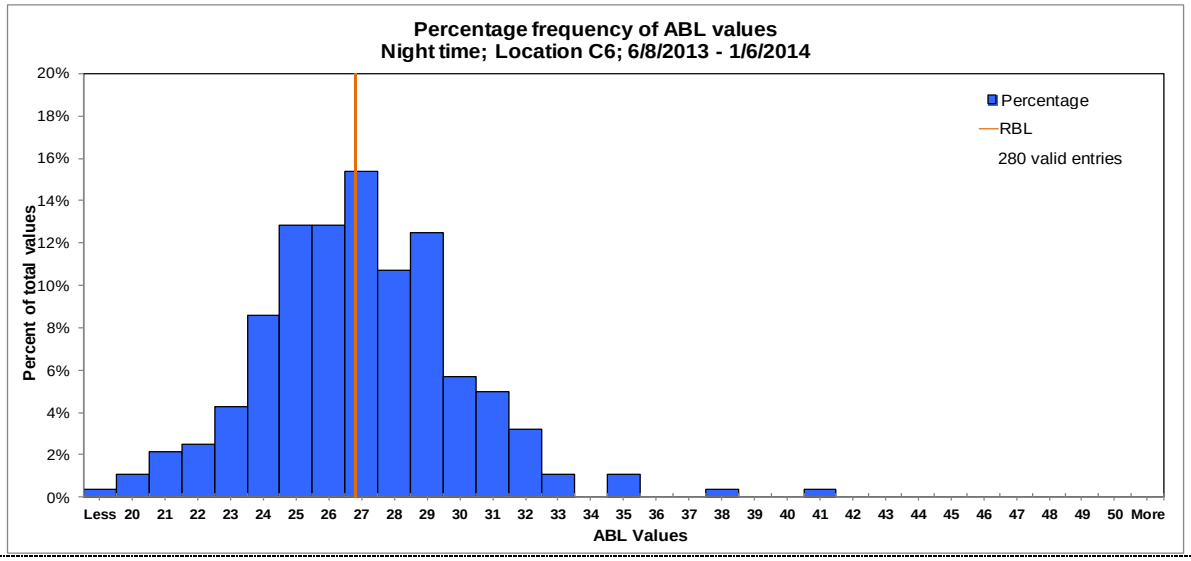
Note: '-' denotes wind or rain effected results excluded in accordance with the INP
Note 1: Where the day time is quieter than the evening set the evening at the daytime level
Note 2: Where the evening is quieter than the night time set the night time at the evening level

## Table 16 – Monitoring Location C6, RBL and Mean $L_{Aeq}$, dB(A)

| INP Stats | Day | Evening | Night |
|---|---|---|---|
| **Mean $L_{Aeq}$** | **44.9** | **46.9** | **37.2** |
| **RBL** | **27.9** | **29.6** | **26.8** |



| INP Analysis | | | |
|---|---|---|---|
| **RBL** | **30 (27.9) [1]** | **30 (29.6) [1]** | **30 (26.8) [1]** |
| **Intrusiveness Criteria** | **35** | **35** | **35** |
| Recommended $L_{Aeq}$ | 50 | 45 | 40 |
| **Mean Measured $L_{Aeq}$ (All Sources)** | **44.9** | **46.9** | **37.2** |
| Estimated Mean $L_{Aeq}$ (Non-industrial) | 44 | 46 | 36 |
| Estimated Mean $L_{Aeq}$ (All Industrial) | 37 | 38 | 31 |
| Estimated Mean $L_{Aeq}$ (Other Industrial) | 36 | 37 | 30 |
| Mean Industrial $L_{Aeq}$ minus Recommended $L_{Aeq}$ | <-6 | <-6 | <-6 |
| Mod Req'd (INP Table 2.2) to ANL | 0 | 0 | 0 |
| **Amenity Criteria** | **50** | **45** | **40** |
| Day time noise level is more than 6 dB below the recommended level therefore set at the recommended level<br>Evening noise level is more than 6 dB below the recommended level therefore at the recommended level<br>Night time noise level is more than 6 dB below the recommended level therefore at the recommended level | | | |
| **Project Specific Noise Level** | **35** | **35** | **35** |

Note: '-' denotes wind or rain effected results excluded in accordance with the INP
Note 1: Where the ABL is less than 30 dB(A) then ABL is set at 30 dB(A)

### Attended Noise Monitoring Noise Levels

The results of the attended monitoring programs are presented in **Table 17**. A sample of the attended monitoring results are presented in **Charts 1** to **16** for the monitoring location N9 to N16.

## Table 17 – Summary of Attended Noise Monitoring Noise Levels, dB(A)

| Monitoring Location | LA90,15min | | | | | | | | | | | | LAeq,15min from all sources | | | | | | | | | | | | For Sleep Disturbance | | | | | | | | | | | | Backg round | | other | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 8/06/2012 | 25/07/2012 | 16/08/2012 | 9/10/2012 | 21/11/2012 | 27/12/2012 | 27/02/2013 | 21/05/2013 | 17/07/2013 | 21/08/2013 | Min | Max | 8/06/2012 | 25/07/2012 | 16/08/2012 | 9/10/2012 | 21/11/2012 | 27/12/2012 | 27/02/2013 | 21/05/2013 | 17/07/2013 | 21/08/2013 | Min | Max | 8/06/2012 | 25/07/2012 | 16/08/2012 | 9/10/2012 | 21/11/2012 | 27/12/2012 | 27/02/2013 | 21/05/2013 | 17/07/2013 | 21/08/2013 | Min | Max | Min | Max | Min | Max |
| **Day-time Period** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **N1** | 26 | 30 | 35 | 37 | 27 | 31 | 45 | 47 | - | 29 | 26 | 47 | 53 | 35 | 51 | 49 | 41 | 44 | 48 | 54 | - | 38 | 35 | 54 | - | - | - | - | - | - | - | - | - | - | - | - | 26 | 47 | 34 | 54 |
| **N2** | 31 | 34 | 38 | 31 | 30 | 32 | 48 | 43 | - | 30 | 30 | 48 | 43 | 39 | 46 | 36 | 37 | 39 | 58 | 47 | - | 36 | 36 | 58 | - | - | - | - | - | - | - | - | - | - | - | - | 28 | 48 | 36 | 58 |
| **N3** | 31 | 37 | 43 | 33 | 33 | 40 | 40 | 52 | - | 33 | 31 | 52 | 58 | 57 | 54 | 48 | 57 | 62 | 59 | 62 | - | 50 | 48 | 62 | - | - | - | - | - | - | - | - | - | - | - | - | 31 | 52 | 48 | 62 |
| **N4** | 34 | 37 | 40 | 35 | 29 | 32 | 34 | - | - | 35 | 29 | 40 | 59 | 56 | 57 | 54 | 53 | 52 | 53 | - | - | 61 | 52 | 61 | - | - | - | - | - | - | - | - | - | - | - | - | 29 | 40 | 52 | 61 |
| **N5** | 41 | 42 | 44 | 36 | 36 | 34 | 48 | 45 | - | 42 | 34 | 48 | 55 | 49 | 48 | 45 | 42 | 39 | 53 | 51 | - | 49 | 39 | 55 | - | - | - | - | - | - | - | - | - | - | - | - | 34 | 48 | 39 | 55 |
| **N6** | 46 | 42 | 51 | 38 | 38 | 40 | 41 | - | - | 47 | 38 | 51 | 53 | 49 | 55 | 41 | 41 | 50 | 56 | - | - | 51 | 41 | 56 | - | - | - | - | - | - | - | - | - | - | - | - | 38 | 51 | 41 | 56 |
| **N8** | 43 | 34 | 35 | 34 | 31 | 35 | 41 | 43 | - | 35 | 31 | 43 | 44 | 49 | 40 | 46 | 37 | 41 | 45 | 48 | - | 40 | 37 | 49 | - | - | - | - | - | - | - | - | - | - | - | - | 31 | 43 | 36 | 49 |
| **Evening Period** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **N1** | 35 | 39 | 38 | 36 | 40 | 35 | 37 | 25 | 36 | 33 | 25 | 40 | 58 | 44 | 40 | 51 | 43 | 42 | 40 | 32 | 40 | 48 | 32 | 58 | 81 | 63 | 47 | 70 | 49 | 53 | 53 | 45 | 49 | 70 | 45 | 81 | 25 | 40 | 32 | 58 |
| **N2** | 32 | 38 | 35 | 35 | 33 | 41 | 33 | 31 | 30 | 35 | 30 | 41 | 38 | 41 | 45 | 43 | 45 | 50 | 47 | 40 | 32 | 39 | 32 | 50 | 51 | 52 | 68 | 62 | 63 | 68 | 70 | 54 | 37 | 48 | 37 | 70 | 30 | 41 | 32 | 50 |
| **N3** | 38 | 35 | 35 | 37 | 31 | 39 | 37 | 33 | 31 | 39 | 31 | 39 | 51 | 48 | 53 | 55 | 33 | 53 | 53 | 47 | 32 | 53 | 32 | 55 | 67 | 72 | 77 | 76 | 43 | 73 | 74 | 68 | 39 | 74 | 39 | 77 | 30 | 39 | 25 | 55 |
| **N4** | 40 | 37 | 36 | 40 | 33 | 39 | 45 | 33 | 34 | 38 | 33 | 45 | 50 | 38 | 38 | 43 | 52 | 54 | 46 | 36 | 48 | 53 | 36 | 54 | 74 | 44 | 46 | 49 | 74 | 75 | 49 | 45 | 73 | 76 | 44 | 76 | 33 | 45 | 36 | 54 |
| **N5** | 43 | 41 | 43 | 36 | 36 | 40 | 41 | 42 | 37 | 42 | 36 | 43 | 47 | 47 | 51 | 44 | 47 | 43 | 43 | 45 | 44 | 47 | 43 | 51 | 57 | 62 | 65 | 57 | 67 | 59 | 53 | 51 | 58 | 56 | 51 | 67 | 36 | 43 | 43 | 50 |
| **N6** | 47 | 46 | 45 | 51 | 35 | 41 | 42 | 40 | 41 | 42 | 35 | 51 | 51 | 51 | 49 | 55 | 42 | 46 | 48 | 47 | 46 | 48 | 42 | 55 | 60 | 59 | 61 | 59 | 53 | 60 | 60 | 59 | 61 | 60 | 53 | 61 | 35 | 51 | 42 | 55 |
| **N8** | 41 | 40 | 40 | 39 | 38 | 38 | 43 | 35 | 42 | 36 | 35 | 43 | 44 | 44 | 43 | 43 | 43 | 42 | 49 | 38 | 45 | 41 | 38 | 49 | 53 | 53 | 49 | 51 | 58 | 56 | 63 | 48 | 52 | 54 | 48 | 63 | 35 | 43 | 38 | 49 |
| **N9** | - | - | - | - | - | - | - | - | - | 31 | 31 | 31 | - | - | - | - | - | - | - | - | - | 59 | 59 | 59 | - | - | - | - | - | - | - | - | - | 82 | 82 | 82 | 31 | 31 | 59 | 59 |
| **N10** | - | - | - | - | - | 52 | - | - | - | 31 | 31 | 52 | - | - | - | - | - | 54 | - | - | - | 61 | 54 | 61 | - | - | - | - | - | 64 | - | - | - | 81 | 64 | 81 | 31 | 52 | 54 | 61 |
| **N11** | - | - | - | - | - | 44 | - | - | - | 32 | 32 | 44 | - | - | - | - | - | 54 | - | - | - | 57 | 54 | 57 | - | - | - | - | - | 73 | - | - | - | 77 | 73 | 77 | 32 | 44 | 54 | 57 |
| **N12** | - | - | - | - | - | 34 | - | - | - | 37 | 34 | 37 | - | - | - | - | - | 41 | - | - | - | 39 | 39 | 41 | - | - | - | - | - | 59 | - | - | - | 48 | 48 | 59 | 34 | 36 | 39 | 41 |
| **N13** | - | - | - | - | - | 39 | - | - | - | - | 39 | 39 | - | - | - | - | - | 54 | - | - | - | - | 54 | 54 | - | - | - | - | - | 72 | - | - | - | - | 72 | 72 | 39 | 39 | 54 | 54 |
| **N14** | - | - | - | - | - | 37 | - | - | - | 36 | 36 | 37 | - | - | - | - | - | 41 | - | - | - | 42 | 41 | 42 | - | - | - | - | - | 50 | - | - | - | 56 | 50 | 56 | 36 | 37 | 41 | 42 |
| **N15** | - | - | - | - | - | 42 | - | - | - | 37 | 37 | 42 | - | - | - | - | - | 51 | - | - | - | 41 | 41 | 51 | - | - | - | - | - | 72 | - | - | - | 59 | 59 | 72 | 37 | 42 | 41 | 50 |
| **N16** | - | - | - | - | - | 51 | - | - | - | 31 | 31 | 51 | - | - | - | - | - | 54 | - | - | - | 34 | 34 | 54 | - | - | - | - | - | 59 | - | - | - | 52 | 52 | 59 | 31 | 51 | 34 | 54 |

| Monitoring Location | LA90,15min | | | | | | | | | | | | LAeq,15min from all sources | | | | | | | | | | | | For Sleep Disturbance | | | | | | | | | | | | Backg round | | other | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 8/06/2012 | 25/07/2012 | 16/08/2012 | 9/10/2012 | 21/11/2012 | 27/12/2012 | 27/02/2013 | 21/05/2013 | 17/07/2013 | 21/08/2013 | Min | Max | 8/06/2012 | 25/07/2012 | 16/08/2012 | 9/10/2012 | 21/11/2012 | 27/12/2012 | 27/02/2013 | 21/05/2013 | 17/07/2013 | 21/08/2013 | Min | Max | 8/06/2012 | 25/07/2012 | 16/08/2012 | 9/10/2012 | 21/11/2012 | 27/12/2012 | 27/02/2013 | 21/05/2013 | 17/07/2013 | 21/08/2013 | Min | Max | Min | Max | Min | Max |
| **Night-time Period** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **N1** | 29 | 34 | 33 | 32 | 35 | 37 | 43 | 34 | 34 | 31 | 29 | 43 | 32 | 36 | 35 | 50 | 37 | 10 | 44 | 41 | 47 | 33 | 10 | 50 | 40 | 44 | 45 | 74 | 41 | 46 | 59 | 57 | 69 | 41 | 40 | 74 | 29 | 42 | 10 | 50 |
| **N2** | 40 | 39 | 36 | 30 | 33 | 35 | 33 | 37 | 31 | 36 | 30 | 40 | 47 | 41 | 45 | 33 | 35 | 38 | 40 | 39 | 33 | 38 | 33 | 47 | 53 | 45 | 42 | 45 | 44 | 52 | 52 | 47 | 44 | 49 | 42 | 53 | 30 | 40 | 29 | 39 |
| **N3** | 40 | 36 | 34 | 35 | 36 | 34 | 38 | 35 | 32 | 40 | 32 | 40 | 42 | 38 | 46 | 53 | 51 | 36 | 39 | 36 | 48 | 44 | 36 | 53 | 46 | 46 | 46 | 78 | 77 | 44 | 48 | 45 | 72 | 56 | 44 | 78 | 26 | 38 | 30 | 53 |
| **N4** | 41 | 40 | 36 | 37 | 38 | 35 | 37 | 35 | 34 | 37 | 34 | 41 | 44 | 42 | 45 | 38 | 40 | 38 | 42 | 37 | 43 | 55 | 37 | 55 | 52 | 47 | 45 | 44 | 48 | 49 | 48 | 51 | 66 | 76 | 44 | 76 | 25 | 41 | 37 | 54 |
| **N5** | 41 | 39 | 43 | 39 | 37 | 39 | 42 | 43 | 41 | 42 | 37 | 43 | 44 | 45 | 57 | 45 | 44 | 54 | 50 | 46 | 45 | 45 | 44 | 57 | 52 | 57 | 57 | 61 | 58 | 78 | 60 | 53 | 53 | 52 | 52 | 78 | 37 | 43 | 43 | 57 |
| **N6** | 42 | 43 | 43 | 38 | 43 | 40 | 43 | 37 | 38 | 41 | 37 | 43 | 46 | 51 | 53 | 47 | 49 | 47 | 49 | 46 | 46 | 49 | 46 | 53 | 57 | 61 | 62 | 54 | 57 | 58 | 60 | 60 | 58 | 64 | 54 | 64 | 37 | 43 | 46 | 53 |
| **N8** | 34 | 41 | 39 | 35 | 37 | 38 | 45 | 36 | 36 | 24 | 24 | 45 | 41 | 44 | 57 | 42 | 39 | 40 | 46 | 41 | 42 | 38 | 38 | 57 | 50 | 53 | 57 | 51 | 46 | 46 | 50 | 55 | 50 | 45 | 45 | 57 | 24 | 44 | 38 | 57 |
| **N9** | - | - | - | - | - | - | - | - | - | 31 | 31 | 31 | - | - | - | - | - | - | - | - | - | 48 | 48 | 48 | - | - | - | - | - | - | - | - | - | 74 | 74 | 74 | 31 | 31 | 48 | 48 |
| **N10** | - | - | - | - | - | 36 | - | - | - | 29 | 29 | 36 | - | - | - | - | - | 38 | - | - | - | 32 | 32 | 38 | - | - | - | - | - | 46 | - | - | - | 44 | 44 | 46 | 29 | 36 | 32 | 38 |
| **N11** | - | - | - | - | - | 38 | - | - | - | 31 | 31 | 38 | - | - | - | - | - | 47 | - | - | - | 33 | 33 | 47 | - | - | - | - | - | 67 | - | - | - | 43 | 43 | 67 | 31 | 38 | 33 | 47 |
| **N12** | - | - | - | - | - | 38 | - | - | - | 33 | 33 | 38 | - | - | - | - | - | 41 | - | - | - | 36 | 36 | 41 | - | - | - | - | - | 50 | - | - | - | 43 | 43 | 50 | 33 | 38 | 36 | 40 |
| **N13** | - | - | - | - | - | 34 | - | - | - | 36 | 34 | 36 | - | - | - | - | - | 44 | - | - | - | 50 | 44 | 50 | - | - | - | - | - | 59 | - | - | - | 69 | 59 | 69 | 34 | 36 | 44 | 50 |
| **N14** | - | - | - | - | - | 36 | - | - | - | 36 | 36 | 36 | - | - | - | - | - | 59 | - | - | - | 54 | 54 | 59 | - | - | - | - | - | 79 | - | - | - | 79 | 79 | 79 | 36 | 36 | 54 | 59 |
| **N15** | - | - | - | - | - | 34 | - | - | - | 37 | 34 | 37 | - | - | - | - | - | 37 | - | - | - | 41 | 37 | 41 | - | - | - | - | - | 55 | - | - | - | 50 | 50 | 55 | 34 | 37 | 37 | 41 |
| **N16** | - | - | - | - | - | 43 | - | - | - | 33 | 33 | 43 | - | - | - | - | - | 45 | - | - | - | 36 | 36 | 45 | - | - | - | - | - | 51 | - | - | - | 45 | 45 | 51 | 33 | 43 | 36 | 45 |

