APPENDIX 8
Noise Impact Assessment

Mangoola Coal Continued Operations Project

Noise Impact Assessment

Prepared for

Umwelt (Australia) Pty Ltd

Global Acoustics

Noise and Vibration Analysis and Solutions

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Mangoola Coal Continued Operations Project

Noise Impact Assessment

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Report date: 10 May 2019

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EXECUTIVE SUMMARY

Global Acoustics Pty Ltd has been engaged by Umwelt (Australia) Pty Ltd (Umwelt) on behalf of Mangoola Coal Operations Pty Limited (Mangoola) to complete a Noise Impact Assessment (NIA, this document) for the Mangoola Coal Continued Operations Project (MCCO Project).

This NIA has considered potential noise impacts associated with the MCCO Project, including operational noise, construction noise, modifying factor adjustments, sleep disturbance, road traffic noise and rail noise. The assessment was completed in accordance with relevant NSW guidelines and policies, including the Noise Policy for Industry (NPfI). The NIA was peer reviewed by EMM Consulting at various stages during the course of the assessment.

Four staged operational scenarios were modelled representing the progression of mining operations over the proposed life of mine, with emphasis on targeting the expected highest noise impact and maximum extraction periods. The stages nominally relate to Year 1, Year 3, Year 5 and Year 8 of the Project. Feasible and reasonable noise controls were identified and applied to the modelling assessment.

The cumulative distribution of results method was adopted to account for the effects of noise enhancing meteorological conditions. 90th percentile predictions for the worst case season were used to represent intrusive noise impact. Modifying factor adjustments were evaluated, and found not to apply.

Operational Noise

Fifty-seven receptors had a 90th percentile prediction that exceeded Project Noise Trigger Levels (PNTL) in at least one time period for at least one of the four stages. Seven of these exceeded PNTL by more than 5 dB. Residual noise impact significance levels were determined in accordance with both Section 4 of the NPfI and the Voluntary Land Acquisition and Mitigation Policy (VLAMP). It is expected voluntary acquisition rights will apply to these seven receptors in accordance with the VLAMP; one of these receptors (83) is currently entitled to voluntary acquisition under the project approval for the Approved Mangoola Mine (PA 06_0014). Additionally, one receptor (25) that has acquisition rights in accordance with PA 06_0014 is not subject to acquisition for the MCCO Project; however, Mangoola propose to retain acquisition rights for this receptor.

In addition to the receptors entitled to acquisition rights under the MCCO Project, eighteen receptors are entitled to mitigation rights based on residual noise impact significance levels (receptor 25 is excluded from this count, as acquisition rights are to be retained). Additionally, six receptors that have mitigation rights in accordance with PA 06_0014 are not subject to mitigation for the MCCO Project; however, Mangoola propose to retain mitigation rights for these six receptors.

Construction Noise

A worst-case construction scenario that considered all relevant tasks scheduled to occur during the peak construction period was assessed in accordance with the NSW Interim Construction Noise Guideline (ICNG). For the majority of receptors, construction noise is predicted to be less than PNTL. All receptors where construction noise predictions exceed PNTL may be entitled to voluntary mitigation or acquisition rights due to operational noise. Therefore, construction noise is not predicted to increase the zone of affection of the MCCO Project relative to that predicted due to operational noise. These are worst case predictions that may occur during strongly enhancing weather conditions. During non-enhancing weather conditions, and outside the peak construction period, construction noise is

predicted to be well below the 'noise affected' construction criterion at all receptor locations.

Private Land Assessment

Private land was assessed in accordance with the VLAMP to determine whether acceptable amenity noise levels plus 5 dB would be exceeded over more than 25 percent of any property area. The percentage of private land exceeding the night period acceptable amenity noise level plus 5 dB was less than 25 percent in all cases.

Cumulative Noise

Cumulative noise involving significant contributions from the Mangoola Coal Mine does not occur due to noise from other mines being mitigated by weather effects when noise is enhanced from Mangoola Coal Mine, and vice versa. Cumulative noise impact where noise is heard from Mangoola Coal Mine concurrently with noise from another coal mine is not predicted to occur.

Sleep Disturbance

Sleep disturbance model predictions were less than the L_{Amax} trigger level for all receptors. As such, there is no sleep disturbance impact predicted.

Road Traffic Noise

The approved maximum ROM coal production rate of 13.5 Mtpa will not change, and no additional staff or traffic associated with the ongoing operation of Mangoola Coal Mine are proposed above existing approved limits. As there is no change to operational road traffic volumes associated with the MCCO Project relative to those approved, no change in operational road traffic noise impact relative to the approved operation is predicted to occur.

Proposed construction activities will generate additional road traffic on the local road network. Construction road traffic noise impact was quantitatively assessed for the nearest receptors to Wybong Road in each direction from the mine access point. All predicted increases were less than the relative increase criterion of 2 dB, except for the PM peak for receptor 250. The corresponding noise level prediction for this receptor was less than the relevant criterion, so relative increase becomes irrelevant. Construction road traffic noise impact is not predicted.

Rail Noise

Product coal is transported from Mangoola Coal Mine via rail, with an approved capacity of up to 10 trains per day. The approved maximum ROM coal production rate of 13.5 Mtpa will not be modified; therefore, no change to the number of trains required for coal transport, or to previously predicted rail noise impact will occur. Mangoola will continue to operate in accordance with previously approved rail volumes.

Global Acoustics Pty Ltd

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1 INTRODUCTION

Global Acoustics Pty Ltd has been engaged by Umwelt (Australia) Pty Ltd (Umwelt) on behalf of Mangoola Coal Operations Pty Limited (Mangoola) to complete a Noise Impact Assessment (NIA, this document) for the Mangoola Coal Continued Operations Project (MCCO Project). The purpose of the assessment is to form part of an Environmental Impact Statement (EIS) being prepared by Umwelt to support an application for development consent under Divisions 4.1 and 4.7 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the MCCO Project.

1.1 Project Overview

Mangoola Coal Mine is an open cut coal mine located approximately 20 kilometres (km) west of Muswellbrook and 10 km north of Denman in the Upper Hunter Valley of NSW (refer Figure 1). Mangoola has operated the Mangoola Coal Mine in accordance with Project Approval (PA) 06_0014 since mining commenced at the site in September 2010.

The MCCO Project will allow for the continuation of mining at Mangoola Coal Mine into a new mining area to the immediate north of the existing operations. The MCCO Project will extend the life of the existing operation providing for ongoing employment opportunities for the Mangoola workforce. The MCCO Project Area includes the existing approved Project Area for Mangoola Coal Mine and the MCCO Additional Project Area as shown on Figure 1.

The MCCO Project generally comprises:

- open cut mining peaking at up to the same rate as that currently approved (13.5 Million tonnes per annum (Mtpa) of run of mine (ROM) coal) using truck and excavator mining methods;
- continued operations within the existing Mangoola Coal Mine;
- mining operations in a new mining area located north of the existing Mangoola Coal Mine, Wybong Road, south of Ridgelands Road and east of the 500 kV Electricity Transmission Line (ETL);
- construction of a haul road overpass over Big Flat Creek and Wybong Road to provide access from the existing mine to the proposed Additional Mining Area;
- establishment of an out-of-pit overburden emplacement area;
- distribution of overburden between the proposed Additional Mining Area and the existing mine in order to optimise the final landform design of the integrated operation;
- realignment of a portion of Wybong Post Office Road;
- the use of all existing or approved infrastructure and equipment for the Mangoola Coal Mine with some minor additions to the existing mobile equipment fleet;

- construction of a water management system to manage sediment laden water runoff, divert clean water catchment, provide flood protection from Big Flat Creek and provide for reticulation of mine water. The water management system will be connected to that of the existing mine;

- continued ability to discharge excess water in accordance with the Hunter River Salinity Trading Scheme (HRSTS);

- establishment of a final landform in line with current design standards at Mangoola Coal Mine including use of natural landform design principles consistent with the existing site;

- rehabilitation of the proposed Additional Mining Area using the same revegetation techniques as at the existing mine;

- a likely construction workforce of approximately 145 persons. No change to the existing approved operational workforce; and

- continued use of the mine access for the existing operational mine and access to/from Wybong Road, Wybong Post Office Road and Ridgelands Road to the MCCO Project Area for construction, emergency services, ongoing operational environmental monitoring and property maintenance.

Figure 2 illustrates the key features of the MCCO Project. A more detailed project description is provided in the MCCO Project EIS that this assessment accompanies.

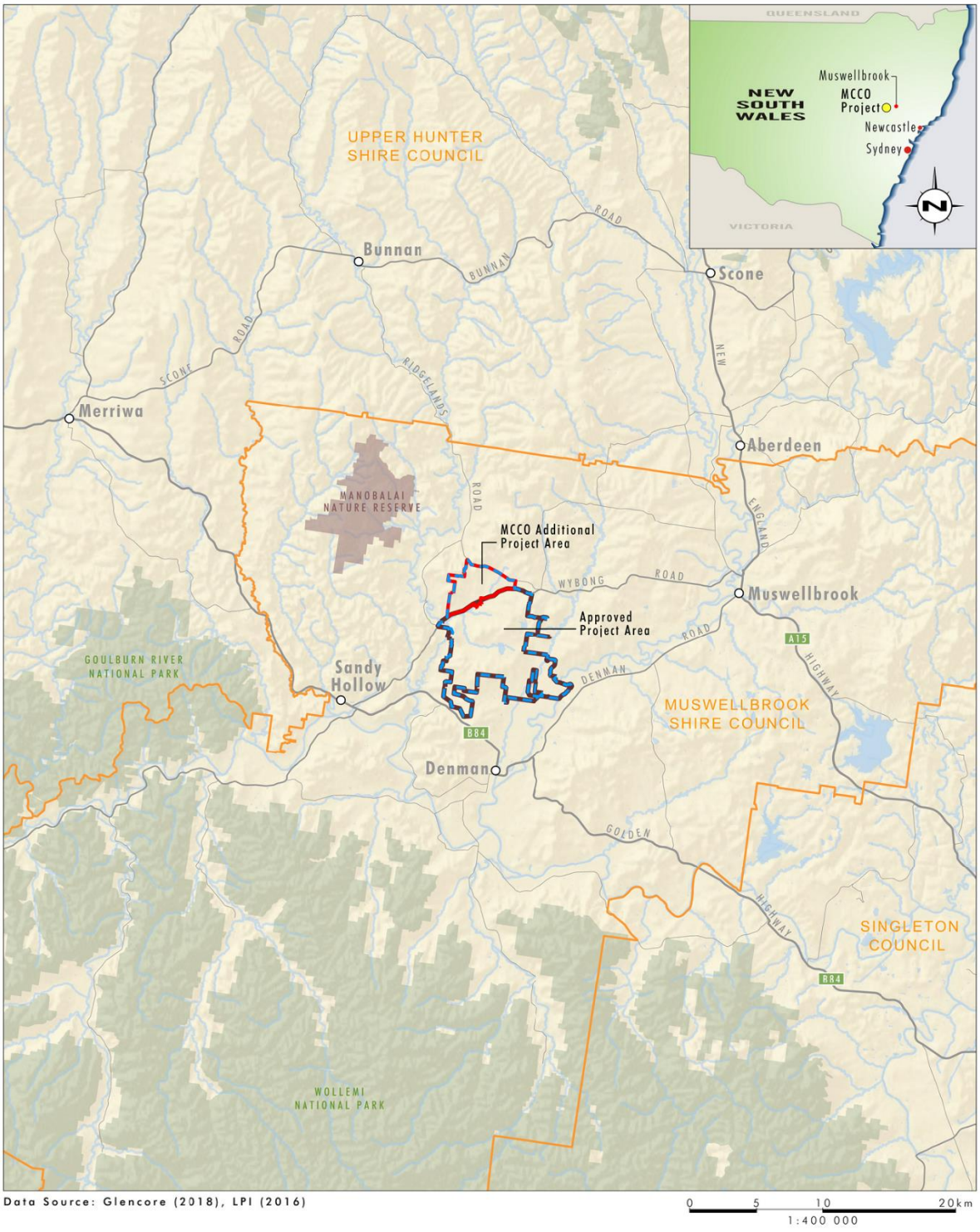

Figure 1: Regional Context

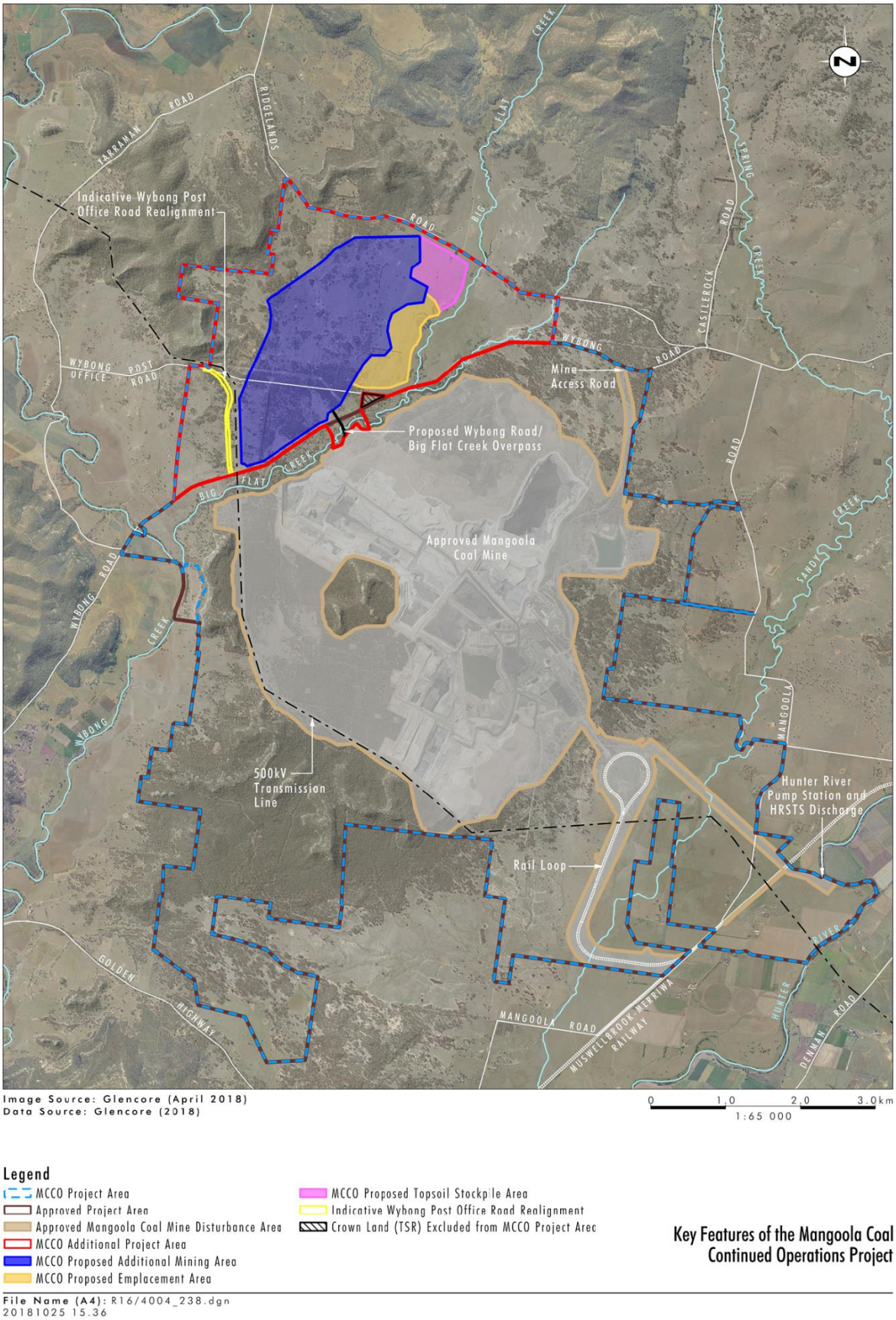

Figure 2 - Key Features of the MCCO Project

1.2 The Surrounding Area

Mangoola Coal Mine is an open cut coal mine located approximately 20 km west of Muswellbrook and 10 km north of Denman in the Upper Hunter Valley of NSW. The area surrounding the Mangoola Coal Mine consists largely of smaller rural landholdings with residences, but also includes larger agricultural land uses.

The topography of the Approved Project Area includes relatively flat agricultural land to the southeast in the vicinity of the Hunter River through to hilly, undulating terrain containing rocky outcrops. Anvil Hill is a notable topographic feature within the Approved Project Area with a high point of approximately 285 metres above Australian Height Datum (AHD).

The proposed Additional Mining Area is located immediately north of the Approved Project Area, with Wybong Road and Big Flat Creek passing between the two areas. The topography of the proposed Additional Mining Area is relatively flat in the southern portion adjacent to Big Flat Creek, sloping upward to the north. A prominent ridge of land with a high point of approximately 370 metres above AHD lies to the north and northwest of the proposed Additional Mining Area. The height of the ridge varies, but is typically 100 to 150 metres higher than the surrounding area. This ridge serves as a natural barrier that will mitigate noise propagation to the north and northwest of the proposed Additional Mining Area. A saddle (low point) on the ridge at approximately 220 metres AHD lies immediately north of the proposed Additional Mining Area, which provides a minor transmission path that will result in higher noise levels immediately north of the saddle than for neighbouring areas located north of the higher portions of the ridge. A photograph showing the ridge of land north of the proposed Additional Mining Area is included as Figure 3.

Mining in the proposed Additional Mining Area will commence at natural surface level in the southeast portion, and progress generally from southeast to northwest becoming deeper within the pit with this progression. Acoustic barriers become more effective the closer they are to either the noise source or receptor. As mining will commence at the furthest point from the ridge of land (barrier), noise mitigation provided by the ridge will be least in the early stages of the MCCO Project. As mining advances north and moves closer to the ridge, barrier attenuation will increase. Additionally, mining will get deeper within the pit as mining advances to the north, which will allow the pit walls to provide additional shielding. Receptors located closest to the ridge on the north side will receive a higher degree of topographical shielding from the ridge than receptors located further north.

Figure 3 - View to North of Wybong Road Showing Intervening Ridge of Land

1.3 Terminology & Abbreviations

Some definitions of acoustic terminology which may be used in this document are as follows:

- L_A, the A-weighted root mean squared (RMS) noise level at any instant;
- L_{A1}, the noise level which is exceeded for 1 per cent of the time;
- $L_{A1,1minute}$, corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms, this represents the maximum measured level, and is often used to assess sleep disturbance;
- L_{A10}, the noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels;
- L_{A90}, the level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes;
- L_{Aeq}, the average noise energy during a measurement period;
- dB(A), noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise;
- dB(C), noise level measurement units are decibels (dB). The "C" weighting scale is used as a measure of human response to high noise levels. It includes more of the low frequency range of sounds. It is often used to assess low frequency noise impact;
- sound power level (L_W denotes linear, L_{WA} denotes A-weighted), 10 times the logarithm of energy radiated from a source (as noise) divided by a reference power, the reference power being 1 picowatt;
- sound pressure level (Lp), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals;
- sound exposure level (SEL), the A-weighted noise energy during a measurement period normalised to one second.;
- Hertz (Hz), cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together;
- Assessment Background Level (ABL), the 10th percentile background noise level for a single period (day, evening or night) of a 24 hour monitoring period;
- Rating Background Level (RBL), the background noise level for a period (day, evening or night) determined from ABL data.

1.4 Purpose of the Report

1.4.1 Secretary's Environmental Assessment Requirements

In preparing this NIA, the Secretary's Environmental Assessment Requirements (SEARS) issued for the MCCO Project (SSD 8642) on 15 February 2019 (replacing a previous version of the SEARs issued on 22 August 2017) have been addressed within this report. The key matters raised by the Secretary for consideration in the NIA are outlined in Table 1.1 along with a reference to where the requirements are addressed. Assessment of blasting impact is beyond the scope of this report and is addressed in the Blast Impact Assessment report which is included as an Appendix of the MCCO Project EIS.

Table 1.1: SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Requirements	Section Addressed
Noise and Blasting, including: • a detailed assessment of the likely construction, operational and off- site transport noise impacts of the development in accordance with the ***Interim Construction Noise Guideline, NSW Noise Policy for Industry*** and the ***NSW Road Noise Policy*** respectively, and having regard to the ***Voluntary Land Acquisition and Mitigation Policy 2018***	Section 4
• an assessment of the likely rail noise impacts of the development under the ***Rail Infrastructure Noise Guideline***	Section 2.5
• proposed blasting hours, frequency and methods	Refer MCCO Project EIS
• a detailed assessment of the likely blasting impacts of the development (including ground vibration, overpressure, visual and odour) on people, animals, buildings, infrastructure and significant natural features, having regard to the relevant ANZEC guidelines	Refer MCCO Project EIS

Notes:
1. *Blasting is not included within the scope of the NIA.*

1.4.2 Noise Impact Assessment Objectives

The primary objectives of this NIA are to:

- assess potential noise impact associated with the MCCO Project Area, including operational noise, construction noise, modifying factor adjustments, sleep disturbance, road traffic noise and rail noise;
- determine suitable criteria for each element of potential noise impact in accordance with relevant NSW guidelines and policies;
- identify and assess all reasonable and feasible noise mitigation controls and management strategies; and
- propose any necessary noise monitoring and management strategies.