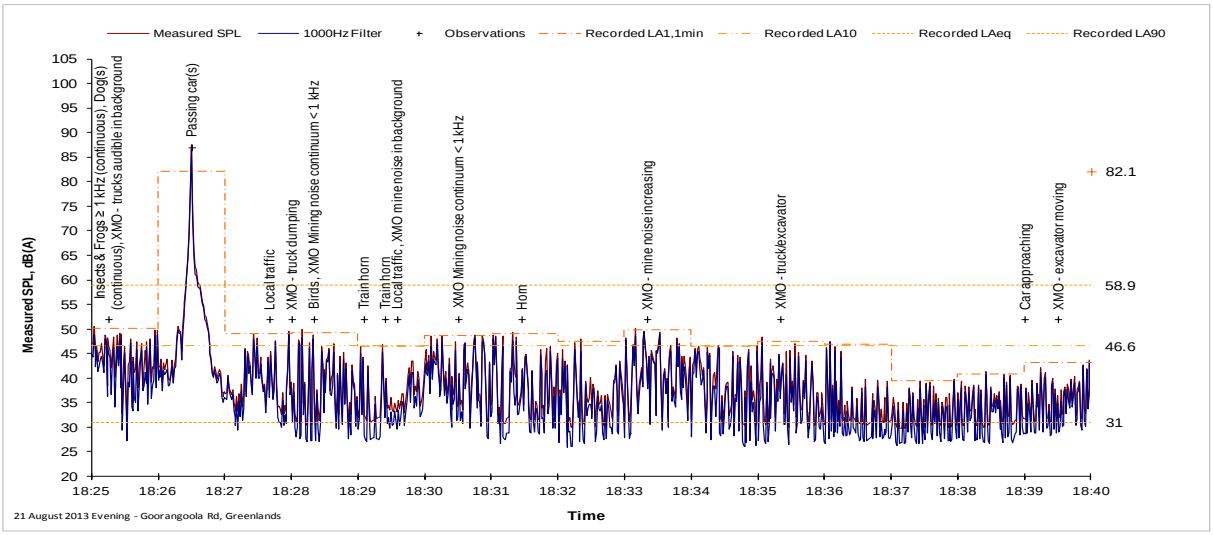



**Chart 1 – Evening: N9 - Goorangoola Road**

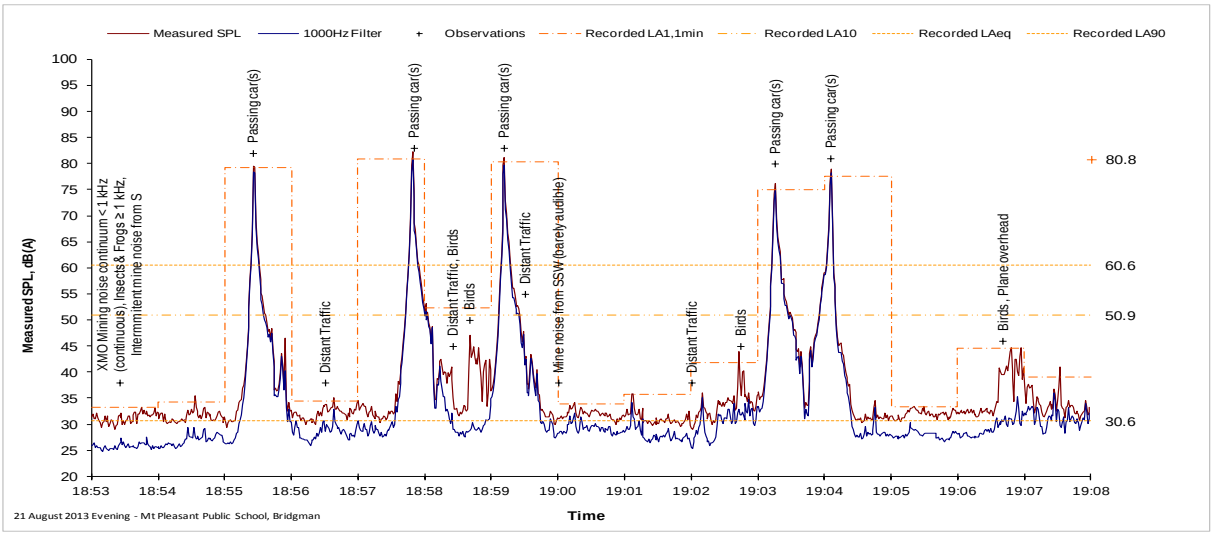



**Chart 2 – Evening: N10 - Mt Pleasant School, Bridgeman Road**

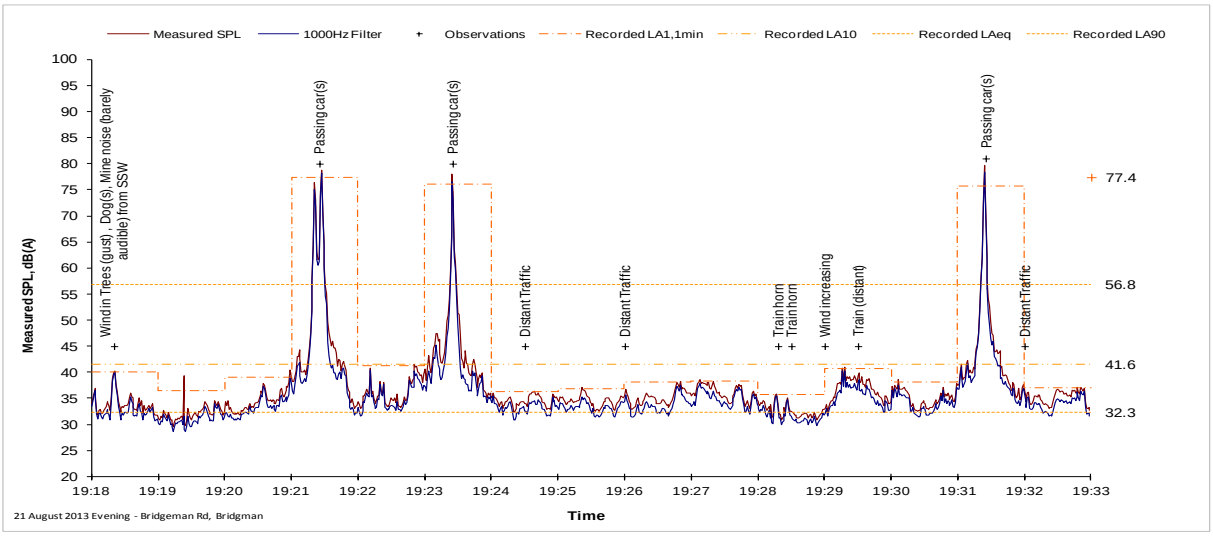



**Chart 3 – Evening: N11 - Bridgeman Road**

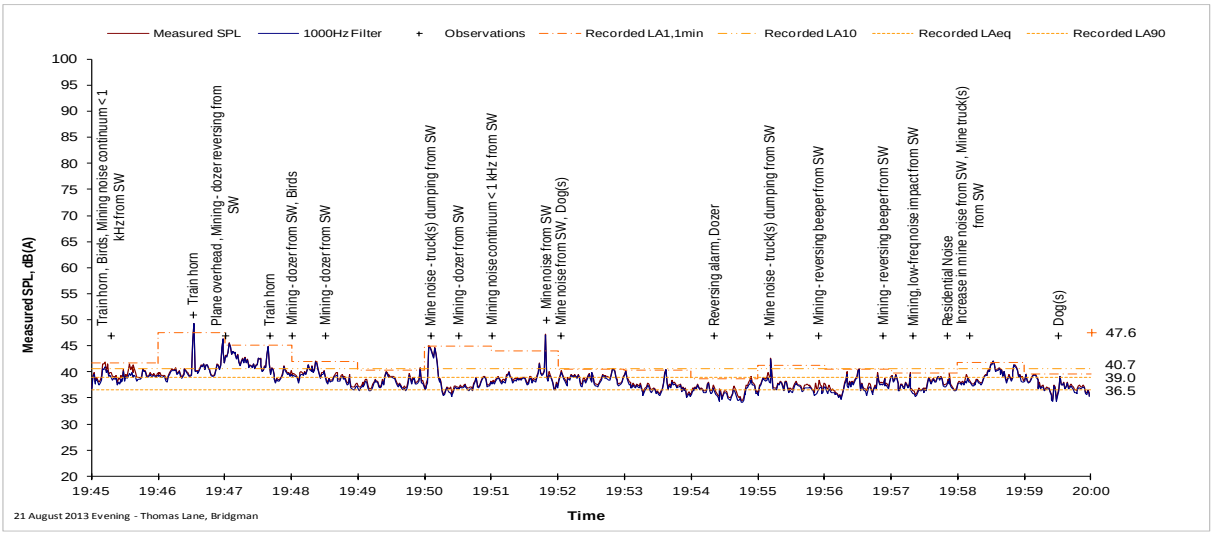



**Chart 4 – Evening: N12 - Thomas Lane**

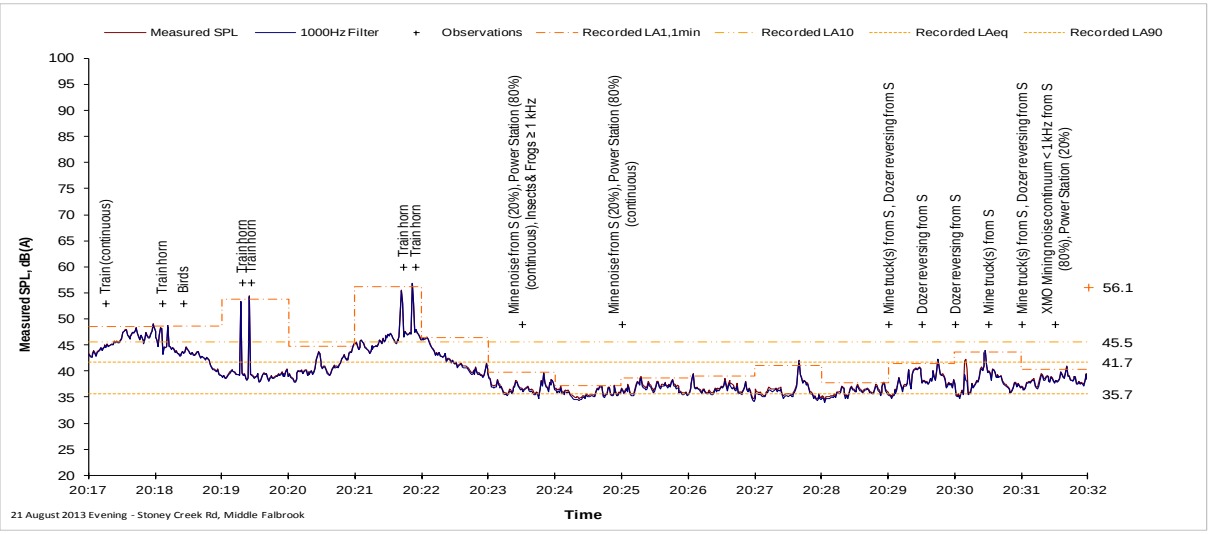



**Chart 5 – Evening: N14 - Middle Falbrook Road/Stoney Creek Road**

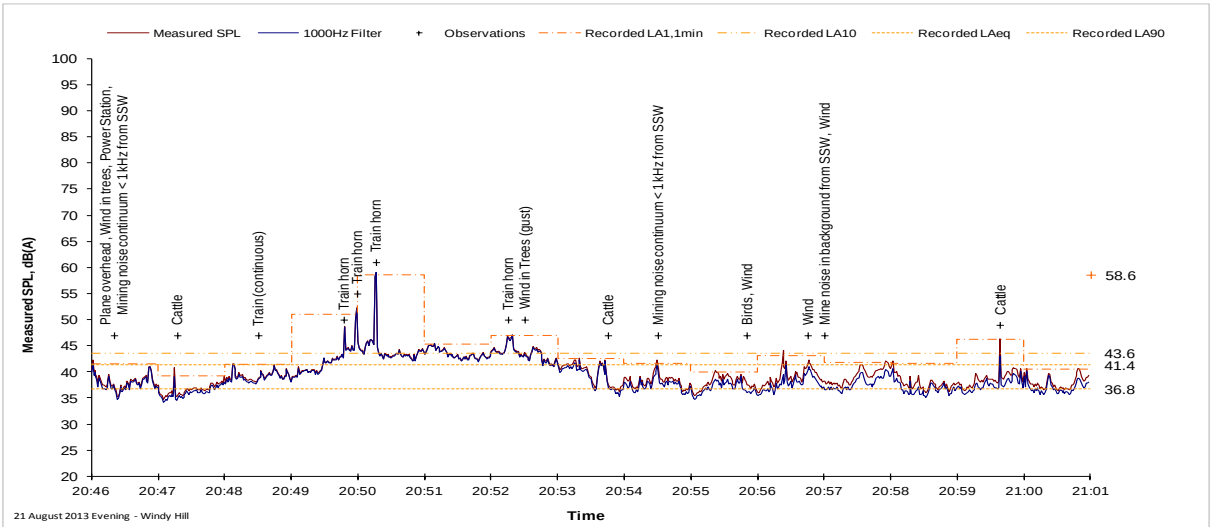



**Chart 6 – Evening: N15 - Middle Falbrook Road**

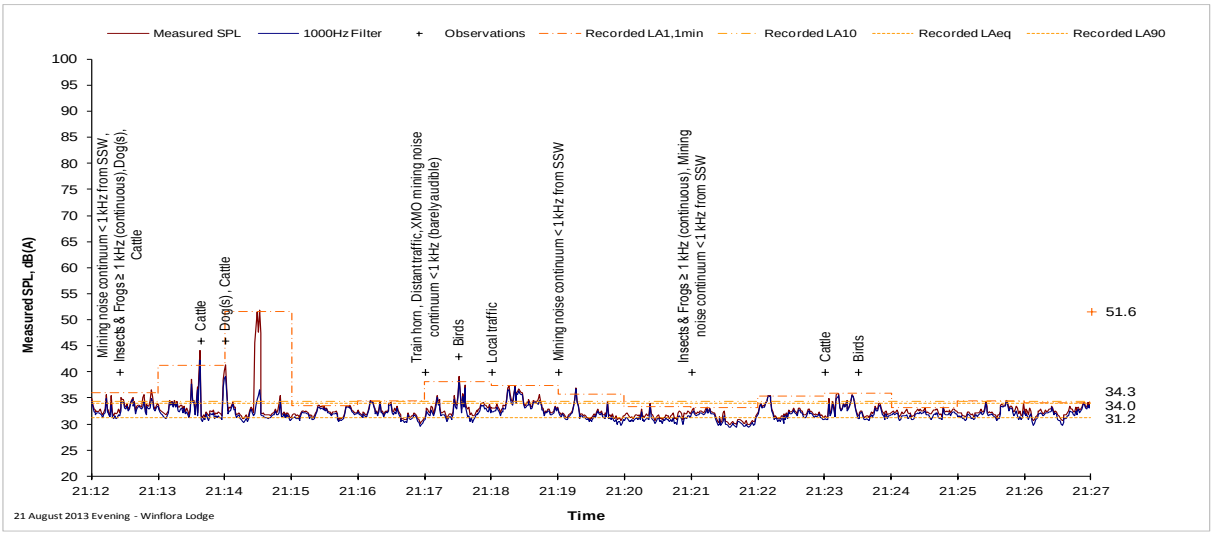



**Chart 7 – Evening: N16 - Middle Falbrook**

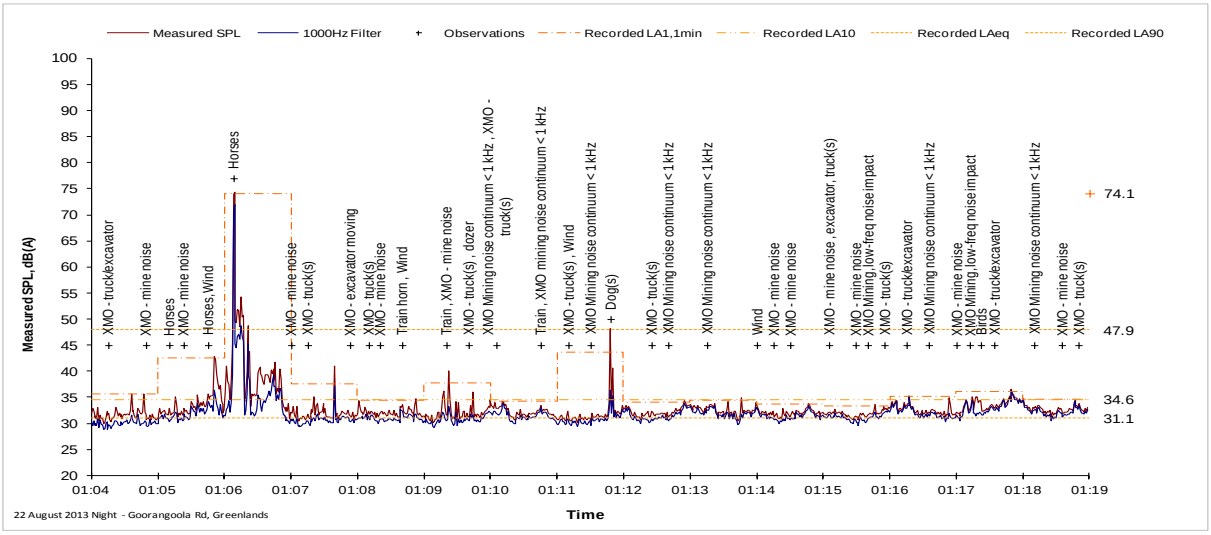



**Chart 8 – Night: N9 - Goorangoola Road**

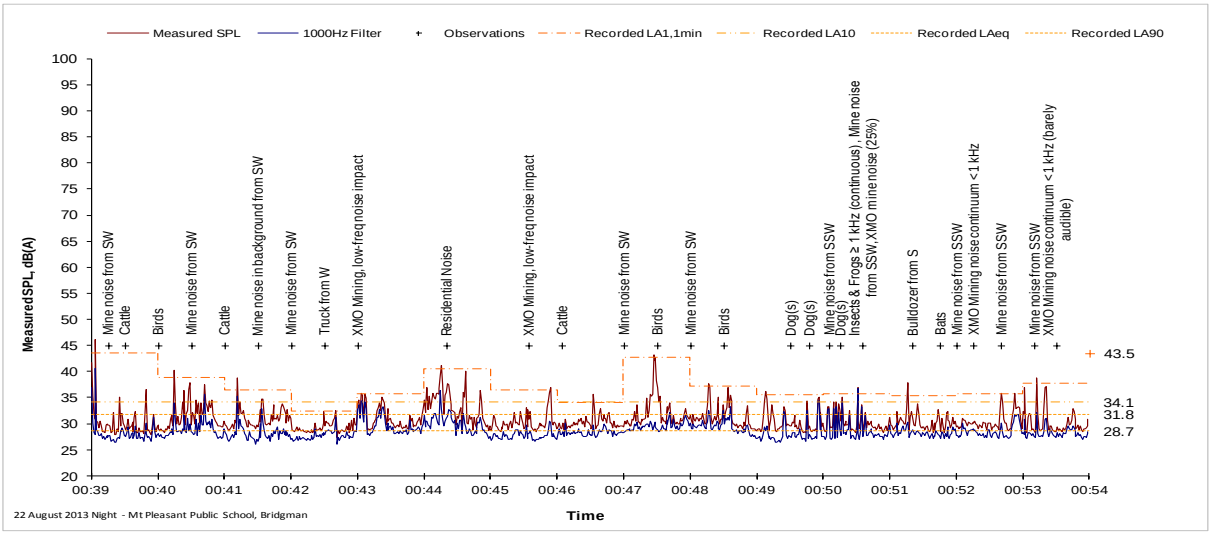



**Chart 9 – Night: N10 - Mt Pleasant School, Bridgeman Road**

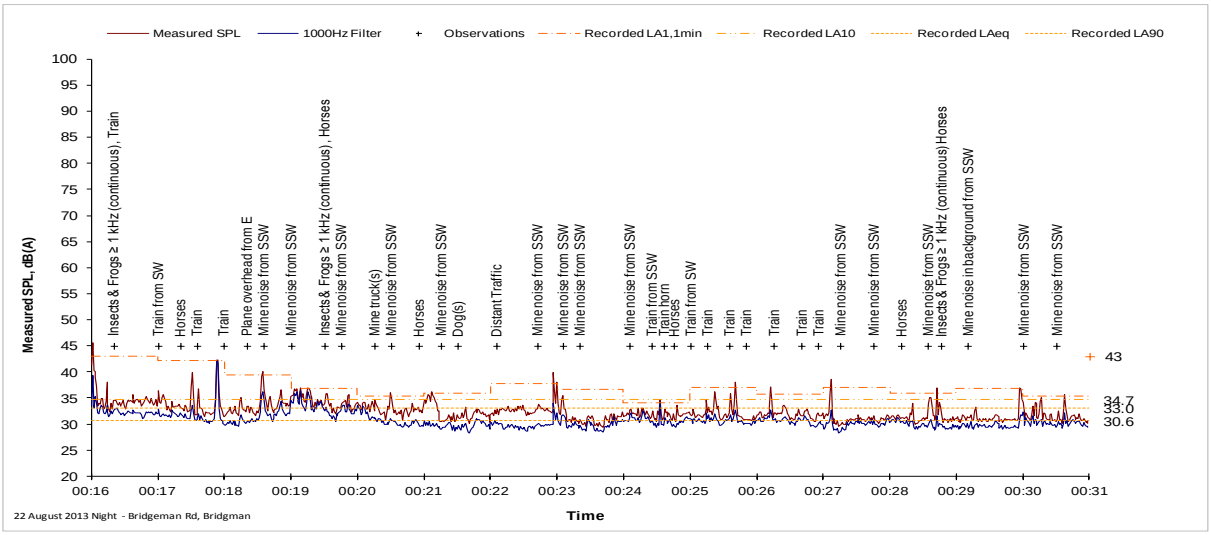



**Chart 10 – Night: N11 - Bridgeman Road**

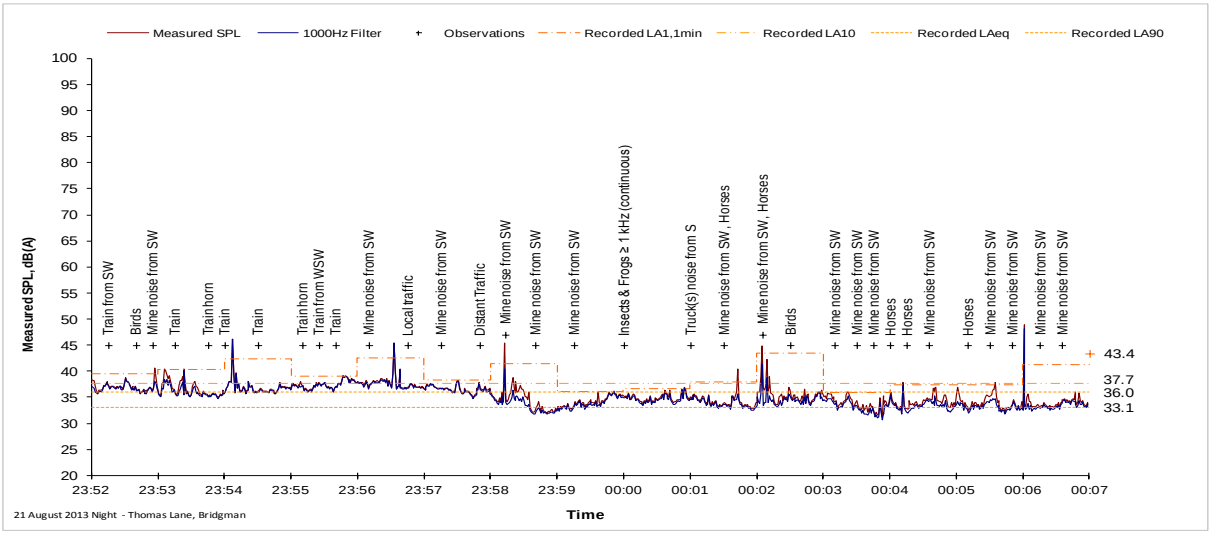



**Chart 11 – Night: N12 - Thomas Lane**

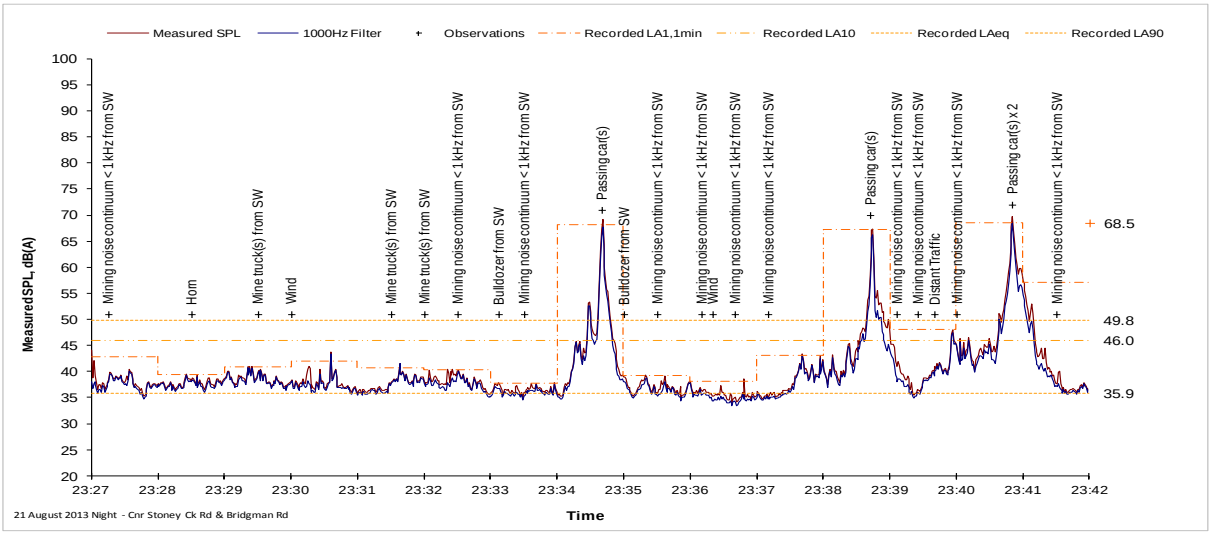



**Chart 12 – Night: N13 - Stoney Creek Road/Bridgeman Road**

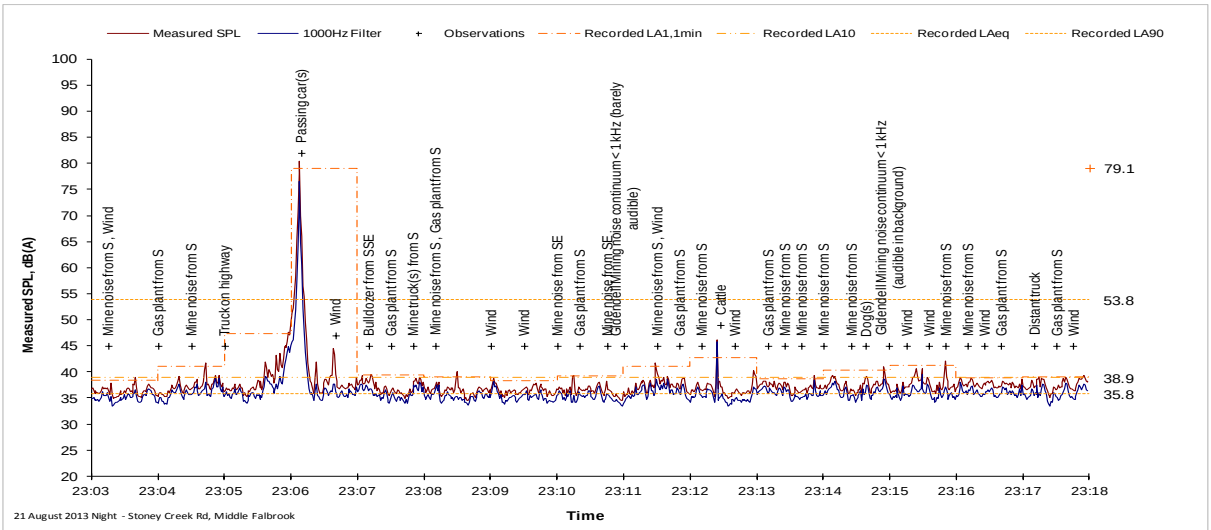



**Chart 13 – Night: N14 - Middle Falbrook Road/Stoney Creek Road**

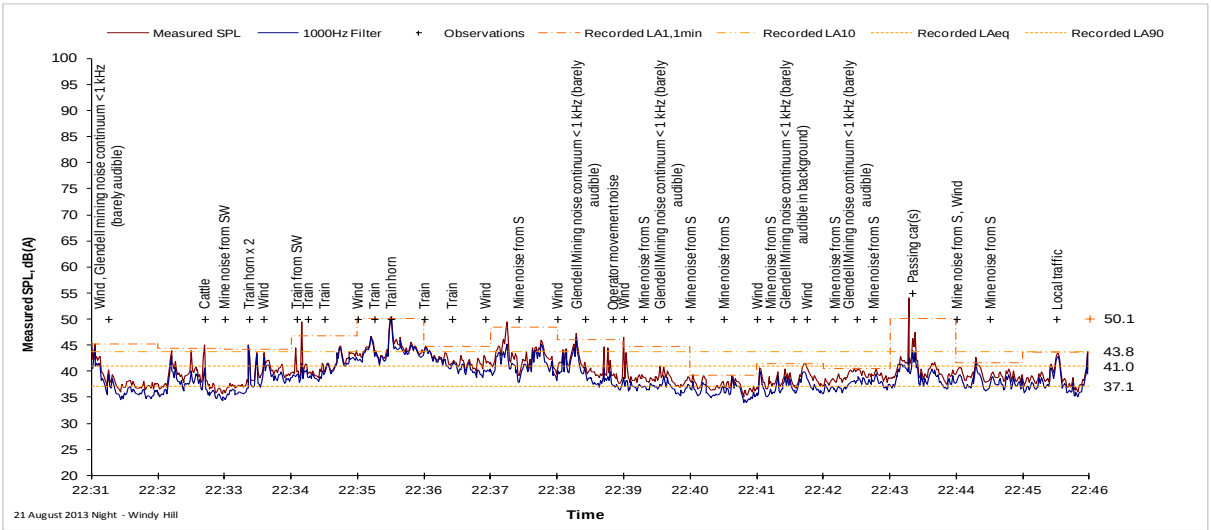



**Chart 14 – Night: N15 - Middle Falbrook Road**

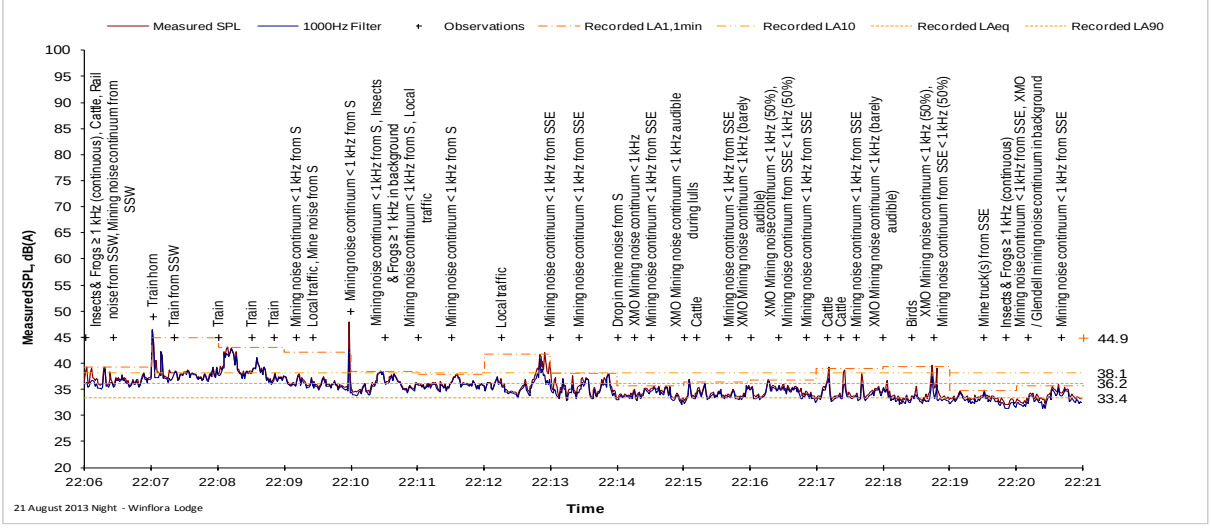



**Chart 15 – Night: N16 - Middle Falbrook**

# APPENDIX D

Assessment Criteria

# Appendix D – Assessment Criteria

## Table 1 – Receivers Location and Assessment Criteria, dB(A)

| Receiver Location | Applicable Monitoring Data | Project-specific Noise Level [1] ( $L_{Aeq,15minute}$/$L_{Aeq,period}$ ) | | | Sleep Disturbance Noise Goal | Construction Noise Goal (standard/ non-std) |
|---|---|---|---|---|---|---|
| | | Day | Evening | Night | | |
| R002 - Glennies Creek Community Hall | INP [2] | -/55 | -/55 | -/55 | - | - |
| R004 | Area 7 | 38/- | 37/- | 37/- | 47 | 43/37 |
| R005 | Area 7 | 38/- | 37/- | 37/- | 47 | 43/37 |
| R006 - Glennies Creek Rural Fire Service | INP [2] | -/55 | -/55 | -/55 | - | - |
| R007 | Area 7 | 37/- | 37/- | 37/- | 47 | 43/37 |
| R010 | Area 4 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R011 | Area 4 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R012 | Area 4 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R013 | Area 4 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R014 | Area 4 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R015a | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R015b | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R015c | Area 3 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R017 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R018 | Area 3 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R019 | Area 4 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R021 | Area 4 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R022 | Area 4 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R023 | Area 4 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R041 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R042 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R043 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R044a | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R044b | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R045 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R046 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R047 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R048 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R049 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R050 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R051 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R052 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R053 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R054 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R055 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R056a | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R056b | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |

| Receiver Location | Applicable Monitoring Data | Project-specific Noise Level [1] ( $L_{Aeq,15minute}$/$L_{Aeq,period}$ ) | | | Sleep Disturbance Noise Goal | Construction Noise Goal (standard/ non-std) |
|---|---|---|---|---|---|---|
| | | Day | Evening | Night | | |
| R057 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R058 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R059 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R060 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R061 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R062 | Area 1 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R063a | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R066 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R067 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R068 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R069a | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R069b | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R071 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R072 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R073 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R074 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R075 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R076 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R077 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R078 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R079 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R080 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R081 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R082 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R083 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R084a | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R084b | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R085 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R086 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R087 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R088 | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R089 | Area 5 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R091 | Area 5 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R092 | Area 5 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R093 | Area 4 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R094 | Area 4 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R095 | Area 4 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R096 | Area 5 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R097 | Area 5 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R098 | Area 5 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R099 | Area 5 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R100 | Area 5 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R101 | Area 5 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R102a | Area 5 | 35/- | 35/- | 35/- | 45 | 40/35 |

| Receiver Location | Applicable Monitoring Data | Project-specific Noise Level [1] ( $L_{Aeq,15minute}$/$L_{Aeq,period}$ ) | | | Sleep Disturbance Noise Goal | Construction Noise Goal (standard/ non-std) |
|---|---|---|---|---|---|---|
| | | Day | Evening | Night | | |
| R102b | Area 5 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R105 | Area 7 | 37/- | 37/- | 37/- | 47 | 42/37 |
| R111 | Area 8 | 36/- | 36 | 35/- | 45 | 41/35 |
| R112 | Area 4 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R114 | Area 4 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R115 | Area 4 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R116 | Area 4 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R122 | Area 6 | 39/- | 39/- | 39/37 | 44 | 44/39 |
| R127a | Area 8 | 36/- | 36 | 35/- | 45 | 41/35 |
| R127b | Area 8 | 36/- | 36 | 35/- | 45 | 41/35 |
| R127c | Area 8 | 36/- | 36 | 35/- | 45 | 41/35 |
| R133 | Area 11 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R134 | Area 11 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R135 | Area 11 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R136 | Area 11 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R143 | Area 8 | 36/- | 36 | 35/- | 45 | 41/35 |
| R144a | Area 10 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R144b | Area 10 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R144c | Area 10 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R145 | Area 10 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R146 | Area 8 | 36/- | 36 | 35/- | 45 | 41/35 |
| R147 | Area 9 | 50/- | 48/45 | 43/38 | 53 | 55/43 |
| R148 | Area 8 | 36/- | 36 | 35/- | 45 | 41/35 |
| R149 - St Clement's Church | Area 9 | -/50 | -/50 | -/50 | - | 55/43 |
| R150 | Area 9 | 50/- | 48/45 | 43/38 | 53 | 55/43 |
| R151 | Area 8 | 36/- | 36 | 35/- | 45 | 41/35 |
| R152 | Area 8 | 36/- | 36 | 35/- | 45 | 41/35 |
| R154 | Area 8 | 36/- | 36 | 35/- | 45 | 41/35 |
| R155 | Area 8 | 36/- | 36 | 35/- | 45 | 41/35 |
| R156 | Area 8 | 36/- | 36 | 35/- | 45 | 41/35 |
| R162b | Area 2 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R174 | Area 4 | 35/- | 35/- | 35/- | 45 | 40/35 |
| R342 - Daracon Mining | INP [2] | -/70 | -/70 | -/70 | - | 75/- |
| R350 - Mount Pleasant Primary School - External | INP [2] | -/55 | - | - | - | 40/- |
| All other Properties | INP [2] | 35/- | 35/- | 35/- | 45 | 40/35 |

Note 1: Where the $L_{Aeq,period}$ is less than the $L_{Aeq,15minute}$ the $L_{Aeq,period}$ has also been provided

Note 2: Where PSNLs have not been specifically derived for a receiver the most stringent default condition presented in the INP (DECC, 2000) has been applied.

# APPENDIX E

Mine Plans and Equipment Schedule

# Appendix E – Mine Plans and Equipment Schedule

## Introduction

Many of the machines and items of equipment presented in the following Tables are represented as multiple point sources in order to simulate:

- the possible alternate locations of the machine e.g. the use of three alternate excavator locations;
- the same machine doing two different activities e.g. a bulldozer pushing and reversing;
- a fleet of trucks as a continuous circuit;
- conveyors as the equivalent of a line source; and
- the rail loop as the equivalent of a line source.

The sound power levels of the equipment (including acoustic utilisation factors) proposed over the life of the mine presented in the **Tables 1**, **2** and **3** for Years 1, 5 and 10 respectively are considered indicative rather than mandatory. The actual performance of the mining operation will be determined by monitoring the environmental noise levels over the life of the Project. That is, while the representative sound power levels provide a guide to equipment selection, the actual performance of the mine as a whole will dictate equipment selection criteria.

The ENM models of the staged mine plans include all the equipment that would be operating in and around the mine. In addition to the mining activities the noise models include:

- raw coal handling facilities for Mount Owen and Glendell mines;
- the Mount Owen Complex CHPP;
- the clean coal handling system and rail load-out facility; and
- the rail loop.

The ENM model of the CHPP, rail loop, conveyor systems and mobile equipment working in and around the CHPP were based on the representative equipment list and topographical layout of the facility. It was assumed that these activities would remain basically unchanged over the life of the mine. The sound power levels of the equipment proposed over the life of the mine presented in the **Table 4**.

The representative locations of the equipment within each stage of the mining operation are shown in **Figures E1**, **E2** and **E3**.

## Table 1 - Year 1 Modelled Equipment List

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 1 | EX01 Liebherr 996 600t Excavator | Overburden | 100% | 117.1 | 122.8 | 322640 | 6412169 | 87 |
| 2 | 1 Cat 854 Rubber Tyred Dozer | Forward | 100% | 110.4 | 115.6 | 322608 | 6412126 | 90 |
| 4 | 1 Cat 793 230t Mine Truck | Idle loading | 100% | 102.7 | 110.0 | 322719 | 6412151 | 87 |
| 5 | 2 Cat 793 230t Mine Truck | Pulling away | 50% | 112.9 | 122.0 | 322719 | 6412204 | 86 |
| 6 | 2 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 323076 | 6412385 | 86 |
| 7 | 3 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 323263 | 6412739 | 57 |
| 8 | 3 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 323125 | 6413115 | 56 |
| 9 | 4 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 322944 | 6413471 | 55 |
| 10 | 4 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 322782 | 6413837 | 71 |
| 11 | 5 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 322743 | 6414235 | 142 |
| 12 | 5 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 322415 | 6414464 | 172 |
| 13 | 6 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 322077 | 6414677 | 206 |
| 14 | 6 Cat 793 230t Mine Truck | Dumping | 50% | 109.8 | 118.8 | 321711 | 6414677 | 225 |
| 15 | 2 Cat 854 Rubber Tyred Dozer | Forward | 100% | 110.4 | 115.6 | 321606 | 6414724 | 225 |
| 17 | EX02 Liebherr 996 600t Excavator | Overburden | 100% | 117.1 | 122.8 | 322587 | 6412358 | 59 |
| 18 | 3 Cat D10 Dozer | Forward | 75% | 111.9 | 120.7 | 322644 | 6412401 | 58 |
| 19 | 3 Cat D10 Dozer | Reverse | 25% | 111.8 | 117.6 | 322644 | 6412320 | 60 |
| 20 | 7 Cat 793 230t Mine Truck | Idle loading | 100% | 102.7 | 110.0 | 322523 | 6412361 | 59 |
| 21 | 8 Cat 793 230t Mine Truck | Pulling away | 50% | 112.9 | 122.0 | 322420 | 6412359 | 58 |
| 22 | 8 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 322113 | 6412360 | 55 |
| 23 | 9 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 321898 | 6412601 | 57 |
| 24 | 9 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 321663 | 6412898 | 53 |
| 25 | 10 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 321429 | 6413199 | 58 |
| 26 | 10 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 321504 | 6413489 | 80 |
| 27 | 11 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 321779 | 6413722 | 113 |

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 28 | 11 Cat 793 230t Mine Truck | Dumping | 50% | 109.8 | 118.8 | 322164 | 6413955 | 150 |
| 29 | 4 Cat 854 Rubber Tyred Dozer | Forward | 100% | 110.4 | 115.6 | 322232 | 6414012 | 151 |
| 31 | EX03 Liebherr 996 600t Excavator | Overburden | 100% | 117.1 | 122.8 | 322437 | 6412699 | -8 |
| 32 | 5 Cat D10 Dozer | Forward | 75% | 111.9 | 120.7 | 322370 | 6412638 | -7 |
| 33 | 5 Cat D10 Dozer | Reverse | 25% | 111.8 | 117.6 | 322370 | 6412699 | -9 |
| 34 | 12 Cat 793 230t Mine Truck | Idle loading | 100% | 102.7 | 110.0 | 322492 | 6412692 | -7 |
| 35 | 13 Cat 793 230t Mine Truck | Pulling away | 50% | 112.9 | 122.0 | 322545 | 6412673 | -6 |
| 36 | 13 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 322519 | 6412581 | 7 |
| 37 | 14 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 322284 | 6412506 | 30 |
| 38 | 14 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 322020 | 6412447 | 56 |
| 39 | 15 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 321795 | 6412736 | 53 |
| 40 | 15 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 321558 | 6413030 | 57 |
| 41 | 16 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 321381 | 6413290 | 64 |
| 42 | 16 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 321629 | 6413605 | 96 |
| 43 | 17 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 321948 | 6413825 | 131 |
| 44 | 17 Cat 793 230t Mine Truck | Dumping | 50% | 109.0 | 116.5 | 322135 | 6413937 | 150 |
| 45 | EX04 Liebherr 996 600t Excavator | Overburden | 100% | 117.1 | 122.8 | 322581 | 6413061 | -68 |
| 46 | 6 Cat D10 Dozer | Forward | 75% | 111.9 | 120.7 | 322650 | 6413091 | -68 |
| 47 | 6 Cat D10 Dozer | Reverse | 25% | 111.8 | 117.6 | 322650 | 6413015 | -66 |
| 48 | 18 Cat 793 230t Mine Truck | Idle loading | 100% | 102.7 | 110.0 | 322568 | 6413015 | -67 |
| 49 | 19 Cat 793 230t Mine Truck | Pulling away | 50% | 112.9 | 122.0 | 322517 | 6413015 | -66 |
| 50 | 19 Cat 793 230t Mine Truck | Flat | 25% | 107.7 | 118.9 | 322325 | 6412943 | -42 |
| 51 | 19 Cat 793 230t Mine Truck | Up Hill | 25% | 109.9 | 119.0 | 322313 | 6413162 | -24 |
| 52 | 20 Cat 793 230t Mine Truck | Up Hill | 25% | 109.9 | 119.0 | 322420 | 6413379 | -5 |
| 53 | 20 Cat 793 230t Mine Truck | Up Hill | 25% | 109.9 | 119.0 | 322426 | 6413561 | 14 |
| 54 | 20 Cat 793 230t Mine Truck | Dumping | 50% | 109.0 | 116.5 | 322287 | 6413341 | 32 |
| 55 | 7 Cat D11 Dozer | Forward | 75% | 110.8 | 121.0 | 322231 | 6413341 | 35 |

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 56 | 7 Cat D11 Dozer | Reverse | 25% | 114.7 | 120.4 | 322231 | 6413284 | 31 |
| 71 | EX06 Hitachci EX2500 200t excavator | Coal | 100% | 115.3 | 123.3 | 322685 | 6412802 | -9 |
| 72 | 9 Cat D10 Dozer | Forward | 75% | 111.9 | 120.7 | 322741 | 6412804 | -10 |
| 73 | 9 Cat D10 Dozer | Reverse | 25% | 111.8 | 117.6 | 322741 | 6412866 | -10 |
| 74 | 5 Cat 785 120t Mine Truck | Idle loading | 100% | 102.7 | 110.0 | 322792 | 6412804 | -10 |
| 75 | 6 Cat 785 120t Mine Truck | Pulling away | 50% | 110.8 | 118.1 | 322733 | 6412759 | -9 |
| 76 | 6 Cat 785 120t Mine Truck | Up Hill | 50% | 110.8 | 118.1 | 322404 | 6412550 | 17 |
| 77 | 7 Cat 785 120t Mine Truck | Up Hill | 50% | 110.8 | 118.1 | 322157 | 6412460 | 43 |
| 78 | 7 Cat 785 120t Mine Truck | Flat | 50% | 108.3 | 117.2 | 321832 | 6412676 | 57 |
| 79 | 8 Cat 785 120t Mine Truck | Flat | 50% | 108.3 | 117.2 | 321617 | 6412957 | 57 |
| 80 | 8 Cat 785 120t Mine Truck | Up Hill | 50% | 110.8 | 118.1 | 321243 | 6413448 | 83 |
| 81 | 9 Cat 785 120t Mine Truck | Up Hill | 50% | 110.8 | 118.1 | 320955 | 6413642 | 112 |
| 82 | 9 Cat 785 120t Mine Truck | Dumping | 50% | 109.0 | 116.5 | 320695 | 6413979 | 129 |
| 83 | 1 Terex Reedrill SK50 Drill | Drilling | 100% | 114.2 | 119.1 | 322169 | 6412551 | 28 |
| 84 | 2 Terex Reedrill SK50 Drill | Drilling | 100% | 114.2 | 119.1 | 322912 | 6412616 | 27 |
| 88 | 1 Service Truck | Road Maintenance | 100% | 111.8 | 112.4 | 322343 | 6412222 | 66 |
| 89 | 2 Service Truck | Road Maintenance | 100% | 111.8 | 112.4 | 322655 | 6412671 | -5 |
| 93 | 1 Cat 777 Water Truck | Dust Suppression | 100% | 114.5 | 125.6 | 320816 | 6413909 | 130 |
| 95 | 2 Cat Water Truck | Dust Suppression | 100% | 114.5 | 125.6 | 322291 | 6413024 | -36 |
| 98 | 1 Cat 16M Grader | Road Maintenance | 100% | 107.6 | 114.5 | 322096 | 6412295 | 55 |
| 99 | 2 Cat 24M Grader | Road Maintenance | 100% | 112.0 | 118.8 | 321868 | 6413770 | 122 |
| **Additional Equipment or Alternate Location During Day Time Scenario** | | | | | | | | |
| 15 | 2 Cat D11 Dozer | Forward | 75% | 110.8 | 121.0 | 321606 | 6414724 | 225 |
| 16 | 2 Cat D11 Dozer | Reverse | 25% | 114.7 | 120.4 | 321606 | 6414586 | 225 |
| 29 | 4 Cat D11 Dozer | Forward | 75% | 110.8 | 121.0 | 322232 | 6414012 | 151 |
| 30 | 4 Cat D11 Dozer | Reverse | 25% | 114.7 | 120.4 | 322307 | 6414012 | 150 |
| 57 | EX05 Hitachci EX2500 200t excavator | Coal | 100% | 115.3 | 123.3 | 322974 | 6412225 | 88 |

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 58 | 8 Cat D10 Dozer | Forward | 75% | 111.9 | 120.7 | 323047 | 6412253 | 88 |
| 59 | 8 Cat D10 Dozer | Reverse | 25% | 111.8 | 117.6 | 323044 | 6412198 | 89 |
| 60 | 1 Cat 785 120t Mine Truck | Idle loading | 100% | 102.7 | 110.0 | 322940 | 6412182 | 88 |
| 61 | 2 Cat 785 120t Mine Truck | Pulling away | 33% | 109.0 | 116.4 | 322886 | 6412228 | 87 |
| 62 | 2 Cat 785 120t Mine Truck | Down Hill | 33% | 106.6 | 115.4 | 322508 | 6412226 | 85 |
| 63 | 2 Cat 785 120t Mine Truck | Flat | 33% | 109.1 | 116.4 | 322154 | 6412218 | 58 |
| 64 | 3 Cat 785 120t Mine Truck | Flat | 25% | 107.8 | 115.1 | 321961 | 6412525 | 56 |
| 65 | 3 Cat 785 120t Mine Truck | Flat | 25% | 107.8 | 115.1 | 321739 | 6412809 | 54 |
| 66 | 3 Cat 785 120t Mine Truck | Flat | 25% | 107.8 | 115.1 | 321486 | 6413125 | 57 |
| 67 | 3 Cat 785 120t Mine Truck | Up Hill | 25% | 105.3 | 114.2 | 321321 | 6413362 | 73 |
| 68 | 4 Cat 785 120t Mine Truck | Up Hill | 33% | 106.6 | 115.4 | 321091 | 6413584 | 100 |
| 69 | 4 Cat 785 120t Mine Truck | Flat | 33% | 109.0 | 116.4 | 320855 | 6413792 | 127 |
| 70 | 4 Cat 785 120t Mine Truck | Dumping | 33% | 107.2 | 114.7 | 320628 | 6413993 | 130 |
| 85 | 3 Reedrill SK50 Drill | Drilling | 100% | 114.2 | 119.1 | 322295 | 6412034 | 115 |
| 86 | 10 Cat D10 Dozer | Forward | 75% | 111.9 | 120.7 | 322991 | 6412671 | 27 |
| 87 | 10 Cat D10 Dozer | Reverse | 25% | 111.8 | 117.6 | 322991 | 6412611 | 28 |
| 90 | 3 Service Truck | Moving | 100% | 111.8 | 112.4 | 322478 | 6413913 | 101 |
| 91 | 11 Cat D11 Dozer- Forward | Road Maintenance | 75% | 110.8 | 121.0 | 323236 | 6412549 | 86 |
| 92 | 11 Cat D11 Dozer - Reverse | Road Maintenance | 25% | 114.7 | 120.4 | 323236 | 6412493 | 87 |
| 94 | 3 Cat 777 Water Truck | Dust Suppression | 100% | 114.5 | 125.6 | 322287 | 6412364 | 57 |
| 96 | 4 Cat 777 Water Truck | Dust Suppression | 100% | 114.5 | 125.6 | 323194 | 6412912 | 58 |
| 97 | 5 Cat 777 Water Truck | Dust Suppression | 100% | 114.5 | 125.6 | 322604 | 6414346 | 160 |
| 100 | 3 Cat 24M Grader | Road Maintenance | 100% | 112.0 | 118.8 | 322257 | 6414564 | 188 |
| 101 | 12 D11 Dozer | Rehab - Forward | 75% | 110.8 | 121.0 | 321328 | 6414840 | 219 |
| 102 | 12 D11 Dozer | Rehab - Reverse | 25% | 114.7 | 120.4 | 321327 | 6414765 | 219 |
| 103 | 13 D11 Dozer | Rehab - Forward | 75% | 110.8 | 121.0 | 322227 | 6414934 | 217 |
| 104 | 13 D11 Dozer | Rehab - Reverse | 25% | 114.7 | 120.4 | 322229 | 6414862 | 219 |

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 105 | 14 Cat 854 Rubber Tyred Dozer | Road Maintenance | 100% | 110.4 | 115.6 | 322291 | 6413024 | -36 |
| **Bayswater North Pit Equipment** | | | | | | | | |
| 501 | Hitachi EX5500 | Overburden | 100% | 124.6 | 118 | 319203 | 6413841 | 114 |
| 502 | Cat D10T Dozer #1 | Forward | 75% | 122 | 110.7 | 319269 | 6413869 | 117 |
| 503 | Cat D10T Dozer #1 | Reverse | 25% | 120.4 | 116.1 | 319293 | 6413826 | 118 |
| 504 | Cat 793D XQ #1 | Idle | 100% | 110 | 102.7 | 319239 | 6413882 | 116 |
| 505 | Cat 793D XQ #2 | Accelerating | 33% | 121.2 | 111.3 | 319321 | 6413977 | 116 |
| 506 | Cat 793D XQ #3 | Dumping | 50% | 120.1 | 113 | 319642 | 6412468 | 127 |
| 507 | Cat 793D XQ #3 | Dumping | 50% | 120.1 | 113 | 319840 | 6411608 | 86 |
| 508 | Cat 793D XQ #2 | Up-ramp | 33% | 120.5 | 111.3 | 319641 | 6413975 | 129 |
| 509 | Cat 793D XQ #2 | Down-ramp | 33% | 117.5 | 111.2 | 319740 | 6413712 | 129 |
| 510 | Cat 793D XQ #4 | Up-ramp | 33% | 120.5 | 111.3 | 319671 | 6413305 | 118 |
| 511 | Cat 793D XQ #4 | Down-ramp | 33% | 117.5 | 111.2 | 319695 | 6413058 | 124 |
| 512 | Cat 793D XQ #4 | Up-ramp | 33% | 120.5 | 111.3 | 320004 | 6412641 | 105 |
| 513 | Cat 793D XQ #5 | Down-ramp | 33% | 117.5 | 111.2 | 320128 | 6412263 | 100 |
| 514 | Cat 793D XQ #5 | Up-ramp | 33% | 120.5 | 111.3 | 320067 | 6411817 | 88 |
| 515 | Cat 793D XQ #5 | Down-ramp | 33% | 117.5 | 111.2 | 319649 | 6412702 | 127 |
| 516 | Hitachi EX2500 | Coal_Overburden | 100% | 120.9 | 116 | 318990 | 6414063 | -4 |
| 517 | Cat D10T Dozer #2 | Forward | 75% | 122 | 110.7 | 318975 | 6414050 | -2 |
| 518 | Cat D10T Dozer #2 | Reverse | 25% | 120.4 | 116.1 | 318975 | 6414031 | -3 |
| 519 | Cat 789C #1 | Idle | 100% | 110 | 102.7 | 319000 | 6414075 | -4 |
| 520 | Cat 789C #2 | Accelerating | 33% | 123 | 111.3 | 319058 | 6414095 | 17 |
| 521 | Cat 789C #3 | Dumping | 50% | 120.1 | 113 | 320058 | 6413215 | 130 |
| 522 | Cat 789C #3 | Dumping | 50% | 120.1 | 113 | 320297 | 6412616 | 115 |
| 523 | Cat 789C #2 | Up-ramp | 33% | 123 | 111.3 | 319116 | 6413899 | 87 |
| 524 | Cat 789C #2 | Down-ramp | 33% | 120.3 | 111.2 | 319752 | 6413869 | 129 |
| 525 | Cat 789C #4 | Up-ramp | 33% | 123 | 111.3 | 319679 | 6413521 | 119 |

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 526 | Cat 789C #4 | Down-ramp | 33% | 120.3 | 111.2 | 319891 | 6413063 | 120 |
| 527 | Cat 789C #4 | Up-ramp | 33% | 123 | 111.3 | 320166 | 6412848 | 118 |
| 528 | Cat D10T Dozer #3 | Forward | 75% | 122 | 110.7 | 319727 | 6412466 | 125 |
| 529 | Cat D10T Dozer #3 | Reverse | 25% | 120.4 | 116.1 | 319729 | 6412426 | 125 |
| 530 | Cat D11 Dozer #4 | Forward | 75% | 122 | 110.7 | 319906 | 6411588 | 85 |
| 531 | Cat D11 Dozer #4 | Reverse | 25% | 120.4 | 116.1 | 319906 | 6411625 | 86 |
| 532 | Cat D6 Dozer #5 | Forward | 75% | 109 | 108.3 | 320350 | 6412587 | 115 |
| 533 | Cat D6 Dozer #5 | Reverse | 25% | 104.3 | 103.5 | 320350 | 6412631 | 115 |
| 534 | Drill Sk50 | Drilling | 100% | 120.1 | 113.4 | 319192 | 6413688 | 101 |
| 535 | Water Cart 777 | Road Maintenance | 100% | 122 | 115 | 319463 | 6414041 | 116 |
| 536 | Grader 16H | Road Maintenance | 100% | 114.5 | 107.6 | 319703 | 6413174 | 118 |
| 537 | Service Truck | Ancillary | 100% | 112.4 | 111.8 | 318966 | 6413839 | 58 |

## Table 2 - Year 5 Modelled Equipment List

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 1 | EX01 Liebherr 996 600t excavator | Overburden | 100% | 117.1 | 122.8 | 322329 | 6411643 | 72 |
| 2 | 1 Cat 854 Rubber Tyred Dozer | Forward | 100% | 110.4 | 115.6 | 322270 | 6411644 | 72 |
| 4 | 1 Cat 793 230t Mine Truck | Idle loading | 100% | 102.7 | 110.0 | 322387 | 6411643 | 72 |
| 5 | 2 Cat 793 230t Mine Truck | Pulling away | 50% | 112.9 | 122.0 | 322430 | 6411599 | 74 |
| 6 | 2 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 322125 | 6411595 | 73 |
| 7 | 3 Cat 793 230t Mine Truck | Down hill | 50% | 110.7 | 121.9 | 322088 | 6411941 | 56 |
| 8 | 3 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 322030 | 6412397 | 58 |
| 9 | 4 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 321834 | 6412660 | 55 |
| 10 | 4 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 321561 | 6413033 | 56 |
| 11 | 5 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 321460 | 6413394 | 81 |
| 12 | 5 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 321844 | 6413526 | 123 |
| 13 | 6 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 322132 | 6413466 | 143 |
| 14 | 6 Cat 793 230t Mine Truck | Dumping | 50% | 109.8 | 118.8 | 322167 | 6413396 | 141 |
| 15 | 2 Cat 854 Rubber Tyred Dozer | Forward | 100% | 110.4 | 115.6 | 322206 | 6413434 | 142 |
| 17 | EX02 Liebherr 996 600t excavator | Overburden | 100% | 117.1 | 122.8 | 322561 | 6412086 | -28 |
| 18 | 3 Cat D10 Dozer | Forward | 75% | 111.9 | 120.7 | 322556 | 6412022 | -27 |
| 19 | 3 Cat D10 Dozer | Reverse | 25% | 111.8 | 117.6 | 322501 | 6412086 | -27 |
| 20 | 7 Cat 793 230t Mine Truck | Idle loading | 100% | 102.7 | 110.0 | 322631 | 6412084 | -28 |
| 21 | 8 Cat 793 230t Mine Truck | Pulling away | 50% | 112.9 | 122.0 | 322628 | 6411957 | -26 |
| 22 | 8 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 322296 | 6411911 | -12 |
| 23 | 9 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 322209 | 6412097 | -4 |
| 24 | 9 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 321942 | 6412713 | 2 |
| 25 | 10 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 321711 | 6413015 | 40 |
| 26 | 10 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 322033 | 6413104 | 68 |
| 27 | 11 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 322340 | 6413183 | 88 |
| 28 | 11 Cat 793 230t Mine Truck | Dumping | 50% | 109.8 | 118.8 | 322538 | 6413315 | 83 |

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 29 | 4 Cat 854 Rubber Tyred Dozer | Forward | 100% | 110.4 | 115.6 | 322573 | 6413364 | 83 |
| 31 | EX03 Hitachci EX2500 200t excavator | Coal | 100% | 115.3 | 123.3 | 322896 | 6412259 | -3 |
| 32 | 5 Cat D10 Dozer | Forward | 75% | 111.9 | 120.7 | 322897 | 6412189 | -4 |
| 33 | 5 Cat D10 Dozer | Reverse | 25% | 111.8 | 117.6 | 322837 | 6412259 | -5 |
| 34 | 1 Cat 785 120t Mine Truck | Idle loading | 100% | 102.7 | 110.0 | 322962 | 6412257 | -2 |
| 35 | 2 Cat 785 120t Mine Truck | Pulling away | 50% | 110.8 | 118.1 | 322964 | 6412169 | -3 |
| 36 | 2 Cat 785 120t Mine Truck | Flat | 50% | 108.3 | 117.2 | 322884 | 6411937 | -2 |
| 37 | 3 Cat 785 120t Mine Truck | Flat | 50% | 108.3 | 117.2 | 322467 | 6411861 | -2 |
| 38 | 3 Cat 785 120t Mine Truck | Flat | 50% | 108.3 | 117.2 | 322132 | 6412460 | -3 |
| 39 | 4 Cat 785 120t Mine Truck | Up Hill | 50% | 110.8 | 118.1 | 321821 | 6412826 | 17 |
| 40 | 4 Cat 785 120t Mine Truck | Up Hill | 50% | 110.8 | 118.1 | 321429 | 6413239 | 72 |
| 41 | 5 Cat 785 120t Mine Truck | Flat | 50% | 108.3 | 117.2 | 320902 | 6413595 | 121 |
| 42 | 5 Cat 785 120t Mine Truck | Dumping | 50% | 109.0 | 116.5 | 320609 | 6413994 | 133 |
| 43 | EX04 Liebherr 996 600t excavator | Overburden | 100% | 117.1 | 122.8 | 323095 | 6412255 | 0 |
| 44 | 6 Cat D10 Dozer | Forward | 75% | 111.9 | 120.7 | 323179 | 6412254 | 2 |
| 45 | 6 Cat D10 Dozer | Reverse | 25% | 111.8 | 117.6 | 323131 | 6412196 | 1 |
| 46 | 12 Cat 793 230t Mine Truck | Idle loading | 100% | 102.7 | 110.0 | 323258 | 6412253 | 3 |
| 47 | 13 Cat 793 230t Mine Truck | Pulling away | 50% | 112.9 | 122.0 | 323258 | 6412189 | 4 |
| 48 | 13 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 323051 | 6412050 | -1 |
| 49 | 14 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 322667 | 6411857 | -1 |
| 50 | 14 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 322196 | 6411852 | -2 |
| 51 | 15 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 322201 | 6412255 | -2 |
| 52 | 15 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 322041 | 6412556 | -2 |
| 53 | 16 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 321757 | 6412904 | 27 |
| 54 | 16 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 321878 | 6413061 | 52 |
| 55 | 17 Cat 793 230t Mine Truck | Down Hill | 50% | 110.7 | 121.9 | 322169 | 6413157 | 82 |
| 56 | 17 Cat 793 230t Mine Truck | Dumping | 50% | 109.8 | 118.8 | 322498 | 6413294 | 84 |

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 67 | 8 Cat D11 Dozer | Forward | 75% | 110.8 | 121.0 | 323025 | 6412876 | -65 |
| 68 | 8 Cat D11 Dozer | Reverse | 25% | 114.7 | 120.4 | 323058 | 6412884 | -60 |
| 69 | EX06 Liebherr 996 600t excavator | Overburden | 100% | 117.1 | 122.8 | 322569 | 6412411 | -124 |
| 70 | 9 Cat D10 Dozer | Forward | 75% | 111.9 | 120.7 | 322620 | 6412438 | -120 |
| 71 | 9 Cat D10 Dozer | Reverse | 25% | 111.8 | 117.6 | 322620 | 6412373 | -118 |
| 72 | 18 Cat 793 230t Mine Truck | Idle loading | 100% | 102.7 | 110.0 | 322666 | 6412407 | -117 |
| 73 | 19 Cat 793 230t Mine Truck | Pulling away | 50% | 112.9 | 122.0 | 322728 | 6412434 | -110 |
| 74 | 19 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 322682 | 6412564 | -96 |
| 75 | 20 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 322802 | 6412785 | -67 |
| 76 | 20 Cat 793 230t Mine Truck | Dumping | 50% | 109.8 | 118.8 | 322972 | 6412915 | -68 |
| 77 | 1 Reedrill SK50 Drill | Drilling | 100% | 114.2 | 119.1 | 322435 | 6412336 | -134 |
| 78 | 2 Reedrill SK50 Drill | Drilling | 100% | 114.2 | 119.1 | 322317 | 6412021 | -27 |
| 82 | 1 Service Truck | Moving | 100% | 111.8 | 112.4 | 322105 | 6412138 | 57 |
| 83 | 2 Service Truck | Moving | 100% | 111.8 | 112.4 | 322387 | 6412515 | -93 |
| 87 | 1 Cat 777 Water Truck | Dust Suppression | 100% | 114.5 | 125.6 | 322199 | 6411953 | -3 |
| 88 | 2 Cat 777 Water Truck | Dust Suppression | 100% | 114.5 | 125.6 | 322726 | 6412727 | -78 |
| 92 | 1 Cat 16M Grader | Road Maintenance | 100% | 107.6 | 114.5 | 322492 | 6411913 | -25 |
| 93 | 2 Cat 24M Grader | Road Maintenance | 100% | 112.0 | 118.8 | 320843 | 6413842 | 130 |
| **Additional Equipment or Alternate Location During Day Time Scenario** | | | | | | | | |
| 12 | 5 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 322135 | 6413777 | 163 |
| 13 | 6 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 322302 | 6414237 | 213 |
| 14 | 6 Cat 793 230t Mine Truck | Dumping | 50% | 109.8 | 118.8 | 321511 | 6413958 | 217 |
| 15 | 2 Cat D11 Dozer | Forward | 75% | 110.8 | 121.0 | 321550 | 6413996 | 218 |
| 16 | 2 Cat D11 Dozer | Reverse | 25% | 114.7 | 120.4 | 321620 | 6413993 | 219 |
| 29 | 4 Cat D11 Dozer | Forward | 75% | 110.8 | 121.0 | 322573 | 6413364 | 83 |
| 30 | 4 Cat D11 Dozer | Reverse | 25% | 114.7 | 120.4 | 322629 | 6413352 | 80 |
| 57 | EX05 Liebherr 9400 300t excavator | Overburden | 100% | 115.3 | 123.3 | 322287 | 6412240 | -60 |

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 58 | 7 Cat D10 Dozer | Forward | 75% | 111.9 | 120.7 | 322333 | 6412264 | -68 |
| 59 | 7 Cat D10 Dozer | Reverse | 25% | 111.8 | 117.6 | 322323 | 6412218 | -64 |
| 60 | 6 Cat 785 120t Mine Truck | Idle loading | 100% | 102.7 | 110.0 | 322290 | 6412298 | -66 |
| 61 | 7 Cat 785 120t Mine Truck | Pulling away | 33% | 109.0 | 116.4 | 322311 | 6412349 | -74 |
| 62 | 7 Cat 785 120t Mine Truck | Down Hill | 33% | 106.6 | 115.4 | 322290 | 6412473 | -88 |
| 63 | 7 Cat 785 120t Mine Truck | Flat | 33% | 106.6 | 115.5 | 322511 | 6412548 | -92 |
| 64 | 8 Cat 785 120t Mine Truck | Up Hill | 33% | 109.0 | 116.4 | 322703 | 6412680 | -83 |
| 65 | 8 Cat 785 120t Mine Truck | Flat | 33% | 106.6 | 115.4 | 322890 | 6412864 | -68 |
| 66 | 8 Cat 785 120t Mine Truck | Dumping | 33% | 107.2 | 114.7 | 323019 | 6412936 | -63 |
| 79 | Drill 3 Reedrill SK50 (day shift only) | Drilling | 100% | 114.2 | 119.1 | 322857 | 6411693 | 73 |
| 80 | 10 Cat D10 Dozer | Forward | 75% | 111.9 | 120.7 | 322777 | 6411712 | 72 |
| 81 | 10 Cat D10 Dozer | Reverse | 25% | 111.8 | 117.6 | 322777 | 6411642 | 73 |
| 84 | 3 Service Truck | Moving | 100% | 111.8 | 112.4 | 321681 | 6413457 | 105 |
| 85 | 11 Cat D10 Dozer | Road Maintenance | 75% | 111.9 | 120.7 | 322072 | 6411772 | 65 |
| 86 | 11 Cat D10 Dozer | Road Maintenance | 25% | 111.8 | 117.6 | 322072 | 6411718 | 68 |
| 89 | 3 Cat 777 Water Truck | Road Maintenance | 100% | 114.5 | 125.6 | 321928 | 6412525 | 54 |
| 90 | 4 Cat 777 Water Truck | Road Maintenance | 100% | 114.5 | 125.6 | 321562 | 6413099 | 53 |
| 91 | 5 Cat 777 Water Truck | Road Maintenance | 100% | 114.5 | 125.6 | 321167 | 6413510 | 107 |
| 94 | 3 Cat 24M Grader | Road Maintenance | 100% | 112.0 | 118.8 | 322023 | 6413647 | 145 |
| 95 | 12 Cat D11 Dozer | Forward | 75% | 110.8 | 121.0 | 321565 | 6413913 | 220 |
| 96 | 12 Cat D11 Dozer | Reverse | 25% | 114.7 | 120.4 | 321565 | 6413840 | 220 |
| 97 | 13 Cat D11 Dozer | Forward | 75% | 110.8 | 121.0 | 322007 | 6414084 | 218 |
| 98 | 13 Cat D11 Dozer | Reverse | 25% | 114.7 | 120.4 | 322005 | 6414029 | 215 |
| 99 | 14 Cat 854 Rubber Tyred Dozer | Road Maintenance | 100% | 110.4 | 115.6 | 322492 | 6411913 | -25 |
| **Bayswater North Pit Equipment** | | | | | | | | |
| 501 | Hitachi EX5500 | Overburden | 100% | 124.6 | 118 | 319402 | 6413934 | -28 |
| 502 | Cat D10T Dozer #1 | Forward | 75% | 122 | 110.7 | 319387 | 6413914 | -27 |

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 503 | Cat D10T Dozer #1 | Reverse | 25% | 120.4 | 116.1 | 319375 | 6413890 | -25 |
| 504 | Cat 793D XQ #1 | Idle | 100% | 110 | 102.7 | 319427 | 6413921 | -22 |
| 505 | Cat 793D XQ #2 | Accelerating | 33% | 121.2 | 111.3 | 319474 | 6413864 | -11 |
| 506 | Cat 793D XQ #3 | Dumping | 50% | 120.1 | 113 | 318693 | 6414033 | 147 |
| 507 | Cat 793D XQ #3 | Dumping | 50% | 120.1 | 113 | 319326 | 6414278 | 122 |
| 508 | Cat 793D XQ #2 | Up-ramp | 33% | 120.5 | 111.3 | 319588 | 6413777 | 92 |
| 509 | Cat 793D XQ #2 | Down-ramp | 33% | 117.5 | 111.2 | 319581 | 6414138 | 130 |
| 510 | Cat 793D XQ #4 | Up-ramp | 33% | 120.5 | 111.3 | 319715 | 6413507 | 110 |
| 511 | Cat 793D XQ #4 | Down-ramp | 33% | 117.5 | 111.2 | 319505 | 6413183 | 138 |
| 512 | Cat 793D XQ #4 | Up-ramp | 33% | 120.5 | 111.3 | 318999 | 6413293 | 155 |
| 516 | Hitachi EX2500 | Coal_Overburden | 100% | 120.9 | 116 | 319070 | 6413616 | 36 |
| 517 | Cat D10T Dozer #2 | Forward | 75% | 122 | 110.7 | 319063 | 6413670 | 39 |
| 518 | Cat D10T Dozer #2 | Reverse | 25% | 120.4 | 116.1 | 318980 | 6413670 | 43 |
| 519 | Cat 789C #1 | Idle | 100% | 110 | 102.7 | 319084 | 6413558 | 33 |
| 520 | Cat 789C #2 | Accelerating | 33% | 123 | 111.3 | 319226 | 6413659 | 4 |
| 521 | Cat 789C #3 | Dumping | 50% | 120.1 | 113 | 320024 | 6413353 | 129 |
| 522 | Cat 789C #3 | Dumping | 25% | 117.1 | 110 | 318738 | 6414092 | 146 |
| 523 | Cat 789C #2 | Up-ramp | 33% | 123 | 111.3 | 319388 | 6413566 | 63 |
| 524 | Cat 789C #2 | Down-ramp | 33% | 120.3 | 111.2 | 319886 | 6413839 | 106 |
| 525 | Cat 789C #4 | Up-ramp | 33% | 123 | 111.3 | 319668 | 6413257 | 121 |
| 526 | Cat 789C #4 | Down-ramp | 33% | 120.3 | 111.2 | 319876 | 6413033 | 120 |
| 527 | Cat 789C #4 | Up-ramp | 33% | 123 | 111.3 | 319259 | 6413159 | 156 |
| 528 | Cat D10T Dozer #3 | Forward | 75% | 122 | 110.7 | 319253 | 6414273 | 120 |
| 529 | Cat D10T Dozer #3 | Reverse | 25% | 120.4 | 116.1 | 319270 | 6414220 | 120 |
| 530 | Cat D11 Dozer #4 | Forward | 75% | 122 | 110.7 | 318655 | 6414092 | 149 |
| 531 | Cat D11 Dozer #4 | Reverse | 25% | 120.4 | 116.1 | 318683 | 6414144 | 149 |
| 534 | Drill Sk50 | Drilling | 100% | 120.1 | 113.4 | 319504 | 6413449 | 88 |

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 535 | Water Cart 777 | Road Maintenance | 100% | 122 | 115 | 319451 | 6413632 | 72 |
| 536 | Grader 16H | Road Maintenance | 100% | 114.5 | 107.6 | 319817 | 6413662 | 110 |
| 537 | Service Truck | Ancillary | 100% | 112.4 | 111.8 | 319286 | 6413575 | 22 |
| 538 | Cat 789C #3 | Up-ramp | 25% | 121.7 | 110 | 318793 | 6413570 | 145 |

## Table 3 - Year 10 Modelled Equipment List

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 1 | EX01 Liebherr 996 600t excavator | Overburden | 100% | 117.1 | 122.8 | 322849 | 6410709 | 88 |
| 2 | 1 Cat D10 Dozer | Forward | 75% | 111.9 | 120.7 | 322788 | 6410709 | 88 |
| 3 | 1 Cat D10 Dozer | Reverse | 25% | 111.8 | 117.6 | 322828 | 6410671 | 89 |
| 4 | 1 Cat 793 230t Mine Truck | Idle loading | 100% | 102.7 | 110.0 | 322893 | 6410709 | 88 |
| 5 | 2 Cat 793 230t Mine Truck | Pulling away | 50% | 112.9 | 122.0 | 322891 | 6410810 | 86 |
| 6 | 2 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 322435 | 6410911 | 78 |
| 7 | 3 Cat 793 230t Mine Truck | Down hill | 50% | 110.7 | 121.9 | 322234 | 6410934 | 62 |
| 8 | 3 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 322039 | 6411326 | 58 |
| 9 | 4 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 322066 | 6411658 | 56 |
| 10 | 4 Cat 793 230t Mine Truck | Flat | 25% | 107.7 | 118.9 | 322086 | 6411919 | 54 |
| 11 | 4 Cat 793 230t Mine Truck | Flat | 25% | 107.7 | 118.9 | 322016 | 6412426 | 58 |
| 12 | 5 Cat 793 230t Mine Truck | Flat | 25% | 107.7 | 118.9 | 321847 | 6412653 | 55 |
| 13 | 5 Cat 793 230t Mine Truck | Flat | 25% | 107.7 | 118.9 | 321544 | 6413035 | 58 |
| 14 | 5 Cat 793 230t Mine Truck | Down hill | 50% | 110.7 | 121.9 | 322038 | 6412814 | 35 |
| 15 | 6 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 322551 | 6412668 | 79 |
| 16 | 6 Cat 793 230t Mine Truck | Dumping | 50% | 109.8 | 118.8 | 322730 | 6412584 | 91 |
| 18 | 2 Cat 854 Rubber Tyred Dozer | Forward | 100% | 110.4 | 115.6 | 322782 | 6412616 | 91 |
| 20 | EX02 Liebherr 996 600t excavator | Overburden | 100% | 117.1 | 122.8 | 322327 | 6411155 | 12 |
| 21 | 3 Cat D10 Dozer | Forward | 75% | 111.9 | 120.7 | 322326 | 6411097 | 14 |
| 22 | 3 Cat D10 Dozer | Reverse | 25% | 111.8 | 117.6 | 322264 | 6411156 | 13 |
| 23 | 7 Cat 793 230t Mine Truck | Idle loading | 100% | 102.7 | 110.0 | 322394 | 6411164 | 12 |
| 24 | 8 Cat 793 230t Mine Truck | Pulling away | 50% | 112.9 | 122.0 | 322459 | 6411225 | 13 |
| 25 | 8 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 322172 | 6411466 | -2 |
| 26 | 9 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 322188 | 6411841 | -2 |
| 27 | 9 Cat 793 230t Mine Truck | Flat | 50% | 110.7 | 121.9 | 322210 | 6412215 | -3 |
| 28 | 10 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 321993 | 6412606 | 23 |

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 29 | 10 Cat 793 230t Mine Truck | Down hill | 50% | 110.7 | 121.9 | 322098 | 6412817 | 37 |
| 30 | 11 Cat 793 230t Mine Truck | Up Hill | 50% | 112.9 | 122.0 | 322458 | 6412752 | 69 |
| 31 | 11 Cat 793 230t Mine Truck | Dumping | 50% | 109.8 | 118.8 | 322707 | 6412649 | 91 |
| 32 | EX03 Liebherr 9400 300t excavator | Overburden | 100% | 115.3 | 123.3 | 322808 | 6411334 | -4 |
| 33 | 4 Cat D10 Dozer | Forward | 75% | 111.9 | 120.7 | 322869 | 6411332 | -4 |
| 34 | 4 Cat D10 Dozer | Reverse | 25% | 111.8 | 117.6 | 322869 | 6411302 | -1 |
| 35 | 12 Cat 793 230t Mine Truck | Idle loading | 100% | 102.7 | 110.0 | 322738 | 6411331 | -6 |
| 36 | 13 Cat 793 230t Mine Truck | Pulling away | 50% | 112.9 | 122.0 | 322459 | 6411341 | -3 |
| 37 | 13 Cat 793 230t Mine Truck | Flat | 25% | 107.7 | 118.9 | 322177 | 6411626 | -2 |
| 38 | 13 Cat 793 230t Mine Truck | Flat | 25% | 107.7 | 118.9 | 322195 | 6412099 | -2 |
| 39 | 14 Cat 793 230t Mine Truck | Up Hill | 25% | 109.9 | 119.0 | 322089 | 6412490 | 8 |
| 40 | 14 Cat 793 230t Mine Truck | Flat | 25% | 107.7 | 118.9 | 322224 | 6412649 | 33 |
| 41 | 14 Cat 793 230t Mine Truck | Dumping | 50% | 109.8 | 118.8 | 322787 | 6412311 | 33 |
| 42 | 5 Cat 854 Rubber Tyred Dozer | Forward | 100% | 110.4 | 115.6 | 322850 | 6412254 | 32 |
| 44 | EX04 Liebherr 9400 300t excavator | Overburden | 100% | 115.3 | 123.3 | 322607 | 6411511 | -63 |
| 45 | 6 Cat D10 Dozer | Forward | 75% | 111.9 | 120.7 | 322660 | 6411525 | -61 |
| 46 | 6 Cat D10 Dozer | Reverse | 25% | 111.8 | 117.6 | 322660 | 6411470 | -61 |
| 47 | 15 Cat 793 230t Mine Truck | Idle loading | 100% | 102.7 | 110.0 | 322550 | 6411511 | -62 |
| 48 | 16 Cat 793 230t Mine Truck | Pulling away | 50% | 112.9 | 122.0 | 322392 | 6411584 | -73 |
| 49 | 16 Cat 793 230t Mine Truck | Flat | 25% | 107.7 | 118.9 | 322452 | 6411787 | -73 |
| 50 | 16 Cat 793 230t Mine Truck | Flat | 25% | 107.7 | 118.9 | 322505 | 6411990 | -42 |
| 51 | 17 Cat 793 230t Mine Truck | Up Hill | 25% | 109.9 | 119.0 | 322299 | 6412239 | -11 |
| 52 | 17 Cat 793 230t Mine Truck | Flat | 25% | 107.7 | 118.9 | 322385 | 6412245 | 2 |
| 53 | 17 Cat 793 230t Mine Truck | Dumping | 50% | 109.8 | 118.8 | 322613 | 6412179 | 3 |
| 54 | 7 Cat D11 Dozer | Forward | 75% | 110.8 | 121.0 | 322669 | 6412215 | 4 |
| 55 | 7 Cat D11 Dozer | Reverse | 25% | 114.7 | 120.4 | 322669 | 6412155 | 1 |
| 56 | EX05 Hitachci EX2500 200t excavator | Coal | 100% | 115.3 | 123.3 | 322857 | 6411201 | 12 |

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 57 | 8 Cat D10 Dozer | Forward | 75% | 111.9 | 120.7 | 322917 | 6411232 | 11 |
| 58 | 8 Cat D10 Dozer | Reverse | 25% | 111.8 | 117.6 | 322917 | 6411172 | 12 |
| 59 | 1 Cat 785 120t Mine Truck | Idle loading | 100% | 102.7 | 110.0 | 322796 | 6411200 | 12 |
| 60 | 2 Cat 785 120t Mine Truck | Pulling away | 50% | 110.8 | 118.1 | 322694 | 6411137 | 16 |
| 61 | 2 Cat 785 120t Mine Truck | Up Hill | 50% | 110.8 | 118.1 | 322838 | 6411006 | 42 |
| 62 | 3 Cat 785 120t Mine Truck | Flat | 50% | 108.3 | 117.2 | 322719 | 6410949 | 57 |
| 63 | 3 Cat 785 120t Mine Truck | Flat | 50% | 108.3 | 117.2 | 322182 | 6410999 | 57 |
| 64 | 4 Cat 785 120t Mine Truck | Flat | 50% | 108.3 | 117.2 | 322054 | 6411485 | 58 |
| 65 | 4 Cat 785 120t Mine Truck | Flat | 50% | 108.3 | 117.2 | 322095 | 6412227 | 59 |
| 66 | 5 Cat 785 120t Mine Truck | Flat | 50% | 108.3 | 117.2 | 321721 | 6412819 | 55 |
| 67 | 5 Cat 785 120t Mine Truck | Down hill | 50% | 108.3 | 117.2 | 321456 | 6413196 | 67 |
| 68 | 6 Cat 785 120t Mine Truck | Up Hill | 50% | 110.8 | 118.1 | 321047 | 6413600 | 117 |
| 69 | 6 Cat 785 120t Mine Truck | Dumping | 50% | 109.0 | 116.5 | 320670 | 6414041 | 130 |
| 70 | 1 Reedrill SK50 Drill | Drilling | 100% | 114.2 | 119.1 | 322312 | 6411478 | -63 |
| 71 | 2 Reedrill SK50 Drill | Drilling | 100% | 114.2 | 119.1 | 323133 | 6411075 | 15 |
| 75 | 1 Service Truck | Moving | 100% | 111.8 | 112.4 | 322376 | 6412070 | -28 |
| 76 | 2 Service Truck | Moving | 100% | 111.8 | 112.4 | 322171 | 6411309 | -1 |
| 80 | 1 Cat 777 Water Truck | Dust Suppression | 100% | 114.5 | 125.6 | 322097 | 6412048 | 59 |
| 81 | 2 Cat 777 Water Truck | Dust Suppression | 100% | 114.5 | 125.6 | 321258 | 6413404 | 89 |
| 84 | 1 Cat 16M Grader | Road Maintenance | 100% | 107.6 | 114.5 | 322064 | 6411792 | 57 |
| 85 | 2 Cat 24M Grader | Road Maintenance | 100% | 112.0 | 118.8 | 321646 | 6412912 | 55 |
| **Additional Equipment or Alternate Location During Day Time Scenario** | | | | | | | | |
| 18 | 2 Cat D11 Dozer | Forward | 75% | 110.8 | 121.0 | 322782 | 6412616 | 91 |
| 19 | 2 Cat D11 Dozer | Reverse | 25% | 114.7 | 120.4 | 322867 | 6412619 | 91 |
| 42 | 5 Cat D11 Dozer | Forward | 75% | 110.8 | 121.0 | 322850 | 6412254 | 32 |
| 43 | 5 Cat D11 Dozer | Reverse | 25% | 114.7 | 120.4 | 322850 | 6412318 | 34 |
| 72 | 3 Reedrill SK50 Drill | Drilling | 100% | 114.2 | 119.1 | 322343 | 6410749 | 88 |

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 73 | 9 Cat D10 Dozer | Forward | 75% | 111.9 | 120.7 | 322238 | 6410812 | 87 |
| 74 | 9 Cat D10 Dozer | Reverse | 25% | 111.8 | 117.6 | 322238 | 6410728 | 89 |
| 77 | 3 Service Truck | Moving | 100% | 111.8 | 112.4 | 322017 | 6411094 | 58 |
| 78 | 10 Cat D11 Dozer | Forward | 75% | 110.8 | 121.0 | 322004 | 6410959 | 56 |
| 79 | 10 Cat D11 Dozer | Reverse | 25% | 114.7 | 120.4 | 322053 | 6410959 | 59 |
| 82 | 3 Cat 777 Water Truck | Dust Suppression | 100% | 114.5 | 125.6 | 322609 | 6411900 | -55 |
| 83 | 4 Cat 777 Water Truck | Dust Suppression | 100% | 114.5 | 125.6 | 322181 | 6412368 | -3 |
| 86 | 3 Cat 24M Grader | Road Maintenance | 100% | 112.0 | 118.8 | 322193 | 6411936 | -2 |
| 87 | 11 Cat D11 Dozer | Forward | 75% | 110.8 | 121.0 | 322772 | 6413028 | 95 |
| 88 | 11 Cat D11 Dozer | Reverse | 25% | 114.7 | 120.4 | 322769 | 6412939 | 94 |
| 89 | 12 Cat D11 Dozer | Forward | 75% | 110.8 | 121.0 | 322996 | 6413083 | 95 |
| 90 | 12 Cat D11 Dozer | Reverse | 25% | 114.7 | 120.4 | 322996 | 6412991 | 94 |
| **RERR Equipment** | | | | | | | | |
| 501 | Hitachi EX5500 | Overburden | 100% | 124.6 | 118 | 320672 | 6410686 | -48 |
| 502 | Cat D10T Dozer #1 | Forward | 75% | 122 | 110.7 | 320636 | 6410681 | -46 |
| 503 | Cat D10T Dozer #1 | Reverse | 25% | 120.4 | 116.1 | 320634 | 6410707 | -46 |
| 504 | Cat 793D XQ #1 | Idle | 100% | 110 | 102.7 | 320707 | 6410688 | -49 |
| 505 | Cat 793D XQ #2 | Accelerating | 33% | 121.2 | 111.3 | 320875 | 6410703 | -3 |
| 506 | Cat 793D XQ #3 | Dumping | 50% | 120.1 | 113 | 319070 | 6413816 | 155 |
| 507 | Cat 793D XQ #3 | Up-ramp | 25% | 119.2 | 110 | 320738 | 6410547 | 18 |
| 508 | Cat 793D XQ #2 | Up-ramp | 33% | 120.5 | 111.3 | 320985 | 6410744 | 42 |
| 509 | Cat 793D XQ #2 | Down-ramp | 33% | 117.5 | 111.2 | 320992 | 6411086 | 76 |
| 510 | Cat 793D XQ #4 | Up-ramp | 33% | 120.5 | 111.3 | 320421 | 6411256 | 94 |
| 511 | Cat 793D XQ #4 | Down-ramp | 33% | 117.5 | 111.2 | 320291 | 6411718 | 97 |
| 512 | Cat 793D XQ #4 | Up-ramp | 33% | 120.5 | 111.3 | 320186 | 6412071 | 100 |
| 513 | Cat 793D XQ #5 | Down-ramp | 33% | 117.5 | 111.2 | 320063 | 6412464 | 102 |
| 514 | Cat 793D XQ #5 | Up-ramp | 33% | 120.5 | 111.3 | 319909 | 6412806 | 108 |

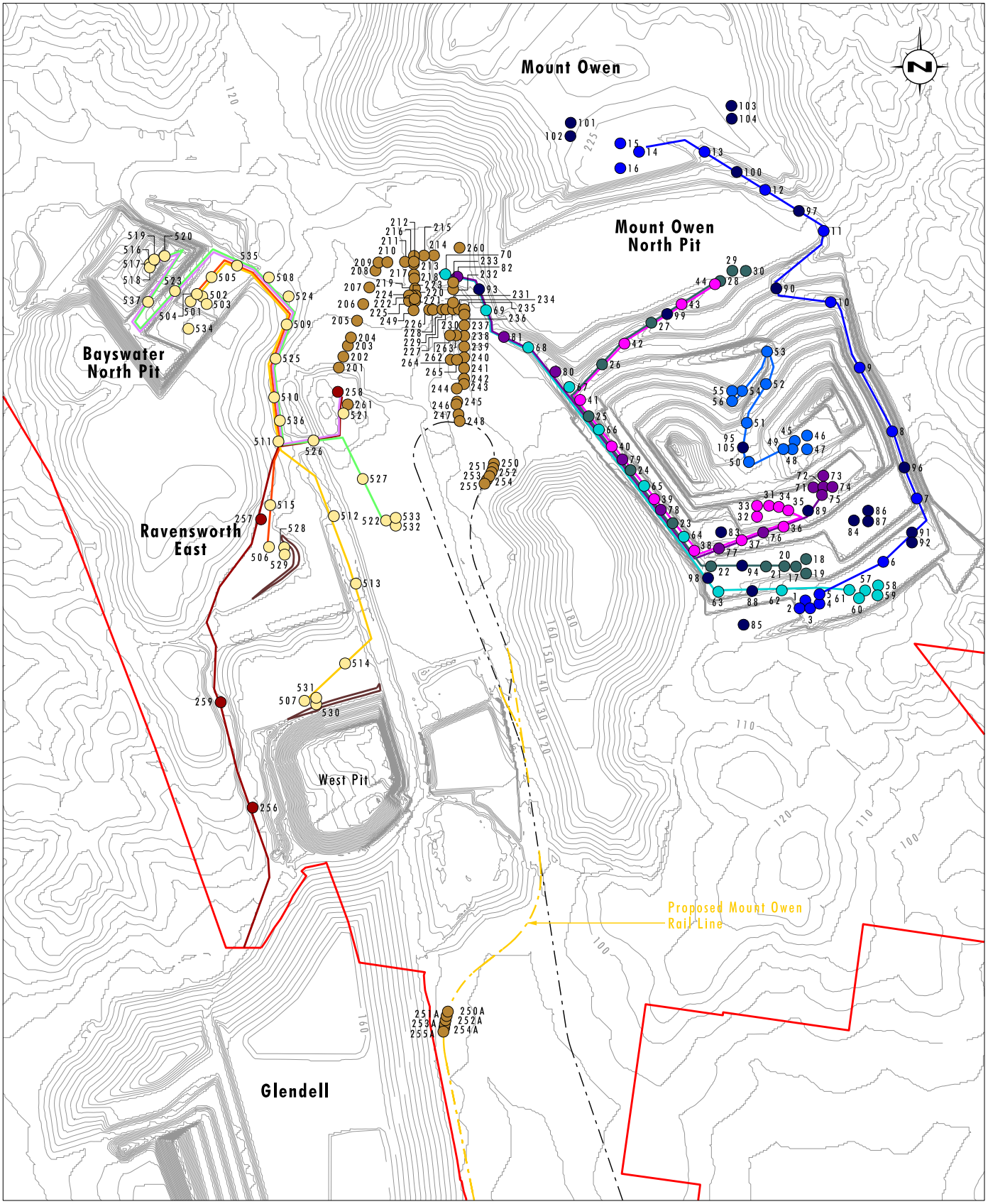
| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 515 | Cat 793D XQ #5 | Down-ramp | 33% | 117.5 | 111.2 | 319487 | 6413161 | 139 |
| 516 | Hitachi EX2500 | Coal_Overburden | 100% | 120.9 | 116 | 320823 | 6410859 | -58 |
| 517 | Cat D10T Dozer #2 | Forward | 75% | 122 | 110.7 | 320815 | 6410882 | -57 |
| 518 | Cat D10T Dozer #2 | Reverse | 25% | 120.4 | 116.1 | 320848 | 6410882 | -60 |
| 519 | Cat 789C #1 | Idle | 100% | 110 | 102.7 | 320813 | 6410836 | -57 |
| 520 | Cat 789C #2 | Accelerating | 33% | 123 | 111.3 | 320779 | 6410765 | -55 |
| 521 | Cat 789C #3 | Dumping | 50% | 120.1 | 113 | 320652 | 6411017 | 13 |
| 522 | Cat 789C #3 | Dumping | 50% | 120.1 | 113 | 320050 | 6413267 | 130 |
| 523 | Cat 789C #2 | Up-ramp | 33% | 123 | 111.3 | 320827 | 6410573 | 28 |
| 524 | Cat 789C #2 | Down-ramp | 33% | 120.3 | 111.2 | 320883 | 6411081 | 13 |
| 525 | Cat 789C #4 | Up-ramp | 33% | 123 | 111.3 | 320728 | 6411247 | 96 |
| 526 | Cat 789C #4 | Down-ramp | 33% | 120.3 | 111.2 | 320252 | 6411887 | 102 |
| 527 | Cat 789C #4 | Up-ramp | 33% | 123 | 111.3 | 320017 | 6412588 | 105 |
| 528 | Cat D10T Dozer #3 | Forward | 75% | 122 | 110.7 | 320615 | 6411014 | 14 |
| 529 | Cat D10T Dozer #3 | Reverse | 25% | 120.4 | 116.1 | 320615 | 6410982 | 13 |
| 530 | Cat D11 Dozer #4 | Forward | 75% | 122 | 110.7 | 319068 | 6413844 | 155 |
| 531 | Cat D11 Dozer #4 | Reverse | 25% | 120.4 | 116.1 | 319104 | 6413844 | 155 |
| 534 | Drill Sk50 | Drilling | 100% | 120.1 | 113.4 | 320634 | 6410482 | 23 |
| 535 | Water Cart 777 | Road Maintenance | 100% | 122 | 115 | 320364 | 6411492 | 97 |
| 536 | Grader 16H | Road Maintenance | 100% | 114.5 | 107.6 | 320127 | 6412262 | 100 |
| 537 | Service Truck | Ancillary | 100% | 112.4 | 111.8 | 320818 | 6410634 | 8 |
| 538 | Cat 789C #3 | Up-ramp | 25% | 116.2 | 109.9 | 319137 | 6413432 | 155 |

## Table 4 - CHPP, Conveyor and Other Modelled Equipment List

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 213 | 113 Conveyor | XMO ROM Conveyor 2 Seg 1 | 100% | 98.9 | 109.5 | 320451 | 6414050 | 114 |
| 214 | 114 Hopper | XMO ROM Hopper | 100% | 111.3 | 119.9 | 320564 | 6414098 | 114 |
| 215 | 115 Conveyor | XMO ROM Conveyor 1 Seg 1 | 100% | 101.5 | 112.1 | 320508 | 6414097 | 114 |
| 216 | 116 Transfer Tower | XMO ROM Conveyor 1 - TT | 100% | 109.4 | 116.5 | 320452 | 6414095 | 114 |
| 217 | 117 Conveyor | XMO ROM Conveyor 2 Seg 2 | 100% | 100.0 | 110.6 | 320452 | 6413991 | 113 |
| 218 | 118 Conveyor Drive | XMO Rom Conveyor 2 - drive | 100% | 104.9 | 113.3 | 320454 | 6413968 | 113 |
| 219 | 119 Conveyor | XMO ROM Conveyor 2 Seg 3 | 100% | 99.9 | 110.5 | 320458 | 6413913 | 113 |
| 220 | 120 Bin | XMO ROM Bin | 100% | 88.5 | 98.2 | 320462 | 6413873 | 113 |
| 221 | 121 Conveyor | XMO ROM Conveyor 4 Seg 1 | 100% | 98.9 | 109.5 | 320458 | 6413842 | 113 |
| 222 | 122 Conveyor | XMO ROM Conveyor 3 Seg 1 | 100% | 98.9 | 109.5 | 320456 | 6413855 | 113 |
| 223 | 123 Conveyor | XMO ROM Conveyor 5 Seg 1 | 100% | 96.8 | 107.4 | 320443 | 6413873 | 113 |
| 224 | 124 Transfer Tower | XMO ROM Conveyor 6 - TT | 100% | 109.4 | 116.5 | 320424 | 6413874 | 113 |
| 225 | 125 Conveyor | XMO ROM Conveyor 6 Seg 1 | 100% | 98.9 | 109.5 | 320425 | 6413843 | 113 |
| 226 | 126 Conveyor | Reject Coal Conveyor Seg 1 | 100% | 97.2 | 112.3 | 320537 | 6413794 | 116 |
| 227 | 127 Conveyor | Reject Coal Conveyor Seg 2 | 100% | 97.2 | 112.3 | 320632 | 6413797 | 116 |
| 228 | 128 Conveyor | Clean Coal Conveyor Seg 1 | 100% | 97.2 | 112.3 | 320558 | 6413794 | 116 |
| 229 | 129 Conveyor | Clean Coal Conveyor Seg 2 | 100% | 97.2 | 112.3 | 320611 | 6413796 | 116 |
| 230 | 130 Transfer Tower | Reject and Clean Coal Conveyor – TT | 100% | 109.4 | 116.5 | 320671 | 6413796 | 111 |
| 231 | 131 Conveyor | Reject Conveyor Seg 1 | 100% | 96.5 | 111.6 | 320671 | 6413834 | 112 |
| 232 | 132 Conveyor | Reject Conveyor Seg 2 | 100% | 96.5 | 111.6 | 320671 | 6413909 | 117 |
| 233 | 133 Bin | Reject Bin | 100% | 88.5 | 98.2 | 320672 | 6413947 | 127 |
| 234 | 134 Conveyor | Clean Coal Conveyor 1 Seg 1 | 100% | 95.8 | 110.9 | 320703 | 6413797 | 113 |
| 235 | 135 Transfer Tower | Clean Coal Conveyor - TT | 100% | 109.4 | 116.5 | 320734 | 6413797 | 120 |
| 236 | 136 Conveyor | Clean Coal Conveyor 2 Seg 2 | 100% | 97.7 | 109.4 | 320734 | 6413767 | 117 |
| 237 | 137 Conveyor | Clean Coal Conveyor 2 Seg 3 | 100% | 97.7 | 109.4 | 320734 | 6413707 | 118 |

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 238 | 138 Conveyor | Clean Coal Conveyor 2 Seg 4 | 100% | 97.7 | 109.4 | 320733 | 6413648 | 119 |
| 239 | 139 Conveyor | Clean Coal Conveyor 2 Seg 5 | 100% | 97.7 | 109.4 | 320733 | 6413588 | 120 |
| 240 | 140 Conveyor | Clean Coal Conveyor 2 Seg 6 | 100% | 97.7 | 109.4 | 320733 | 6413528 | 120 |
| 241 | 141 Conveyor | Clean Coal Conveyor 2 Seg 7 | 100% | 97.7 | 109.4 | 320732 | 6413468 | 120 |
| 242 | 142 Conveyor | Clean Coal Conveyor 2 Seg 8 | 100% | 97.7 | 109.4 | 320732 | 6413409 | 120 |
| 243 | 143 Conveyor Drive | Clean Coal Conveyor 2 - drive | 100% | 104.9 | 113.3 | 320732 | 6413379 | 120 |
| 244 | 144 Conveyor | Product Conveyor 1 Seg 1 | 100% | 98.2 | 110.6 | 320691 | 6413354 | 115 |
| 245 | 145 Conveyor | Product Conveyor 1 Seg 2 | 100% | 98.2 | 110.6 | 320694 | 6413281 | 118 |
| 246 | 146 Conveyor Drive | Product Conveyor 1 - drive | 100% | 110.1 | 115.8 | 320689 | 6413265 | 118 |
| 247 | 147 Conveyor | Product Conveyor 1 Seg 3 | 100% | 98.2 | 110.6 | 320701 | 6413209 | 118 |
| 248 | 148 Bin | Product Bin | 100% | 88.5 | 98.2 | 320708 | 6413172 | 117 |
| 249 | 149 CHPP building | Operating | 200% | 113.8 | 126.3 | 320450 | 6413791 | 113 |
| 250 | 150 Train | Notch 2 during loading | 100% | 102.1 | 119.5 | 320899 | 6412934 | 120 |
| 251 | 151 Train | Notch 2 during loading | 100% | 102.1 | 119.5 | 320894 | 6412909 | 120 |
| 252 | 152 Train | Notch 2 during loading | 100% | 102.1 | 119.5 | 320886 | 6412886 | 120 |
| 253 | 153 Train | Idle | 50% | 94.3 | 115.0 | 320694 | 6409285 | 90 |
| 254 | 154 Train | Idle | 50% | 94.3 | 115.0 | 320714 | 6409183 | 90 |
| 255 | 155 Train | Idle | 50% | 94.3 | 115.0 | 320737 | 6409068 | 90 |
| 260 | 160 Mt Owen ROM FEL | Working on Raw Coal | 100% | 112.9 | 120.8 | 320707 | 6414141 | 130 |
| 261 | 161 GlendellROM FEL | Working on Raw Coal | 100% | 112.9 | 120.8 | 320082 | 6413265 | 126 |
| 262 | 162 Dozer Product Coal 1 | Forward | 75% | 110.7 | 124.9 | 320653 | 6413651 | 119 |
| 263 | 163 Dozer Product Coal 1 | Reversing | 25% | 116.1 | 123.6 | 320688 | 6413651 | 125 |
| 264 | 164 Dozer Product Coal 2 | Forward | 75% | 110.7 | 124.9 | 320657 | 6413515 | 121 |
| 265 | 165 Dozer Product Coal 2 | Reversing | 25% | 116.1 | 123.6 | 320692 | 6413515 | 131 |
| **Glendell Haul Road Machines (Year 1)** | | | | | | | | |
| 256 | 156 Glendell Truck 190t | Uphill | 100% | 113.8 | 121.1 | 319588 | 641101 | 92 |
| 257 | 157 Glendell Truck 190t | Uphill | 100% | 113.8 | 121.1 | 319978 | 6412685 | 108 |

| Source ID | Equipment Name | Activity | Acoustic Utilisation Factor | SWL, dB(A) | SWL, dB(Z) | Easting, MGA | Northing, MGA | Ground Elevation, m AHD |
|---|---|---|---|---|---|---|---|---|
| 258 | 158 Glendell Truck 190t | Dumping at ROM | 100% | 112.0 | 119.5 | 320026 | 6413335 | 127 |
| 259 | 159 Glendell Truck 190t | Downhill | 100% | 111.3 | 120.2 | 319888 | 6411641 | 97 |
| **Glendell Haul Road Machines (Year 5)** | | | | | | | | |
| 256 | 156 Glendell Truck 190t | Uphill | 100% | 113.8 | 121.1 | 320394 | 6410892 | 105 |
| 257 | 157 Glendell Truck 190t | Uphill | 100% | 113.8 | 121.1 | 320114 | 6412707 | 117 |
| 258 | 158 Glendell Truck 190t | Dumping at ROM | 100% | 112.0 | 119.5 | 320026 | 6413335 | 127 |
| 259 | 159 Glendell Truck 190t | Downhill | 100% | 111.3 | 120.2 | 320442 | 6411573 | 115 |
| **CHPP components utilised exclusively by Glendell Mine and Bayswater North Pit (Year 1 and Year 5) and RERR (Year 10)** | | | | | | | | |
| 201 | 101 Hopper | Glendell ROM Hopper | 100% | 111.3 | 119.9 | 320032 | 6413471 | 107 |
| 202 | 102 Conveyor | Glendell ROM Conveyor 1 Seg 1 | 100% | 101.9 | 112.5 | 320058 | 6413532 | 108 |
| 203 | 103 Transfer Tower | Glendell ROM Conveyor 1 - TT | 100% | 109.4 | 116.5 | 320083 | 6413593 | 109 |
| 204 | 104 Conveyor | Glendell ROM Conveyor 2 Seg 1 | 100% | 101.0 | 111.6 | 320100 | 6413639 | 109 |
| 205 | 105 Conveyor | Glendell ROM Conveyor 2 Seg 2 | 100% | 101.0 | 111.6 | 320134 | 6413733 | 111 |
| 206 | 106 Conveyor | Glendell ROM Conveyor 2 Seg 3 | 100% | 101.0 | 111.6 | 320169 | 6413826 | 112 |
| 207 | 107 Conveyor | Glendell ROM Conveyor 2 Seg 4 | 100% | 101.0 | 111.6 | 320203 | 6413919 | 113 |
| 208 | 108 Conveyor | Glendell ROM Conveyor 2 Seg 5 | 100% | 101.0 | 111.6 | 320237 | 6414013 | 115 |
| 209 | 109 Transfer Tower | Glendell ROM Conveyor 2 - TT | 100% | 109.4 | 116.5 | 320254 | 6414059 | 115 |
| 210 | 110 Conveyor | Glendell ROM Conveyor 3 Seg 1 | 100% | 100.9 | 111.5 | 320304 | 6414060 | 115 |
| 211 | 111 Conveyor | Glendell ROM Conveyor 3 Seg 2 | 100% | 100.9 | 111.5 | 320402 | 6414062 | 113 |
| 212 | 112 Transfer Tower | Glendell-XMO ROM Conveyor TT | 100% | 109.4 | 116.5 | 320452 | 6414063 | 114 |




Data Source: Mount Owen (2014)
Note: Contour Interval 5m

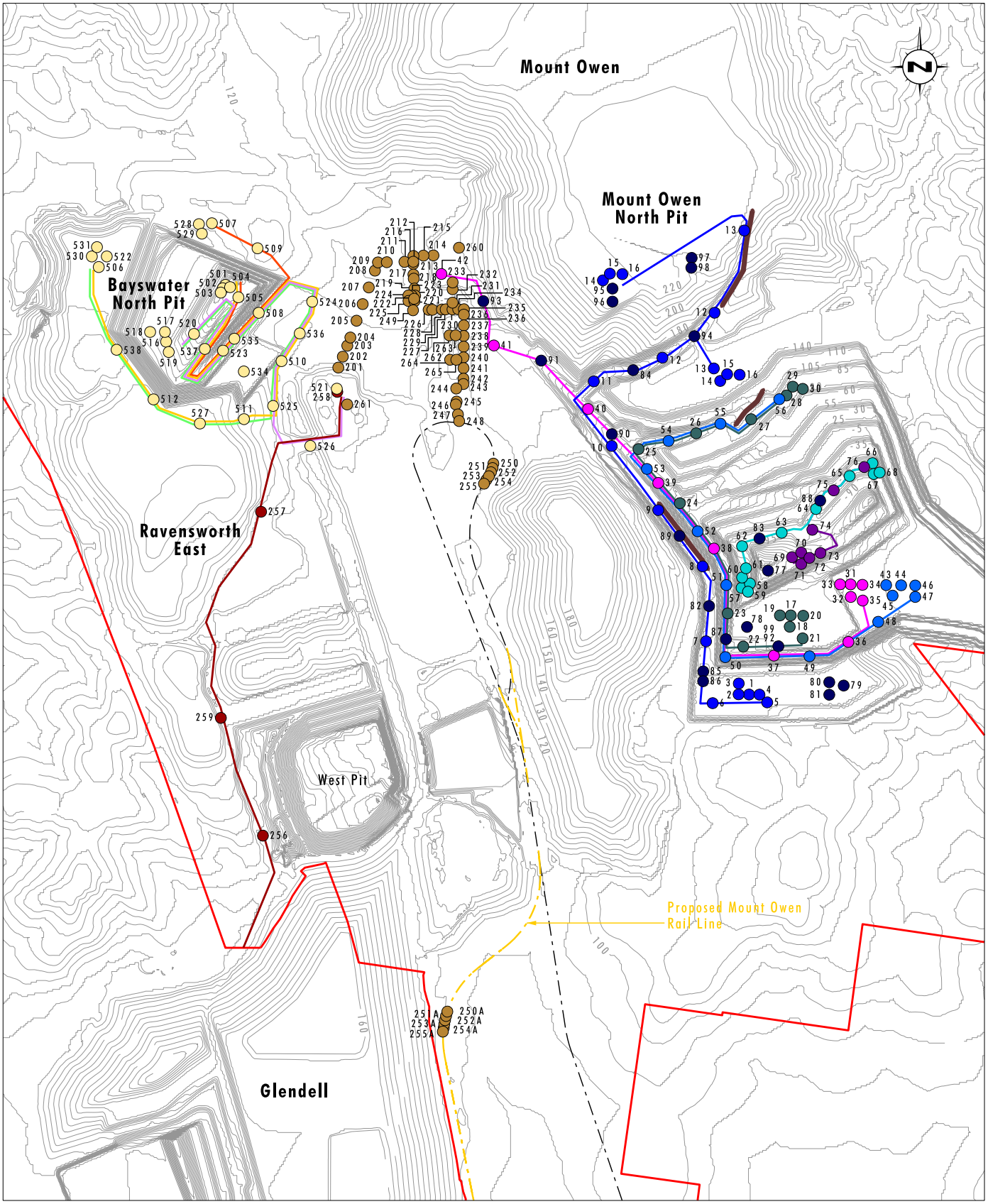
## Legend

- Project Area
- Existing Railway
- Proposed Rail Upgrade Works
- Ancillary Sources
- CHPP Related Sources
- 01 Overburden Route 01 (Ex01)
- 02 Overburden Route 02 (Ex02)
- 03 Coal Route 01 (Ex03)
- 04 Overburden Route 03 (Ex04)
- 05 Overburden Route 04 (Ex05)
- 06 Overburden Route 03 (Ex06)
- Glendell Haul Road
- BNP Coal Route 1 (EX2500)
- BNP Overburden Route 1 (EX5500)
- BNP Overburden Route 2 (EX5500)
- BNP Overburden Route 3 (EX2500)
- Bund
- BNP Source

FIGURE E.1

Year 1
Noise Model
Source Locations

File Name (A4): R11/3109_671.dgn
20140908 10.26




Data Source: Mount Owen (2014)
Note: Contour Interval 5m

0 0.5 1.0 1.5km
1:30 000

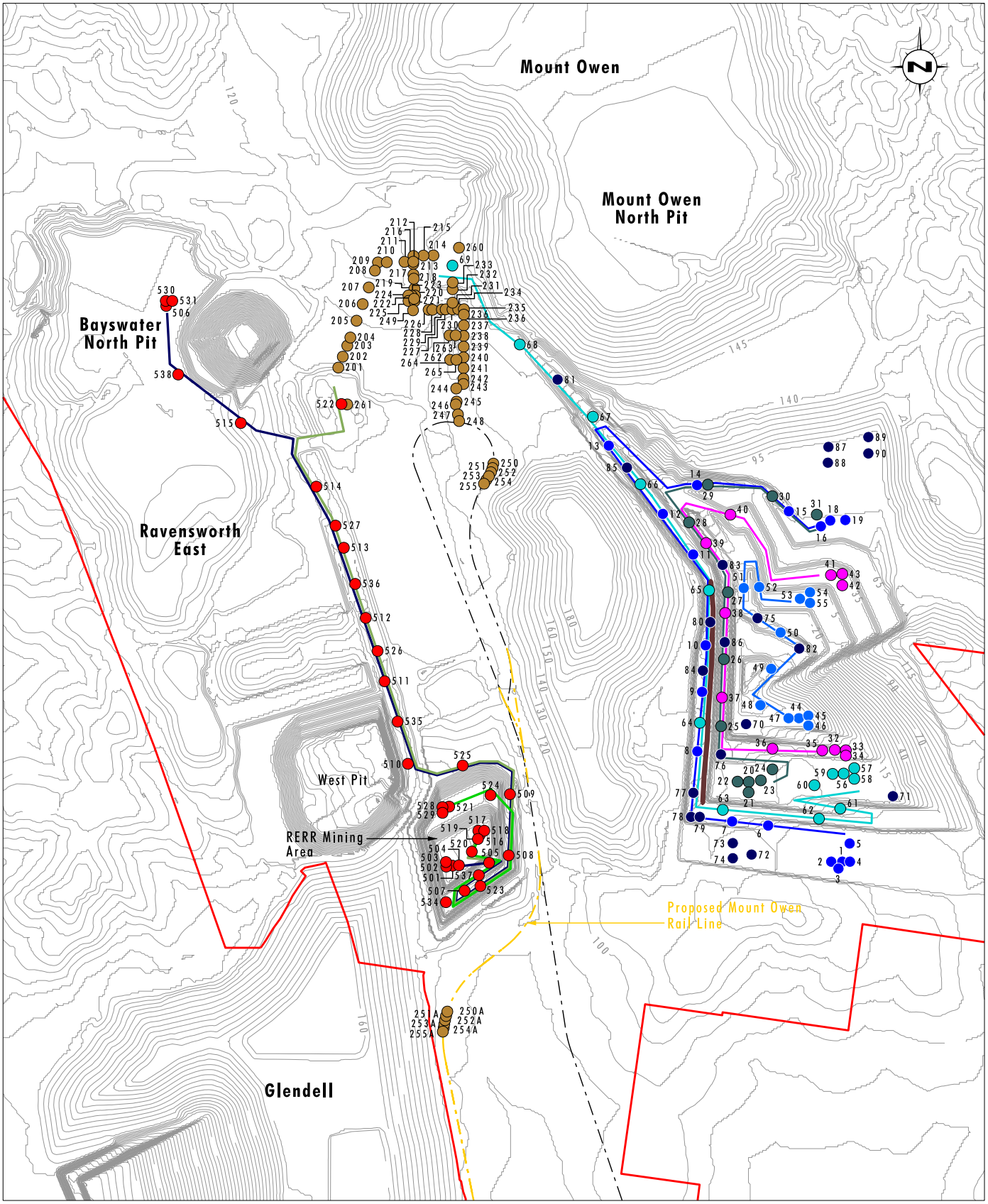
## Legend

- Project Area
- Existing Railway
- Proposed Rail Upgrade Works
- Ancillary Sources
- CHPP Related Sources
- 01 Overburden Route 01 (Ex01)
- 02 Overburden Route 02 (Ex02)
- 03 Coal Route 01 (Ex03)
- 04 Overburden Route 03 (Ex04)
- 05 Overburden Route 04 (Ex05)
- 06 Overburden Route 03 (Ex06)
- Glendell Haul Road
- BNP Coal Route 1 (EX2500)
- BNP Overburden Route 1 (EX5500)
- BNP Overburden Route 2 (EX5500)
- BNP Overburden Route 3 (EX2500)
- Bund
- BNP Source

FIGURE E.2

Year 5
Noise Model
Source Locations

File Name (A4): R11/3109_672.dgn
20140908 10.28




Data Source: Mount Owen (2014)
Note: Contour Interval 5m

0 0.5 1.0 1.5km
1:30 000

## Legend

- Project Area
- Existing Railway
- Proposed Rail Upgrade Works
- Ancillary Sources
- CHPP Related Sources
- 01 Overburden Route 01 (Ex01)
- 02 Overburden Route 02 (Ex02)
- 03 Overburden Route 03 (Ex03)
- 04 Overburden Route 04 (Ex04)
- 05 Coal Route 01 (Ex05)
- Noise Bund
- RERR Coal Route 1 (EX2500)
- RERR Overburden Route 1 (EX5500)
- RERR Overburden Route 2 (EX2500)
- RERR Source

FIGURE E.3

Year 10
Noise Model
Source Locations

File Name (A4): R11/3109_673.dgn
20140908 10.29

# APPENDIX F

Assessment of Meteorological Data

# Appendix F – Assessment of Meteorological Data

Section 5 of the Industrial Noise Policy (INP) (EPA 2000) requires that noise impacts be assessed under weather conditions that would be expected to occur at a particular site for a significant period of time.