The NIA was peer reviewed by EMM Consulting. The peer review concluded that the noise impact assessment provides a detailed investigation of the likely noise from the proposed MCCO Project and can be relied upon to assess the proposal. The peer review letter is included as Appendix F.

2 METHODOLOGY

This section provides an overview of the methodology used to predict noise emission from the MCCO Project Area, including how the effect of noise enhancing meteorological conditions are accounted for.

2.1 Policy and Guidelines

NSW technical policy and guidelines relevant to the NIA include:

- Noise Policy for Industry (NPfI) (EPA, 2017);
- Interim Construction Noise Guideline (ICNG) (DECCW[1], 2009);
- Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments (VLAMP) (NSW Government, 2018);
- Road Noise Policy (DECCW, 2011); and
- Rail Infrastructure Noise Guideline (RING) (EPA, 2013).

In accordance with Section 2.2 of the NPfI and Appendix B2 of the RNP, all model predictions in this NIA are rounded to the nearest integer.

2.2 Operational Noise

Operational noise assessment in this NIA is generally in accordance with guidelines outlined in the NPfI. An exception is the cumulative distribution of results methodology was employed in lieu of the 'noise enhancing weather conditions' method outlined in the NPfI. The cumulative distribution method allows assessment of impact for a far more comprehensive set of meteorological conditions as discussed in Section 2.6.

Four staged operational scenarios were modelled representing the progression of mining operations over the proposed life of mine, with emphasis on targeting the highest noise impact, including periods when operations are closest to identified private residential receptors and maximum extraction periods. Maximum extraction periods are the years with the highest extraction of overburden/interburden and coal. Year 1 represents the highest overburden/interburden extraction period, and Year 3 represents the highest coal extraction period.

Each stage modelled represents a representative typical worst case operating configuration for that period of operations. The stages nominally relate to Year 1, Year 3, Year 5 and Year 8 of the MCCO Project. Year 1 is anticipated to be approximately 2022, subject to date of approval. The four stages represent:

- Year 1: this stage represents the early stages of the MCCO Project. Mining commences in the MCCO Proposed Additional Mining Area with typically two excavators mining overburden.

[1] Now the Environment Protection Authority.

Three excavators continue to operate in the Approved Project Area. ROM coal production is approximately 10.5 Mtpa, with all coal extraction from the Approved Project Area (i.e. existing Mangoola Coal Mine). The majority of overburden mined from the MCCO Proposed Additional Mining Area is hauled to the Approved Project Area for emplacement;

- Year 3: in this stage, the MCCO Proposed Additional Mining Area is well established, with typically two excavators mining overburden and one excavator mining coal. Two excavators continue to operate in the Approved Project Area. This stage represents the maximum production rate scenario, with ROM coal production of up to 13.5 Mtpa. Overburden mined from the MCCO Proposed Additional Mining Area is either hauled to the Approved Project Area or placed on the MCCO Proposed Emplacement Area;

- Year 5: in this stage, mining in the Approved Project Area is complete, and three excavators continue to operate in the MCCO Proposed Additional Mining Area. ROM coal production is approximately 7.7 Mtpa, with all coal extraction from the MCCO Proposed Additional Mining Area. Overburden mined from the MCCO Proposed Additional Mining Area is either hauled to the Approved Project Area or placed in the MCCO Proposed Additional Mining Area; and

- Year 8: in this stage, three excavators continue to operate in the MCCO Proposed Additional Mining Area, with mining occurring at the outer extent of the mining area. ROM coal production is approximately 6 Mtpa, with all coal extraction from the MCCO Proposed Additional Mining Area. Overburden mined from the MCCO Proposed Additional Mining Area is placed in that area. It is expected noise emission after this point in time would gradually reduce until closure of the mine.

Operational intrusive, cumulative, and modifying factor adjustments, and potential sleep disturbance impact associated with each of these stages is assessed. Further detail regarding the operating scenarios is provided in Section 4.1.2.

An assessment area was defined that encompasses all known private residential receptors that may be noise impacted by the MCCO Project.

Figure 4 to Figure 7 present conceptual mine plans for each of the four stages assessed.