The INP (EPA 2000) notes that there are two approaches for the assessment of meteorological effects, such as gradient winds and temperature inversions, on propagating the noise from the source to the receiver. The simple method is to use default conditions outlined in the INP. Alternatively, the local meteorological data can be used to determine weather conditions that would be expected to occur at a particular site for a significant period of time.

Meteorological data for the period September 2011 to August 2012 was sourced from Mount Owen. This data was analysed to determine the frequency of occurrence of prevailing winds and temperature inversions.

This meteorological data was used to determine the prevailing meteorological conditions for the area surrounding Mount Owen as well as for the probability analysis. The prevailing meteorological conditions were used to assess the construction and sleep disturbance noise levels to give an indication of worst-case noise impacts at the residential receivers. Probability analysis used all the meteorological data to determine the percentage occurrence of the operational noise impacts at the residential receivers.

**Wind**

The INP (EPA 2000) requires that wind effects need to be assessed when wind is considered a feature of the area. Wind is considered a feature of the area where source-to-receiver winds of 3 m/s occur for 30 per cent of the time in any assessment period.

Section 5 of the INP requires that noise impacts be assessed under weather conditions that would be expected to occur at a particular site for a significant period of time.

The collated meteorological data for the September 2011 to August 2012 period was analysed to determine prevailing wind conditions likely to influence the propagation of noise at the project site and is summarised in **Tables 1** to **4**.

**Table 1 – Gradient Wind Analysis, Summer**

| | **<0.5** | **0.5 to <0.9** | **0.9 to <1.7** | **1.7 to <2.8** | **2.8 to <4.2** | **4.2 to <5.2** | **>5.2** |
|---|---|---|---|---|---|---|---|
| **Day** | | | | | | | |
| N | 4.0% | 0.2% | 0.2% | 0.2% | - | - | - |
| NNE | | 0.1% | - | 0.1% | - | - | - |
| NE | | 0.1% | - | - | - | - | - |
| ENE | | 0.1% | 0.1% | 0.1% | - | - | - |
| E | | 0.1% | - | 0.2% | - | 0.6% | 1.1% |
| ESE | | 1.1% | 0.3% | 4.7% | 8.3% | 4.6% | 2.0% |
| SE | | 1.5% | - | 5.9% | 14.8% | 8.6% | 0.7% |
| SSE | | 1.4% | 0.8% | 3.0% | 5.5% | 3.2% | 0.1% |
| S | | 0.2% | 0.2% | 1.3% | 2.7% | - | - |
| SSW | | 0.2% | 0.1% | 0.3% | 0.2% | - | - |

| | <0.5 | 0.5 to <0.9 | 0.9 to <1.7 | 1.7 to <2.8 | 2.8 to <4.2 | 4.2 to <5.2 | >5.2 |
|---|---|---|---|---|---|---|---|
| SW | | 0.3% | - | 0.1% | 0.4% | - | - |
| WSW | | 1.0% | 0.6% | 0.4% | - | - | 0.2% |
| W | | 1.4% | 1.1% | 1.1% | 0.8% | 0.1% | 0.6% |
| WNW | | 1.3% | 0.6% | 1.8% | 1.3% | 0.8% | 0.1% |
| NW | | 0.4% | 0.2% | 0.9% | 1.8% | 1.4% | 1.4% |
| NNW | | 0.3% | 0.1% | 0.7% | - | - | - |
| **Evening** | | | | | | | |
| N | 1.4% | - | - | 0.5% | 0.5% | - | - |
| NNE | | 0.3% | 0.3% | 3.3% | 0.3% | - | - |
| NE | | 2.7% | - | 5.8% | 0.3% | - | - |
| ENE | | 1.1% | 0.3% | 3.3% | 2.5% | 0.5% | - |
| E | | 3.6% | 0.3% | 7.7% | 5.2% | 0.3% | - |
| ESE | | 2.7% | - | 12.4% | 15.7% | 1.4% | - |
| SE | | 4.7% | - | 5.5% | 9.3% | 1.4% | - |
| SSE | | 1.1% | 0.3% | 0.5% | - | - | - |
| S | | 0.5% | - | 0.3% | - | - | - |
| SSW | | - | - | - | - | - | - |
| SW | | - | - | - | - | - | - |
| WSW | | - | - | 0.3% | 0.3% | - | - |
| W | | - | - | - | - | - | - |
| WNW | | - | - | 0.5% | - | - | - |
| NW | | - | 0.3% | - | - | 0.5% | - |
| NNW | | - | - | 1.1% | 0.5% | 0.3% | 0.3% |
| **Night** | | | | | | | |
| N | 6.5% | 6.6% | 1.1% | 2.0% | - | - | - |
| NNE | | 5.4% | 1.7% | 1.7% | - | - | - |
| NE | | 1.8% | 0.9% | 0.6% | - | - | - |
| ENE | | 1.0% | 1.0% | - | - | - | - |
| E | | 3.8% | 3.5% | 0.9% | 0.1% | - | - |
| ESE | | 0.4% | - | 3.7% | 5.7% | - | - |
| SE | | 7.8% | 4.0% | 7.9% | 6.2% | 1.1% | - |
| SSE | | 2.3% | 1.5% | 3.3% | 2.1% | 0.1% | - |
| S | | 0.5% | 0.1% | 0.9% | 0.5% | - | - |
| SSW | | 0.1% | - | 0.4% | - | - | - |
| SW | | - | - | - | - | - | - |
| WSW | | - | - | - | - | - | - |
| W | | - | 0.4% | - | - | - | - |
| WNW | | 1.0% | 0.5% | 0.6% | - | - | - |
| NW | | 0.7% | 0.2% | 1.6% | 0.9% | 0.1% | - |
| NNW | | 1.2% | 0.7% | 2.6% | 1.8% | 0.1% | 0.5% |

## Table 2 – Gradient Wind Analysis, Autumn

| | <0.5 | 0.5 to <0.9 | 0.9 to <1.7 | 1.7 to <2.8 | 2.8 to <4.2 | 4.2 to <5.2 | >5.2 |
|---|---|---|---|---|---|---|---|
| **Day** | | | | | | | |
| N | 4.4% | 1.2% | 0.6% | 0.4% | - | - | - |
| NNE | | 0.3% | 0.4% | - | - | - | - |
| NE | | 0.2% | - | - | - | - | - |
| ENE | | 0.1% | - | - | - | - | - |
| E | | 0.6% | 0.1% | 0.2% | 0.7% | 0.3% | 0.5% |
| ESE | | 0.8% | 0.1% | 4.2% | 2.6% | 1.0% | 0.2% |
| SE | | 3.3% | 0.5% | 5.6% | 4.5% | 1.3% | 0.1% |
| SSE | | 3.6% | 0.7% | 6.1% | 4.4% | 0.7% | - |
| S | | 1.2% | 1.0% | 2.1% | 1.6% | 0.7% | 0.5% |
| SSW | | 1.1% | 0.3% | 0.6% | 0.4% | 0.1% | 0.1% |
| SW | | 0.3% | 0.7% | 0.8% | 0.2% | - | - |
| WSW | | 0.8% | 1.0% | 0.2% | 0.3% | - | - |
| W | | 0.6% | 0.3% | 1.7% | 1.4% | 0.8% | 1.1% |
| WNW | | 1.7% | 0.8% | 3.7% | 3.2% | 1.2% | 2.4% |
| NW | | 1.5% | 0.7% | 3.9% | 4.4% | 0.8% | 2.9% |
| NNW | | 1.1% | 0.2% | 2.0% | 0.4% | 0.1% | - |
| **Evening** | | | | | | | |
| N | 1.6% | 0.8% | 0.3% | 5.4% | 0.5% | - | - |
| NNE | | 2.2% | 0.3% | 9.0% | - | - | - |
| NE | | 6.3% | 0.3% | 9.0% | - | - | - |
| ENE | | 3.5% | 0.3% | 3.5% | 1.6% | - | - |
| E | | 3.3% | 0.8% | 5.2% | 3.0% | 0.3% | - |
| ESE | | 0.5% | - | 3.0% | 1.4% | - | - |
| SE | | 4.3% | 0.8% | 1.1% | 2.7% | 1.1% | - |
| SSE | | 4.3% | 2.2% | - | 1.6% | - | - |
| S | | 0.3% | 0.3% | - | 1.1% | - | - |
| SSW | | - | - | - | - | - | - |
| SW | | - | - | - | - | - | - |
| WSW | | - | 0.3% | - | - | - | - |
| W | | 0.5% | - | - | - | - | - |
| WNW | | 0.8% | - | 2.4% | 0.8% | - | 0.3% |
| NW | | 0.5% | 0.3% | 4.1% | 1.4% | 1.4% | 1.9% |
| NNW | | - | - | 2.2% | 1.4% | - | - |
| **Night** | | | | | | | |
| N | 7.0% | 8.6% | 1.4% | 6.6% | - | - | - |
| NNE | | 7.6% | 2.2% | 2.7% | - | - | - |
| NE | | 2.3% | 1.1% | - | - | - | - |
| ENE | | 0.6% | 0.1% | - | - | - | - |
| E | | 1.3% | 0.8% | - | - | - | - |
| ESE | | 0.2% | - | 0.5% | 0.5% | 0.7% | - |
| SE | | 2.4% | 1.7% | 1.3% | 2.4% | 0.4% | - |

| | <0.5 | 0.5 to <0.9 | 0.9 to <1.7 | 1.7 to <2.8 | 2.8 to <4.2 | 4.2 to <5.2 | >5.2 |
|---|---|---|---|---|---|---|---|
| SSE | | 2.7% | 3.1% | 2.4% | 1.1% | - | - |
| S | | 0.1% | 0.1% | 0.6% | 0.5% | - | - |
| SSW | | - | - | 0.5% | 0.1% | - | - |
| SW | | 0.1% | - | - | - | - | - |
| WSW | | 0.1% | - | - | - | - | - |
| W | | - | - | 0.5% | - | - | - |
| WNW | | 0.6% | 0.8% | 0.4% | - | - | - |
| NW | | 3.7% | 1.0% | 2.3% | 3.6% | 2.1% | 2.1% |
| NNW | | 5.2% | 1.2% | 8.0% | 3.1% | 1.0% | 0.5% |

**Table 3 – Gradient Wind Analysis, Winter**

| | <0.5 | 0.5 to <0.9 | 0.9 to <1.7 | 1.7 to <2.8 | 2.8 to <4.2 | 4.2 to <5.2 | >5.2 |
|---|---|---|---|---|---|---|---|
| **Day** | | | | | | | |
| N | 1.8% | 0.7% | 0.2% | 0.1% | 0.2% | - | - |
| NNE | | 0.1% | 0.3% | 0.1% | - | - | - |
| NE | | 0.1% | 0.1% | - | - | - | - |
| ENE | | 0.2% | - | - | - | - | - |
| E | | 0.5% | 0.1% | 0.1% | - | - | - |
| ESE | | 0.9% | 0.2% | 2.2% | 0.8% | - | - |
| SE | | 1.1% | 0.8% | 3.5% | 0.6% | - | - |
| SSE | | 2.4% | 0.6% | 2.7% | 2.5% | - | - |
| S | | 1.0% | 0.3% | 2.1% | 4.5% | 0.9% | 0.4% |
| SSW | | 0.7% | 0.1% | 1.3% | 0.9% | 0.3% | 0.4% |
| SW | | 0.2% | 0.2% | 0.6% | 0.2% | 0.1% | - |
| WSW | | 0.6% | 0.2% | 0.5% | 0.2% | 0.2% | 0.7% |
| W | | 1.3% | 0.4% | 0.8% | 0.7% | 1.0% | 1.2% |
| WNW | | 2.2% | 0.7% | 2.5% | 5.9% | 4.5% | 8.2% |
| NW | | 1.3% | 0.2% | 2.4% | 7.5% | 6.1% | 6.7% |
| NNW | | 0.8% | 0.1% | 1.4% | 2.2% | 1.4% | 1.5% |
| **Evening** | | | | | | | |
| N | 0.8% | - | - | 2.7% | 1.6% | 0.5% | 0.5% |
| NNE | | 1.1% | - | 4.6% | 0.5% | - | - |
| NE | | 3.0% | - | 3.8% | - | - | - |
| ENE | | 0.8% | - | 1.4% | - | - | - |
| E | | - | 0.5% | 0.3% | - | - | - |
| ESE | | - | - | 2.2% | - | - | - |
| SE | | 2.7% | 1.4% | 1.1% | - | - | - |
| SSE | | 5.2% | 2.2% | 2.2% | 1.1% | - | - |
| S | | 0.3% | 1.1% | 1.6% | - | - | - |
| SSW | | - | - | 0.5% | 0.3% | - | - |
| SW | | - | - | - | - | - | - |

| | <0.5 | 0.5 to <0.9 | 0.9 to <1.7 | 1.7 to <2.8 | 2.8 to <4.2 | 4.2 to <5.2 | >5.2 |
|---|---|---|---|---|---|---|---|
| WSW | | 0.3% | 1.4% | 0.5% | 0.8% | - | - |
| W | | 2.2% | 0.8% | 0.8% | 0.5% | - | - |
| WNW | | 2.2% | 0.8% | 3.0% | 1.9% | 1.1% | - |
| NW | | 0.3% | - | 7.1% | 7.6% | 4.3% | 4.1% |
| NNW | | 0.3% | - | 6.3% | 5.7% | 2.7% | 1.4% |
| **Night** | | | | | | | |
| N | 4.2% | 3.9% | 0.7% | 2.4% | - | - | 0.4% |
| NNE | | 1.9% | 1.3% | 0.8% | - | - | - |
| NE | | 0.4% | 0.1% | - | - | - | - |
| ENE | | - | 0.6% | - | - | - | - |
| E | | - | 1.0% | 0.6% | - | - | - |
| ESE | | - | - | 0.7% | - | - | - |
| SE | | 1.3% | 1.4% | 1.6% | - | - | - |
| SSE | | 3.4% | 1.9% | 1.3% | 1.1% | - | - |
| S | | 0.2% | 0.6% | 1.3% | - | - | - |
| SSW | | - | - | - | 1.0% | - | - |
| SW | | - | - | - | 0.1% | - | - |
| WSW | | - | 0.6% | - | - | - | - |
| W | | 0.6% | 0.6% | - | - | - | - |
| WNW | | 1.4% | 2.4% | 0.8% | - | - | - |
| NW | | 2.9% | 0.4% | 5.7% | 6.2% | 8.0% | 5.2% |
| NNW | | 3.9% | - | 10.9% | 9.4% | 4.7% | 1.9% |

**Table 4 – Gradient Wind Analysis, Spring**

| | <0.5 | 0.5 to <0.9 | 0.9 to <1.7 | 1.7 to <2.8 | 2.8 to <4.2 | 4.2 to <5.2 | >5.2 |
|---|---|---|---|---|---|---|---|
| **Day** | | | | | | | |
| N | 2.7% | 0.3% | 0.2% | 0.4% | 0.1% | - | - |
| NNE | | 0.2% | - | 0.1% | - | - | - |
| NE | | 0.3% | 0.3% | 0.3% | - | - | - |
| ENE | | - | 0.2% | 0.3% | - | - | - |
| E | | 0.4% | 0.5% | 0.9% | 0.1% | - | - |
| ESE | | 1.1% | 0.1% | 3.4% | 3.2% | 2.0% | 0.8% |
| SE | | 0.8% | 0.8% | 3.2% | 7.7% | 6.1% | 3.0% |
| SSE | | 0.4% | 1.0% | 1.3% | 1.7% | 0.6% | 0.3% |
| S | | 0.8% | 0.3% | 0.5% | 1.1% | 0.7% | - |
| SSW | | 0.7% | 0.4% | 0.5% | 0.5% | 0.1% | - |
| SW | | 1.0% | 0.2% | 0.2% | 0.2% | - | 0.1% |
| WSW | | 0.8% | 0.7% | 1.0% | 0.4% | - | 1.0% |
| W | | 0.8% | 0.7% | 1.8% | 2.1% | 1.2% | 3.5% |
| WNW | | 1.5% | 0.2% | 1.5% | 3.5% | 2.8% | 4.5% |
| NW | | 0.8% | 0.2% | 1.7% | 4.0% | 3.6% | 6.3% |
| NNW | | 0.9% | - | 0.9% | 0.7% | 0.1% | 0.8% |

| | <0.5 | 0.5 to <0.9 | 0.9 to <1.7 | 1.7 to <2.8 | 2.8 to <4.2 | 4.2 to <5.2 | >5.2 |
|---|---|---|---|---|---|---|---|
| **Evening** | | | | | | | |
| N | 0.3% | - | - | 3.3% | 2.7% | 1.1% | 0.5% |
| NNE | | 0.3% | - | 2.7% | 3.6% | 0.8% | 0.3% |
| NE | | 2.2% | 0.3% | 6.9% | 1.4% | - | - |
| ENE | | 1.1% | - | 3.0% | 1.1% | - | - |
| E | | 2.7% | 0.5% | 6.3% | 4.7% | - | - |
| ESE | | - | - | 5.5% | 8.0% | 2.2% | - |
| SE | | 2.2% | - | 2.5% | 1.9% | 4.4% | - |
| SSE | | 1.6% | 0.8% | 0.3% | 0.5% | 0.8% | - |
| S | | 0.3% | - | 1.1% | - | - | - |
| SSW | | 0.3% | - | - | 0.3% | - | - |
| SW | | - | - | - | - | - | - |
| WSW | | - | - | - | 0.3% | 0.3% | 0.5% |
| W | | 1.4% | - | 0.5% | 0.3% | 0.5% | - |
| WNW | | 0.5% | 0.3% | 1.4% | 0.8% | 1.1% | - |
| NW | | 1.9% | 0.3% | 1.9% | 2.2% | 0.5% | 0.8% |
| NNW | | 0.8% | - | 3.3% | 0.5% | 0.5% | 0.5% |
| **Night** | | | | | | | |
| N | 6.7% | 3.9% | 1.5% | 4.6% | 1.1% | 0.7% | 1.0% |
| NNE | | 2.3% | 1.3% | 1.5% | - | - | - |
| NE | | 2.2% | 1.1% | - | - | - | - |
| ENE | | 0.7% | 1.5% | 0.1% | - | - | - |
| E | | 3.8% | 2.0% | 0.6% | 0.6% | - | - |
| ESE | | - | - | 0.5% | 0.7% | 0.5% | - |
| SE | | 6.6% | 2.7% | 4.4% | 2.4% | 3.8% | 0.2% |
| SSE | | 2.3% | 1.6% | 0.6% | - | 0.1% | - |
| S | | 0.2% | 0.1% | - | - | - | - |
| SSW | | 0.4% | - | 0.2% | 0.1% | - | - |
| SW | | - | - | 0.1% | - | - | - |
| WSW | | 0.2% | 0.1% | - | - | - | - |
| W | | 0.2% | - | 0.1% | - | - | - |
| WNW | | 1.2% | 0.9% | 0.1% | - | 0.5% | - |
| NW | | 1.0% | 1.0% | 3.8% | 3.7% | 1.7% | 2.6% |
| NNW | | 1.6% | 0.7% | 5.0% | 5.4% | 0.9% | 4.4% |

Wind speed analysis of the prevailing winds has also been conducted and is summarised in **Figures F.1** to **F.4**.

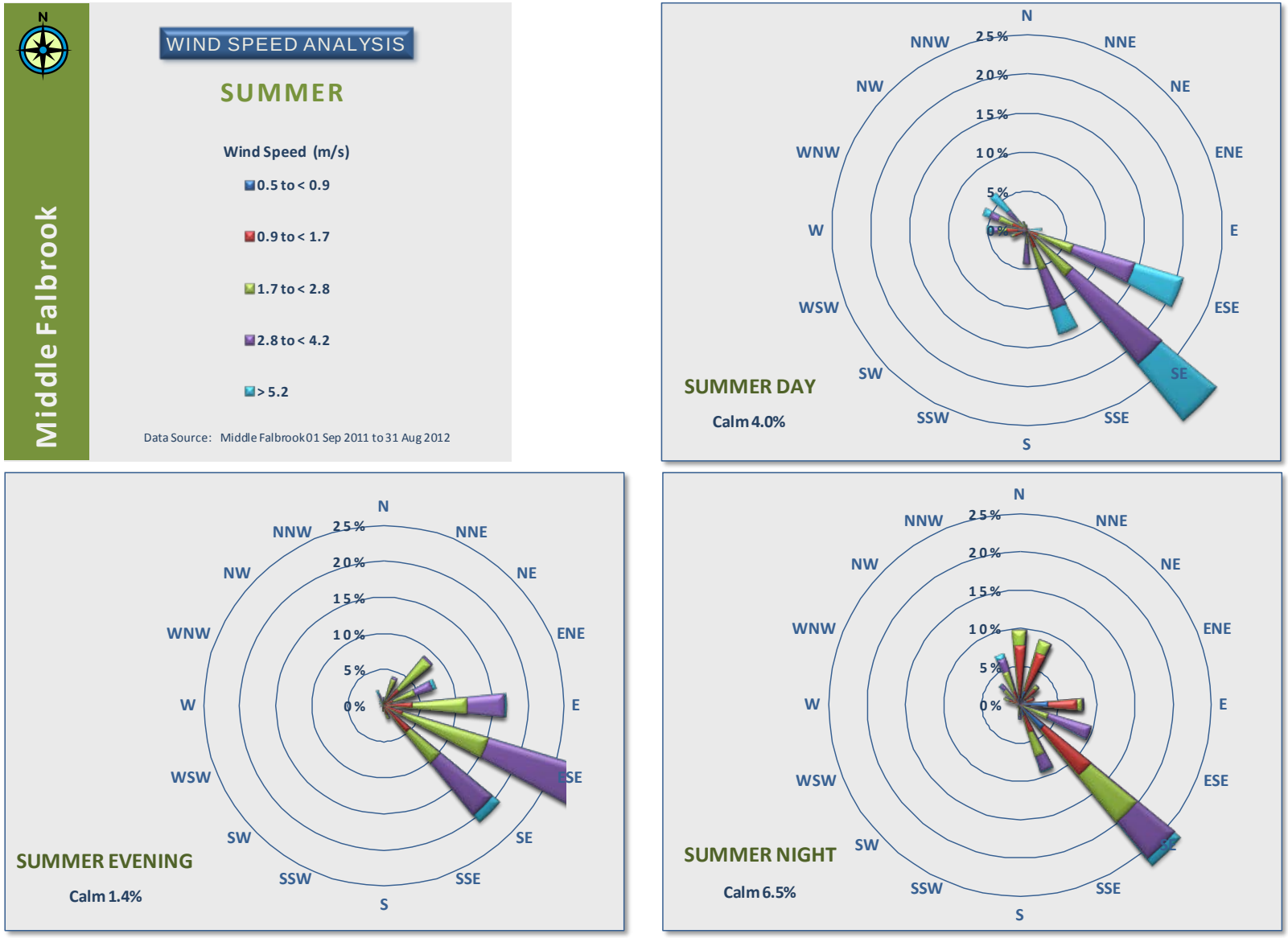
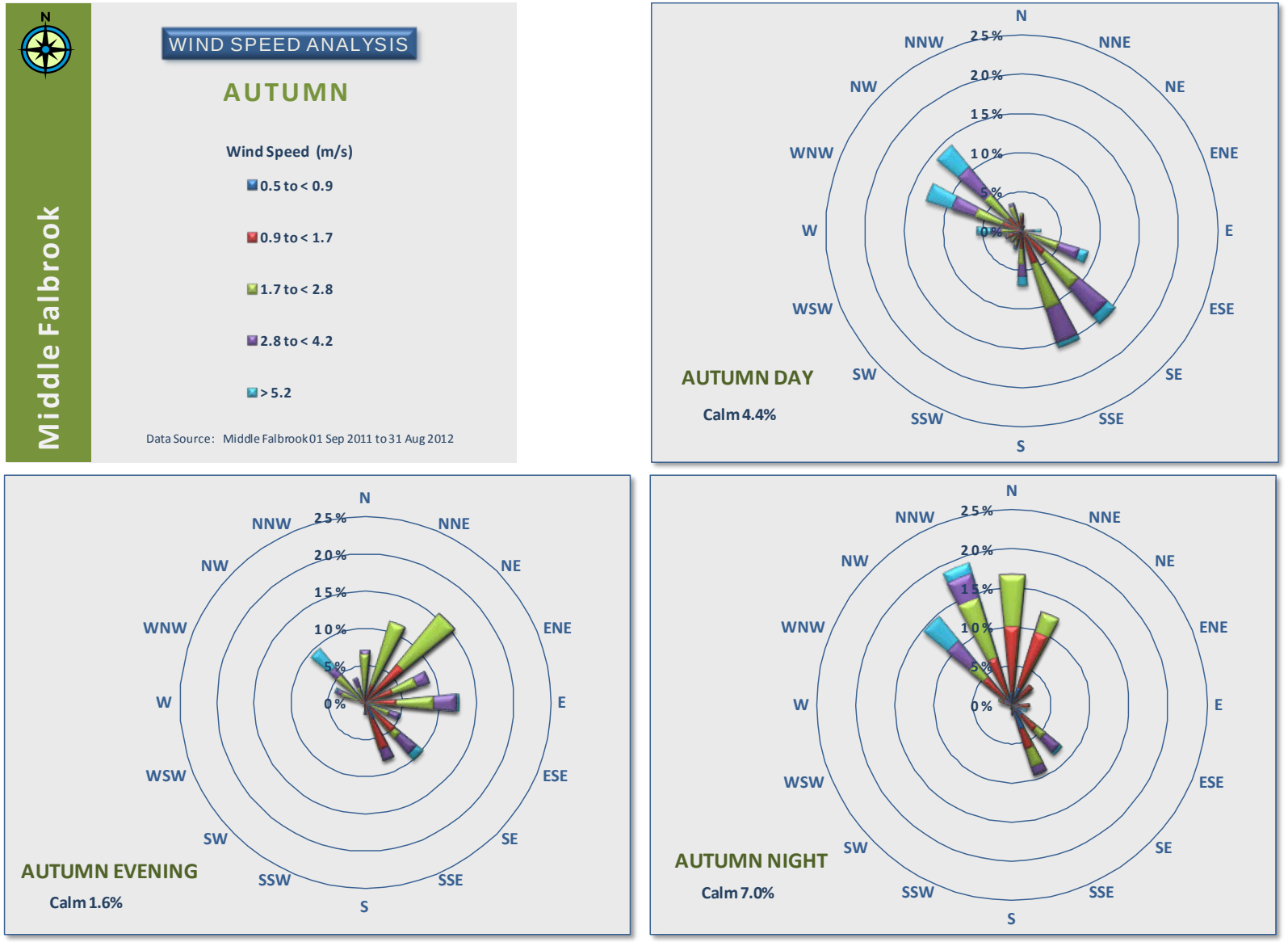



**Figure F.1 – Wind Speed Analysis, Summer**




**FigureF.2 – Wind Speed Analysis, Autumn**

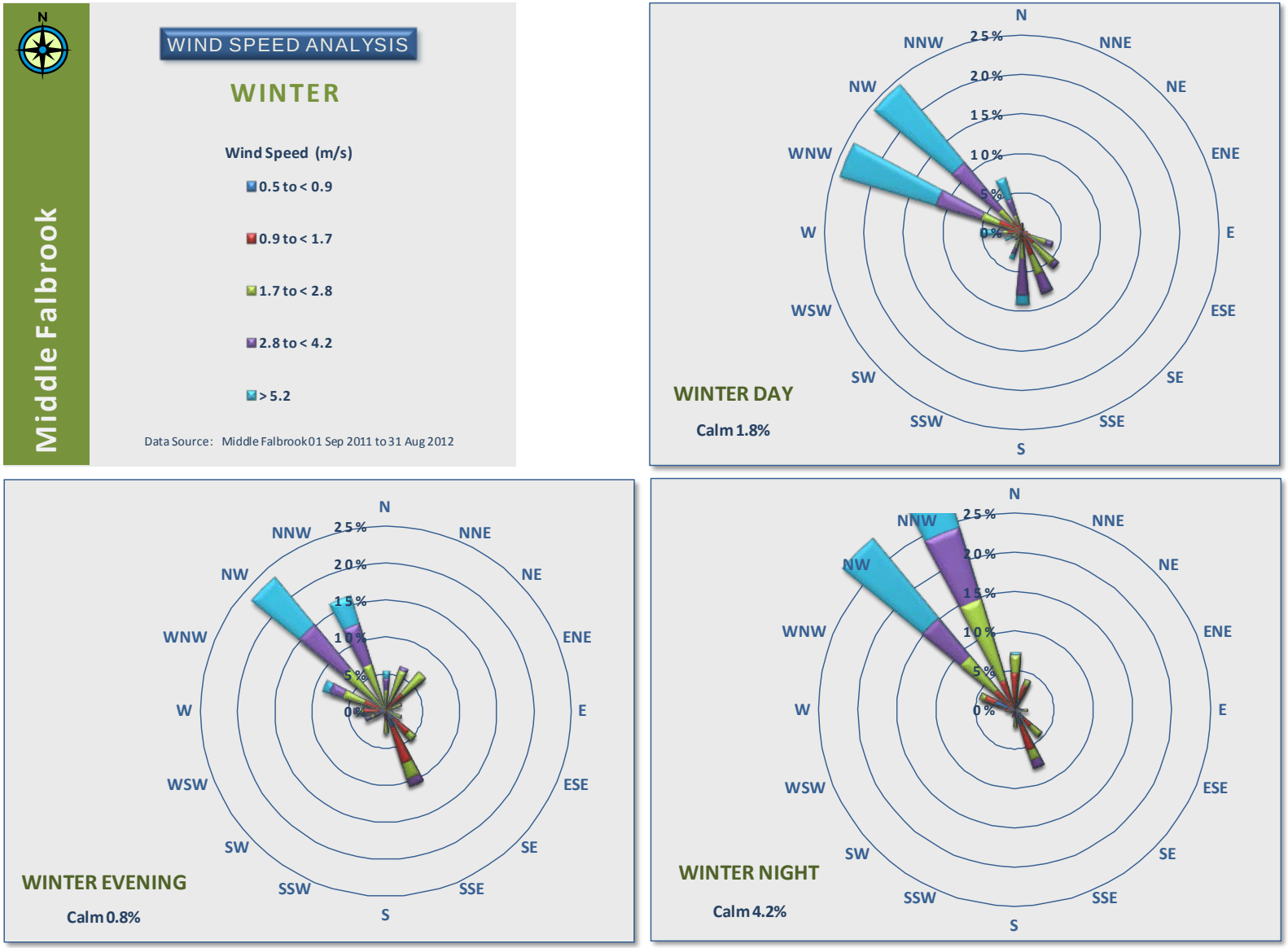



**Figure F.3 – Wind Speed Analysis, Winter**

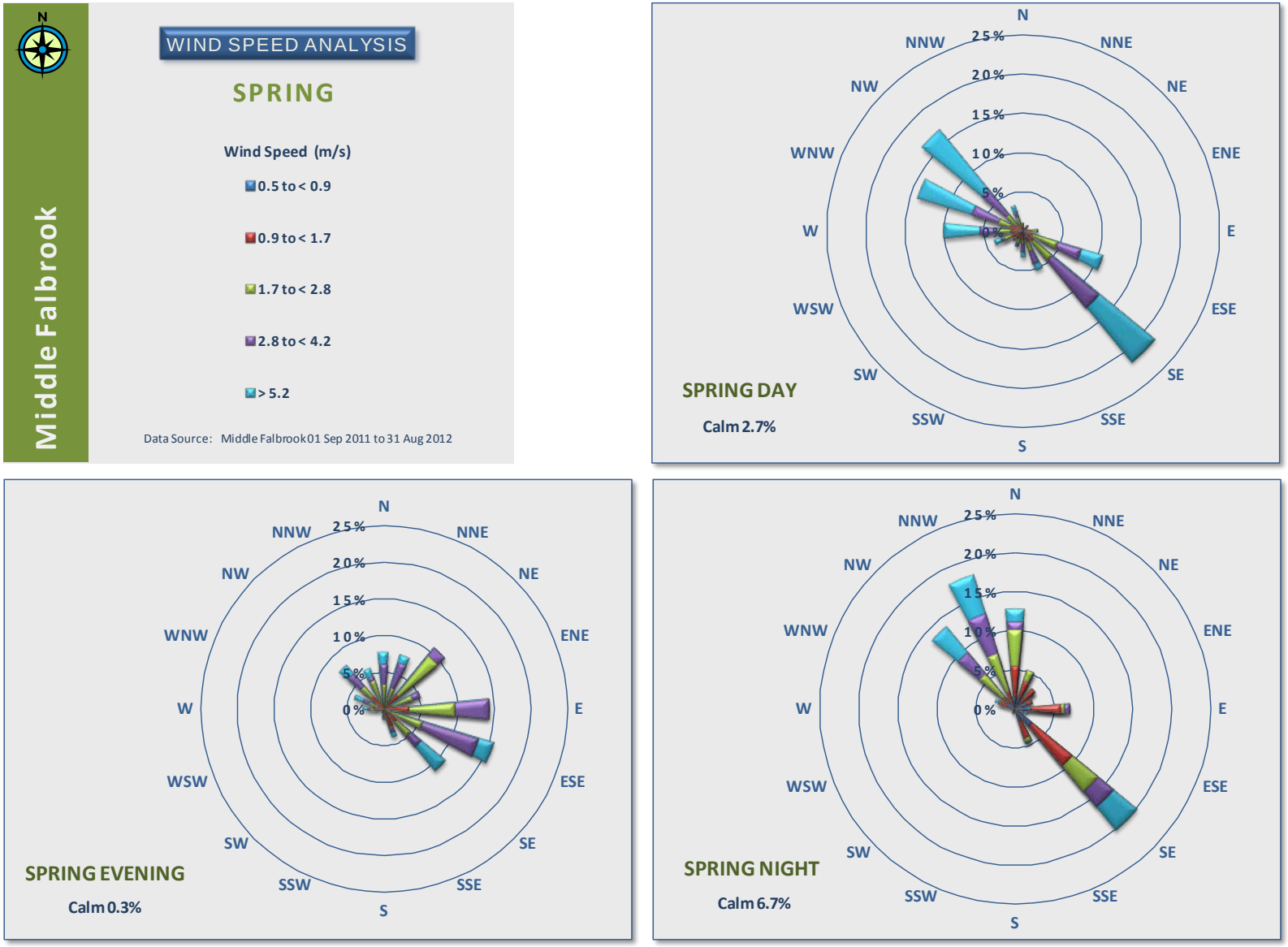



**Figure F.4 – Wind Speed Analysis, Spring**

## Temperature Inversions

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 a significant characteristic of the area it needs to occur for approximately 30 per cent of the total night time (i.e. the evening and night-time periods) during winter, or about two nights per week.

Meteorological data was assessed in accordance with INP (EPA 2000) methodology to determine the likelihood of temperature inversions during the winter evening and night time periods. These results of the analysis of the meteorological data for the September 2011 to August 2012 period are presented in **Table 5**.

**Table 5 – Stability Class Wind Analysis, Winter Evening and Night (6.00 pm to 7.00 am)**

| | **<0.5** | **0.5 to <0.9** | **0.9 to <1.7** | **1.7 to <2.8** | **2.8 to <4.2** | **4.2 to <5.2** | **>5.2** |
|---|---|---|---|---|---|---|---|
| **Non-Inversion Conditions - 54.7%** | | | | | | | |
| N | 1.2% | 0.3% | 0.3% | 0.3% | 0.4% | 0.2% | 0.4% |
| NNE | | 0.3% | - | 0.2% | - | - | - |
| NE | | 0.1% | - | 0.1% | - | - | - |
| ENE | | 0.2% | - | 0.1% | - | - | - |
| E | | 0.3% | - | 0.5% | - | - | - |
| ESE | | - | - | 1.1% | - | - | - |
| SE | | 1.4% | 1.5% | 1.4% | - | - | - |
| SSE | | 1.8% | 2.8% | 1.6% | 1.1% | - | - |
| S | | 0.3% | 0.3% | 1.4% | - | - | - |
| SSW | | - | - | 0.2% | 0.8% | - | - |
| SW | | - | - | - | 0.1% | - | - |
| WSW | | 0.3% | - | - | 0.3% | - | - |
| W | | 0.1% | - | 0.2% | 0.2% | - | - |
| WNW | | 1.0% | 0.3% | 0.4% | 0.5% | 0.3% | - |
| NW | | 0.3% | 0.1% | 0.9% | 4.6% | 6.9% | 4.8% |
| NNW | | - | 0.3% | 0.7% | 5.9% | 4.1% | 1.8% |
| **F Class Stability Conditions - 36.0%** | | | | | | | |
| N | 0.4% | 0.1% | 0.8% | 1.6% | 0.1% | - | - |
| NNE | | 0.2% | 0.2% | 1.4% | 0.2% | - | - |
| NE | | - | 0.8% | 0.8% | - | - | - |
| ENE | | 0.1% | 0.3% | 0.3% | - | - | - |
| E | | 0.5% | - | - | - | - | - |
| ESE | | - | - | 0.1% | - | - | - |
| SE | | - | 0.3% | - | - | - | - |
| SSE | | 0.2% | 1.1% | - | - | - | - |
| S | | 0.5% | - | - | - | - | - |
| SSW | | - | - | - | - | - | - |
| SW | | - | - | - | - | - | - |
| WSW | | 0.6% | 0.1% | 0.2% | - | - | - |
| W | | 0.4% | 1.0% | 0.1% | - | - | - |
| WNW | | 0.7% | 1.4% | 1.1% | 0.1% | - | - |
| NW | | - | 1.8% | 5.0% | 2.0% | - | - |

| | <0.5 | 0.5 to <0.9 | 0.9 to <1.7 | 1.7 to <2.8 | 2.8 to <4.2 | 4.2 to <5.2 | >5.2 |
|---|---|---|---|---|---|---|---|
| NNW | | - | 1.1% | 8.1% | 2.3% | - | - |
| **G Class Stability Conditions - 9.4%** | | | | | | | |
| N | 0.5% | 0.2% | 1.7% | 0.6% | - | - | - |
| NNE | | 0.5% | 1.5% | 0.4% | - | - | - |
| NE | | - | 0.3% | 0.3% | - | - | - |
| ENE | | 0.2% | - | - | - | - | - |
| E | | - | - | - | - | - | - |
| ESE | | - | - | - | - | - | - |
| SE | | - | - | - | - | - | - |
| SSE | | - | - | - | - | - | - |
| S | | - | - | - | - | - | - |
| SSW | | - | - | - | - | - | - |
| SW | | - | - | - | - | - | - |
| WSW | | - | - | - | - | - | - |
| W | | 0.2% | 0.1% | - | - | - | - |
| WNW | | 0.3% | - | - | - | - | - |
| NW | | - | 0.3% | 0.2% | - | - | - |
| NNW | | - | 1.4% | 0.7% | - | - | - |

From the analysis of the meteorological data F class stability conditions are present more than 30 per cent of the time.

**Temperature Inversion and Drainage Flow**

Drainage flow is the low level wind associated with the flow of cold air from higher ground to lower during the presence of a temperature inversion.

The INP states that the:

> drainage-flow wind default value should generally be applied where a development is at a higher altitude than the residential receiver, with no intervening higher ground.

The area surrounding the Project is typically undulating with residential receivers at both a high and lower altitude to the Project.

Inspection of the windroses in **Figure F.5** indicates source-to-receiver vectored wind can occur from the north-west during winter evenings and nights.

The meteorological data for the September 2011 to August 2012 period was analysed to determine the prevalence and speed of the prevailing winds from the north-west during winter evening and night. The results of this analysis are summarised in **Table 5**.

Based on the data presented in **Table 5** drainage-flow winds of 2.0 m/s from the north-west should be considered as part of the meteorological conditions for modelling the noise impacts of the Project.

**Modelling Parameters**

The meteorological conditions that should be considered as a part of the assessment of the construction and sleep disturbance noise levels for the noise impact assessment are:

- calm;
- 3 m/s south-east wind;
- 3 m/s north-west wind; and
- F class stability with 2 m/s drainage flow from the north-west.