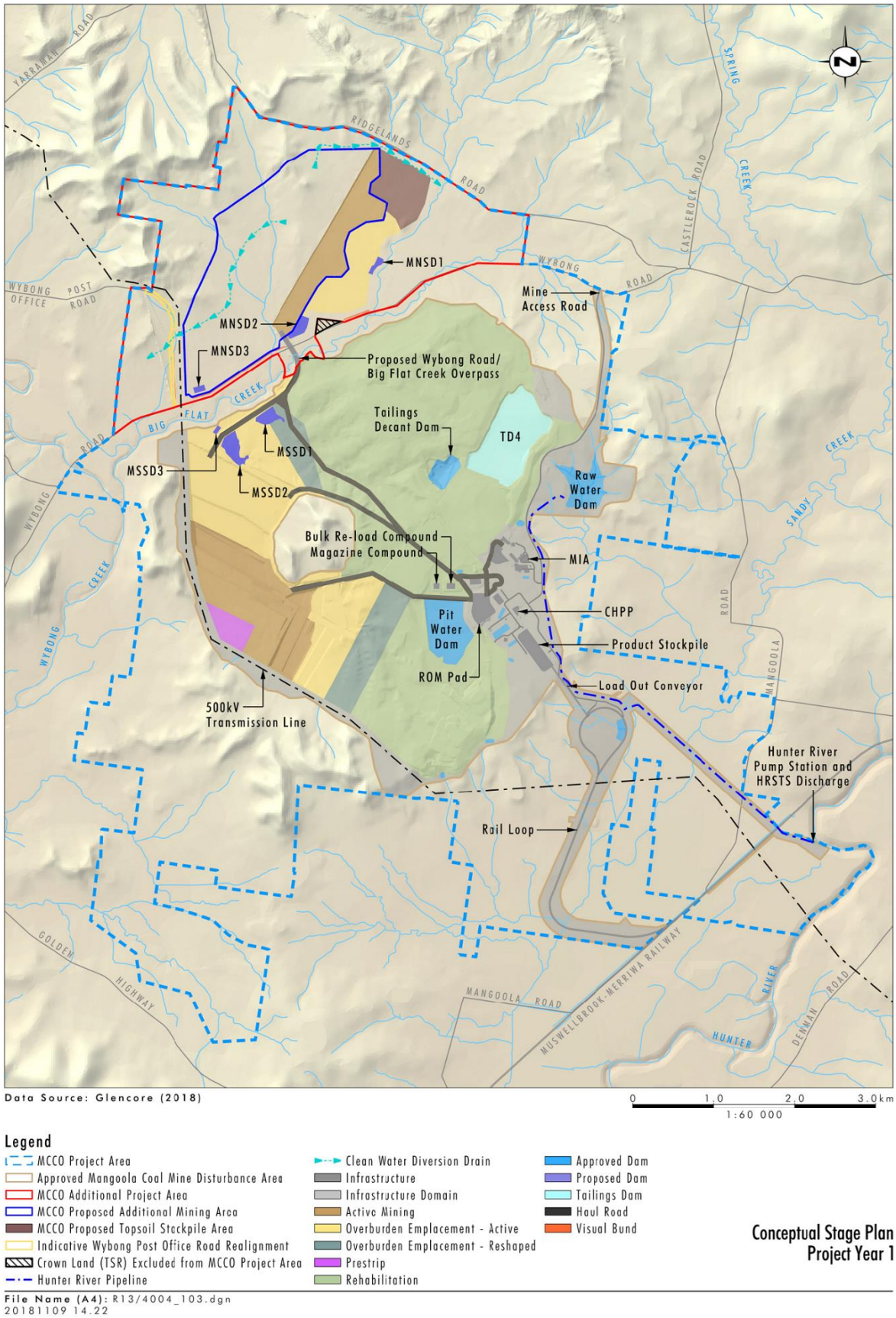

Figure 4 - Conceptual Stage Plan Project Year 1

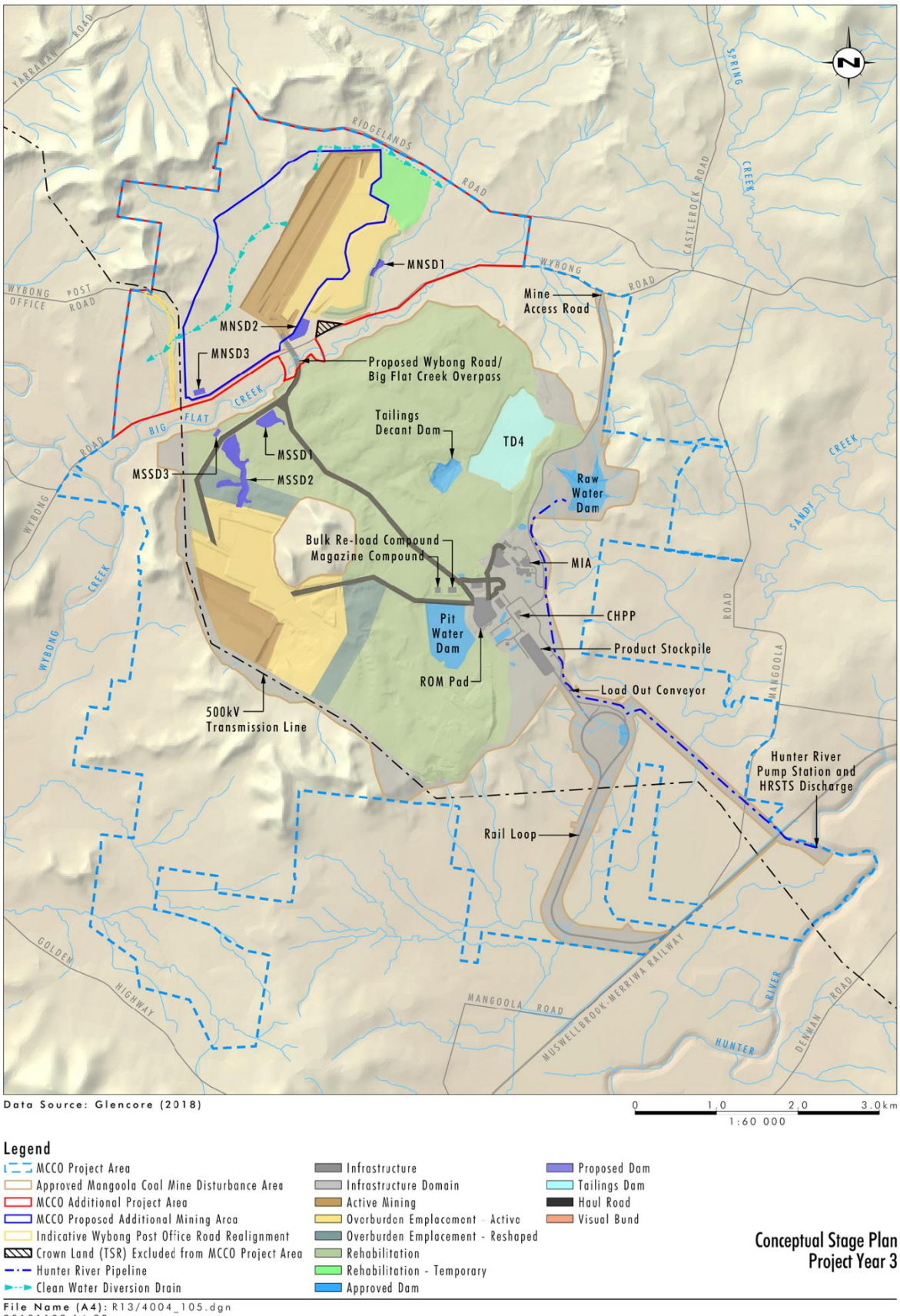

Figure 5 - Conceptual Stage Plan Project Year 3

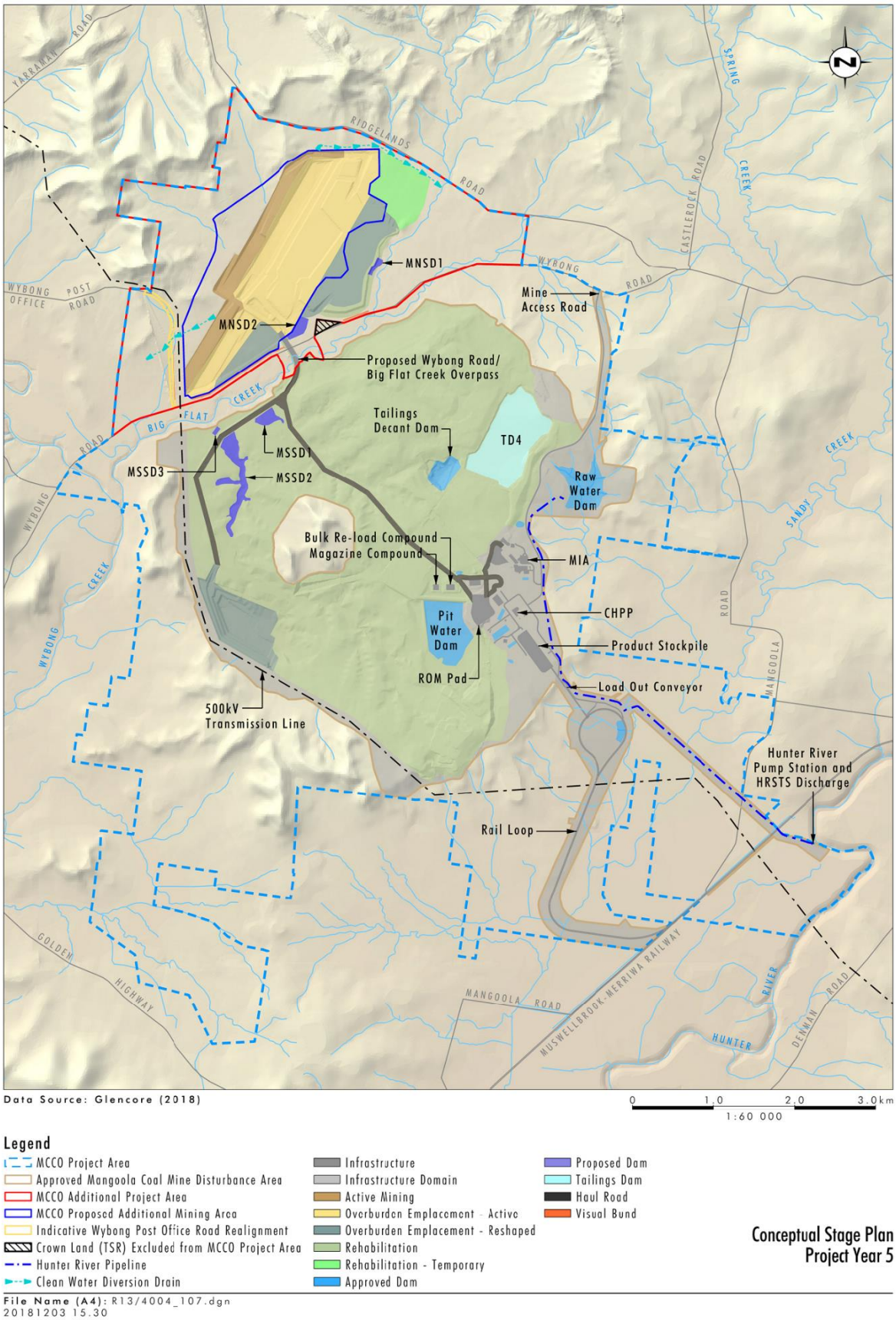

Figure 6 - Conceptual Stage Plan Project Year 5

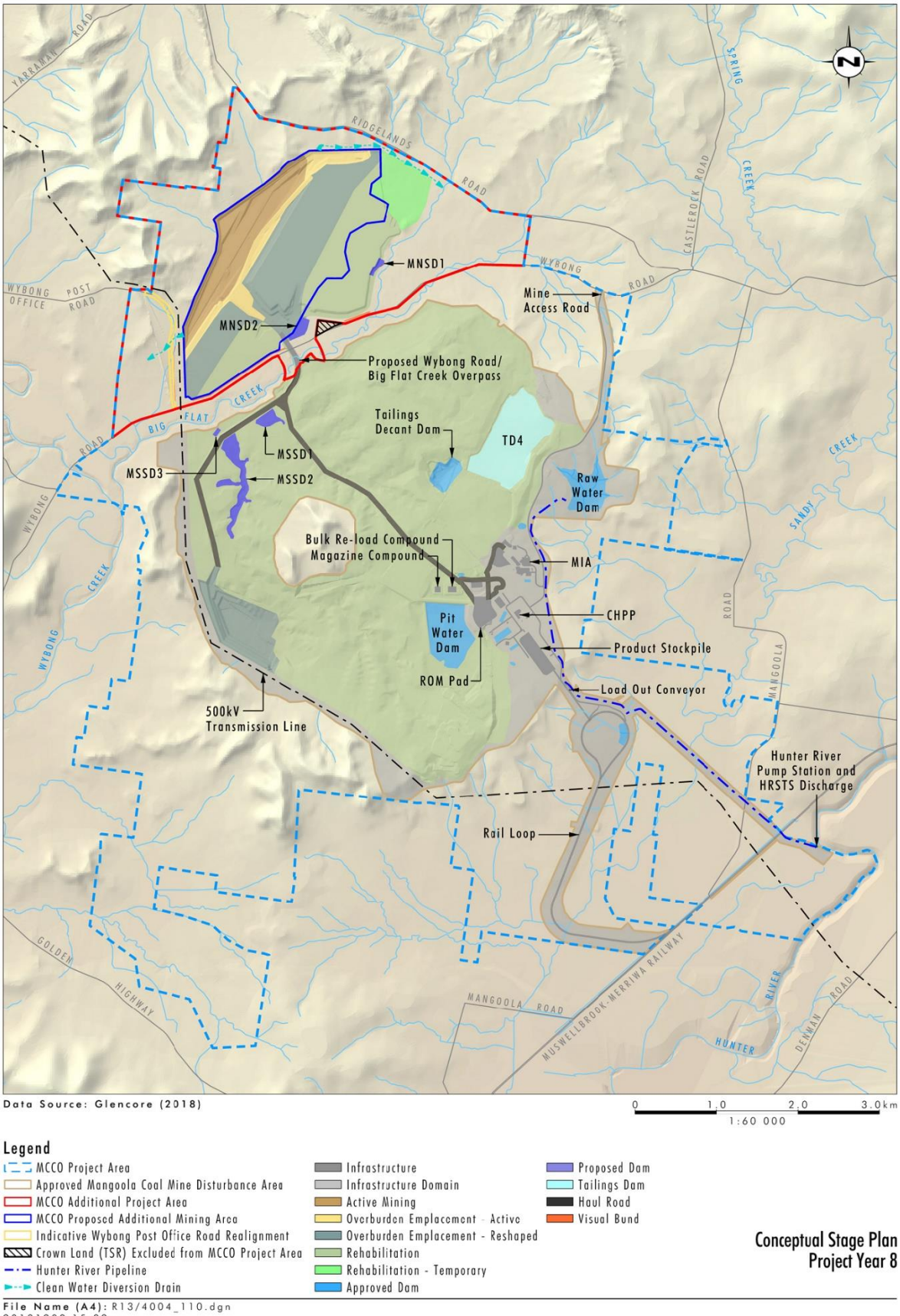

Figure 7 - Conceptual Stage Plan Project Year 8

2.3 Construction Noise

The following primary construction tasks are proposed for the MCCO Project:

1. Establishment of construction access, temporary office/equipment laydown areas and relocation of transmission lines within the MCCO Additional Project Area;

2. Construction of a haul road overpass over Big Flat Creek and Wybong Road to connect the Approved Project Area to the MCCO Proposed Additional Mining Area;

3. Realignment of a portion of Wybong Post Office Road to the west of the MCCO Proposed Additional Mining Area; and

4. Construction of a water management system, including construction of dams and clean water diversion drains up catchment of and within the MCCO Proposed Additional Mining Area.

A worst-case construction scenario that includes the peak construction period, and incorporates each of these tasks, was assessed in accordance with the ICNG. The peak construction period occurs prior to Year 1 of mining. A construction noise impact assessment, prepared in accordance with the ICNG, is provided in Section 4.4.2 of this report.

2.4 Road Traffic Noise

The approved maximum ROM coal production rate of 13.5 Mtpa will not change, and no additional staff or traffic associated with the ongoing operation of Mangoola Coal Mine are proposed. As there is no change to operational road traffic volumes associated with the MCCO Project relative to those that are already approved, no change in operational road traffic noise impact relative to the approved operation should occur.

Proposed construction activities will generate additional road traffic on the local road network during the construction phase. A quantitative road traffic noise impact assessment has been prepared using projected construction traffic volumes presented in the Traffic and Transport Impact Assessment (TTIA) report titled 'Mangoola Coal Mine Continued Operations Traffic and Transport Report' (GHD, 2019).

The road traffic noise impact assessment for the construction phase is included in Section 4.9 of this report.