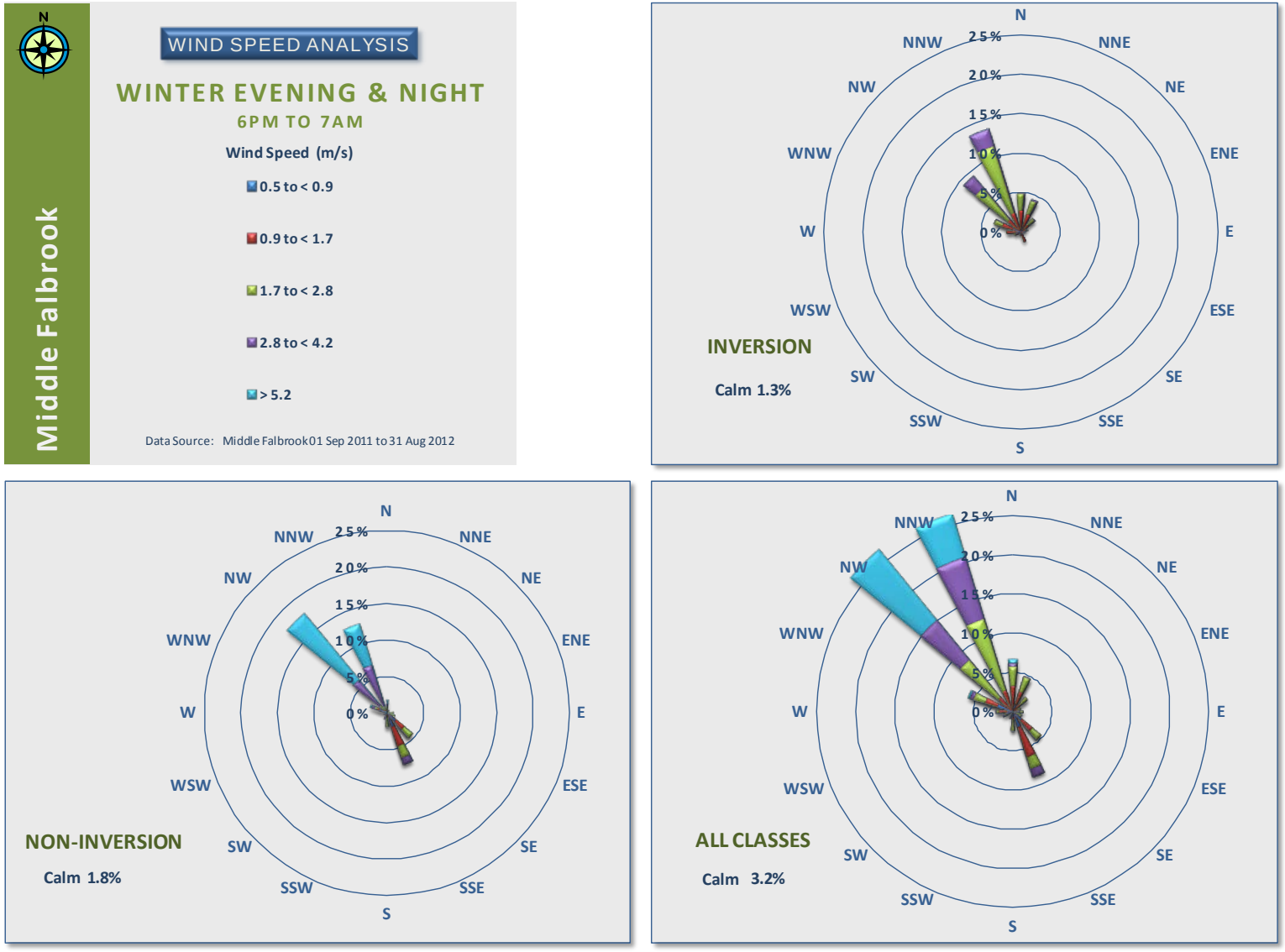



**Figure F.5 – Wind Speed Analysis, Winter Night (6.00 pm to 7.00 am**

# APPENDIX G

Predicted Noise Impacts (Tables)

# Appendix G – Predicted Noise Impacts (Tables)

## Operational Noise Levels

ENM's Single Point calculation feature was used to determine noise levels from the Project at the nearest residential receiver under a full range of meteorological conditions

The 90$^{th}$ percentile predicted operational noise levels at all the residential receiver locations are presented in **Table 1** for winter night-time, non-winter night-time, non-winter evenings and all seasons day-time in Years 1, 5 and 10. The number if effected properties is summarised in **Table 2**.

## Sleep Disturbance Noise Levels

ENM's Single Point Calculation feature was used to determine sleep disturbance noise levels at the nearest residential receiver locations under three meteorological conditions: calm neutral, F Class Stability with accompanying 2 m/s drainage flow from the north to north-west and 3m/s gradienrts winds from north-west. The predicted received $L_{A1,1minute}$ noise levels associated with these activities that could result in sleep disturbance are presented in **Table 4**. The number of affected properties is summarised in **Table 5**.

## Construction Noise Levels

ENM's Single Point Calculation feature was used to determine the construction noise levels at the nearest residential receiver locations under worst-case meteorological conditions of source to receiver winds of 3 m/s. The predicted received $L_{Aeq,15minute}$ noise levels associated with the construction activities are presented in **Table 6**. The number of affected properties is summarised in **Table 7**.

## Table 1 – 90th percentile predicted operational noise level, dB(A)

| Receiver Location | Period | PSNL | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 1 - R041 | Day | 35 | - | - | - | 36 | - | - | - | 34 | - | - | | 31 |
| | Evening | 35 | - | - | 31 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 35 | 32 | - | - | 33 | 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R042 | Day | 35 | - | - | - | 35 | - | - | - | 33 | - | - | - | < 30 |
| | Evening | 35 | | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 34 | 31 | - | - | 32 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R043 | Day | 35 | - | - | - | 33 | - | - | - | 33 | - | - | | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 33 | 30 | - | - | 32 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R044a | Day | 35 | - | - | - | 32 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R044b | Day | 35 | - | - | - | 34 | - | - | - | 32 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 32 | < 30 | - | - | 31 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R045 | Day | 35 | - | - | - | 32 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R046 | Day | 35 | - | - | - | 32 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R047 | Day | 35 | - | - | - | 31 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |

| Receiver Location | Period | PSNL | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 1 - R048 | Day | 35 | - | - | - | 36 | - | - | - | 34 | - | - | - | 33 |
| | Evening | 35 | - | - | 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 35 | 32 | - | - | 33 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R049 | Day | 35 | - | - | - | 32 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R050 | Day | 35 | - | - | - | 33 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 31 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R051 | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R052 | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R053 | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R054 | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R055 | Day | 35 | - | - | - | 34 | - | - | - | 32 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 32 | < 30 | - | - | 31 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R056a | Day | 35 | - | - | - | 32 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |

| Receiver Location | Period | PSNL | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 1 - R056b | Day | 35 | - | - | - | 31 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R057 | Day | 35 | - | - | - | 31 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R058 | Day | 35 | - | - | - | 35 | - | - | - | 33 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 34 | 31 | - | - | 32 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R059 | Day | 35 | - | - | - | 34 | - | - | - | 33 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 34 | 30 | - | - | 32 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R060 | Day | 35 | - | - | - | 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R061 | Day | 35 | - | - | - | 32 | - | - | - | 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 1 - R062 | Day | 35 | - | - | - | 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R015a | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R015b | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |

| Receiver Location | Period | PSNL | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 2 - R017 | Day | 35 | - | - | - | 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | 30 | - | - |
| Area 2 - R063a | Day | 35 | - | - | - | 32 | - | - | - | 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 32 | < 30 | - | - | 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R066 | Day | 35 | - | - | - | 32 | - | - | - | 31 | - | - | - | 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 32 | < 30 | - | - | 31 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R067 | Day | 35 | - | - | - | 31 | - | - | - | 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 32 | < 30 | - | - | 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R068 | Day | 35 | - | - | - | 31 | - | - | - | 31 | - | - | - | 31 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 32 | < 30 | - | - | 31 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R069a | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R069b | Day | 35 | - | - | - | 31 | - | - | - | 31 | - | - | - | 31 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 32 | < 30 | - | - | 31 | < 30 | - | - | 30 | < 30 | - | - |
| Area 2 - R071 | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R072 | Day | 35 | - | - | - | 33 | - | - | - | 33 | - | - | - | 32 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 34 | 30 | - | - | 33 | 30 | - | - | 30 | 30 | - | - |

| Receiver Location | Period | PSNL | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 2 - R073 | Day | 35 | - | - | - | 33 | - | - | - | 32 | - | - | - | 33 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 34 | 30 | - | - | 33 | < 30 | - | - | 32 | 31 | - | - |
| Area 2 - R074 | Day | 35 | - | - | - | 33 | - | - | - | 33 | - | - | - | 33 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 34 | 31 | - | - | 35 | 30 | - | - | 32 | 32 | - | - |
| Area 2 - R075 | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R076 | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R077 | Day | 35 | - | - | - | 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 31 | < 30 | - | - | 30 | < 30 | - | - | 30 | < 30 | - | - |
| Area 2 - R078 | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R079 | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R080 | Day | 35 | - | - | - | 32 | - | - | - | 31 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 32 | < 30 | - | - | 31 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R081 | Day | 35 | - | - | - | 32 | - | - | - | 31 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 33 | < 30 | - | - | 31 | < 30 | - | - | < 30 | < 30 | - | - |

| Receiver Location | Period | PSNL | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 2 - R082 | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R083 | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R084a | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R084b | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R085 | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | 30 | < 30 | - | - |
| Area 2 - R086 | Day | 35 | - | - | - | 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | 30 | < 30 | - | - |
| Area 2 - R087 | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R088 | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 2 - R162b | Day | 35 | - | - | - | 31 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 32 | < 30 | - | - | 30 | < 30 | - | - | < 30 | < 30 | - | - |

| Receiver Location | Period | PSNL | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 2 (INP) - R350 | Day | -/55 | - | - | - | 33 | - | - | - | 32 | - | - | - | 30 |
| | Evening | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | - | 32 | < 30 | - | - | 32 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 3 - R015c | Day | 35 | - | - | - | 44 | - | - | - | 43 | - | - | - | 43 |
| | Evening | 35 | - | - | 38 | - | - | - | 37 | - | - | - | 35 | - |
| | Night | 35 | 44 | 41 | - | - | 43 | 40 | - | - | 41 | 38 | - | - |
| Area 3 - R018 | Day | 35 | - | - | - | 44 | - | - | - | 44 | - | - | - | 47 |
| | Evening | 35 | - | - | 40 | - | - | - | 39 | - | - | - | 40 | - |
| | Night | 35 | 46 | 41 | - | - | 46 | 41 | - | - | 44 | 42 | - | - |
| Area 3 – R174 | Day | 35 | - | - | - | 42 | - | - | - | 42 | - | - | - | 43 |
| | Evening | 35 | - | - | 38 | - | - | - | 37 | - | - | - | 36 | - |
| | Night | 35 | 44 | 41 | - | - | 44 | 41 | - | - | 43 | 39 | - | - |
| Area 4 - R010 | Day | 35 | - | - | - | 34 | - | - | - | 34 | - | - | - | 35 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | 35 | - |
| | Night | 35 | 34 | 30 | - | - | 34 | 30 | - | - | 32 | 37 | - | - |
| Area 4 - R011 | Day | 35 | - | - | - | 36 | - | - | - | 36 | - | - | - | 37 |
| | Evening | 35 | - | - | 32 | - | - | - | 32 | - | - | - | 35 | - |
| | Night | 35 | 37 | 34 | - | - | 36 | 33 | - | - | 37 | 37 | - | - |
| Area 4 - R012 | Day | 35 | - | - | - | 35 | - | - | - | 36 | - | - | - | 36 |
| | Evening | 35 | - | - | 31 | - | - | - | 31 | - | - | - | 36 | - |
| | Night | 35 | 36 | 33 | - | - | 36 | 33 | - | - | 35 | 38 | - | - |
| Area 4 - R013 | Day | 35 | - | - | - | 36 | - | - | - | 36 | - | - | - | 38 |
| | Evening | 35 | - | - | 32 | - | - | - | 31 | - | - | - | 34 | - |
| | Night | 35 | 37 | 34 | - | - | 37 | 33 | - | - | 38 | 37 | - | - |
| Area 4 - R014 | Day | 35 | - | - | - | 36 | - | - | - | 35 | - | - | - | 37 |
| | Evening | 35 | - | - | 32 | - | - | - | 31 | - | - | - | 33 | - |
| | Night | 35 | 37 | 34 | - | - | 36 | 32 | - | - | 37 | 35 | - | - |

| Receiver Location | Period | PSNL | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 4 - R019 | Day | 35 | - | - | - | 36 | - | - | - | 36 | - | - | - | 38 |
| | Evening | 35 | - | - | 31 | - | - | - | 30 | - | - | - | 35 | - |
| | Night | 35 | 37 | 33 | - | - | 37 | 32 | - | - | 39 | 38 | - | - |
| Area 4 - R021 | Day | 35 | - | - | - | 36 | - | - | - | 36 | - | - | - | 39 |
| | Evening | 35 | - | - | 32 | - | - | - | 31 | - | - | - | 37 | - |
| | Night | 35 | 37 | 34 | - | - | 37 | 33 | - | - | 41 | 39 | - | - |
| Area 4 - R022 | Day | 35 | - | - | - | 37 | - | - | - | 38 | - | - | - | 40 |
| | Evening | 35 | - | - | 34 | - | - | - | 34 | - | - | - | 37 | - |
| | Night | 35 | 38 | 35 | - | - | 38 | 35 | - | - | 41 | 39 | - | - |
| Area 4 - R023 | Day | 35 | - | - | - | 36 | - | - | - | 36 | - | - | - | 38 |
| | Evening | 35 | - | - | 31 | - | - | - | 31 | - | - | - | 38 | - |
| | Night | 35 | 36 | 33 | - | - | 36 | 32 | - | - | 41 | 39 | - | - |
| Area 4 - R093 | Day | 35 | - | - | - | 35 | - | - | - | 35 | - | - | - | 38 |
| | Evening | 35 | - | - | 32 | - | - | - | 31 | - | - | - | 34 | - |
| | Night | 35 | 36 | 33 | - | - | 35 | 32 | - | - | 40 | 36 | - | - |
| Area 4 - R094 | Day | 35 | - | - | - | 35 | - | - | - | 35 | - | - | - | 37 |
| | Evening | 35 | - | - | 31 | - | - | - | 31 | - | - | - | 33 | - |
| | Night | 35 | 35 | 33 | - | - | 35 | 32 | - | - | 38 | 36 | - | - |
| Area 4 - R095 | Day | 35 | - | - | - | 38 | - | - | - | 35 | - | - | - | 37 |
| | Evening | 35 | - | - | 35 | - | - | - | 31 | - | - | - | 34 | - |
| | Night | 35 | 38 | 35 | - | - | 36 | 33 | - | - | 37 | 36 | - | - |
| Area 4 - R112 | Day | 35 | - | - | - | 34 | - | - | - | 35 | - | - | - | 35 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | 35 | - |
| | Night | 35 | 35 | 30 | - | - | 35 | < 30 | - | - | 34 | 38 | - | - |
| Area 4 - R114 | Day | 35 | - | - | - | 35 | - | - | - | 35 | - | - | - | 37 |
| | Evening | 35 | - | - | 30 | - | - | - | 30 | - | - | - | 34 | - |
| | Night | 35 | 35 | 31 | - | - | 36 | 31 | - | - | 36 | 35 | - | - |

| Receiver Location | Period | PSNL | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 4 - R115 | Day | 35 | - | - | - | 36 | - | - | - | 36 | - | - | - | 37 |
| | Evening | 35 | - | - | 32 | - | - | - | 32 | - | - | - | 34 | - |
| | Night | 35 | 37 | 33 | - | - | 37 | 33 | - | - | 37 | 36 | - | - |
| Area 4 - R116 | Day | 35 | - | - | - | 33 | - | - | - | 32 | - | - | - | 33 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | 30 | - |
| | Night | 35 | 32 | < 30 | - | - | 33 | < 30 | - | - | 33 | 31 | - | - |
| Area 5 - R089 | Day | 35 | - | - | - | 31 | - | - | - | 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 31 | < 30 | - | - | 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 5 - R091 | Day | 35 | - | - | - | 34 | - | - | - | 33 | - | - | - | 36 |
| | Evening | 35 | - | - | 31 | - | - | - | 30 | - | - | - | 33 | - |
| | Night | 35 | 35 | 32 | - | - | 34 | 31 | - | - | 36 | 35 | - | - |
| Area 5 - R092 | Day | 35 | - | - | - | 34 | - | - | - | 34 | - | - | - | 37 |
| | Evening | 35 | - | - | 31 | - | - | - | 31 | - | - | - | 34 | - |
| | Night | 35 | 35 | 32 | - | - | 35 | 32 | - | - | 37 | 36 | - | - |
| Area 5 - R096 | Day | 35 | - | - | - | 32 | - | - | - | 32 | - | - | - | 33 |
| | Evening | 35 | - | - | 30 | - | - | - | < 30 | - | - | - | 31 | - |
| | Night | 35 | 33 | 31 | - | - | 31 | 30 | - | - | 32 | 32 | - | - |
| Area 5 - R097 | Day | 35 | - | - | - | 32 | - | - | - | 32 | - | - | - | 33 |
| | Evening | 35 | - | - | 30 | - | - | - | < 30 | - | - | - | 31 | - |
| | Night | 35 | 33 | 31 | - | - | 32 | 30 | - | - | 33 | 33 | - | - |
| Area 5 - R098 | Day | 35 | - | - | - | 30 | - | - | - | 30 | - | - | - | 32 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 31 | < 30 | - | - | 30 | < 30 | - | - | 31 | 31 | - | - |
| Area 5 - R099 | Day | 35 | - | - | - | 33 | - | - | - | 33 | - | - | - | 34 |
| | Evening | 35 | - | - | 31 | - | - | - | < 30 | - | - | - | 32 | - |
| | Night | 35 | 33 | 32 | - | - | 33 | 31 | - | - | 33 | 33 | - | - |

| Receiver Location | Period | PSNL | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 5 - R100 | Day | 35 | - | - | - | 34 | - | - | - | 33 | - | - | - | 34 |
| | Evening | 35 | - | - | 31 | - | - | - | < 30 | - | - | - | 32 | - |
| | Night | 35 | 34 | 32 | - | - | 32 | 31 | - | - | 33 | 33 | - | - |
| Area 5 - R101 | Day | 35 | - | - | - | 33 | - | - | - | 31 | - | - | - | 31 |
| | Evening | 35 | - | - | 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 33 | 31 | - | - | 31 | < 30 | - | - | 30 | 30 | - | - |
| Area 5 - R102a | Day | 35 | - | - | - | 31 | - | - | - | 30 | - | - | - | 33 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | 31 | - |
| | Night | 35 | 31 | 30 | - | - | 30 | < 30 | - | - | 32 | 32 | - | - |
| Area 5 - R102b | Day | 35 | - | - | - | 32 | - | - | - | 31 | - | - | - | 33 |
| | Evening | 35 | - | - | 30 | - | - | - | < 30 | - | - | - | 31 | - |
| | Night | 35 | 32 | 30 | - | - | 31 | < 30 | - | - | 32 | 32 | - | - |
| Area 6 - R122 | Day | 39 | - | - | - | 40 | - | - | - | 38 | - | - | - | 42 |
| | Evening | 39 | - | - | 39 | - | - | - | 37 | - | - | - | 42 | - |
| | Night | 37/39 | 42 | 39 | - | - | 41 | 37 | - | - | 42 | 42 | - | - |
| Area 7 (INP) - R002 | Day | -/55 | - | - | - | 35 | - | - | - | 35 | - | - | - | 36 |
| | Evening | -/55 | - | - | 33 | - | - | - | 32 | - | - | - | 34 | - |
| | Night | -/55 | 36 | 34 | - | - | 35 | 33 | - | - | 35 | 36 | - | - |
| Area 7 - R004 | Day | 37 | - | - | - | 37 | - | - | - | 36 | - | - | - | 38 |
| | Evening | 37 | - | - | 33 | - | - | - | 33 | - | - | - | 36 | - |
| | Night | 37 | 38 | 35 | - | - | 37 | 34 | - | - | 36 | 37 | - | - |
| Area 7 - R005 | Day | 37 | - | - | - | 36 | - | - | - | 35 | - | - | - | 37 |
| | Evening | 37 | - | - | 33 | - | - | - | 32 | - | - | - | 35 | - |
| | Night | 37 | 36 | 34 | - | - | 36 | 33 | - | - | 36 | 36 | - | - |
| Area 7 - R007a | Day | 37 | - | - | - | 36 | - | - | - | 36 | - | - | - | 37 |
| | Evening | 37 | - | - | 32 | - | - | - | 32 | - | - | - | 35 | - |
| | Night | 37 | 36 | 34 | - | - | 36 | 33 | - | - | 36 | 37 | - | - |

| Receiver Location | Period | PSNL | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 7 - R007b | Day | 37 | - | - | - | 36 | - | - | - | 35 | - | - | - | 37 |
| | Evening | 37 | - | - | 32 | - | - | - | 32 | - | - | - | 35 | - |
| | Night | 37 | 36 | 33 | - | - | 35 | 33 | - | - | 37 | 37 | - | - |
| Area 7 - R007c | Day | 37 | - | - | - | 35 | - | - | - | 35 | - | - | - | 36 |
| | Evening | 37 | - | - | 32 | - | - | - | 31 | - | - | - | 35 | - |
| | Night | 37 | 36 | 33 | - | - | 35 | 32 | - | - | 35 | 36 | - | - |
| Area 7 (INP) - R006 | Day | -/55 | - | - | - | 36 | - | - | - | 35 | - | - | - | 37 |
| | Evening | -/55 | - | - | 32 | - | - | - | 32 | - | - | - | 35 | - |
| | Night | -/55 | 36 | 33 | - | - | 35 | 33 | - | - | 36 | 36 | - | - |
| Area 7 - R105 | Day | 37 | - | - | - | 36 | - | - | - | 35 | - | - | - | 37 |
| | Evening | 37 | - | - | 31 | - | - | - | 32 | - | - | - | 35 | - |
| | Night | 37 | 37 | 33 | - | - | 37 | 33 | - | - | 36 | 35 | - | - |
| Area 8 - R111 | Day | 36 | - | - | - | 35 | - | - | - | 34 | - | - | - | 36 |
| | Evening | 36 | - | - | 34 | - | - | - | 33 | - | - | - | 36 | - |
| | Night | 35 | 36 | 34 | - | - | 35 | 33 | - | - | 35 | 36 | - | - |
| Area 8 - R127a | Day | 36 | - | - | - | 32 | - | - | - | < 30 | - | - | - | 31 |
| | Evening | 36 | - | - | 32 | - | - | - | 30 | - | - | - | 31 | - |
| | Night | 35 | 33 | 32 | - | - | 32 | 30 | - | - | < 30 | 31 | - | - |
| Area 8 - R127b | Day | 36 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 36 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 8 - R127c | Day | 36 | - | - | - | 33 | - | - | - | 31 | - | - | - | 31 |
| | Evening | 36 | - | - | 32 | - | - | - | 32 | - | - | - | 31 | - |
| | Night | 35 | 34 | 32 | - | - | 33 | 32 | - | - | < 30 | 31 | - | - |
| Area 8 - R143 | Day | 36 | - | - | - | 32 | - | - | - | 31 | - | - | - | 30 |
| | Evening | 36 | - | - | 32 | - | - | - | 31 | - | - | - | 30 | - |
| | Night | 35 | 34 | 32 | - | - | 33 | 31 | - | - | < 30 | 30 | - | - |

| Receiver Location | Period | PSNL | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 8 - R146 | Day | 36 | - | - | - | 31 | - | - | - | < 30 | - | - | - | 31 |
| | Evening | 36 | - | - | 31 | - | - | - | < 30 | - | - | - | 31 | - |
| | Night | 35 | 33 | 31 | - | - | 31 | 30 | - | - | < 30 | 31 | - | - |
| Area 8 - R148 | Day | 36 | - | - | - | 33 | - | - | - | 31 | - | - | - | 33 |
| | Evening | 36 | - | - | 32 | - | - | - | 31 | - | - | - | 33 | - |
| | Night | 35 | 33 | 32 | - | - | 32 | 31 | - | - | 31 | 33 | - | - |
| Area 8 - R151 | Day | 36 | - | - | - | 31 | - | - | - | < 30 | - | - | - | 30 |
| | Evening | 36 | - | - | 32 | - | - | - | 30 | - | - | - | 30 | - |
| | Night | 35 | 34 | 32 | - | - | 32 | 30 | - | - | < 30 | 30 | - | - |
| Area 8 - R152 | Day | 36 | - | - | - | 33 | - | - | - | 30 | - | - | - | 30 |
| | Evening | 36 | - | - | 32 | - | - | - | 31 | - | - | - | 31 | - |
| | Night | 35 | 34 | 32 | - | - | 32 | 30 | - | - | < 30 | 30 | - | - |
| Area 8 - R154 | Day | 36 | - | - | - | 32 | - | - | - | < 30 | - | - | - | 30 |
| | Evening | 36 | - | - | 32 | - | - | - | 31 | - | - | - | 30 | - |
| | Night | 35 | 34 | 32 | - | - | 32 | 30 | - | - | < 30 | 30 | - | - |
| Area 8 - R155 | Day | 36 | - | - | - | 32 | - | - | - | 30 | - | - | - | < 30 |
| | Evening | 36 | - | - | 32 | - | - | - | 30 | - | - | - | 30 | - |
| | Night | 35 | 33 | 32 | - | - | 32 | 30 | - | - | < 30 | 30 | - | - |
| Area 8 - R156 | Day | 36 | - | - | - | 31 | - | - | - | 30 | - | - | - | < 30 |
| | Evening | 36 | - | - | 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | 32 | 30 | - | - | 31 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 9 - R147 | Day | 50 | - | - | - | 33 | - | - | - | 31 | - | - | - | 32 |
| | Evening | 48/45 | - | - | 32 | - | - | - | 30 | - | - | - | 33 | - |
| | Night | 43/38 | 33 | 32 | - | - | 31 | 30 | - | - | 31 | 33 | - | - |
| Area 9 - R149 | Day | -/50 | - | - | - | 31 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | -/50 | - | - | 31 | - | - | - | 30 | - | - | - | 30 | - |
| | Night | -/50 | 33 | 31 | - | - | 31 | < 30 | - | - | < 30 | 30 | - | - |

| Receiver Location | Period | PSNL | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 9 - R150 | Day | 50 | - | - | - | 33 | - | - | - | 30 | - | - | - | < 30 |
| | Evening | 48/45 | - | - | 32 | - | - | - | 30 | - | - | - | 30 | - |
| | Night | 43/38 | 34 | 32 | - | - | 32 | 30 | - | - | < 30 | 30 | - | - |
| Area 9 (INP) - R342 | Day | -/70 | - | - | - | 34 | - | - | - | 33 | - | - | - | 34 |
| | Evening | -/70 | - | - | 40 | - | - | - | 39 | - | - | - | 39 | - |
| | Night | -/70 | 41 | 38 | - | - | 39 | 36 | - | - | 34 | 35 | - | - |
| Area 10 - R144a | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 10 - R144b | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 10 - R144c | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 10 - R145 | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 11 - R133 | Day | 35 | - | - | - | 35 | - | - | - | 35 | - | - | - | 32 |
| | Evening | 35 | - | - | 33 | - | - | - | 34 | - | - | - | 30 | - |
| | Night | 35 | 31 | 32 | - | - | 31 | 32 | - | - | < 30 | < 30 | - | - |
| Area 11 - R134 | Day | 35 | - | - | - | 32 | - | - | - | 32 | - | - | - | 31 |
| | Evening | 35 | - | - | 30 | - | - | - | 31 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |
| Area 11 - R135 | Day | 35 | - | - | - | 34 | - | - | - | 33 | - | - | - | 31 |
| | Evening | 35 | - | - | 31 | - | - | - | 32 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | 30 | - | - | < 30 | < 30 | - | - |

| Receiver Location | Period | PSNL | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 11 - R136 | Day | 35 | - | - | - | 34 | - | - | - | 34 | - | - | - | 32 |
| | Evening | 35 | - | - | 32 | - | - | - | 33 | - | - | - | 31 | - |
| | Night | 35 | < 30 | 30 | - | - | 30 | 31 | - | - | < 30 | < 30 | - | - |
| All other Properties | Day | 35 | - | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 |
| | Evening | 35 | - | - | < 30 | - | - | - | < 30 | - | - | - | < 30 | - |
| | Night | 35 | < 30 | < 30 | - | - | < 30 | < 30 | - | - | < 30 | < 30 | - | - |

Note 1: Where the LAeq,period is less than the LAeq,15minute the LAeq,period has also been provided ($L_{Aeq,15minute}/L_{Aeq,period}$)

Note 2: Where PSNLs have not been specifically derived for a receiver the most stringent default condition presented in the INP (DECC, 2000) has been applied.

## Table 2 – No of Properties Exceeding Criteria

| Comparison with Criteria | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Greater-than PSNL to PSNL + 2 | 11 | 2 | - | 11 | 10 | - | 2 | 7 | 7 | 9 | 4 | 10 |
| Greater-than PSNL + 2 to PSNL + 5 | 3 | - | 3 | 1 | 2 | 1 | 1 | 1 | 5 | 9 | 3 | 7 |
| Greater-than PSNL + 5 | 3 | 3 | - | 3 | 3 | 2 | - | 3 | 6 | 1 | - | 3 |
| Maximum Predicted Noise Level | 46 | 41 | 40 | 44 | 46 | 41 | 39 | 44 | 44 | 42 | 42 | 47 |

**Table 3 – Probability[1] of exceeding PSNL**

(Results presented are for receivers that exceed the PSNL greater than 10% of the time period)

| Receiver Location | Period | PSNL[2] | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 1 - R041 | Day | 35 | - | - | - | 15% | - | - | - | - | - | - | - | - |
| Area 1 - R048 | Day | 35 | - | - | - | 11% | - | - | - | - | - | - | - | - |
| Area 3 - R015c (vacant land) | Day | 35 | - | - | - | 37% | - | - | - | 37% | - | - | - | 33% |
| | Evening | 35 | - | - | 16% | - | - | - | 11% | - | - | - | - | - |
| | Night | 35 | 70% | 25% | - | - | 69% | 19% | - | - | 58% | 17% | - | - |
| Area 3 - R018 (vacant land) | Day | 35 | - | - | - | 35% | - | - | - | 36% | - | - | - | 36% |
| | Evening | 35 | - | - | 24% | - | - | - | 22% | - | - | - | 26% | - |
| | Night | 35 | 76% | 41% | - | - | 75% | 40% | - | - | 74% | 46% | - | - |
| Area 3 – R174 (vacant land) | Day | 35 | - | - | - | 35% | - | - | - | 34% | - | - | - | 36% |
| | Evening | 35 | - | - | 18% | - | - | - | 17% | - | - | - | 16% | - |
| | Night | 35 | 71% | 26% | - | - | 69% | 24% | - | - | 64% | 25% | - | - |
| Area 4 - R010 | Night | 35 | - | - | - | - | - | - | - | - | - | 15% | - | - |
| Area 4 - R011 | Day | 35 | - | - | - | 12% | - | - | - | 16% | - | - | - | 18% |
| | Night | 35 | 20% | - | - | - | 20% | - | - | - | 12% | 15% | - | - |
| Area 4 - R012 | Day | 35 | - | - | - | - | - | - | - | 12% | - | - | - | 11% |
| | Evening | 35 | - | - | - | - | - | - | - | - | - | - | 10% | - |
| | Night | 35 | 20% | - | - | - | 20% | - | - | - | - | 15% | - | - |
| Area 4 - R013 | Day | 35 | - | - | - | 13% | - | - | - | 14% | - | - | - | 19% |
| | Night | 35 | 20% | - | - | - | 16% | - | - | - | 29% | 10% | - | - |
| Area 4 - R014 | Day | 35 | - | - | - | 14% | - | - | - | - | - | - | - | 14% |
| | Night | 35 | 20% | - | - | - | 12% | - | - | - | 20% | - | - | - |
| Area 4 - R019 | Day | 35 | - | - | - | 10% | - | - | - | 12% | - | - | - | 14% |
| | Night | 35 | 20% | - | - | - | 20% | - | - | - | 20% | 16% | - | - |

**Table 3 – Probability[1] of exceeding PSNL (cont.)**
(Results presented are for receivers that exceed the PSNL greater than 10% of the time period)

| Receiver Location | Period | PSNL[2] | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 4 - R021 | Day | 35 | - | - | - | 12% | - | - | - | 12% | - | - | - | 19% |
| | Evening | 35 | - | - | - | - | - | - | - | - | - | - | 16% | - |
| | Night | 35 | 23% | - | - | - | 20% | - | - | - | 27% | 21% | - | - |
| Area 4 - R022 | Day | 35 | - | - | - | 18% | - | - | - | 21% | - | - | - | 24% |
| | Evening | 35 | - | - | - | - | - | - | - | - | - | - | 17% | - |
| | Night | 35 | 42% | - | - | - | 42% | - | - | - | 42% | 21% | - | - |
| Area 4 - R023 | Day | 35 | - | - | - | 12% | - | - | - | 12% | - | - | - | 16% |
| | Evening | 35 | - | - | - | - | - | - | - | - | - | - | 19% | - |
| | Night | 35 | 20% | - | - | - | 18% | - | - | - | 22% | 25% | - | - |
| Area 4 - R093 | Day | 35 | - | - | - | - | - | - | - | - | - | - | - | 17% |
| | Night | 35 | 14% | - | - | - | - | - | - | - | 40% | 10% | - | - |
| Area 4 - R094 | Day | 35 | - | - | - | - | - | - | - | - | - | - | - | 17% |
| | Night | 35 | - | - | - | - | - | - | - | - | 20% | 10% | - | - |
| Area 4 - R095 | Day | 35 | - | - | - | 24% | - | - | - | - | - | - | - | 18% |
| | Night | 35 | 47% | 11% | - | - | 16% | - | - | - | 20% | - | - | - |
| Area 4 - R112 | Night | 35 | - | - | - | - | - | - | - | - | - | 15% | - | - |
| Area 4 - R114 | Day | 35 | - | - | - | - | - | - | - | - | - | - | - | 12% |
| | Night | 35 | - | - | - | - | 13% | - | - | - | 16% | - | - | - |
| Area 4 - R115 | Day | 35 | - | - | - | 10% | - | - | - | 14% | - | - | - | 16% |
| | Night | 35 | 21% | - | - | - | 25% | - | - | - | 20% | 11% | - | - |
| Area 5 - R091 | Day | 35 | - | - | - | - | - | - | - | - | - | - | - | 12% |
| | Night | 35 | - | - | - | - | - | - | - | - | 12% | - | - | - |
| Area 5 - R092 | Day | 35 | - | - | - | - | - | - | - | - | - | - | - | 18% |
| | Night | 35 | - | - | - | - | - | - | - | - | 20% | 11% | - | - |

**Table 3 – Probability[1] of exceeding PSNL (cont.)**

(Results presented are for receivers that exceed the PSNL greater than 10% of the time period)

| Receiver Location | Period | PSNL[2] | Year 1 | | | | Year 5 | | | | Year 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day | Winter Night | Non-winter Nights | Non-winter Evening | All Seasons Day |
| Area 6 - R122 [3] | Day | 39 | - | - | - | 11% | - | - | - | - | - | - | - | 14% |
| | Evening | 39 | - | - | - | - | - | - | - | - | - | - | 15% | - |
| | Night | 39/37 [4] | 48% | - | - | - | 21% | - | - | - | 21% | 20% | - | - |
| Area 7 - R004 | Day | 37 | - | - | - | - | - | - | - | - | - | - | - | 11% |
| Area 8 – R111 | Night | 35 | 21% | - | - | - | - | - | - | - | - | 16% | - | - |

Note 1: Probability is based on the precentage of time that each receiver is likely to exceed their PSNL during the meterological condtions considered. Meterological conditions considered include wind speeds up to and including 5m/s winds and G class stability conditions with and without drainage flow.

Note 3: Noise predictions are at the residence.

Note 4: Criteria 39 dB(A) $L_{Aeq,15minute}$ and 37 dB(A) $L_{Aeq,night}$.

## Table 4 – Predicted Sleep Disturbance Noise Levels, dB(A)

| Receiver Location | Period | Criteria | Year 1 - Winter Night | | | Year 5 - Winter Night | | | Year 10 - Winter Night | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calm | F-Class Stability 2m/s NW | 3m/s NW Wind | Calm | F-Class Stability 2m/s NW | 3m/s NW Wind | Calm | F-Class Stability 2m/s NW | 3m/s NW Wind |
| Area 1 - R041 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R042 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R043 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R044a | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R044b | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R045 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R046 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R047 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R048 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R049 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R050 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R051 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R052 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R053 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R054 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R055 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R056a | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R056b | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R057 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R058 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R059 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R060 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R061 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 1 - R062 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |

| Receiver Location | Period | Criteria | Year 1 - Winter Night | | | Year 5 - Winter Night | | | Year 10 - Winter Night | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calm | F-Class Stability 2m/s NW | 3m/s NW Wind | Calm | F-Class Stability 2m/s NW | 3m/s NW Wind | Calm | F-Class Stability 2m/s NW | 3m/s NW Wind |
| Area 2 - R015a | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R015b | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R017 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R063a | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R066 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R067 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R068 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R069a | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R069b | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R071 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R072 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R073 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R074 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R075 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R076 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R077 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R078 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R079 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R080 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R081 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R082 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R083 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R084a | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R084b | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R085 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R086 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |

| Receiver Location | Period | Criteria | Year 1 - Winter Night | | | Year 5 - Winter Night | | | Year 10 - Winter Night | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calm | F-Class Stability 2m/s NW | 3m/s NW Wind | Calm | F-Class Stability 2m/s NW | 3m/s NW Wind | Calm | F-Class Stability 2m/s NW | 3m/s NW Wind |
| Area 2 - R087 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R088 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 2 - R162b | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 3 - R015c | Night | 45 | < 30 | 34 | 33 | < 30 | 33 | 32 | < 30 | 33 | 33 |
| Area 3 - R018 | Night | 45 | < 30 | 35 | 35 | < 30 | 36 | 37 | < 30 | 46 | 47 |
| Area 3 - R174 | Night | 45 | < 30 | 34 | 34 | < 30 | 33 | 33 | < 30 | 34 | 34 |
| Area 4 - R010 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 34 | 35 |
| Area 4 - R011 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 34 | 34 |
| Area 4 - R012 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 35 | 36 |
| Area 4 - R013 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 32 | 32 |
| Area 4 - R014 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 30 |
| Area 4 - R019 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 35 | 35 |
| Area 4 - R021 | Night | 45 | < 30 | 30 | 30 | < 30 | < 30 | < 30 | < 30 | 37 | 37 |
| Area 4 - R022 | Night | 45 | < 30 | 30 | 30 | < 30 | < 30 | 30 | < 30 | 35 | 35 |
| Area 4 - R023 | Night | 45 | < 30 | 30 | 31 | < 30 | < 30 | < 30 | < 30 | 37 | 38 |
| Area 4 - R093 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 31 | 32 |
| Area 4 - R094 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 30 | 30 |
| Area 4 - R095 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 4 - R112 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 36 | 37 |
| Area 4 - R114 | Night | 45 | < 30 | 30 | 30 | < 30 | < 30 | < 30 | < 30 | 30 | 31 |
| Area 4 - R115 | Night | 45 | < 30 | 30 | 30 | < 30 | < 30 | < 30 | < 30 | 31 | 31 |
| Area 4 - R116 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 5 - R089 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 5 - R091 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 5 - R092 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 30 | 30 |
| Area 5 - R096 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |

| Receiver Location | Period | Criteria | Year 1 - Winter Night | | | Year 5 - Winter Night | | | Year 10 - Winter Night | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calm | F-Class Stability 2m/s NW | 3m/s NW Wind | Calm | F-Class Stability 2m/s NW | 3m/s NW Wind | Calm | F-Class Stability 2m/s NW | 3m/s NW Wind |
| Area 5 - R097 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 5 - R098 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 5 - R099 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 5 - R100 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 5 - R101 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 5 - R102a | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 5 - R102b | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 6 - R122 | Night | 49 | < 30 | 35 | 35 | < 30 | 31 | 31 | < 30 | 37 | 37 |
| Area 7 - R004 | Night | 47 | < 30 | 30 | 30 | < 30 | < 30 | < 30 | < 30 | 36 | 37 |
| Area 7 - R005 | Night | 47 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 31 | 31 |
| Area 7 - R007a | Night | 47 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 32 | 33 |
| Area 7 - R007b | Night | 47 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 32 | 32 |
| Area 7 - R007c | Night | 47 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 32 | 32 |
| Area 7 - R105 | Night | 47 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 34 | 35 |
| Area 8 - R111 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 8 - R127a - | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 8 - R127b | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 8 - R127c | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 8 - R143 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 8 - R146 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 8 - R148 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 8 - R151 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 8 - R152 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 8 - R154 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 8 - R155 - | Night | 45 | < 30 | 30 | 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 8 - R156 | Night | 45 | < 30 | 30 | 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |

| Receiver Location | Period | Criteria | Year 1 - Winter Night | | | Year 5 - Winter Night | | | Year 10 - Winter Night | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calm | F-Class Stability 2m/s NW | 3m/s NW Wind | Calm | F-Class Stability 2m/s NW | 3m/s NW Wind | Calm | F-Class Stability 2m/s NW | 3m/s NW Wind |
| Area 9 - R147 | Night | 53 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 9 - R150 | Night | 53 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 10 - R144a | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 10 - R144b | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 10 - R144c | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 10 - R145 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 11 - R133 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 11 - R134 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 11 - R135 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| Area 11 - R136 | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| All other Properties | Night | 45 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |

**Table 5 – Number of Properties Exceeding Criteria**

| Comparison with Criteria | Year 1 - Winter Night | | | Year 5 - Winter Night | | | Year 10 - Winter Night | | |
|---|---|---|---|---|---|---|---|---|---|
| | Calm | F-Class Stability 2m/s NW | 3m/s NW Wind | Calm | F-Class Stability 2m/s NW | 3m/s NW Wind | Calm | F-Class Stability 2m/s NW | 3m/s NW Wind |
| Greater-than Sleep Disturbance Criteria | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Maximum Predicted Nosie Level | < 30 | 37 | 35 | < 30 | 36 | 37 | < 30 | 46 | 47 |

## Table 6 – Predicted Construction Noise Levels, dB(A)

| Receiver Location | Bridge Upgrade – Standard Time | | | Rail Duplication – Standard Time | | | Construction Noise Goal (standard/ non-standard) |
|---|---|---|---|---|---|---|---|
| | Calm Neutral | 3 m/s NW | 3 m/s SE | Calm Neutral | 3 m/s NW | 3 m/s SE | |
| Area 1 - Falbrook Road and Goorangoola | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 40/35 |
| Area 2 – Bridgeman Road | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 40/35 |
| Area 3 – Falbrook | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 40/35 |
| Area 4 – Middle Falbrook | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 40/35 |
| Area 5 – Thomas Lane /Bridgeman Road | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 40/35 |
| Area 6 - R122 | < 30 | < 30 | < 30 | 41 | 44 | 39 | 44/39 |
| Area 7 - R105 \ | < 30 | < 30 | < 30 | < 30 | 32 | < 30 | 42/37 |
| Area 7 – Other properties Middle Falbrook Road/Stoney Creek Road | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 42/37 |
| Area 8 - R111 | < 30 | < 30 | < 30 | 36 | 43 | 33 | 41/35 |
| Area 8 - R127a | < 30 | < 30 | < 30 | < 30 | 32 | < 30 | 41/35 |
| Area 8 - R127b | < 30 | < 30 | < 30 | < 30 | 34 | < 30 | 41/35 |
| Area 8 - R127c | < 30 | < 30 | < 30 | < 30 | 34 | < 30 | 41/35 |
| Area 8 - R143 | < 30 | < 30 | < 30 | < 30 | 32 | < 30 | 41/35 |
| Area 8 - R146 | < 30 | < 30 | < 30 | < 30 | 32 | < 30 | 41/35 |
| Area 8 – Other properties in Norther Camberwell Village | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 41/35 |
| Area 9 (INP) - R342 | 62 | 58 | 66 | < 30 | < 30 | 31 | 75 |
| Area 9 – Other properties in Central Camberwell Village | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 55/43 |
| Area 10 – South of New England Highway | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 40/35 |
| Area 11 – Hebden | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 40/35 |
| All other Properties | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 40/35 |

**Table 7 – Number of Properties Exceeding Construction Noise Management Level**

| Receiver Location | Bridge Upgrade – Standard Time | | | Rail Duplication – Standard Time | | |
|---|---|---|---|---|---|---|
| | Calm Neutral | 3 m/s NW | 3 m/s SE | Calm Neutral | 3 m/s NW | 3 m/s SE |
| Greater than Standard Construction Noise Goals | 0 | 0 | 0 | 0 | 1 | 0 |
| Maximum Predicted Nosie Level at Residential Receiver | < 30 | < 30 | < 30 | 36 | 43 | 33 |

# APPENDIX H

Predicted Noise Impacts (Probability Contours)

# Appendix H – Predicted Noise Impacts (Probability Contours)

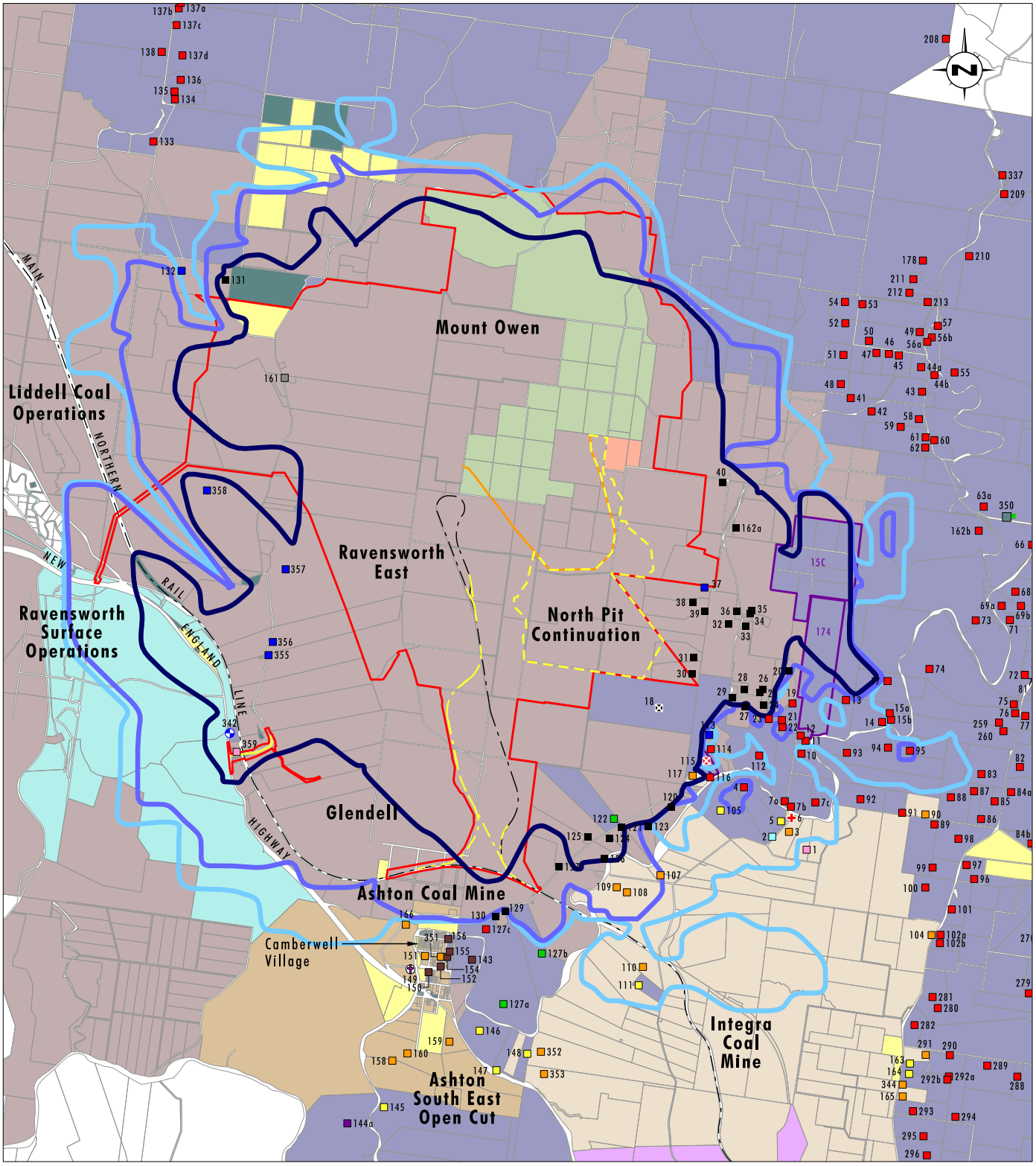
## Operational Noise Levels

ENM's Single Point calculation feature was used to determine noise levels from the Project at the nearest residential receiver under a full range of meteorological conditions. 90$^{th}$ percentile noise level contours were prepared for winter night-time, non-winter night-time, non-winter evenings and all seasons day-time for Years 1, 5 and 10 of the mining operations.