2.5 Rail Noise

Product coal is transported from Mangoola Coal Mine via rail, with an approved capacity of up to 10 trains per day. The approved maximum ROM coal production rate of 13.5 Mtpa will not be modified; therefore, no change to the number of trains required for coal transport, or to previously predicted rail noise impact will occur. No further assessment of rail noise impact is required, as Mangoola will continue to operate in accordance with previously approved rail volumes. It is noted an extension of 1 year to the approved duration of use is required to maintain consistency with the proposed duration of the MCCO Project.

2.6 Noise Modelling Methodology

Noise levels were predicted using RTA Technology's Environmental Noise Model (ENM), a computer based environmental noise model, to determine the acoustic impact of operational and construction activities. ENM is approved by the NSW Department of Planning and Environment (DP&E) and EPA as suitable for prediction of industrial noise involving large propagation distances and is currently the industry standard for NIA of this nature. The model takes into account geometric spreading, atmospheric absorption, and, barrier and ground attenuation. ENM Terrain Category 2, representing a rural land environment, was adopted for model input.

Potential impacts were evaluated using the cumulative distribution of results methodology. This method determines a noise level that is likely to be exceeded 10 percent of the time in each of the four seasons. A range of results is calculated for a comprehensive set of meteorological conditions, and frequency of occurrence of each of these meteorological conditions is calculated from historical meteorological data. The cumulative distribution of these results is analysed to establish a single value for comparison with the limiting criterion. It is considered appropriate to use the 90th percentile result (10 percent of results are higher than this number) to represent intrusive noise impact. Results provided are 90th percentile L_{Aeq} values; that is, a range of L_{Aeq} results (260 meteorological conditions) have been calculated for each receptor, and the 90th percentile L_{Aeq} has been determined based on the percentage distribution of meteorological conditions. Appendix D lists the 260 meteorological conditions included in this assessment.

Shorter duration weather conditions that increase noise may be an insignificant percentage of time if the assessment is based on annual distribution of meteorological conditions. Therefore, results are determined for each season and the worst-case season result is adopted as the predicted level; the worst-case season may not be the same for each receptor.

This methodology requires more calculation than would a procedure involving a smaller set of prevailing meteorological parameters (i.e. NPfI conditions) but represents best available technology and is, in our opinion, one of the most comprehensive methods available to estimate the range of likely noise levels for a receptor. The NPfI procedures only require assessment of potentially enhancing meteorological conditions if they occur more than 30 percent of a time period (day, evening and night) in any season. This could mean conditions that enhance noise and result in unacceptably high levels, and which may occur for significant periods of time (right up to 30 percent), are not assessed.

On the other hand, the cumulative distribution method results in a level being calculated for all possible meteorological conditions. The range of wind speed, wind direction and stability class combinations is actually infinite in the real world. For the purpose of modelling we've broken this down into 260 conditions, which can be considered to be quite a comprehensive analysis. Using historical meteorological data, the percentage of time each condition may occur per period and season is calculated. For any mining scenario modelled it is then possible to determine the likely percentage occurrence of any noise level. Further, the likely percentage of time a criterion might be exceeded can also be estimated.

2.7 Mine Plan Development

Modelling for this NIA commenced in December 2016 as part of the initial constraints analysis phase of the Project. Noise modelling was undertaken during this phase to assist Mangoola in the planning and development of the MCCO Project mine plans in order to ensure that noise impacts were considered and minimised as far as practicable. Since that time, numerous model iterations have been undertaken to achieve the outcomes presented in this report. A series of noise controls and management strategies were developed to ensure all reasonable and feasible mitigation controls were considered and included in the development of the MCCO Project mine plan and modelling process. Further detail regarding reasonable and feasible mitigation controls is included in Section 4.2.4 of this report.

2.8 Noise Contours

Noise contours were produced over the assessment area to provide a visual representation of the model results. It should be noted that noise contours are based on interpolation of results determined for individual points, and as such are indicative, and are included for presentation purposes only.

3 CRITERIA

3.1 Existing Acoustic Environment

The ambient acoustic environment around the Mangoola Coal Mine has been measured and documented on a number of occasions. Previous noise surveys have shown that ambient background noise levels are generally low, and often in the range L_{A90} 20 to 30 dB during the winter months.

The PA06_0014 Modification 4 Environmental Assessment titled Environmental Assessment - Modifications to Mangoola Coal Mine Plans and Relocation of 500 kV Electricity Transmission Line (Umwelt, 2010) included a noise impact assessment as Appendix C7. The noise impact assessment titled Mangoola Mine Modifications Noise and Vibration Assessment (Wilkinson Murray, 2010) included details of un-attended and attended noise surveys. Un-attended survey results showed measured background noise levels surrounding the operation were typically in the range L_{A90} 25 to 28 dB during the non-summer months, and concluded:

> *…it is clear that the RBL background levels are generally below 30 dB(A) for day, evening and night. There are some locations which show dramatic increases in RBL noise levels in the summer and autumn months, but this is most likely due to localised insect noise.*

Wilkinson Murray also conducted attended measurements at eight locations around the Mangoola Coal Mine with the purpose of establishing whether there was any industrial noise in the area. The survey outcome was that:

> *…no industrial noise sources were noted at any time.*

Despite that observation, industrial noise from other mining operations is at times audible in some areas around the Mangoola Coal Mine, including receptors located south and southeast, evidenced by years of attended monitoring in the area by Global Acoustics which show influence from operations such as Mt Arthur and Bengalla mines. However, due to the physics of atmospheric enhancement, the usual case is that when enhancement is from the direction of Mangoola Coal Mine, weather effects tend to mitigate noise from mining operations in the other direction, and vice versa. Therefore, cumulative noise levels do not occur that include significant contributions from multiple mines.

Un-attended monitoring data from the Mangoola Coal Mine real-time network were analysed for this NIA to further quantify existing background levels around the MCCO Additional Project Area. Figure 8, sourced from the Mangoola Coal Mine Noise Management Plan (NMP), shows monitoring locations around the mine. Locations NC02 and NC10 are located east and west of the MCCO Additional Project Area respectively, and are considered representative of areas east, north and west of the MCCO Additional Project Area that may be impacted by noise from proposed mining operations.

Figure 9 to Figure 14 present Assessment Background Levels (ABL) and log average L_{Aeq} measured during the years 2014 to 2017 inclusive for these two monitoring locations, for the day, evening and night periods. Periods where wind speed exceeded 5 m/s or rainfall was present were excluded in accordance with NPfI guidelines. Data in these graphs confirm the seasonal variation in background

levels noted by Wilkinson Murray, with the lowest background levels measured during the winter months, with significantly higher background levels in the summer months. Measured ABL were as low as less than L_{A90} 25 dB at both locations during all time periods.

Table 2.1 of the NPfI nominates minimum Rating Background Levels (RBL) and intrusiveness noise levels to be used for areas with low background levels. These are shown in Table 3.1. RBL measured around the MCCO Additional Project Area during the quietest periods in the winter months are less than L_{A90} 30 dB. Therefore, default minimum RBL and project intrusiveness noise levels have been adopted in this NIA for derivation of Project Noise Trigger Levels (PNTL) in accordance with the NPfI.

Table 3.1 MINIMUM ASSUMED RBL AND INTRUSIVENESS NOISE LEVELS

Time Period	**Minimum Assumed RBL L_{A90} dB**	**Minimum Project Intrusiveness Noise Level $L_{Aeq,15minute}$ dB**
Day	35	40
Evening	30	35
Night	30	35

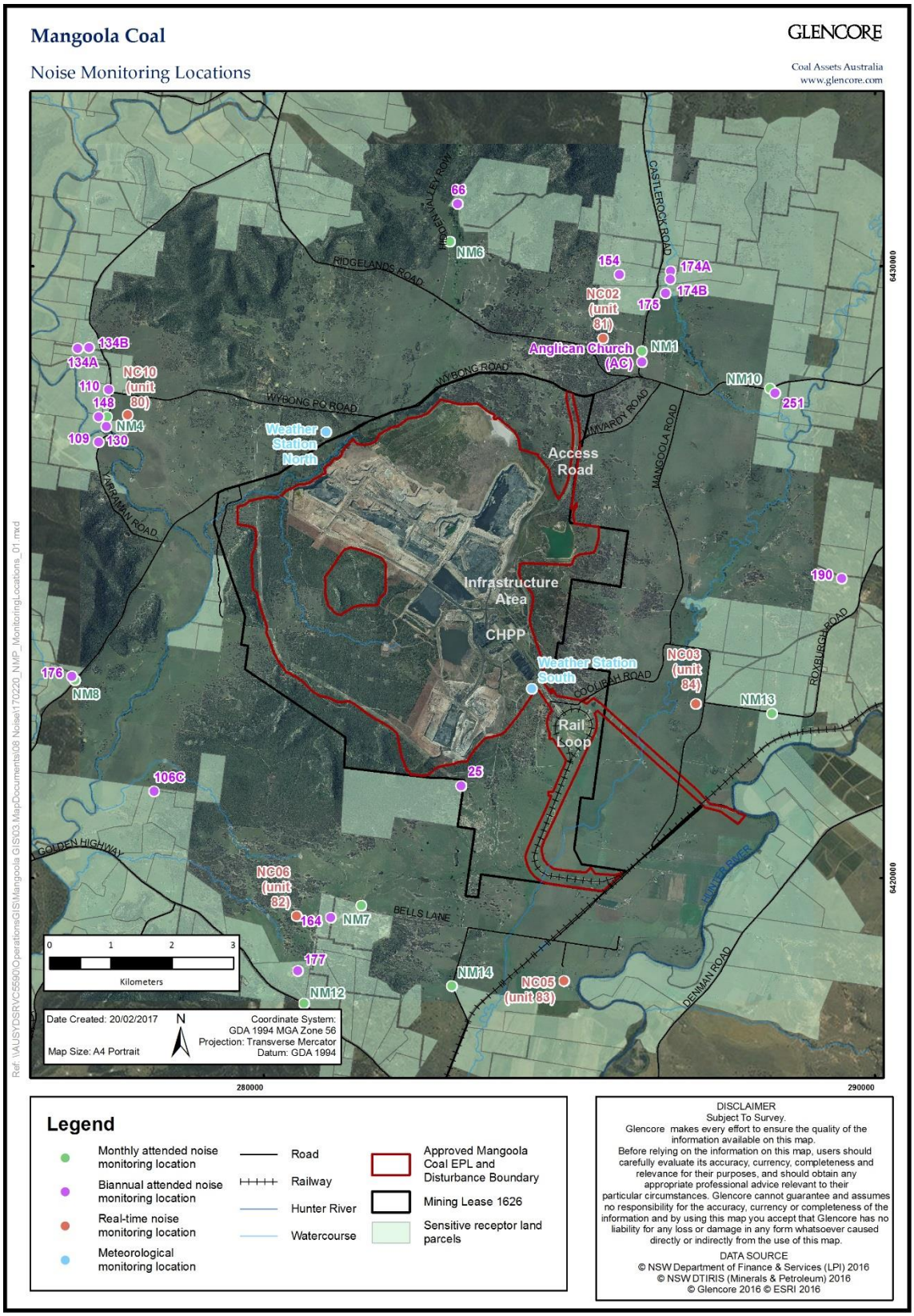

Figure 8 - Monitoring Locations (*source: Mangoola Coal Mine Noise Management Plan*)