**Figures H.1** to **H.4** present the 90$^{th}$ percentile noise level contours for Year 1 winter night-time, non-winter night-time, non-winter evenings and all seasons day-time.

**Figures H.5** to **H.8** present the 90$^{th}$ percentile noise level contours for Year 5 winter night-time, non-winter night-time, non-winter evenings and all seasons day-time.

**Figures H.9** to **H.12** present the 90$^{th}$ percentile noise level contours for Year 10 winter night-time, non-winter night-time, non-winter evenings and all seasons day-time.




Data Source: Mount Owen (2014), Department of Lands (2009)

0 1 2 4 km

Scale 1:90 000

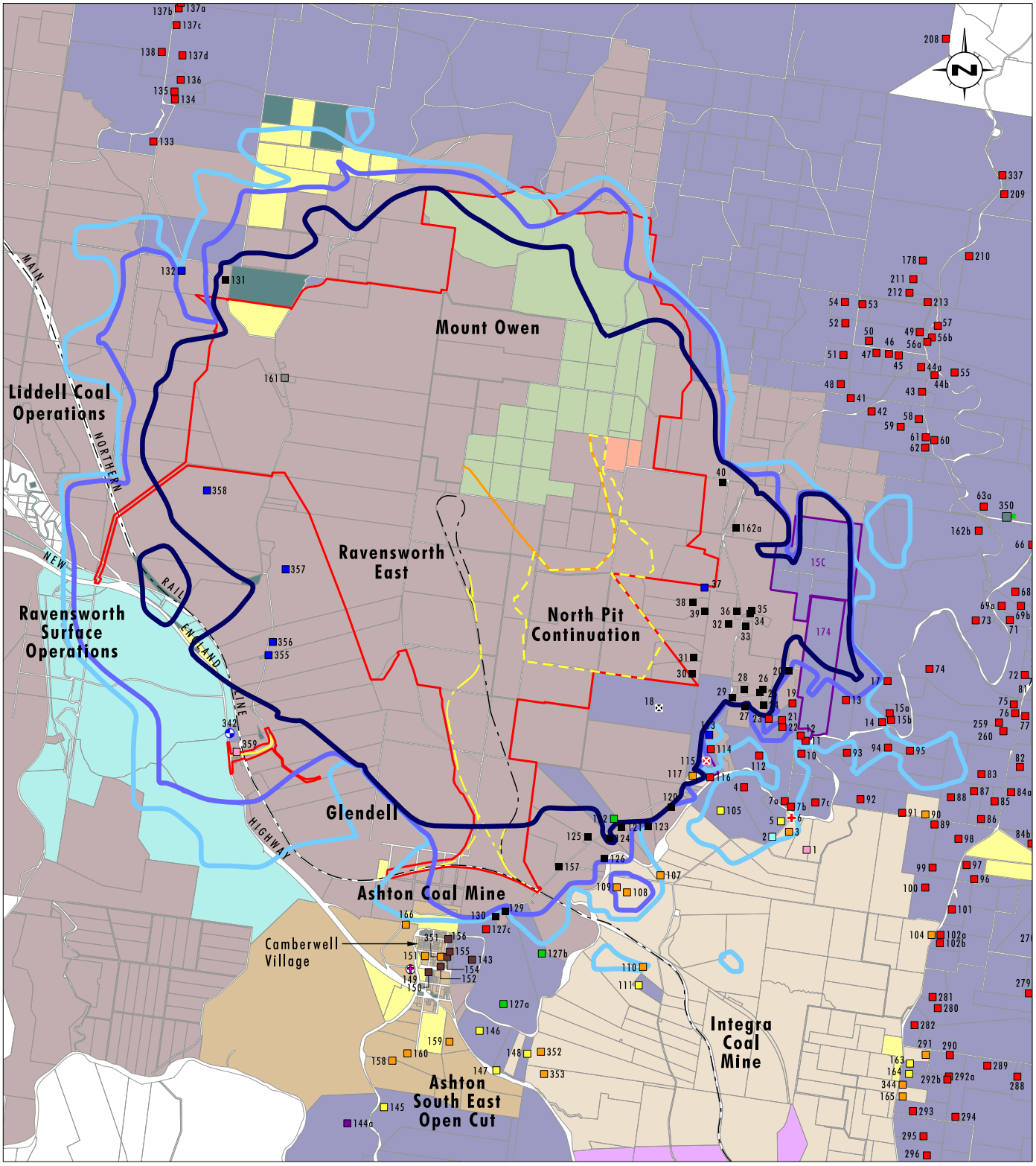
## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
- Integra Coal
- Macquarie Generation
- Glencore
- Private
- Rixs Creek Mine
- State Forest
- Minister for Education
- 35 dB(A) 10th Percentile Exceedence
- 37 dB(A) 10th Percentile Exceedence
- 40 dB(A) 10th Percentile Exceedence
- Mt Pleasant Primary School
- Currently Subject to Acquisition Rights - Dairy
- SEOC Acquisition
- Private Residence
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Community Hall
- Private No Dwelling
- Church
- Daracon Site Office
- Glennies Creek Fire Brigade
- Former Hebden Public School

FIGURE H.1

**Year 1 Winter Nights Noise Contours**

File Name (A4): R11/3109_633.dgn
20141009 9.47




Data Source: Mount Owen (2014), Department of Lands (2009)

0 1 2 4 km

Scale 1:90 000

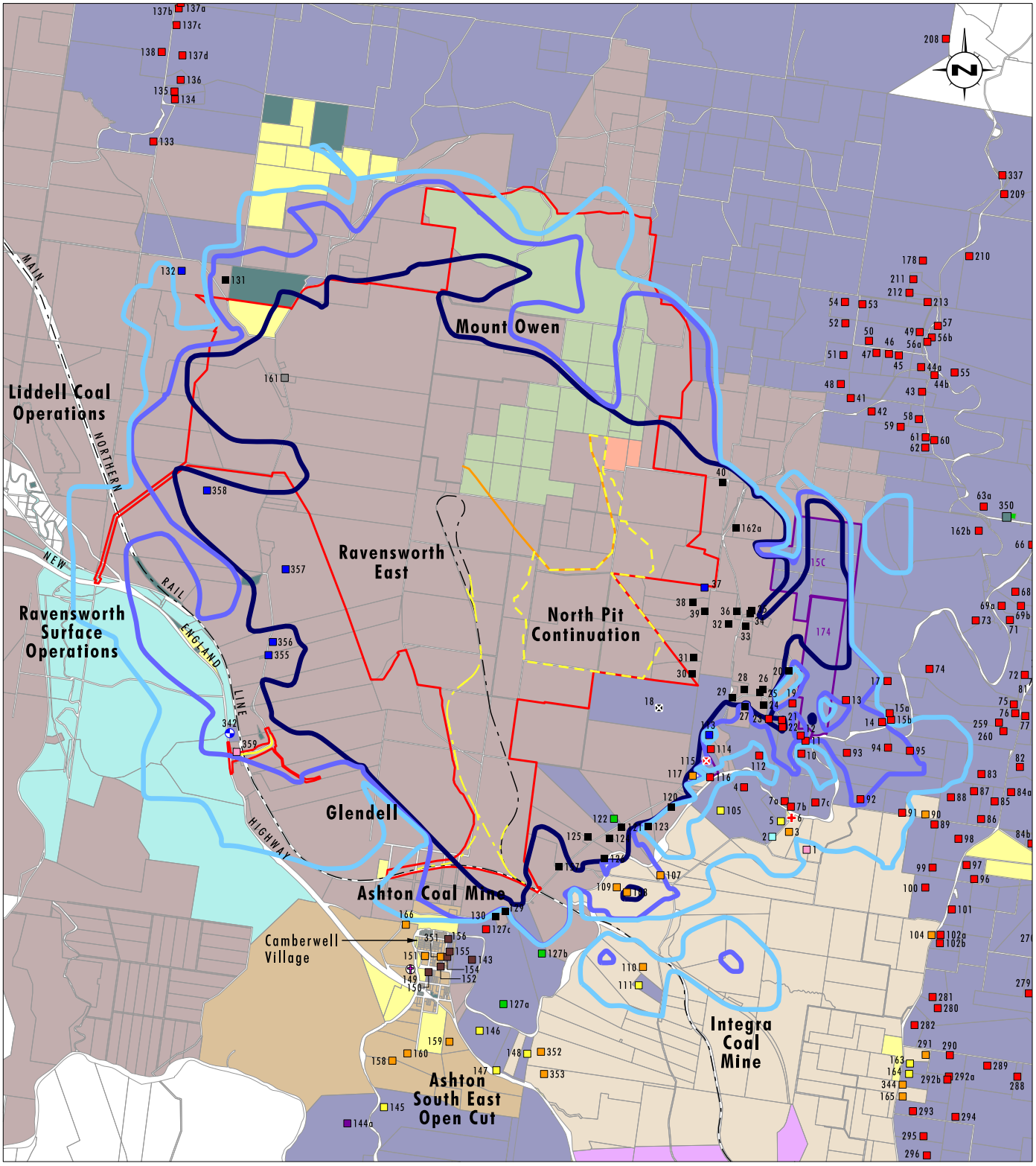
## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
- Integra Coal
- Macquarie Generation
- Glencore
- Private
- Rixs Creek Mine
- State Forest
- Minister for Education
- 35 dB(A) 10th Percentile Exceedence
- 37 dB(A) 10th Percentile Exceedence
- 40 dB(A) 10th Percentile Exceedence
- Mt Pleasant Primary School
- Currently Subject to Acquisition Rights - Dairy
- SEOC Acquisition
- Private Residence
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Community Hall
- Private No Dwelling
- Church
- Daracon Site Office
- Glennies Creek Fire Brigade
- Former Hebden Public School

FIGURE H.2

**Year 5 Winter Nights Noise Contours**

File Name (A4): R11/3109_634.dgn
20141009 9.48




Data Source: Mount Owen (2014), Department of Lands (2009)

0 1 2 4 km

Scale 1:90 000

## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
- Integra Coal
- Macquarie Generation
- Glencore
- Private
- Rixs Creek Mine
- State Forest
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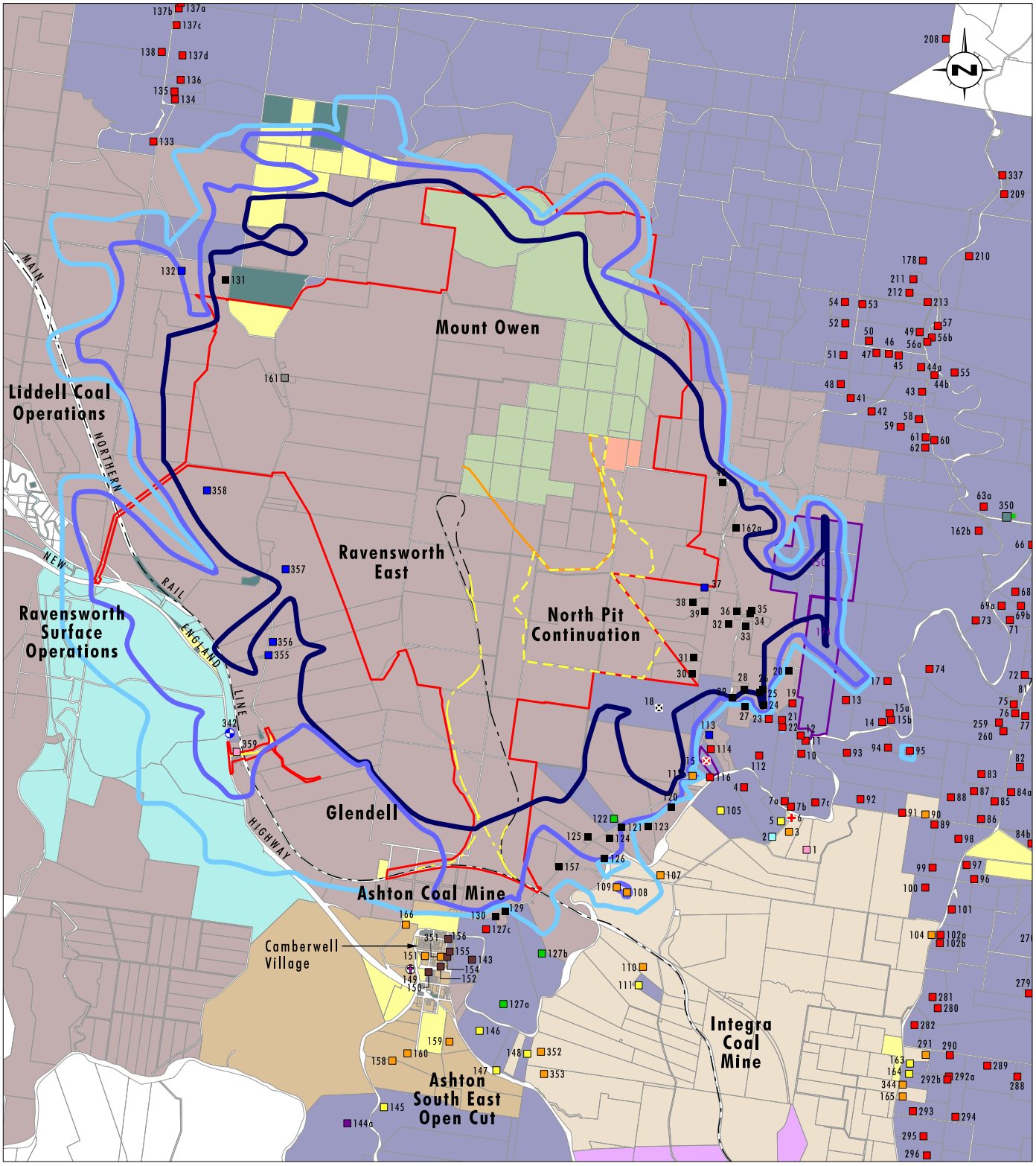
- 37 dB(A) 10th Percentile Exceedence
- 40 dB(A) 10th Percentile Exceedence
- Mt Pleasant Primary School
- Currently Subject to Acquisition Rights - Dairy
- SEOC Acquisition
- Private Residence
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Community Hall
- Private No Dwelling
- Church
- Daracon Site Office
- Glennies Creek Fire Brigade
- Former Hebden Public School

FIGURE H.3

Year 10 Winter Nights Noise Contours

File Name (A4): R11/3109_635.dgn
20141009 9.49




Data Source: Mount Owen (2014), Department of Lands (2009)

0 1 2 4 km

Scale 1:90 000

## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
- Integra Coal
- Macquarie Generation
- Glencore
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- 40 dB(A) 10th Percentile Exceedence
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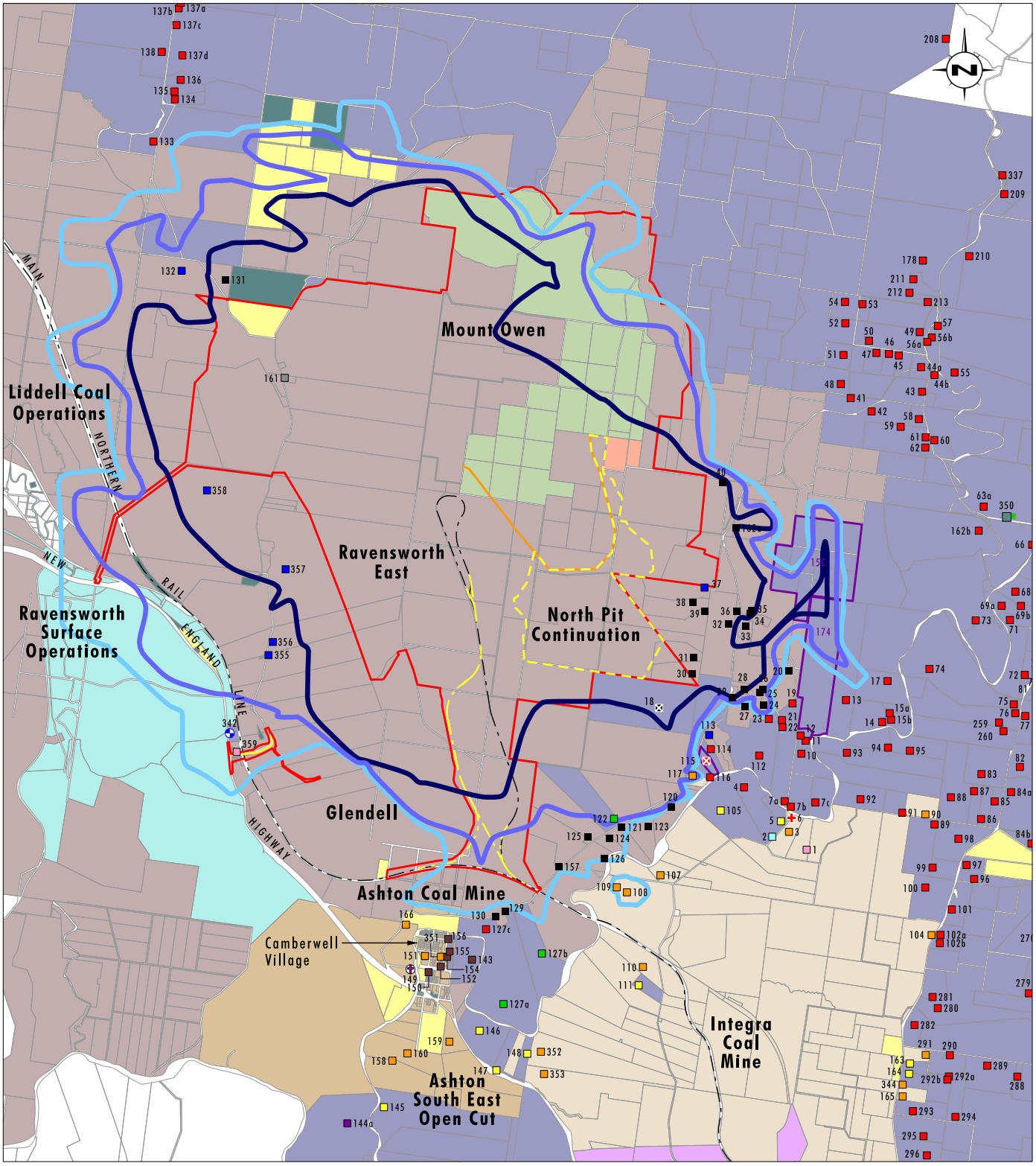
- Currently Subject to Acquisition Rights - Dairy
- SEOC Acquisition
- Private Residence
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Community Hall
- Private No Dwelling
- Church
- Daracon Site Office
- Glennies Creek Fire Brigade
- Former Hebden Public School

FIGURE H.4

**Year 1 Non-Winter Nights Noise Contours**

File Name (A4): R11/3109_636.dgn
20141009 9.49




Data Source: Mount Owen (2014), Department of Lands (2009)

0 1 2 4 km

Scale 1:90 000

## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
- Integra Coal
- Macquarie Generation
- Glencore
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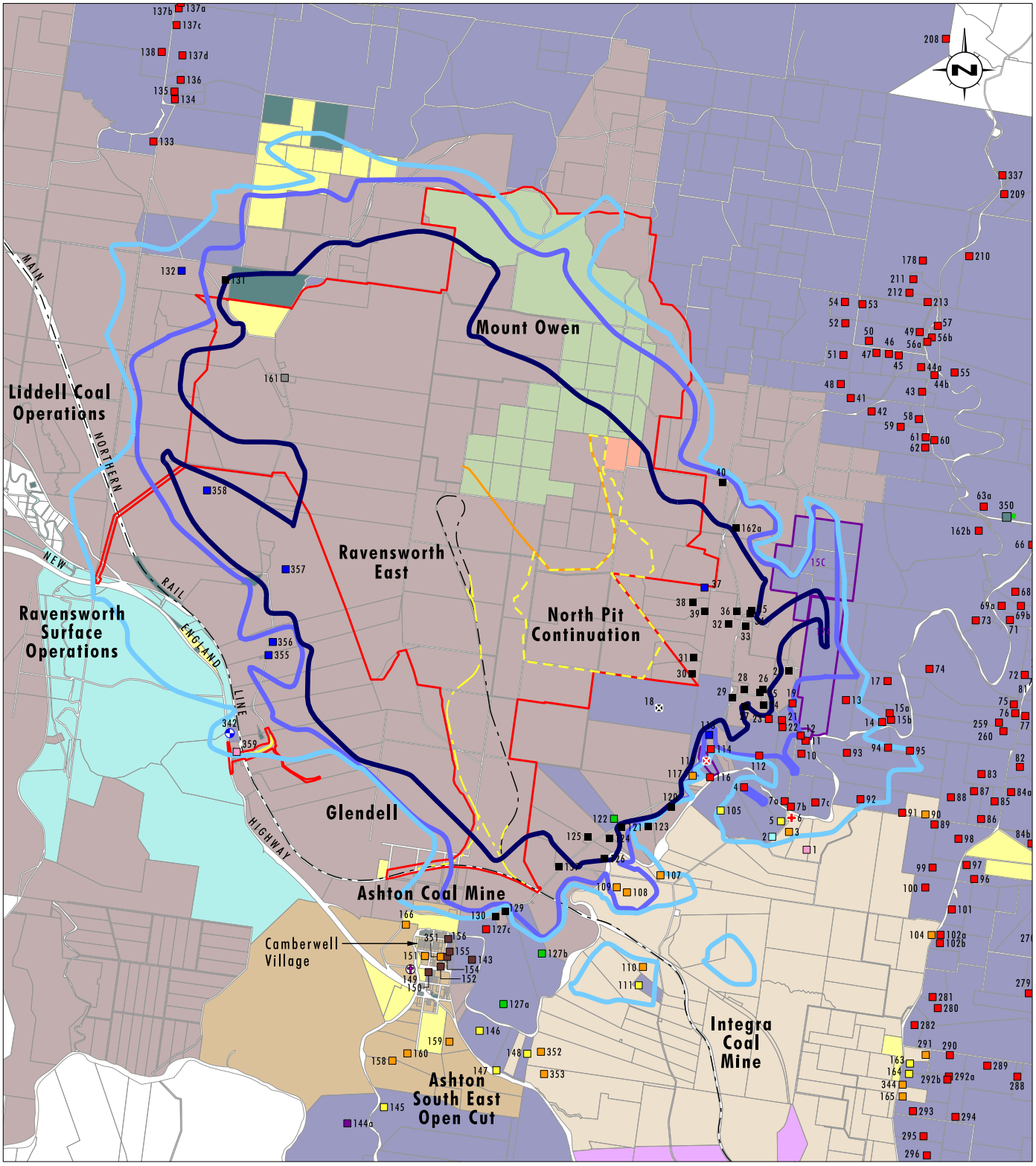
- 40 dB(A) 10th Percentile Exceedence
- Mt Pleasant Primary School
- Currently Subject to Acquisition Rights - Dairy
- SEOC Acquisition
- Private Residence
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Community Hall
- Private No Dwelling
- Church
- Daracon Site Office
- Glennies Creek Fire Brigade
- Former Hebden Public School

FIGURE H.5

**Year 5 Non-Winter Nights Noise Contours**

File Name (A4): R11/3109_637.dgn
20141009 9.50




Data Source: Mount Owen (2014), Department of Lands (2009)

0 1 2 4 km

Scale 1:90 000

## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
- Integra Coal
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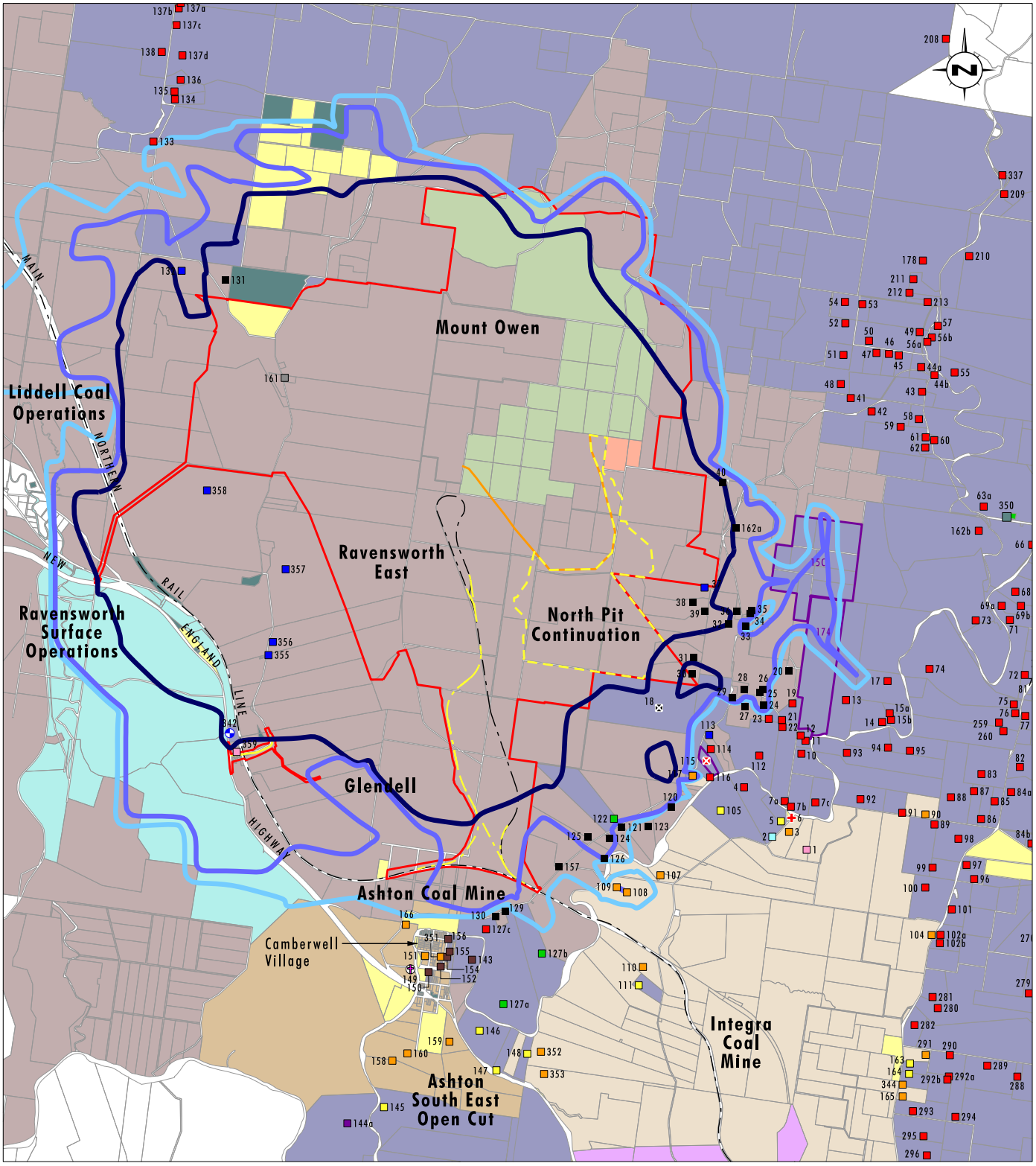
- 40 dB(A) 10th Percentile Exceedence
- Mt Pleasant Primary School
- Currently Subject to Acquisition Rights - Dairy
- SEOC Acquisition
- Private Residence
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Community Hall
- Private No Dwelling
- Church
- Daracon Site Office
- Glennies Creek Fire Brigade
- Former Hebden Public School

FIGURE H.6

# Year 10 Non-Winter Nights Noise Contours

File Name (A4): R11/3109_638.dgn
20141009 9.51




Data Source: Mount Owen (2014), Department of Lands (2009)

0 1 2 4 km

Scale 1:90 000

## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
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- Integra Coal
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- 40 dB(A) 10th Percentile Exceedence
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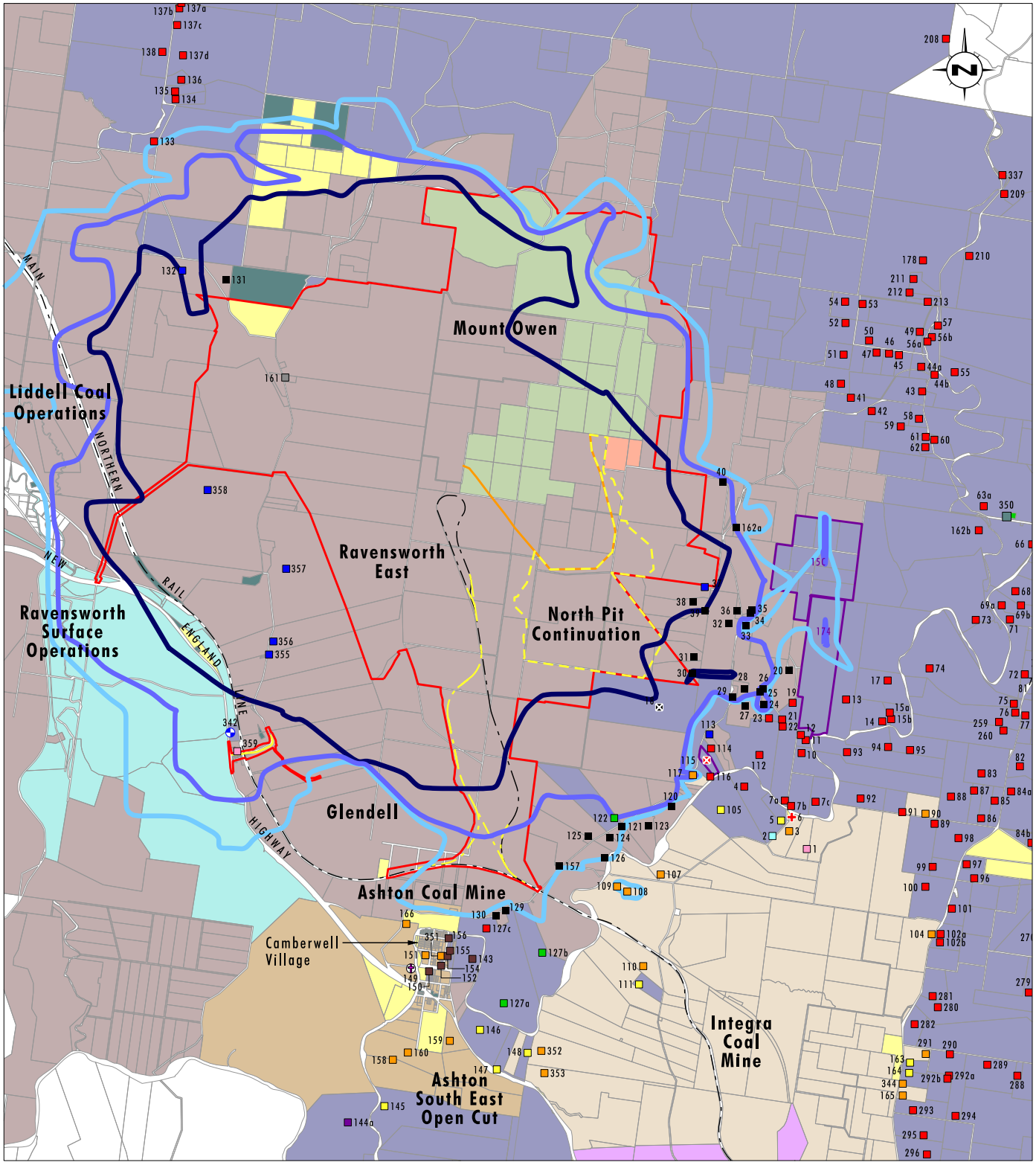
- SEOC Acquisition
- Private Residence
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Community Hall
- Private No Dwelling
- Church
- Daracon Site Office
- Glennies Creek Fire Brigade
- Former Hebden Public School

FIGURE H.7

**Year 1 Non-Winter Evenings Noise Contours**

File Name (A4): R11/3109_639.dgn
20141009 9.51




Data Source: Mount Owen (2014), Department of Lands (2009)

0 1 2 4 km

Scale 1:90 000

## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
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- Glencore
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- State Forest
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- 40 dB(A) 10th Percentile Exceedence
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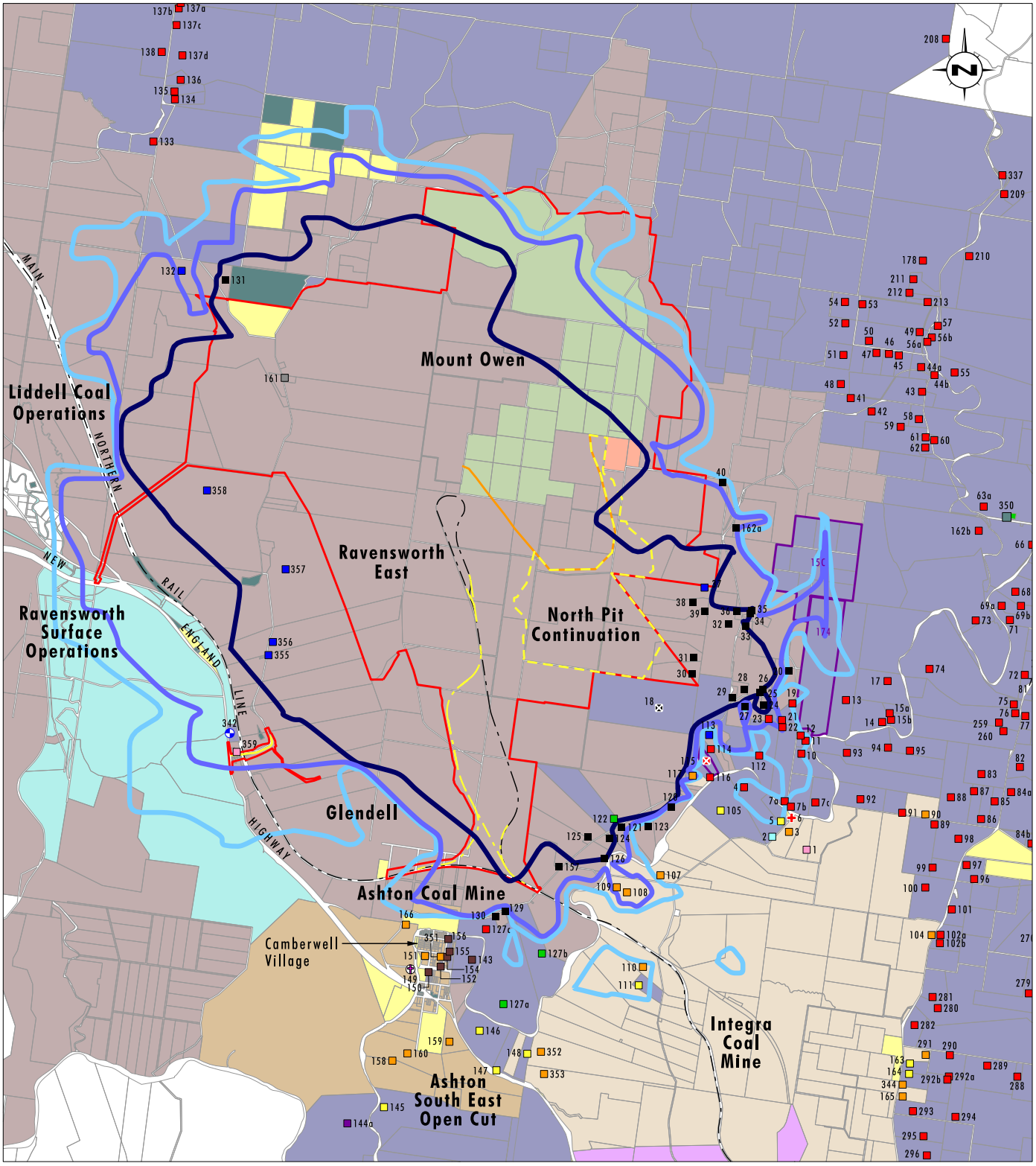
- Currently Subject to Acquisition Rights - Dairy
- SEOC Acquisition
- Private Residence
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Community Hall
- Private No Dwelling
- Church
- Daracon Site Office
- Glennies Creek Fire Brigade
- Former Hebden Public School

FIGURE H.8

**Year 5 Non-Winter Evenings Noise Contours**

File Name (A4): R11/3109_640.dgn
20141009 9.52




Data Source: Mount Owen (2014), Department of Lands (2009)

0 1 2 4 km

Scale 1:90 000

## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
- Integra Coal
- Macquarie Generation
- Glencore
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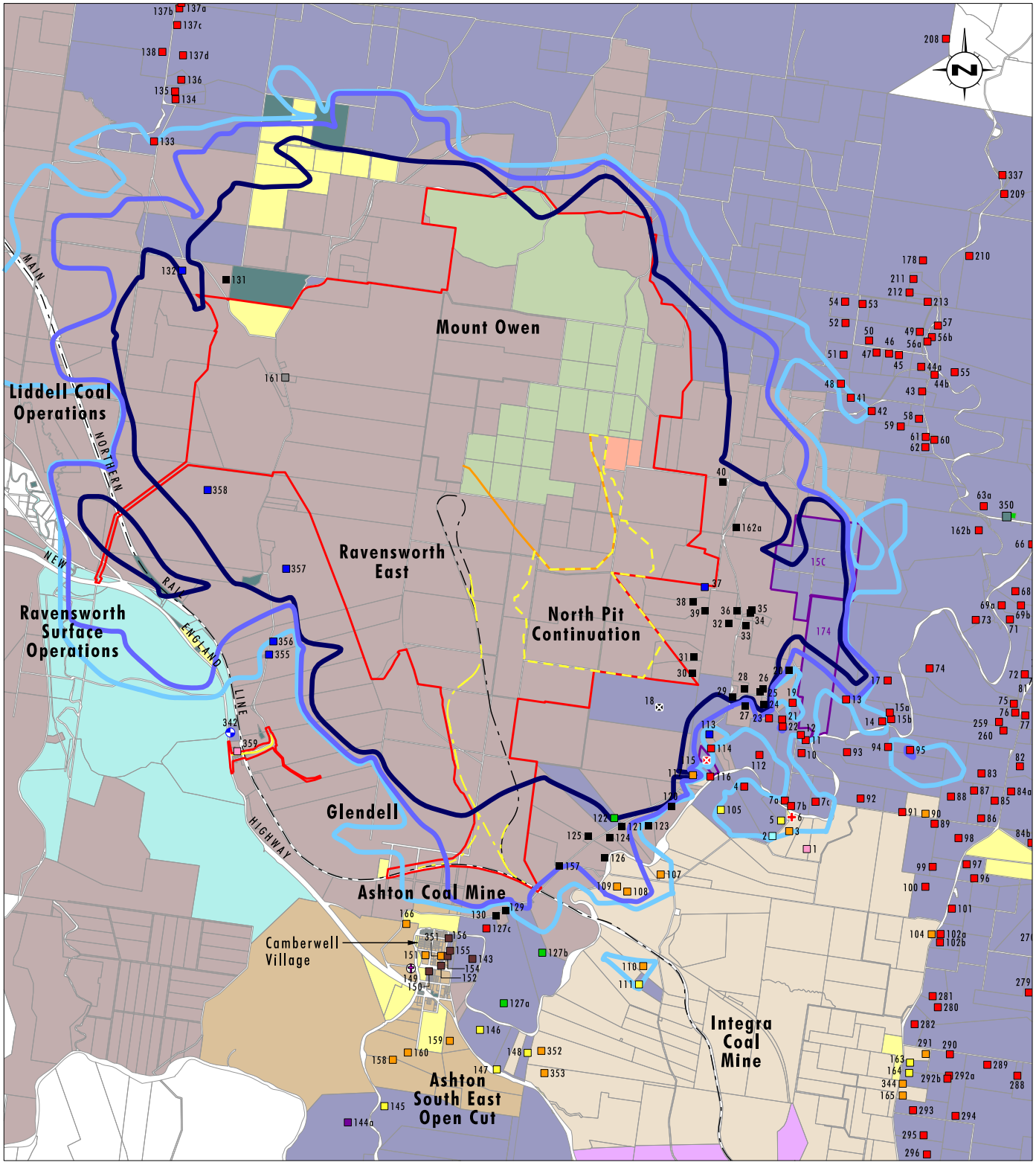
- State Forest
- Minister for Education
- 35 dB(A) 10th Percentile Exceedence
- 37 dB(A) 10th Percentile Exceedence
- 40 dB(A) 10th Percentile Exceedence
- Mt Pleasant Primary School
- Currently Subject to Acquisition Rights - Dairy
- SEOC Acquisition
- Private Residence
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Community Hall
- Private No Dwelling
- Church
- Daracon Site Office
- Glennies Creek Fire Brigade
- Former Hebden Public School

FIGURE H.9

# Year 10 Non-Winter Evenings Noise Contours

File Name (A4): R11/3109_641.dgn
20141009 9.52




Data Source: Mount Owen (2014), Department of Lands (2009)

0 1 2 4 km

Scale 1:90 000

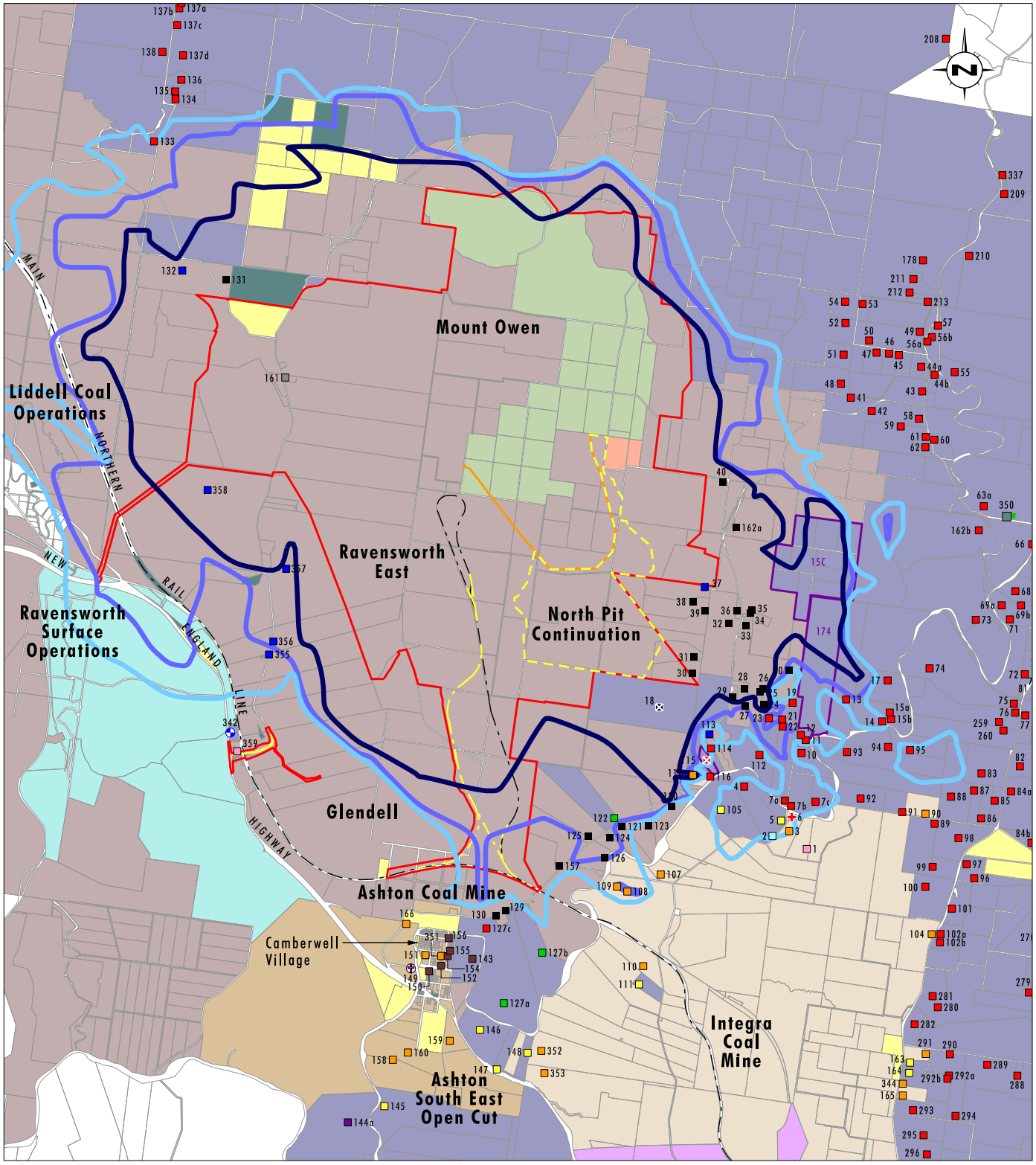
## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
- Integra Coal
- Macquarie Generation
- Glencore
- Private
- Rixs Creek Mine
- State Forest
- Minster for Education
- 35 dB(A) 10th Percentile Exceedence
- 37 dB(A) 10th Percentile Exceedence
- 40 dB(A) 10th Percentile Exceedence
- Mt Pleasant Primary School
- Currently Subject to Acquisition Rights - Dairy
- SEOC Acquisition
- Private Residence
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Community Hall
- Private No Dwelling
- Church
- Daracon Site Office
- Glennies Creek Fire Brigade
- Former Hebden Public School

FIGURE H.10

**Year 1 All Seasons Day Noise Contours**

File Name (A4): R11/3109_642.dgn
20141009 9.53




Data Source: Mount Owen (2014), Department of Lands (2009)

0 1 2 4 km

Scale 1:90 000

## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
- Integra Coal
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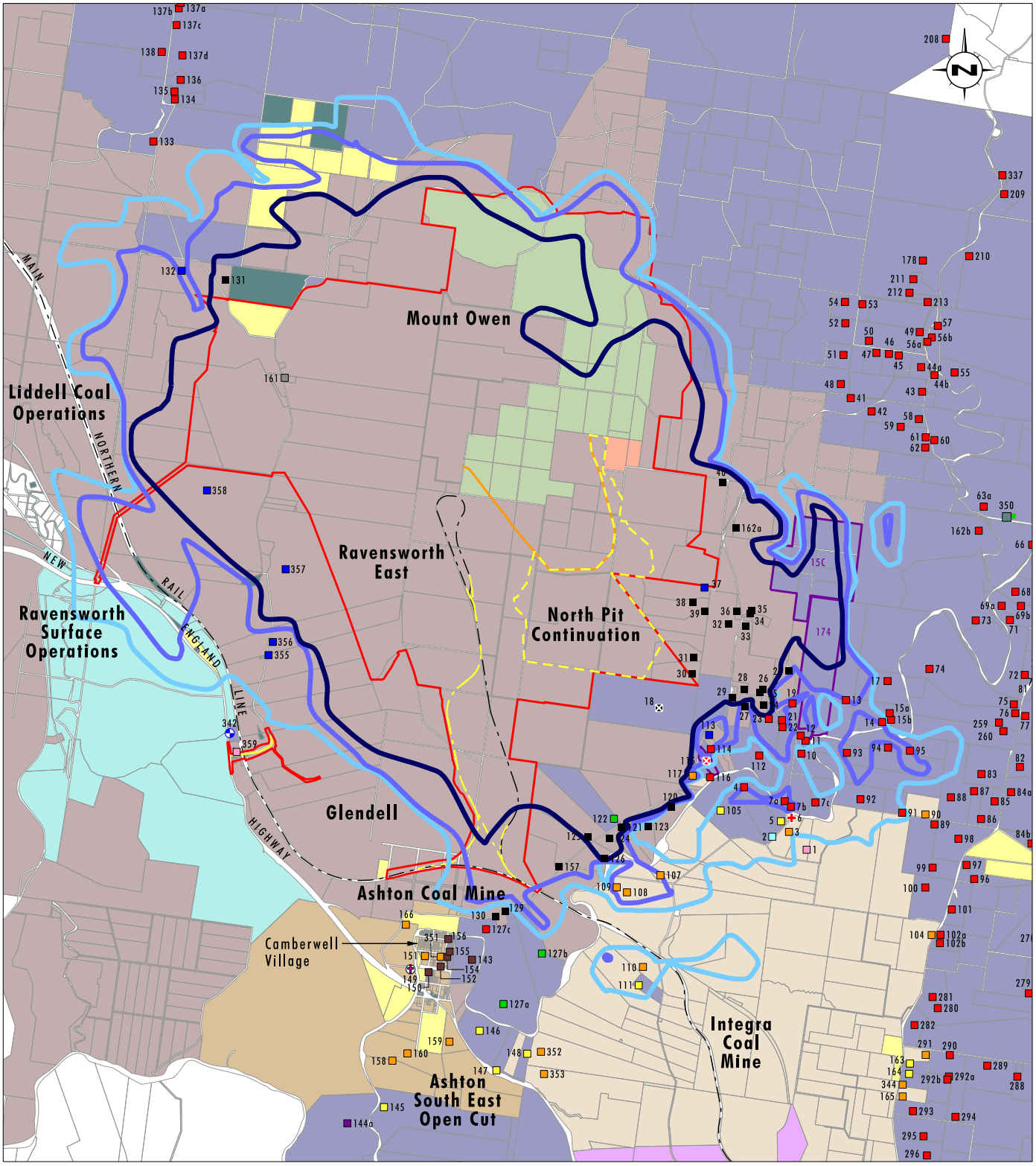
- Private Residence
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Community Hall
- Private No Dwelling
- Church
- Daracon Site Office
- Glennies Creek Fire Brigade
- Former Hebden Public School

FIGURE H.11

**Year 5 All Seasons Day Noise Contours**

File Name (A4): R11/3109_643.dgn
20141009 9.54




Data Source: Mount Owen (2014), Department of Lands (2009)

0 1 2 4 km

Scale 1:90 000

## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
- Integra Coal
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- 40 dB(A) 10th Percentile Exceedence
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- Currently Subject to Acquisition Rights - Dairy
- SEOC Acquisition
- Private Residence
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Community Hall
- Private No Dwelling
- Church
- Daracon Site Office
- Glennies Creek Fire Brigade
- Former Hebden Public School

FIGURE H.12

**Year 10 All Seasons Day Noise Contours**

File Name (A4): R11/3109_645.dgn
20141009 9.54

# APPENDIX I

Cumulative Noise Assessment

# Appendix I – Cumulative Noise Assessment

## Introduction

The assessment of cumulative noise levels from industrial operations considers:

- the predicted noise levels from Project and existing and approved Glendell operations known collectively as the Mount Owen Complex;
- the cumulative noise levels in the regions to the north-west of the Project as a result of the contributions to noise levels from Liddell Coal Mine and the Project; and
- the cumulative noise levels in the regions to the south-east of the Project as a result of the contributions to noise levels from Vale Coal surface and underground operations, Ashton Coal surface and underground operations; Glendell Coal mine and the Project.

The contributions to the cumulative noise levels are based on predicted noise levels in the respective project assessments and the predicted noise levels presented in the NIA of this Project.

## Mount Owen Complex Cumulative Noise Levels

The Mount Owen Complex incorporates the Project, Ravensworth East and Glendell Mine. **Figures I.1** and **I.2** show the cumulative noise predictions for the Mount Owen Complex incorporating Year 1 and Year 5 of the Project. The results are presented as 10$^{th}$ percentile 40 dB(A) and 45 dB(A) $L_{Aeq, 15\ minute}$ probability contours. When assessed against the $L_{Aeq, period}$ (where period = day, evening or night) descriptor the $L_{Aeq, 15\ minute}$ probability contours overstate the period based impact.

## North-West of the Project

The predicted noise levels at the closest privately owned residential receiver to the north-west of the Project from Liddell Coal Mine are reported in *Liddell Coal Operations Environmental Assessment* (Liddell EA) - *Proposed Modification to DA 305-11-01* (SLR 2013). The predicted $L_{Aeq, 15\ minute}$ noise levels in **Table 1** are the highest predicted noise levels at each receptor for the various prevailing meteorological conditions considered in the Liddell EA. No specific details were provided on the meteorological conditions associated with the highest predicted noise levels.

**Table 1 – Predicted $L_{Aeq, 15\ minute}$ Noise Levels – Liddell Coal Operational, dB(A)**

| **Receiver** [1] | **2015 Results** Day/Evening/Night | **2017 Results** Day/Evening/Night | **2018 Results** Day/Evening/Night |
|---|---|---|---|
| R01 | 33 / 19 / 35 | 13 / 24 / 33 | 32 / 22 / 34 |
| R02 | 34 / 19 / 35 | 31 / 25 / 34 | 34 / 23 / 36 |
| R03 | 33 / 19 / 35 | 31 / 25 / 34 | 36 / 28 / 37 |
| R04 | 33 / 21 / 33 | 31 / 29 / 33 | 36 / 31 / 36 |

Source: *Liddell Coal Operations Environmental Assessment* (SLR, 2013)
Note 1: Receiver number from Liddell EA

The predicted $L_{Aeq, 15\ minute}$ noise levels at the closest privately owned residential receiver to the north-west of the Project from Project are presented in **Table 2** for the worst case source to receiver meteorological conditions of south-east wind at 3 m/s. This represents worst case conditions for the Project, in consideration of potential interactions with Liddell Coal Operations.

**Table 2 – Predicted $L_{Aeq, 15\ minute}$ Noise Levels – Proposed Project, dB(A)**

| **Receiver** | **Year 1** Day/Evening/Night | **Year 5** Day/Evening/Night | **Year 10** Day/Evening/Night |
|---|---|---|---|
| R134 | 30 / 30 / 30 | 32 / 31 / 31 | 29 / 29 / 26 |
| R135 | 32 / 31 / 31 | 32 / 32 / 32 | 29 / 29 / 27 |
| R136 | 33 / 32 / 32 | 32 / 33 / 33 | 31 / 31 / 27 |
| R138 | 33 / 32 / 32 | 32 / 32 / 32 | 30 / 30 / 27 |

The cumulative noise impacts of greatest concern occur during the night time where $L_{Aeq, Period}$ criteria is 40 dB(A). The summation of the loudest predicted noise levels in **Tables 1** and **2** during the night time period would results in cumulative $L_{Aeq, Night}$ noise levels presented in **Table 3**. It has been assumed that the difference between the intrusive and amenity noise level descriptors range is 2 dB.

**Table 3 – Predicted $L_{Aeq, period}$ Noise Levels – Cumulative Liddell Coal and Mount Owen Continued Operations Project, dB(A)**

| **Receiver** | **Year 1** Day/Evening/Night | **Year 5** Day/Evening/Night | **Year 10** Day/Evening/Night |
|---|---|---|---|
| R134 | 33 / 28 / 34 | 30 / 30 / 33 | 32 / 28 / 33 |
| R135 | 34 / 29 / 34 | 33 / 31 / 34 | 33 / 28 / 35 |
| R136 | 34 / 30 / 35 | 33 / 32 / 35 | 35 / 31 / 35 |
| R138 | 34 / 30 / 34 | 33 / 32 / 34 | 35 / 32 / 35 |

The results in **Table 3** indicate the cumulative $L_{Aeq, Night}$ noise levels to the north west of the Project are less than 40 dB(A). The worst case predicted $L_{Aeq, 15\ minute}$ noise levels from Liddell ranges from 35 to 37 dB(A) during the night time period. The worst case noise level from the Project is 32 to 33 dB(A). When combined, assuming a 2 dB difference between the intrusive and amenity noise level descriptors range, the summation of the night time period noise impacts gives a maximum cumulative $L_{Aeq, night}$ noise level of 35 dB(A) at receiver R136 for Years 1, 5 and 10 and receivers R135 and R138 during Year 10. This does not account for the differences in meteorological conditions associated with the predicted noise levels, i.e. the loudest predicted noise level at R01 in **Table 1** during 2015 is unlikely to be associated with worst case Project source to receiver meteorological conditions of south-east wind at 3 m/s, due to the relative location of Liddell Coal Operations to the receiver.

## South-East of the Project

The Ashton Coal environmental assessment *South East Open Cut Project and Modification to the Existing ACP Consent,* (Ashton EA) (Wells Environmental Services 2009) does not specifically include the prediction of noise levels in the Middle Falbrook region to the south-east of the Project. Under night time inversion conditions, the noise contours for each of years of the development assessed in the Ashton EA indicate the $L_{Aeq, 15\ minute}$ noise levels

will be less than 35 dB(A) in the Glennies Creek regions to the south west of Middle Falbrook.

The predicted noise levels at representative privately owned residential receivers to the south-east of the Project from Integra Coal Mine are reported in *Integra Mine Complex Modification 2* (Integra EA) – Environmental Assessment (EMM 2012). The predicted $L_{Aeq, 15\ minute}$ noise levels presented in **Table 4** are for night time inversion conditions considered for the two coal haulage alternatives considered in the Integra EA for 'full-pit operations'.

**Table 4 – Predicted $L_{Aeq, 15\ minute}$ Noise Levels – Integera Coal Operational, dB(A)**

| Receiver [1] | Night – Inversion: Haul Rd vs Convey Alt for Full Pit Operation | | | |
|---|---|---|---|---|
| | Year 1 | Year 4 | Year 6 | Year 8 |
| R48 | 35 / 30 | 36 / 34 | 36 / 35 | 35 / 32 |
| R53 | 38 / 36 | 38 / 37 | 38 / 37 | 36 / 36 |
| R31 | 35 / 33 | 34 / 35 | 34 / 35 | 33 / 35 |

Source: *Integra Mine Complex Modification 2* (EMM 2012)

Note 1: Receiver number from Integra EA

The corresponding predicted $L_{Aeq, 15\ minute}$ noise levels at the representative privately owned residential receiver to the south-east from the Project for the likely worst case meteorological condition of F-class stability conditions with a 2 m/s drainage flow from the north-west are presented in **Table 5**.

**Table 5 – Predicted $L_{Aeq, 15\ minute}$ Noise Levels – Proposed Project, dB(A)**

| Receiver | Year 1 Night | Year 5 Night | Year 10 Night |
|---|---|---|---|
| Area 7: R007 | 34 | 33 | 33 |
| Area 4: R021 | 34 | 34 | 34 |
| Area 2: R088 | 25 | 24 | 22 |

To account for the cumulative impact of the Mount Owen Complex (including the Project) **Table 6** presents the predicted $L_{Aeq, 15\ minute}$ noise levels at the representative privately owned residential receiver to the south-east of the Project from the Mount Owen Complex under likely worst case meteorological condition of F-class stability conditions with a 2 m/s drainage flow from the north west.

**Table 6 – Predicted $L_{Aeq, 15\ minute}$ Noise Levels – Mount Owen Complex, dB(A)**

| Receiver | Year 1 Night | Year 5 Night | Year 10 Night |
|---|---|---|---|
| Area 7: R007 | 35 | 34 | 33 |
| Area 4: R021 | 35 | 34 | 34 |
| Area 2: R088 | 27 | 25 | 22 |

The cumulative noise impacts of greatest concern occur during the night time where $L_{Aeq, Period}$ criteria is 40 dB(A). The summation of the loudest predicted noise levels in **Tables 4** and **6** during the night time period, plus the noise impacts from Ashton Coal would result in cumulative $L_{Aeq, Night}$ noise levels of less than 40 dB(A). The predicted cumulative noise levels at the representative privately owned residential receiver is presented in **Table 7**.

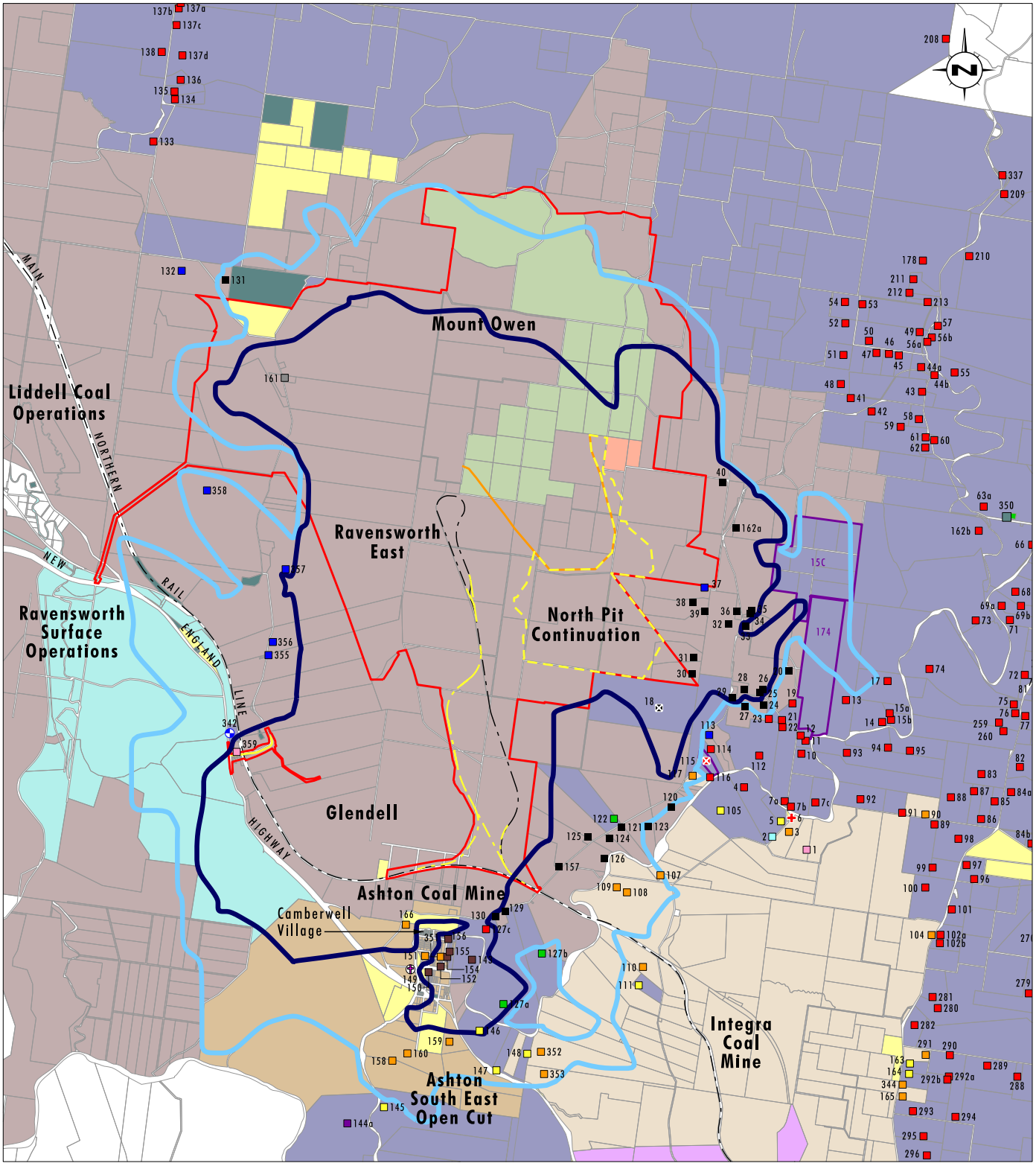
**Table 7 – Predicted Cumulative $L_{Aeq, night}$ Noise Levels, dB(A)**

| **Receiver** [1] | **Integra + Ashton + Mount Owen Complex** | | | |
|---|---|---|---|---|
| | **Year 1** | **Year 4** [1] **plus Year 5** [2] | **Year 6** [1] **plus Year 5** [2] | **Year 8** [1] **plus Year 10** [2] |
| R48 | 36 / 34 | 36 / 35 | 36 / 36 | 35 / 34 |
| R53 | 38 / 37 | 37 / 37 | 37 / 37 | 36 / 36 |
| R31 | 34 / 32 | 33 / 35 | 33 / 35 | 31 / 33 |

Note 1: Year designation from Integra EA

Note 2: Year designation for the proposed MOCO Project

The loudest predicted cumulative $L_{Aeq, Night}$ noise levels is at receiver R053 where the Year 5 predicted $L_{Aeq, 15\ minute}$ noise levels is 37 dB(A) and the worst case Year 10 predicted $L_{Aeq, 15\ minute}$ noise levels from Integra is 37 to 38 dB(A) and Ashton is less than 35 dB(A). Assuming a 2 dB difference between the intrusive and amenity noise level descriptors range, the summation of the night time period noise impacts gives a cumulative $L_{Aeq, night}$ less than 40 dB(A). This assumes similarities in the meteorological conditions associated but does not necessarily fully align the operational scenarios.




Data Source: Mount Owen (2014), Department of Lands (2009)

0 1 2 4 km

Scale 1:90 000

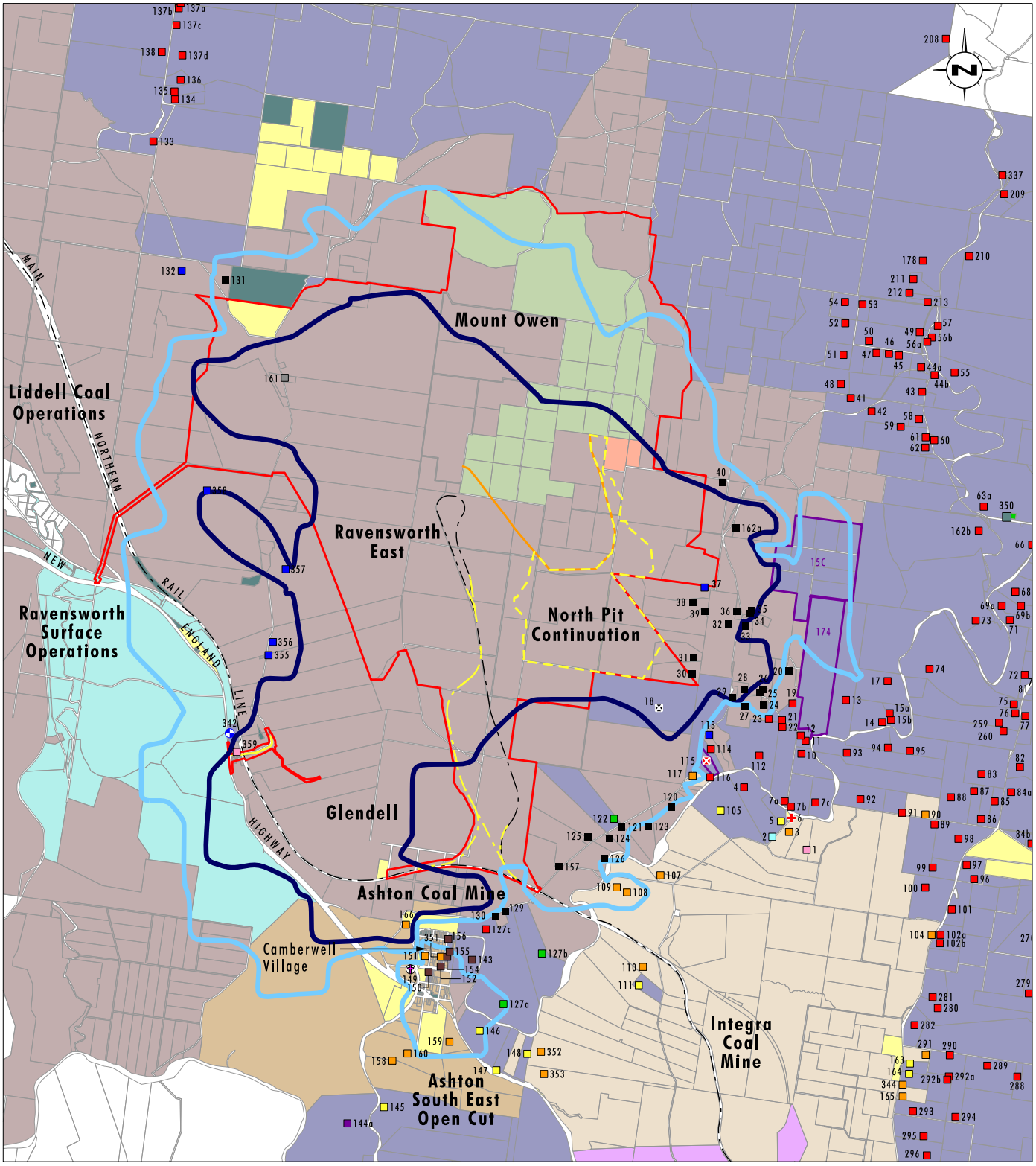
## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
- Integra Coal
- Macquarie Generation
- Glencore
- Private
- Rixs Creek Mine
- State Forest
- Minister for Education
- 40 dB(A) 10th Percentile Exceedence
- 45 dB(A) 10th Percentile Exceedence
- Mt Pleasant Primary School
- Currently Subject to Acquisition Rights - Dairy
- SEOC Acquisition
- Private Residence
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Private No Dwelling
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Community Hall
- Church
- Daracon Site Office
- Glennies Creek Fire Brigade
- Former Hebden Public School

FIGURE I.1

# Year 1 Cumulative Mount Owen Complex Winter Nights Noise Contours

File Name (A4): R11/3109_689.dgn
20141009 9.55




Data Source: Mount Owen (2014), Department of Lands (2009)

0 1 2 4 km

Scale 1:90 000

## Legend

- Project Area
- Approved North Pit Mining Extent
- Proposed North Pit Continuation
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Vacant Land
- Ashton Coal
- Crown Land
- Crown Land TSR
- Government Authority
- Integra Coal
- Macquarie Generation
- Glencore
- Private
- Rixs Creek Mine
- State Forest
- Minister for Education
- 40 dB(A) 10th Percentile Exceedence
- 45 dB(A) 10th Percentile Exceedence
- Mt Pleasant Primary School
- Currently Subject to Acquisition Rights - Dairy
- SEOC Acquisition
- Private Residence
- Private Residence - Currently Subject to Acquisition Rights - Glencore
- Private Residence - Currently Subject to Acquisition Rights - Other Mines
- Subject to Acquisition Rights - Glencore No Dwelling
- Private No Dwelling
- Mine Owned Residence - Glencore
- Mine Owned Residence - Other Mine
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Community Hall
- Church
- Daracon Site Office
- Glennies Creek Fire Brigade
- Former Hebden Public School

FIGURE I.2

# Year 5 Cumulative Mount Owen Complex Winter Nights Noise Contours

File Name (A4): R11/3109_690.dgn
20141009 9.56

# APPENDIX J

Assessment of Modifying Factors

# Appendix J – Assessment of Modifying Factors

## Industrial Noise Policy

Section 4 of the NSW Industrial Noise Policy (INP) (EPA 2000) notes that noise sources containing characteristics such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequencies can cause greater annoyance than other noise at the same noise level.

Where the noise source contains annoying characteristics, the INP outlines the correction factors that should be applied to the noise from the source measured or predicted at the receiver before comparison with the Project Specific Noise Level.

The modifying factors that are potentially relevant to the noise impact assessment of the Project are:

- Tonal noises with prominent frequency determined according to the following criteria:
    - Level of one-third octave band exceeds the level of the adjacent bands on both sides by:
        - 5 dB or more if the centre frequency of the band containing the tone is above 400 Hz;
        - 8 dB or more if the centre frequency of the band containing the tone is 160 to 400 Hz inclusive;
        - 15 dB or more if the centre frequency of the band containing the tone is below 160 Hz.
- Impulsive noise characterised by a short rise time of 35 milliseconds and decay time of 1.5 seconds:
    - Measured as the difference in A-weighted maximum noise levels between fast response and impulse response is greater than 2 dB.
- Intermittent noise applied to night-time only:
    - Subjectively assessed where the noise level varies by more than 5 dB.
- Duration:
    - Measured as a single-event noise where the duration may range from 1.5 minutes to 2.5 hours over any 24-hour period.
- Low-frequency noise in the 20 Hz to 250 Hz range according to the following criteria:
    - Measure/assess C- and A-weighted levels over same time period. Correction to be applied if the difference between the two levels is 15 dB or more.

The INP states that the modifying factors are to be applied to the noise from the source measured or predicted at the receiver and before comparison with the criteria, and where two or more modifying factors are present, the maximum correction is limited to 10 dB. However, the INP also notes that where a source emits tonal and low frequency noise, only one 5 dB correction should be applied if the tone is in the low-frequency range.

## Alternative Methodologies for the Assessment of Low Frequency Noise

Research into the annoyance from low frequency noise by Broner (2011) and others, suggests that the INP approach to the assessment of annoyance from low frequency noise may overstate the level of perceived annoyance.

DP&I has suggested in a draft guideline (DP&I 2013) that a more appropriate criterion for mining operations, based on the work of Broner (2011), of 65 dB(C) during the daytime and evening and 60 dB(C) during the night be adapted as the assessment criteria for the addition of a 5 dB modification factor.

However, DP&I have an agreement with the EPA that the INP procedure is the current approved government policy and should be used to assess the impact of low frequency noise unless it results in *perverse environmental outcomes*.

## Noise Modelling

The noise model for the Project was prepared on the basis that equipment generating noise in the potentially audible range of 25 to 20,000 Hz range is well maintained. Failure to replace damaged mufflers, acoustic louvres and associated attenuation equipment could result in the generation of unacceptable tonal or low frequency noises. Notwithstanding this, each item of equipment used in the ENM noise model of Project was assessed for tonal noise and low frequency noise in accordance with the procedure outlined in the INP. While the INP provides guidance for the assessment of tonal and low frequency noise, two important additional factors need to be considered:

- Air attenuation over distance reduces the high frequency noises. The contribution air makes to the absorption of high frequency sound is a function of air temperature, humidity, and frequency. It is reasonable to conclude that if a high frequency noise is inaudible due to the distance from the source then it should not be included in the tonal noise assessment described above.

- There is a threshold to the audibility of low frequency noises that the human ear can detect. As with the high frequency noises, if low frequency noises are inaudible, it is reasonable to conclude that they should not be included in the low frequency noise assessment described above. The threshold of audibility is defined in AS ISO 389.7 2003 'Acoustics- Reference zero for the calibration of audiometric equipment Part 7: Reference threshold of hearing under free-field and diffuse field listening conditions'.

Based on the above, for each predicted noise result an analysis of audibility, as defined by AS ISO 389.7 2003, is made against each one-third octave band. Where the predicted noise result for an octave band was found to be inaudible the octave band noise result is excluded from the assessment of tonality and low frequency noise.

The tonal assessment of the predicted noise levels at example receiver locations under the INP default worst case meteorological conditions (3°C/100 metre inversion with 2 m/s drainage flow from the north-west) are presented graphically in **Figures J.1** to **J.15** for receiver locations R007c, R022, R041, R095 and R100 which were chosen to represent a selection of the receivers most affected by tonal and low frequency noise.

## Low Frequency Noise Assessment

Low frequency analysis of the noise levels at the receivers shows that the difference between C-weighted and A-weighted noise levels generally does not exceed the 15 dB criteria set out in the INP. The difference between C-weighted and A-weighted noise levels are typically less than 15 dB.

However, for a limited number of receivers (refer to **Tables 1** to **3**), a strict interpretation of the INP under worst case INP meteorological conditions, results in the requirement for the addition of a low frequency modifying factor.

For the receivers listed in **Tables 1** to **3**, the following is noted (refer to examples locations in **Figures J.1** to **J.15**) in regard to the predicted noise levels:

- The predicted noise levels are generally within a few dB of the background noise environment.
- The predicted noise levels comprise of noise only in the range of 25 Hz to 2,000 Hz (i.e. almost entirely made up of low frequency noise). This is due to the combined effects of distance attenuation and noise attenuation applied at the source rendering the high frequency components inaudible.
- Generally the predicted noise levels comprise frequencies below 80Hz These in turn combine to make up the largest component of the combined single number C-weighted result. This provides a C-weighted predicted noise levels which are relatively high compared to the A-weighted noise level but that are not always audible to the human ear.
- The predicted noise levels are approximately 10 to 14 dB below the Broner 2011 and DP&I 2013 recommended night time threshold of 60 dB(C) for low frequency assessment. A difference of 10 dB is generally considered to be a halving/doubling of perceived volume.
- The predicted noise levels shown are for worst case INP meteorological conditions.

The predicted noise levels shown are due to the Project only and do not consider the masking effect of the background noise environment. The INP states that in examining results in relation to the assessment of modifying factors that 'noise from all sources, individually and in combination, that contribute to the total noise at a site' should be considered. Given the predicted noise levels are relatively low compared to the background noise environment, with consideration of the masking effect of the background noise environment, it is unlikely that the predicted low frequency noise levels from the Project would be overly intrusive or cause greater annoyance over that of the full spectrum analysis.

Additionally, it is noted that for the receivers identified in **Tables 1** to **3** the INP low frequency threshold is triggered not by an overall abundance of low frequency noise (as shown in **Figures J.1** to **J.15**) but by an absence of high frequency noise. This is primarily due to a combination of both distance attenuation of high frequency noise from the Project and the combined action of OEM and aftermarket noise attenuation gear incorporated into the sound power levels of the modelled mining equipment. Given these considerations it could be argued that the selective removal of noise attenuation equipment from mining machinery for selected high frequencies would, while increasing the overall noise levels, reduce the relative difference in noise levels between the A and C weightings (through the addition of high frequency noise) and eventuate in the INP low frequency threshold not being triggered. The removal of noise attenuation equipment would result in reversal of the desired environmental outcome.

Given the relatively low levels of low frequency noise predicted, low frequency modifying factors have not been applied to the predicted noise levels for the Project.

**Table 1 - Year 1 Night Time Predicted INP Low Frequency Modifying Factors under 3°C/100 metre inversion with a 2 m/s drainage flow from the North-West**

| Receiver | Predicted Noise Level dB(A) | Predicted Noise Level dB(C) | dB(C) minus dB(A) | Predicted Noise Level with low frequency modifying factor dB(A)[1] | PSNL dB(A) |
|---|---|---|---|---|---|
| R005 | 34.4 | 49.5 | 15.1 | 39.4 | 37 |
| R007c | 33.7 | 48.8 | 15.1 | 38.7 | 37 |
| R013 | 34.3 | 49.3 | 15.0 | 39.3 | 35 |
| R041 | 34.2 | 50.6 | 16.4 | 39.2 | 35 |
| R042 | 32.6 | 48.3 | 15.7 | 37.6 | 35 |
| R043 | 32.0 | 48.5 | 16.5 | 37.0 | 35 |
| R044b | 31.7 | 48.8 | 17.1 | 36.7 | 35 |
| R048 | 34.5 | 50.2 | 15.7 | 39.5 | 35 |
| R050 | 30.5 | 46.1 | 15.6 | 35.5 | 35 |
| R055 | 31.9 | 49.1 | 17.2 | 36.9 | 35 |
| R058 | 33.1 | 48.9 | 15.8 | 38.1 | 35 |
| R059 | 32.7 | 48.0 | 15.3 | 37.7 | 35 |
| R066 | 30.1 | 46.8 | 16.7 | 35.1 | 35 |
| R072 | 31.4 | 48.2 | 16.8 | 36.4 | 35 |
| R073 | 31.1 | 47.5 | 16.4 | 36.1 | 35 |
| R074 | 31.6 | 48.0 | 16.4 | 36.6 | 35 |
| R080 | 30.3 | 47.3 | 17.0 | 35.3 | 35 |
| R081 | 30.6 | 47.5 | 16.9 | 35.6 | 35 |
| R091 | 32.9 | 48.9 | 16.0 | 37.9 | 35 |
| R092 | 32.6 | 47.7 | 15.1 | 37.6 | 35 |
| R093 | 33.7 | 48.8 | 15.1 | 38.7 | 35 |
| R094 | 33.2 | 49.1 | 15.9 | 38.2 | 35 |
| R095 | 36.3 | 51.9 | 15.6 | 41.3 | 35 |
| R096 | 31.3 | 47.3 | 16.0 | 36.3 | 35 |
| R097 | 31.2 | 47.2 | 16.0 | 36.2 | 35 |
| R099 | 32.0 | 48.0 | 16.0 | 37.0 | 35 |
| R100 | 32.3 | 48.8 | 16.5 | 37.3 | 35 |
| R101 | 31.5 | 47.9 | 16.4 | 36.5 | 35 |
| R102a | 30.1 | 46.6 | 16.5 | 35.1 | 35 |
| R102b | 30.8 | 47.4 | 16.6 | 35.8 | 35 |

Note 1: As required by a strict interpretation of Section 4 the INP

**Table 2 - Year 5 Night Time Predicted INP Low Frequency Modifying Factors under 3°C/100 metre inversion with 2 m/s drainage flow from the North-West**

| Receiver | Predicted Noise Level dB(A) | Predicted Noise Level dB(C) | dB(C) minus dB(A) | Predicted Noise Level with low frequency modifying factor dB(A)[1] | PSNL dB(A) |
|---|---|---|---|---|---|
| R005 | 33.7 | 50.0 | 16.3 | 38.7 | 37 |
| R007 | 33.3 | 48.6 | 15.3 | 38.3 | 37 |
| R007a | 33.6 | 49.6 | 16.0 | 38.6 | 37 |
| R007c | 33.0 | 49.4 | 16.4 | 38.0 | 37 |
| R011 | 34.1 | 49.1 | 15.0 | 39.1 | 35 |
| R013 | 33.6 | 49.0 | 15.4 | 38.6 | 35 |
| R014 | 32.9 | 49.4 | 16.5 | 37.9 | 35 |
| R019 | 33.3 | 49.1 | 15.8 | 38.3 | 35 |
| R021 | 33.8 | 49.3 | 15.5 | 38.8 | 35 |
| R022 | 35.8 | 51.4 | 15.6 | 40.8 | 35 |
| R041 | 32.8 | 49.3 | 16.5 | 37.8 | 35 |
| R042 | 31.5 | 46.9 | 15.4 | 36.5 | 35 |
| R043 | 31.6 | 47.4 | 15.8 | 36.6 | 35 |
| R044b | 30.4 | 46.3 | 15.9 | 35.4 | 35 |
| R048 | 32.3 | 48.7 | 16.4 | 37.3 | 35 |
| R055 | 30.5 | 46.8 | 16.3 | 35.5 | 35 |
| R058 | 31.4 | 47.8 | 16.4 | 36.4 | 35 |
| R059 | 31.0 | 46.8 | 15.8 | 36.0 | 35 |
| R072 | 31.3 | 47.9 | 16.6 | 36.3 | 35 |
| R073 | 30.1 | 46.2 | 16.1 | 35.1 | 35 |
| R074 | 31.2 | 48.5 | 17.3 | 36.2 | 35 |
| R091 | 32.0 | 48.2 | 16.2 | 37.0 | 35 |
| R092 | 32.4 | 48.2 | 15.8 | 37.4 | 35 |
| R093 | 33.0 | 49.5 | 16.5 | 38.0 | 35 |
| R094 | 32.7 | 48.3 | 15.6 | 37.7 | 35 |
| R095 | 33.2 | 49.7 | 16.5 | 38.2 | 35 |
| R096 | 30.0 | 47.3 | 17.3 | 35.0 | 35 |
| R097 | 30.4 | 47.4 | 17.0 | 35.4 | 35 |
| R099 | 31.1 | 48.3 | 17.2 | 36.1 | 35 |
| R100 | 31.1 | 48.2 | 17.1 | 36.1 | 35 |

Note 1: As required by a strict interpretation of Section 4 the INP

**Table 3 - Year 5 Night Time Predicted INP Low Frequency Modifying Factors under 3°C/100 metre inversion with 2 m/s drainage flow from the North-West**

| Receiver | Predicted Noise Level dB(A) | Predicted Noise Level dB(C) | dB(C) minus dB(A) | Predicted Noise Level with low frequency modifying factor dB(A)[1] | PSNL dB(A) |
|---|---|---|---|---|---|
| R005 | 33.5 | 49.2 | 15.7 | 38.5 | 37 |
| R007a | 33.6 | 48.7 | 15.1 | 38.6 | 37 |
| R096 | 31.4 | 46.8 | 15.4 | 36.4 | 35 |

| | | | | | |
|---|---|---|---|---|---|
| R097 | 31.7 | 46.9 | 15.2 | 36.7 | 35 |
| R099 | 32.5 | 47.7 | 15.2 | 37.5 | 35 |
| R100 | 32.3 | 47.6 | 15.3 | 37.3 | 35 |
| R116 | 30.6 | 46.1 | 15.5 | 35.6 | 35 |
| R102a | 30.7 | 46.2 | 15.5 | 35.7 | 35 |
| R102b | 30.6 | 46.6 | 16.0 | 35.6 | 35 |

Note 1: As required by a strict interpretation of Section 4 the INP

## Tonal Noise Assessment

The ENM noise models incorporated over 100 1/3 octave noise sources per model. The tonal noises that can be generated by Project would emanate from:

- reversing beepers on mobile equipment;
- alarms and sirens;
- 50 Hz drives associated with rotating machinery;
- mechanical gearbox gear noise on drives; and
- hydraulics systems.