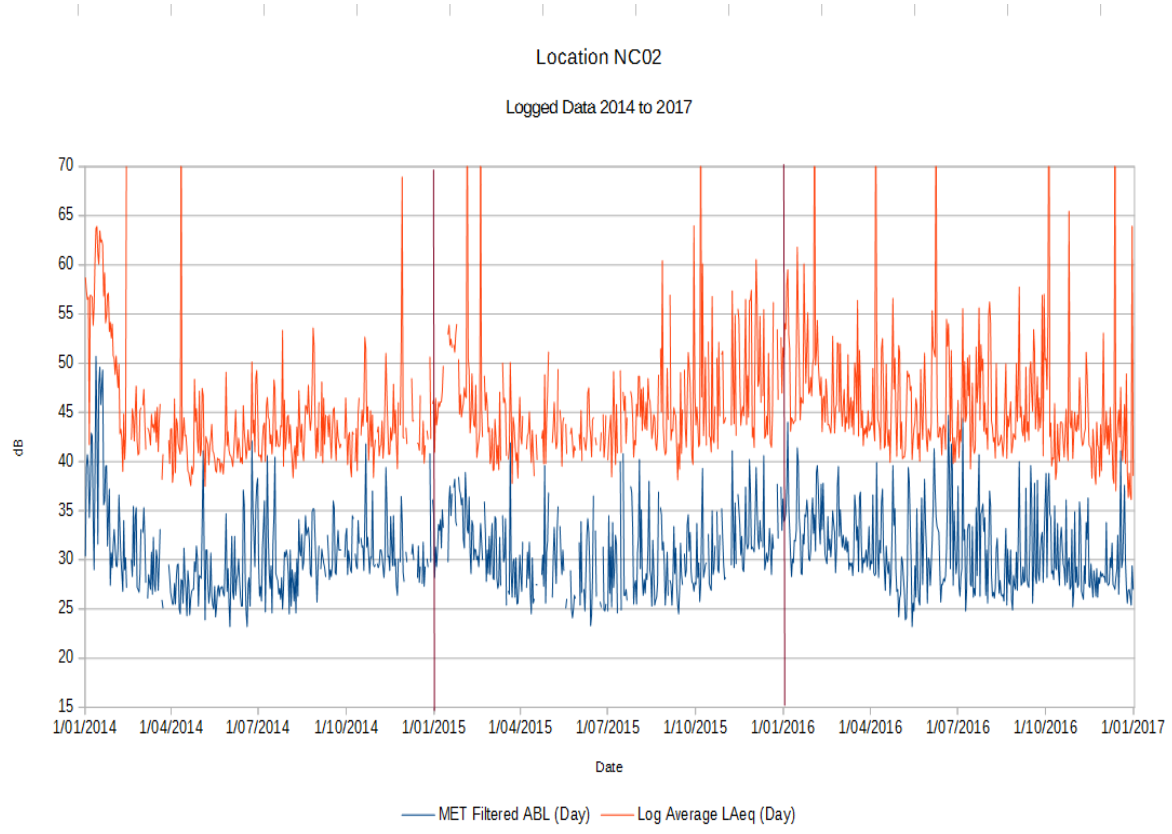

Figure 9 - NC02 Logged Data 2014 to 2017, Day Period

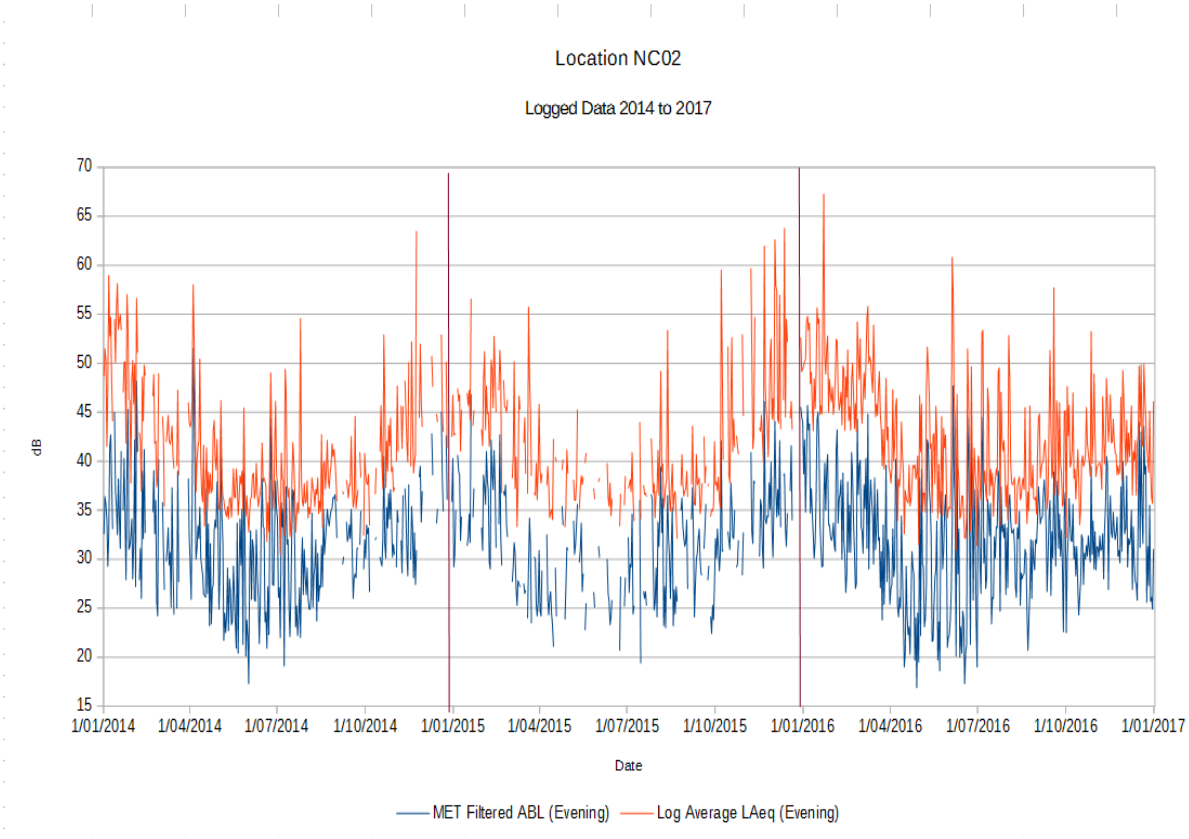

Figure 10 - NC02 Logged Data 2014 to 2017, Evening Period

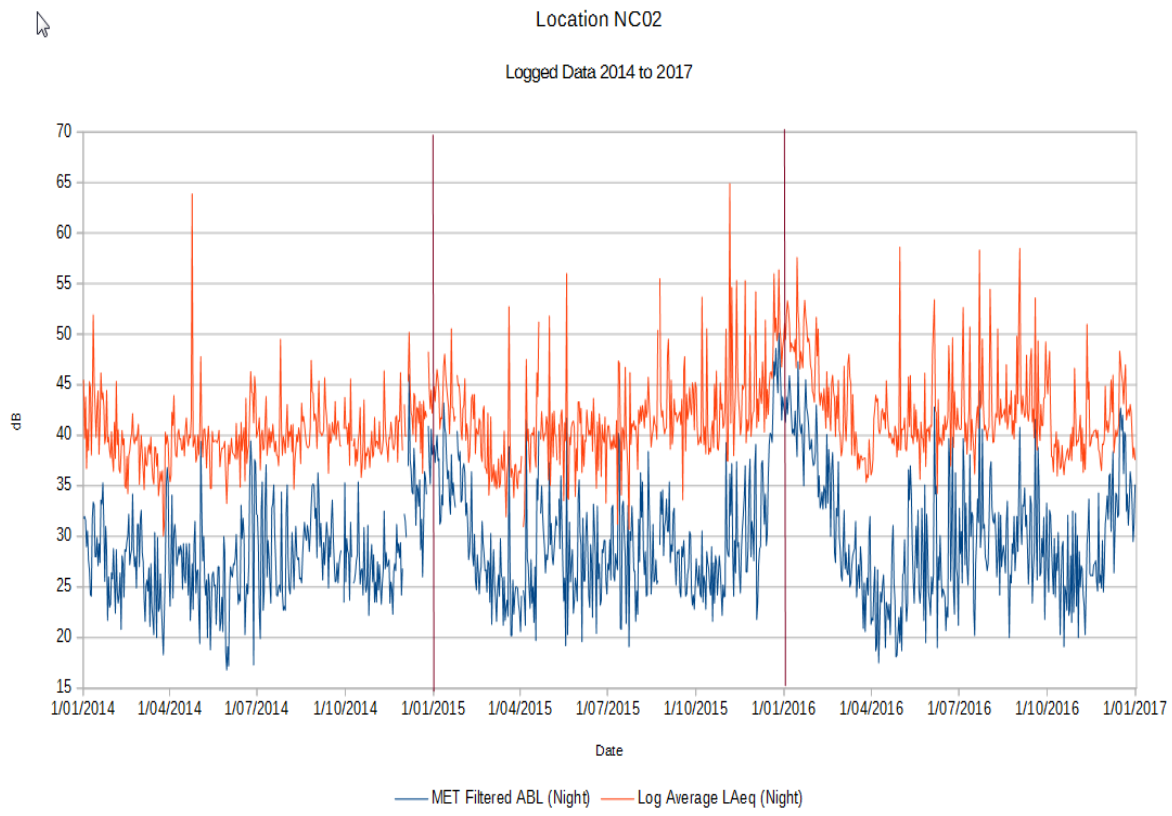

Figure 11 - NC02 Logged Data 2014 to 2017, Night Period

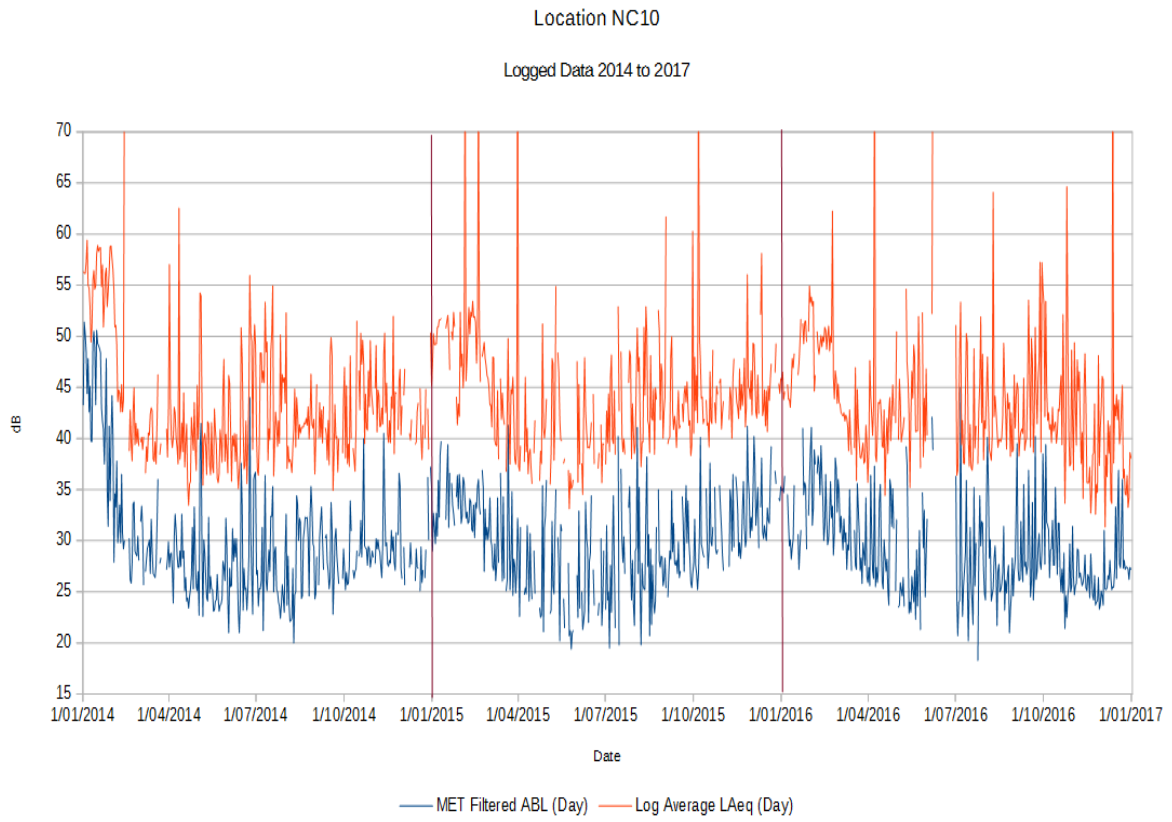

Figure 12 - NC10 Logged Data 2014 to 2017, Day Period

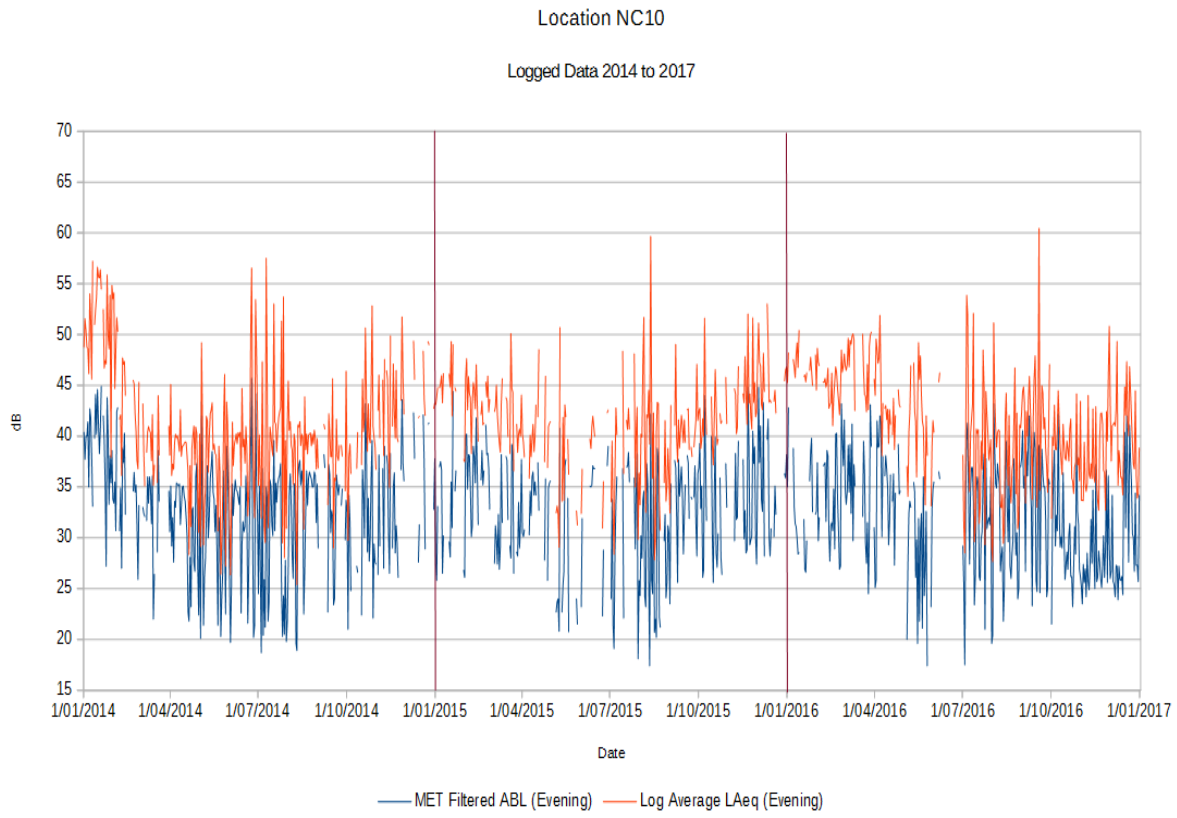

Figure 13 - NC10 Logged Data 2014 to 2017, Evening Period

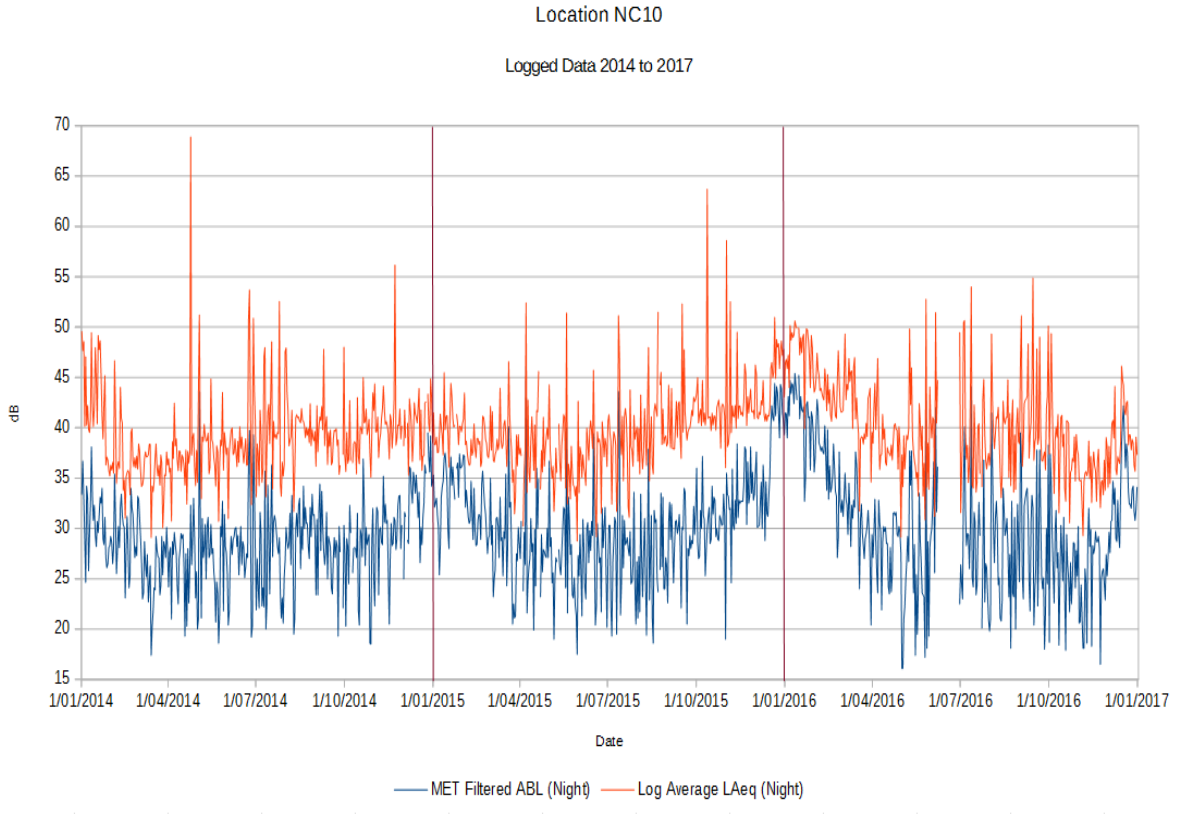

Figure 14 - NC10 Logged Data 2014 to 2017, Night Period

3.2 Land Ownership and Receptors

All known private residential receptors that may be noise impacted by the MCCO Project were assessed. Wybong Hall and the Anglican Church on Castlerock Road were also assessed. Figure 15 illustrates the assessment area, land ownership and receptor locations. Details of assessed receptors are included in Appendix E.

Three blocks of crown land located northwest of the MCCO Proposed Additional Mining Area have a recreational land use, and were assessed against NPfI recreation area amenity noise levels. These blocks are shown on Figure 15 and have the following identifiers:

1. DP750968 Lot 54;
2. DP750968 Lot 105; and
3. DP750968 Lot 145.

Section 4.4.2 of this NIA presents assessment outcomes for these three blocks.