While individually these noise sources may be observed to have tonal aspects when in close proximity to the equipment, the cumulative sound power attributable to the Project would not typically have tonal noises that exceed the criteria set out in the INP (EPA 2000).

The results of the analysis in **Figures J.1** to **J.15** show that the noise generated at the source by the cumulative sound power attributable to the mining operation does not exceed the tonal noise criteria set out in the INP.

## Assessment for Impulsive or Intermittent Noise and Single-event Duration

As a 24 hour per day, 7 day per week operation the Project would not normally generate noises that are impulsive or intermittent in character or give rise to short duration single-event noises.

## Assessment of Predicted Noise Levels

Based on the analysis of the modifying factors that are potentially relevant to the noise impact assessment of the Project, a modifying factor correction does not need to be applied to the predicted noise levels.

## References


Australian Standard ISO 389.7 2003 *Acoustics- Reference zero for the calibration of audiometric equipment Part 7: Reference threshold of hearing under free-field and diffuse field listening conditions*

Broner.N. 2011. *A Simple Outdoor Criterion For Assessment Of Low Frequency Noise Emission*. Acoustics Australia Vol 39 No.1.

Department of Planning (DP&I). *NSW Draft Guideline: Mining. Noise Monitoring Application Note.* 2013

NSW Environment Protection Authority 2000. *New South Wales Industrial Noise Policy*.

NSW Environment Protection Authority 2000. *New South Wales Industrial Noise Policy, Application Notes* (Refer to Appendix B)

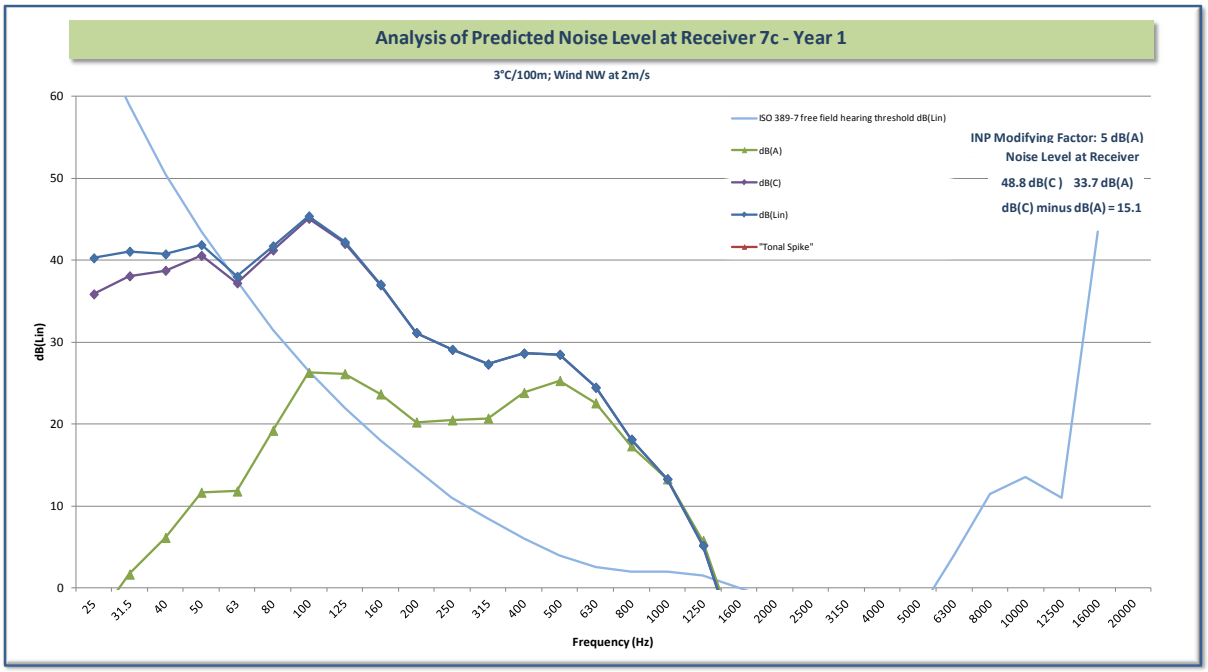



**Figure I.1 - Tonal and Low Frequency Analysis of at Receiver R007c Year 1**

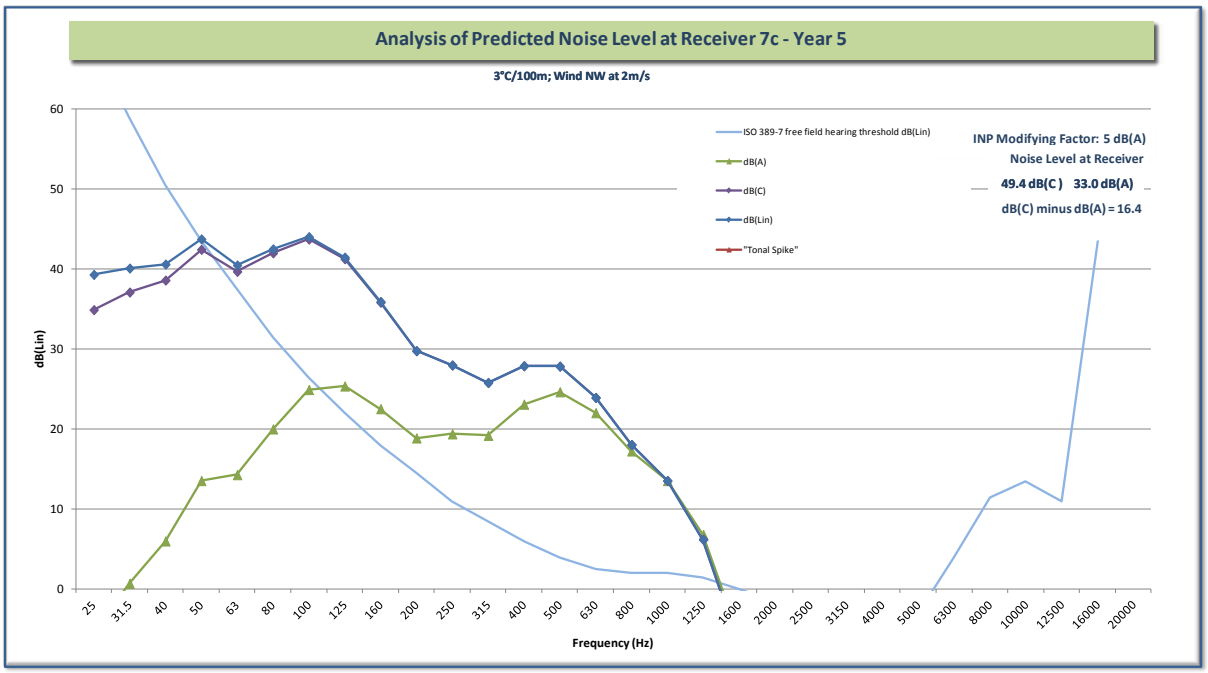



**Figure I.2 - Tonal and Low Frequency Analysis of at Receiver R007c Year 5**

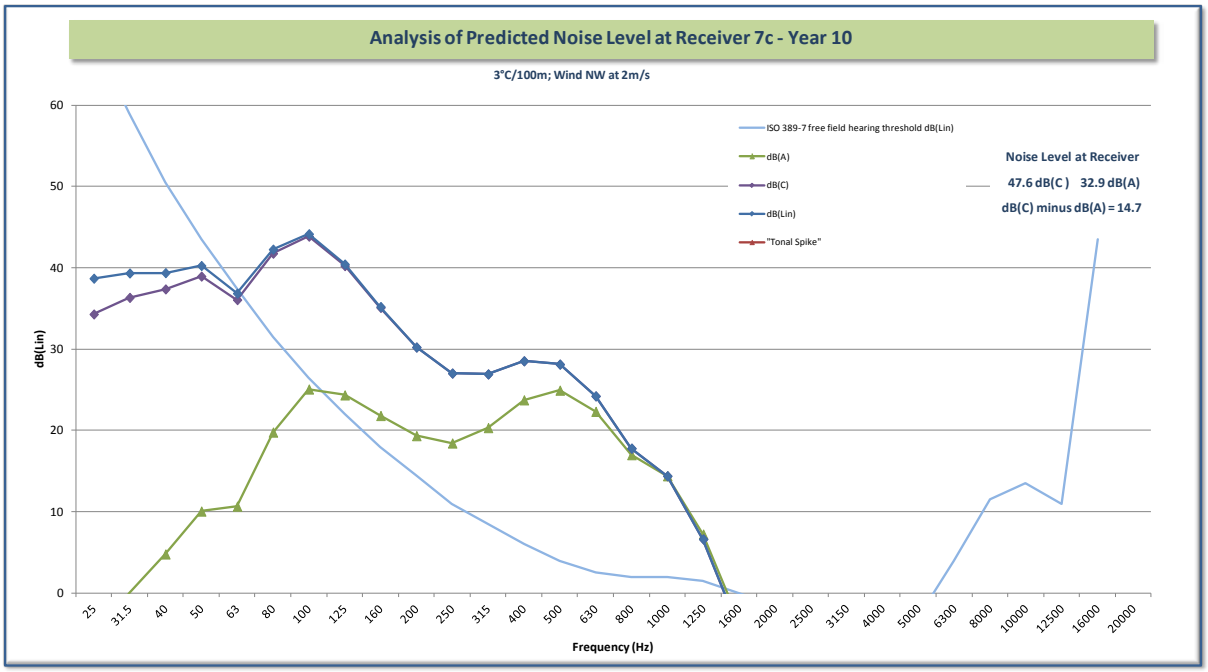



**Figure I.3 - Tonal and Low Frequency Analysis of at Receiver R007c Year 10**

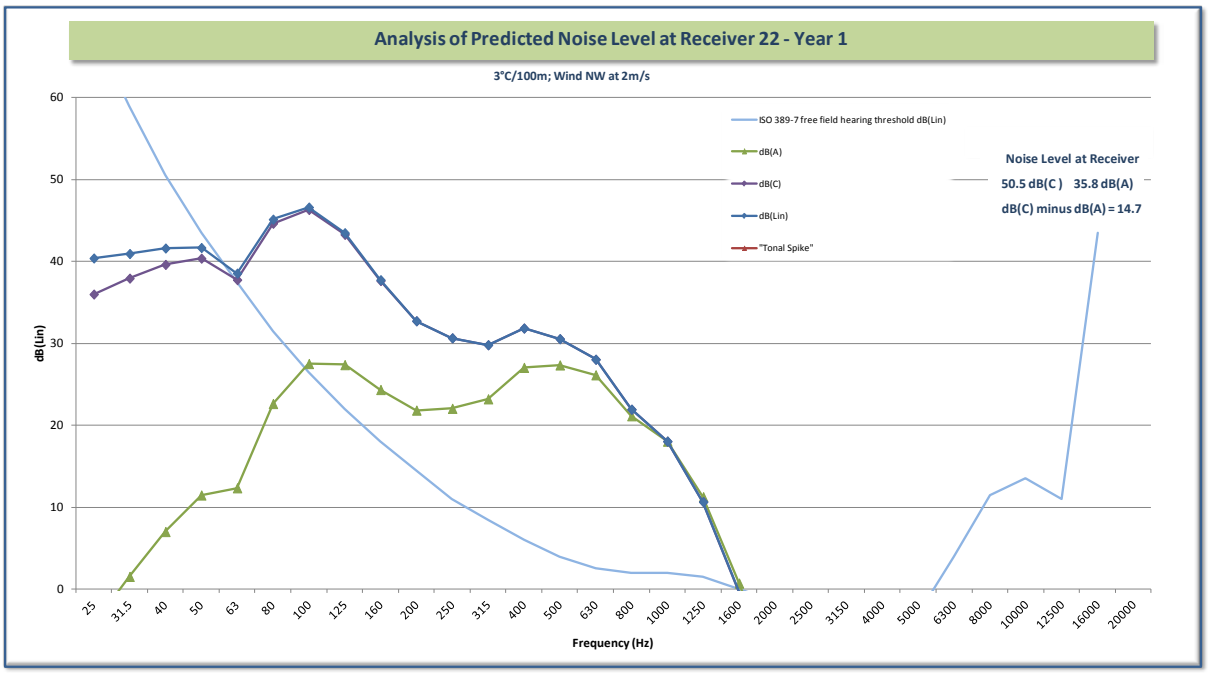



**Figure I.4 - Tonal and Low Frequency Analysis of at Receiver 22 Year 1**

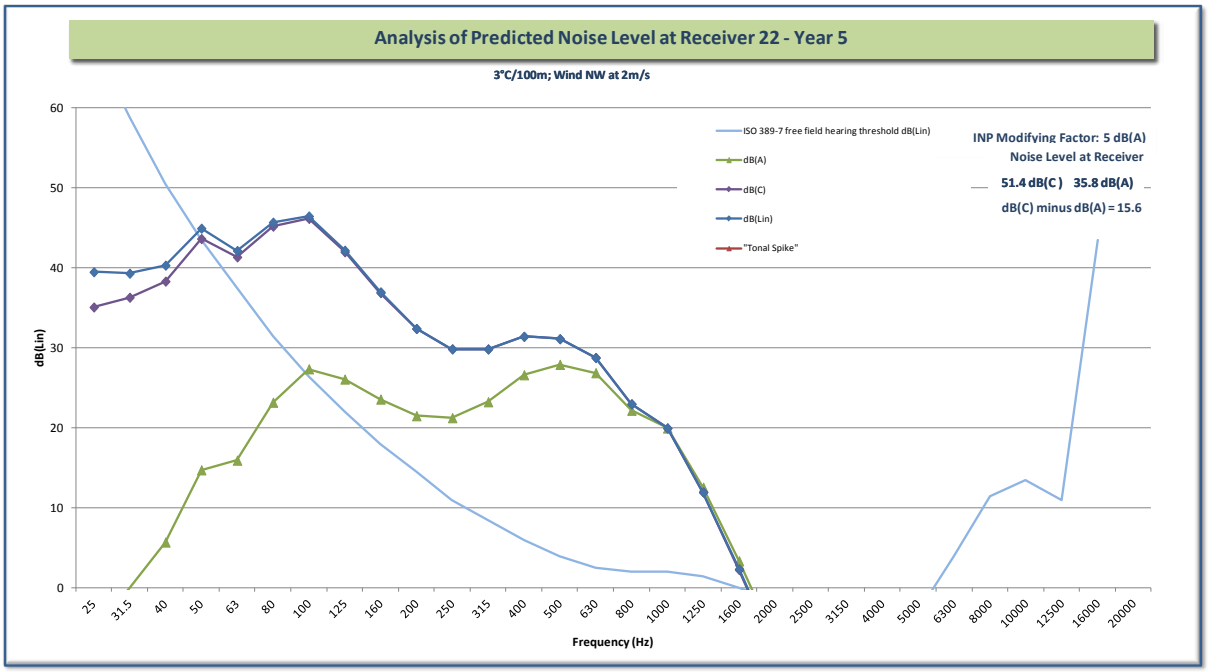



**Figure I.5 - Tonal and Low Frequency Analysis of at Receiver 22 Year 5**

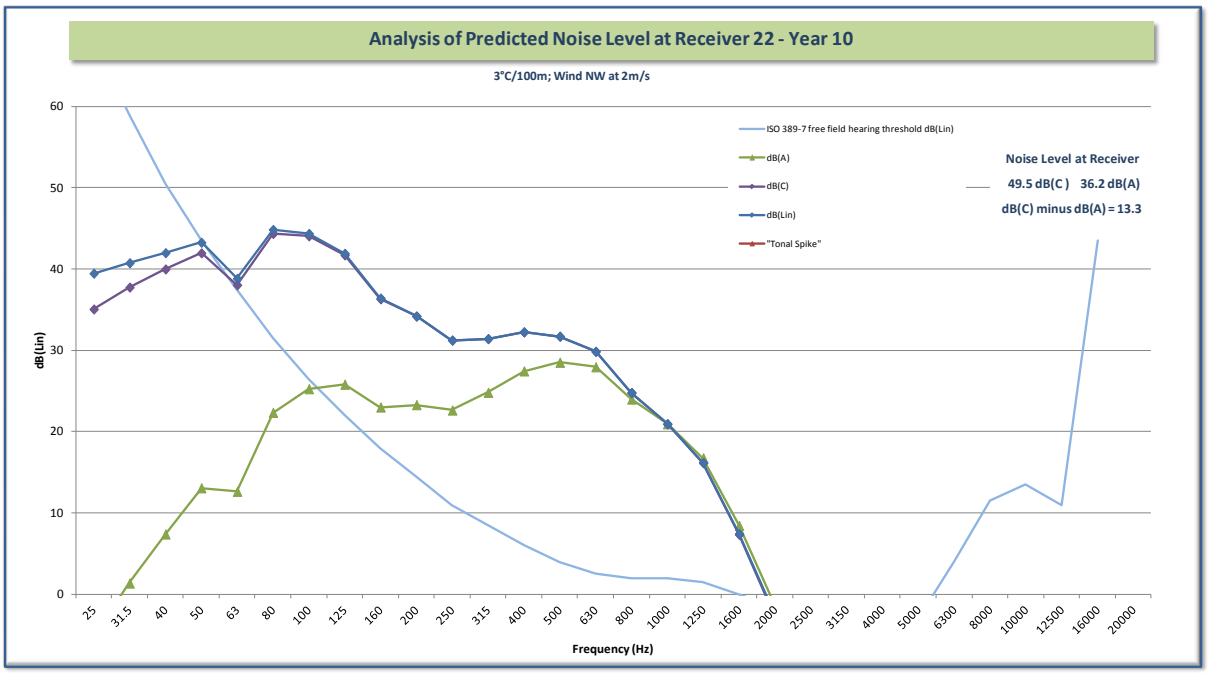



**Figure I.6 - Tonal and Low Frequency Analysis of at Receiver 22 Year 10**

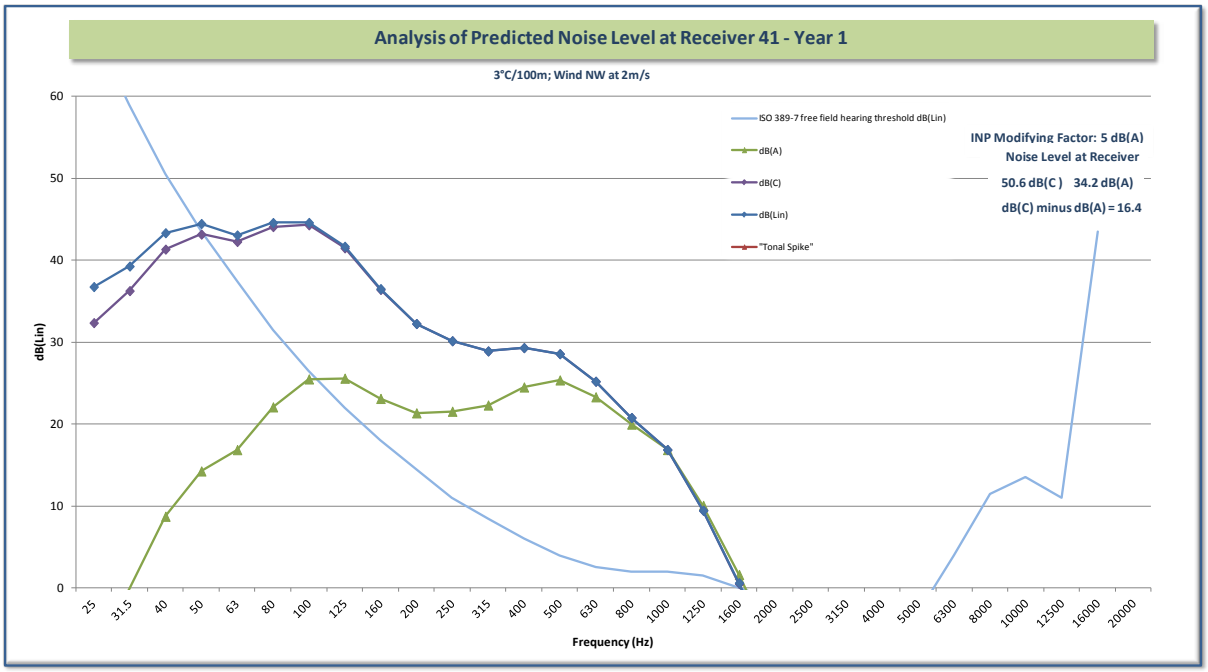



**Figure I.7 - Tonal and Low Frequency Analysis of at Receiver 41 Year 1**

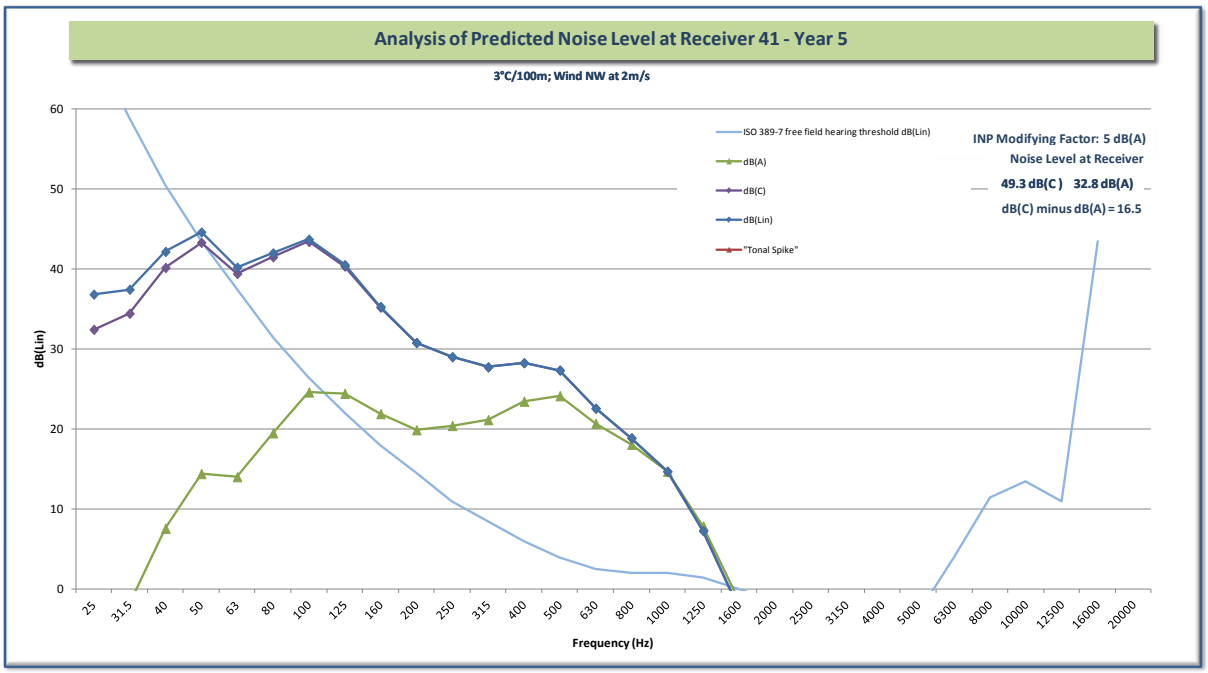



**Figure I.8 - Tonal and Low Frequency Analysis of at Receiver 41 Year 5**

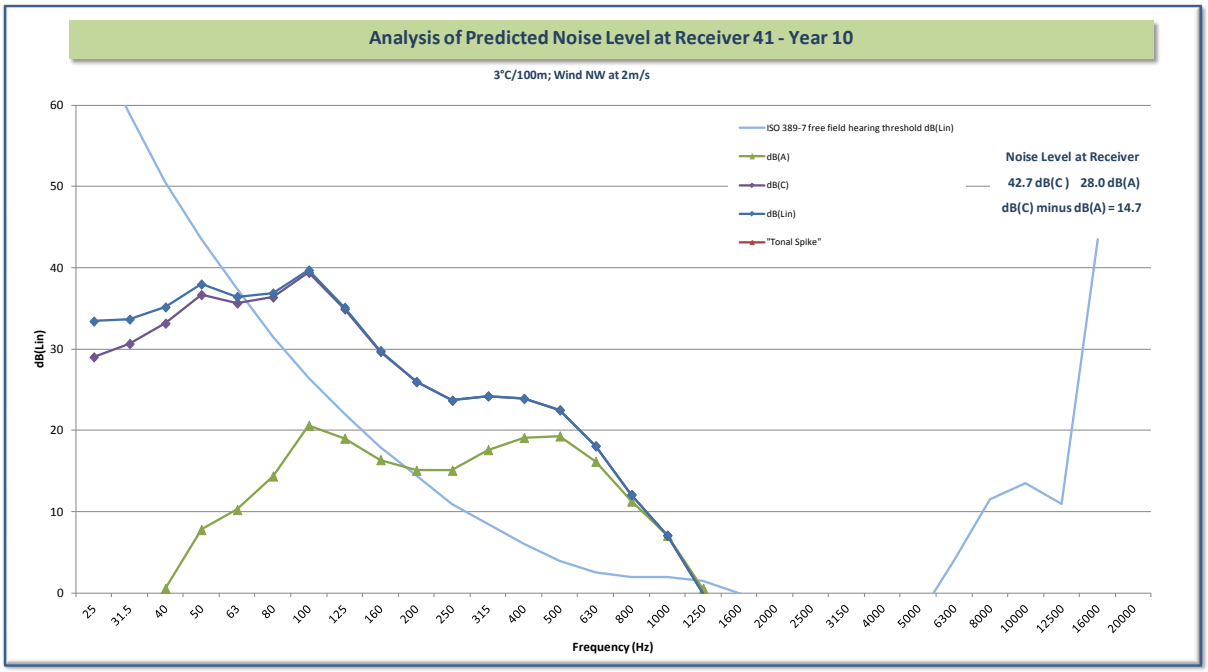



**Figure I.9 - Tonal and Low Frequency Analysis of at Receiver 41 Year 10**

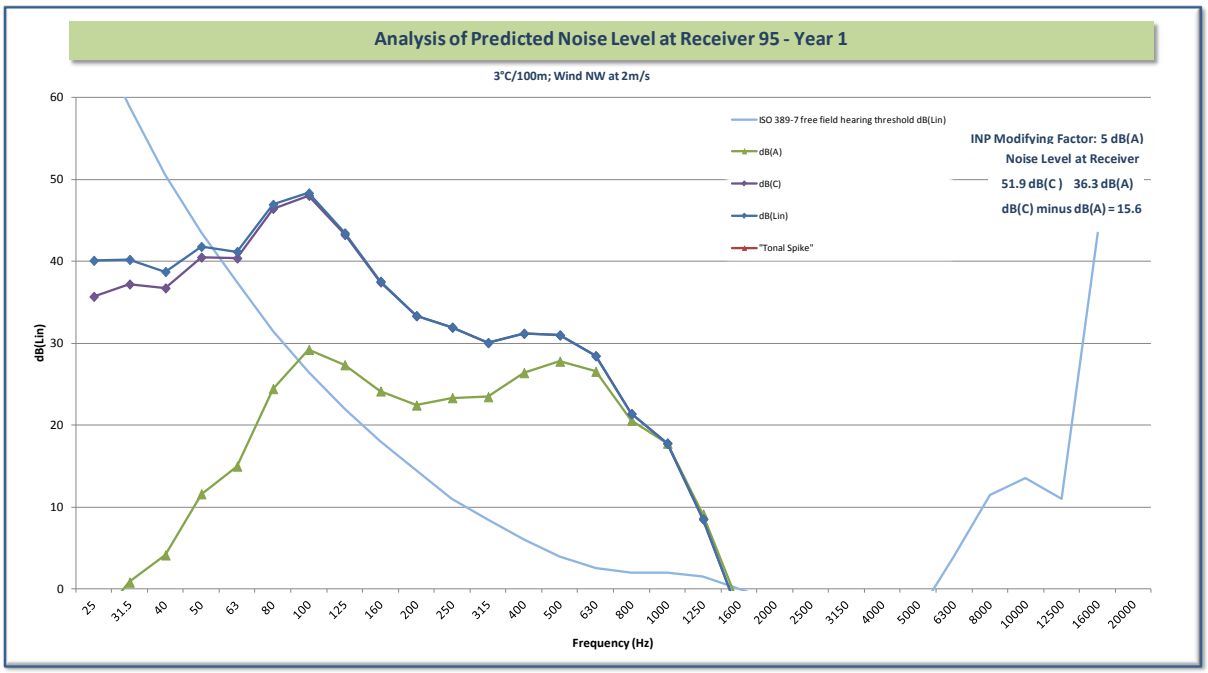



**Figure I.10 - Tonal and Low Frequency Analysis of at Receiver 95 Year 1**

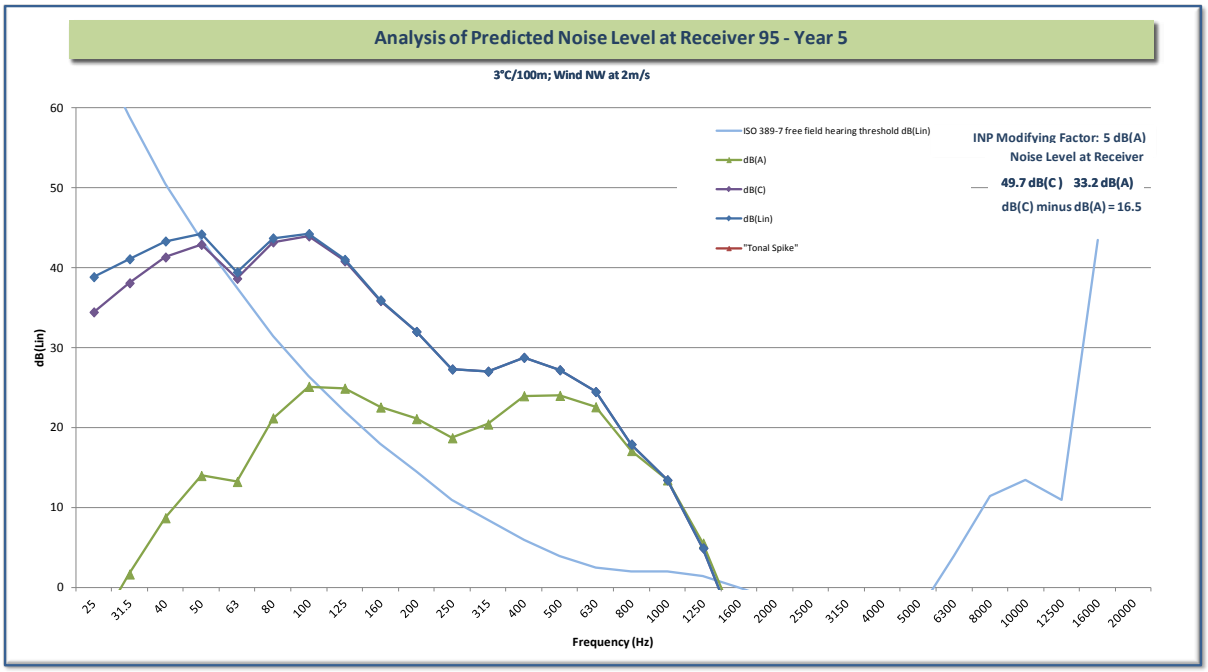



**Figure I.11 - Tonal and Low Frequency Analysis of at Receiver 95 Year 5**

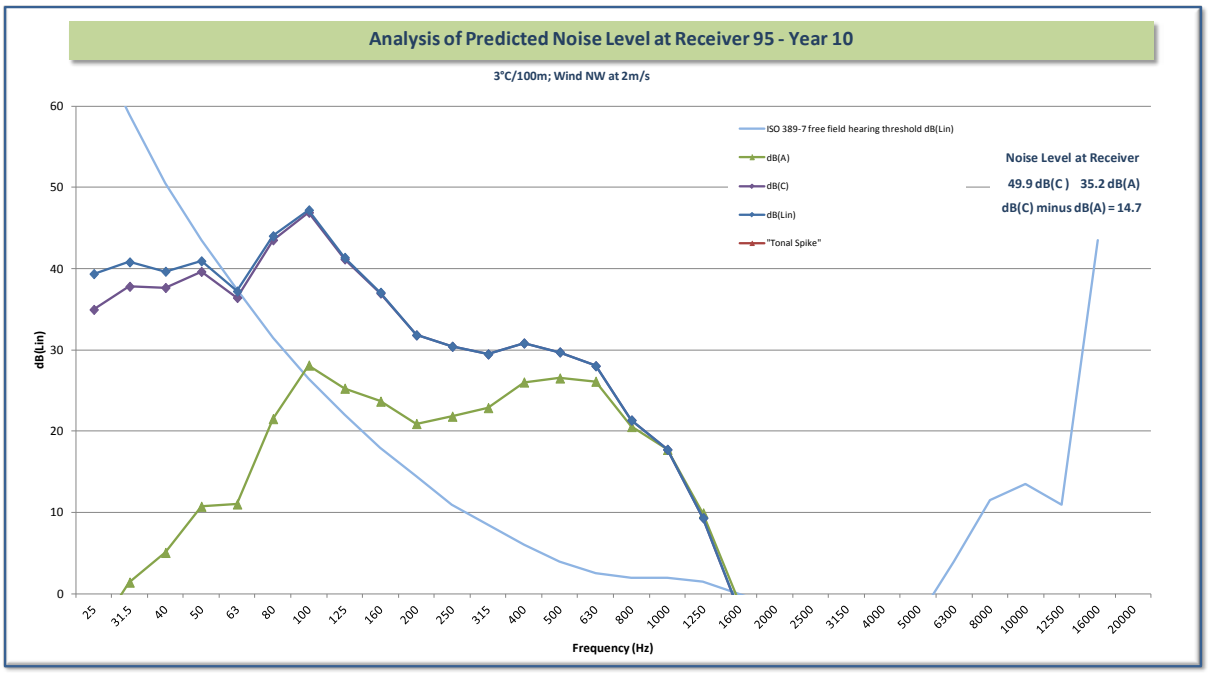



**Figure I.12 - Tonal and Low Frequency Analysis of at Receiver 95 Year 10**

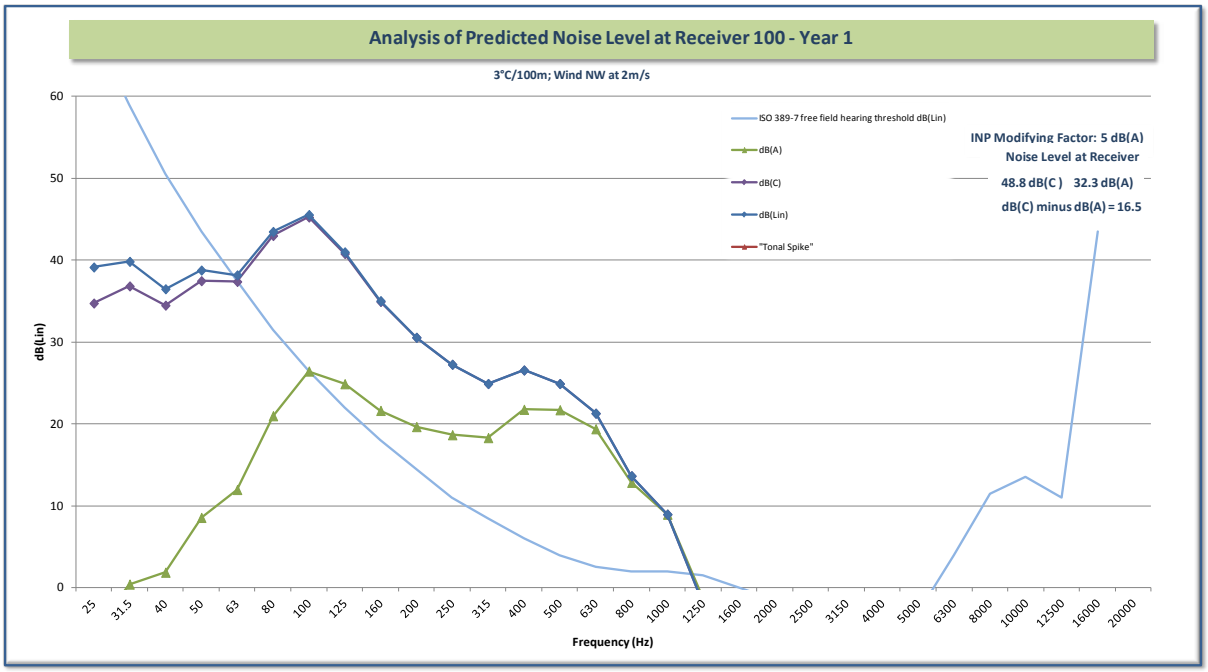



**Figure I.13 - Tonal and Low Frequency Analysis of at Receiver 100 Year 1**

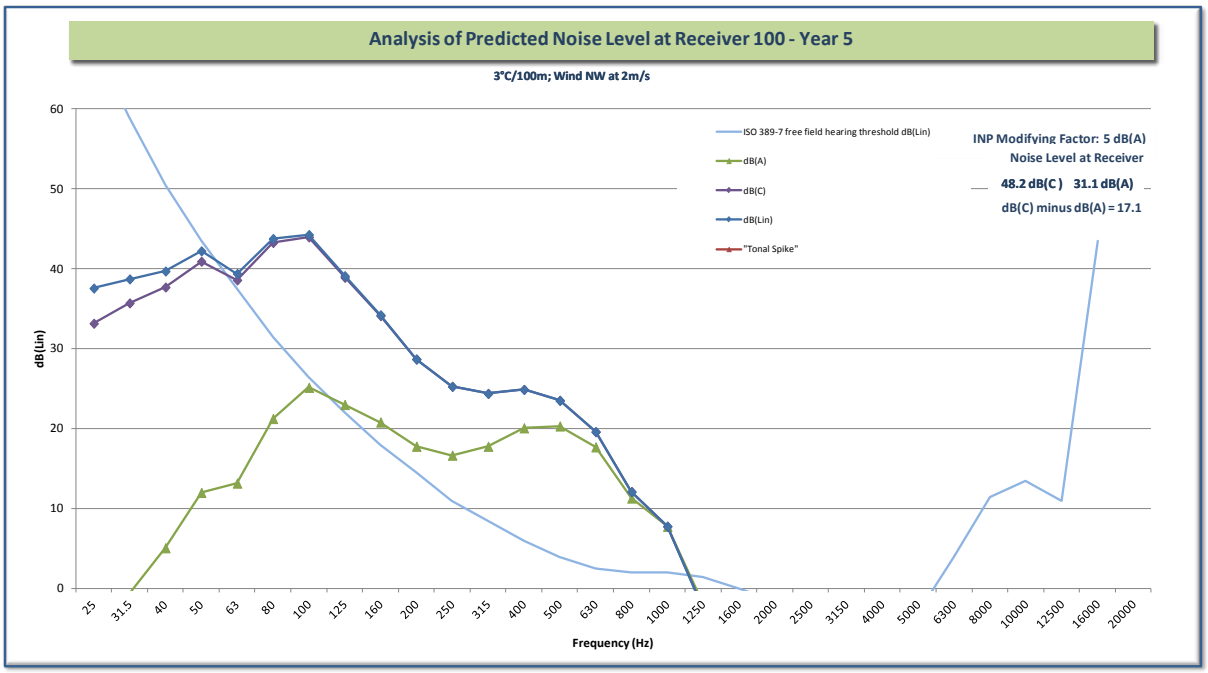



**Figure I.14 - Tonal and Low Frequency Analysis of at Receiver 100 Year 5**

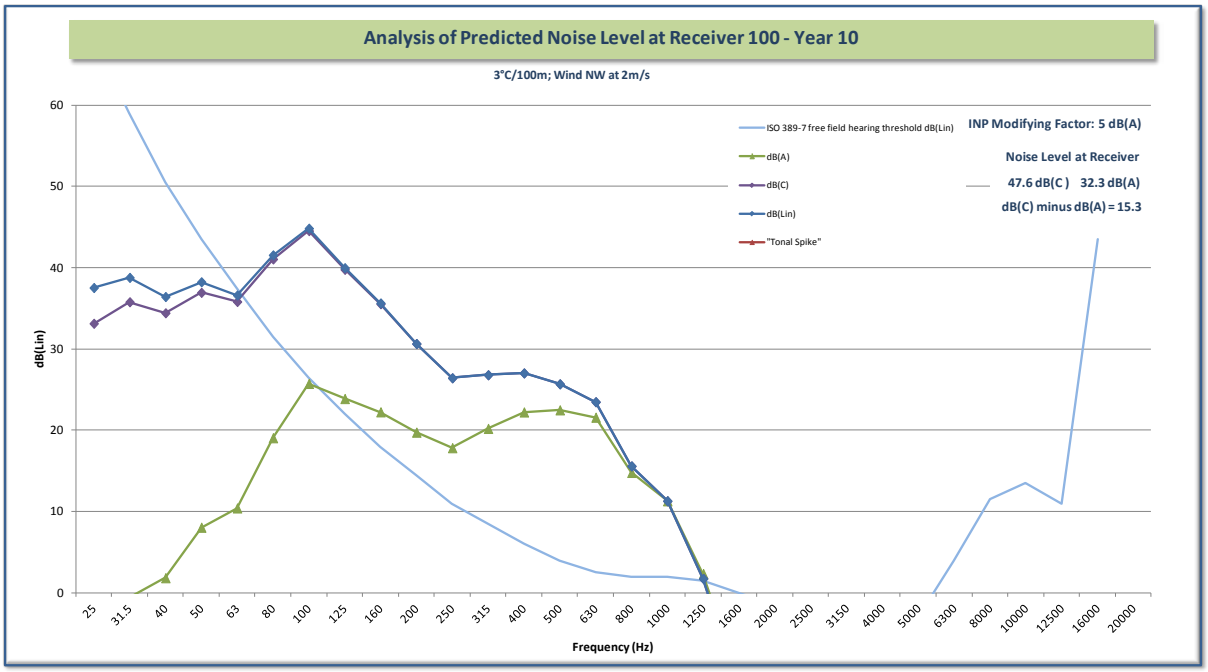



**Figure I.15 - Tonal and Low Frequency Analysis of at Receiver 100 Year 10**

# APPENDIX K

Record of Peer Review

# Appendix K – Record of Peer Review

17 October 2014

630.10434 LR Final 20141017

Mount Owen Pty Limited
PO Box 320
Singleton NSW 2330

**Attention: Vicki McBride**

## Noise Impact Assessment
## Mount Owen Continued Operations Project
## Peer Review

SLR Consulting Australia Pty Ltd (SLR) has conducted a peer review of the noise impact assessment prepared by Umwelt (Australia) Pty Limited (Umwelt) regarding the Mount Owen Continued Operations Project.

The peer review has been conducted with reference to the Director-General's Requirements (DGRs) for the Project (issued 13 March 2014). It is noted that the Supplementary Director General's Requirements (EPBC 2013/6978) do not contain any requirements specific to the assessment of noise.

The peer review has consisted of the following:

- Review of various draft versions and the Final version (dated September 2014) of the Noise Impact Assessment (NIA) report.
- Various review meetings and discussions between SLR, Umwelt and the proponent (Glencore).

I can confirm that the NIA report has been prepared in general accordance with the DGRs which includes the Industrial Noise Policy (EPA, 2000). Where new or updated relevant policies and guidelines exist, relative to those specified in the DGRs, the most current documents applicable have been used for the purpose of preparing the NIA.

Yours sincerely

KATIE TEYHAN
Associate - Acoustics & Vibration

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