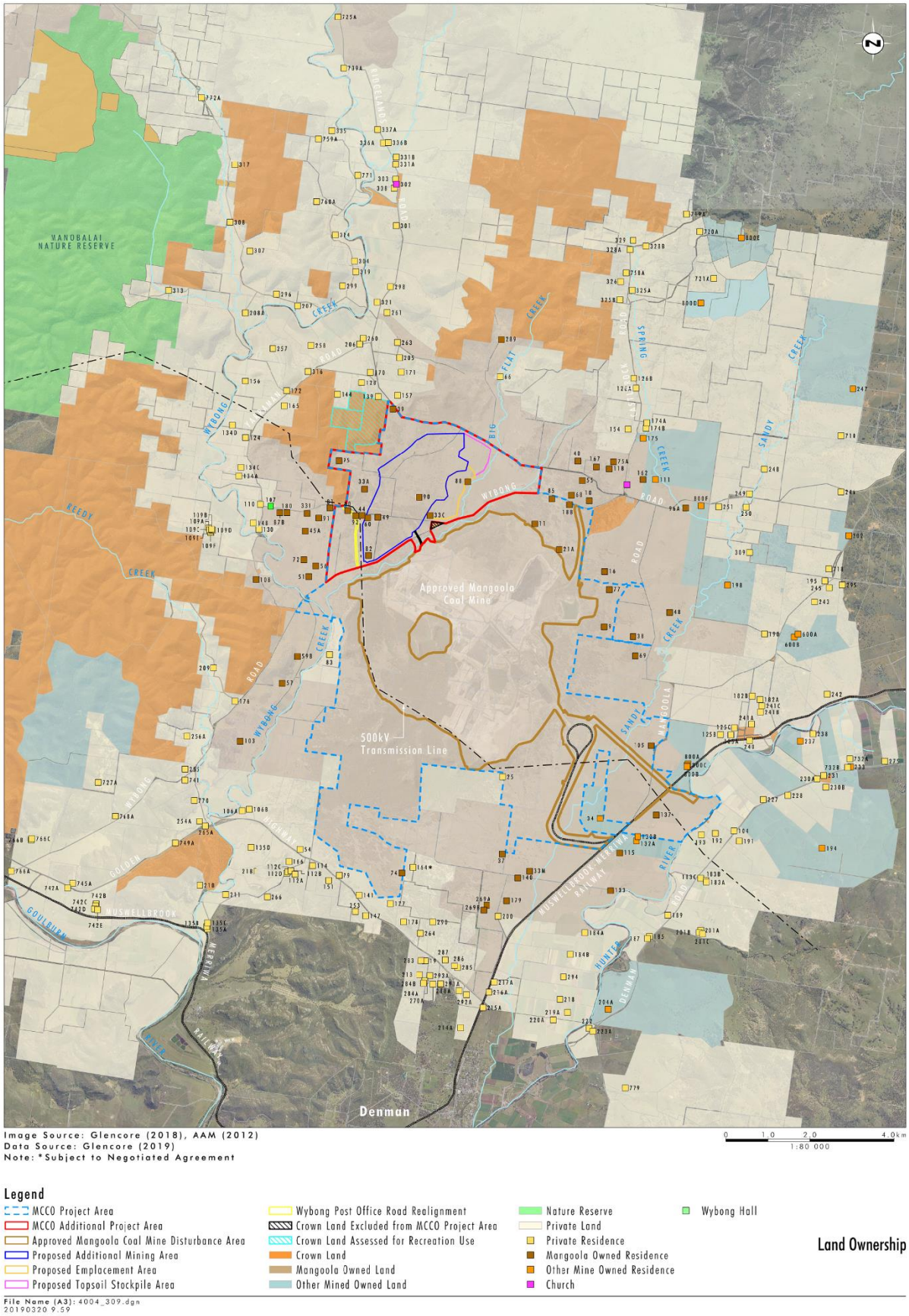

Figure 15 - Land Ownership and Receptor Locations

3.3 Existing Project Approval

Mangoola Coal Mine commenced mining operations in September 2010 and currently operates under project approval PA 06_0014. This has been modified on eight occasions since the original approval in 2007. All references in this NIA refer to the modified project approval, the most recent being issued following Modification 8.

Schedule 3, Conditions 1 to 9 outline environmental performance conditions pertaining to noise.

Table 1 within Condition 1 of PA 06_0014 lists land subject to acquisition on request and is reproduced below.

Table 1: Land subject to acquisition upon request

Land Number [1]	
25	121*
34	132*
66*	164*
81	Lot 1 DP 75029, Lot 1 DP 414239 *
83	Lots 68, 69, 70, 71, 76 & 77 DP 750924 *

It is noted that acquisition rights for some landowners ceased 12 months from the date of approval of Modification 6 (28 April 2015). Accordingly, Table 3.2 provides an update on the status of these properties.

Table 3.2 STATUS OF LAND PREVIOUSLY SUBJECT TO ACQUISITION ON REQUEST

Land Number [1]	Status
25	Acquisition rights current
34	Other mine owned
66*	Acquisition rights lapsed
81	Mangoola owned
83	Acquisition rights current
121*	Mangoola owned
132*	Other mine owned, acquisition rights lapsed
164*	Negotiated agreement in place
Lot 1 DP 75029, Lot 1 DP 414239*	Acquisition rights lapsed
Lots 68,69,70,71,76&77 DP750924*	Mangoola owned

Notes:

1. *Acquisition rights for the landowners in the above table with * ceased 12 months from the date of approval of Modification 6 (28 April 2015).*

Table 2 within Condition 2 of PA 06_0014 lists noise impact assessment criteria applicable for residences on privately-owned land, and the Anglican Church located on Castlerock Road. This table is reproduced below.

Table 2: Noise impact assessment criteria dB(A)

Day	Evening	Night		Land Number
$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{A1(1minute)}$	
40	40	40	45	132A
39	39	39	45	121, 132B
38	38	38	45	176
37	37	37	45	25, 66, 110, 130, 148 154, 164
36	36	36	45	106C, 111, 174A, 174B, 175
35	35	35	45	109, 134A, 134B, 177, 190, 251
35	35	35	45	All other privately-owned land
41	41	41	-	Anglican Church, Castlerock Road

Condition 4 of PA 06_0014, reproduced below, describes noise mitigation entitlements.

4. Upon receiving a written request from:
   - the owner of a residence on the land listed in Table 1 (unless the landowner has requested acquisition); or
   - the owner of any residence identified with a specific land number listed in Table 2 (except where a negotiated noise agreement is in place); or
   - the owner of residences 246, 249 or 251 due to road traffic noise impacts (except where a negotiated noise agreement is in place for road traffic noise),

   the Proponent must implement additional noise mitigation measures such as double glazing, insulation, and/or air conditioning at any residence on the land in consultation with the landowner.

   These additional mitigation measures must be reasonable and feasible.

   If within 3 months of receiving this request from the landowner, the Proponent and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Secretary for resolution.

   Within 3 months of this approval (or within 3 months of any subsequent modification to the approval which results in additional properties being affected), the Proponent must notify all applicable landowners that they are entitled to receive additional noise mitigation measures.

3.4 Operational Noise Assessment Levels

Section 2 of the NPfI outlines the procedure to determine PNTL relevant to a particular industrial development, and applying it to existing private residential receptors. If it is predicted that the development is likely to cause PNTL to be exceeded at existing private residential receptors, reasonable and feasible noise controls and/or management measures should be considered to reduce predicted noise as far as practicable.

The NPfI states:

> *The project noise trigger level provides a benchmark or objective for assessing a proposal or site. It is not intended for use as a mandatory requirement. The project noise trigger level is a level that, if exceeded, would indicate a potential noise impact on the community, and so 'trigger' a management response; for example, further investigation of mitigation measures.*
>
> *The project noise trigger level, feasible and reasonable mitigation, and consideration of residual noise impacts are used together to assess noise impact and manage the noise from a proposal or site.* ***It is the***

combination of these elements that is designed to ensure that acceptable noise outcomes are determined by decision makers.

The NPfI also states:

> Where the project noise trigger level is exceeded, assess the feasible and reasonable mitigation measures that could be implemented to reduce noise down towards the relevant project noise trigger level. If it is reasonable to achieve these levels, the proponents should do so. If not, then achievable noise levels should be identified. It is not mandatory to achieve the trigger levels but the assessment should provide justification if they cannot be met. An assessment of the acceptability of residual impacts should also be provided.

The key point in these extracts is that PNTL are not mandatory but are intended to provide an initial screening trigger to determine if further noise controls and/or management measures need to be considered. Once all reasonable and feasible mitigation controls are determined and implemented/applied, an assessment of the significance of residual noise impacts can be made in accordance with Section 4 of the NPfI.

The PNTL is the lower (that is, the more stringent) value of the project intrusiveness noise level and project amenity noise level.

Project intrusiveness noise levels aim to protect against significant changes in noise levels relative to existing background levels. Project amenity noise levels seek to protect against cumulative noise impacts from industry and maintain amenity for particular land uses. Applying the most stringent requirement as the PNTL ensures that both intrusive noise is limited and amenity is protected in such a way that no single industry can unacceptably change the noise level of an area.

3.4.1 Project Intrusiveness Noise Levels

The intrusiveness noise level is expressed as:

$L_{Aeq,15minute}$ = Rating Background Level + 5 dB

Where:

- $L_{Aeq,15minute}$ represents the equivalent continuous (energy average) A-weighted sound pressure level of the source over 15 minutes; and
- RBL represents the background level to be used for assessment purposes.

As mentioned previously, NPfI default minimum background levels are adopted for all receptors. Default minimum background levels and project intrusiveness noise levels for private residential receptors are discussed in Section 3.1 and presented in Table 3.1.

Intrusive noise levels are only applied to residential receptors (residences). For other receptor categories, only recommended amenity noise levels apply.

3.4.2 Recommended Amenity Noise Levels

Table 2.2 of the NPfI provides recommended amenity noise levels for various land uses. Where the

existing noise level from industrial sources approaches the recommended amenity noise level, noise from new sources must be limited to protect the amenity of the area. Recommended amenity noise levels are intended to protect community against noise impacts such as speech interference, annoyance and some sleep disturbance. Ambient noise levels within an area from all industrial noise sources combined should remain below recommended amenity noise levels where feasible and reasonable.

Table 2.3 of the NPfI provides guidance on assigning residential receptor noise categories. Private residential receptors in the assessment area are categorised rural residential in accordance with Table 2.3, the relevant section of which is reproduced below.

Receiver category	Typical planning zoning – standard instrument*	Typical existing background noise levels	Description
Rural residential	RU1 – primary production RU2 – rural landscape RU4 – primary production small lots R5 – large lot residential E4 – environmental living	Daytime RBL <40 dB(A) Evening RBL <35 dB(A) Night RBL <30 dB(A)	**Rural** – an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels. Settlement patterns would be typically sparse. Note: Where background noise levels are higher than those presented in column 3 due to existing industry or intensive agricultural activities, the selection of a higher noise amenity area should be considered.

The assessment area includes two non-residential receptors; Wybong Hall and the Anglican Church (refer Figure 15). Wybong Hall is treated as a passive recreation area for the purpose of allocating recommended amenity criteria in this NIA. The Anglican Church is a place of worship.

Recreation areas on crown land are assessed against amenity noise levels for active recreation areas listed in Table 2.2 of the NPfI.

Recommended amenity noise levels for relevant receptor categories in this NIA are listed in Table 3.3.

Table 3.3 RECOMMENDED AMENITY NOISE LEVELS - $L_{Aeq,period}$ dB

Receptor Category	Day	Evening	Night
Private residential (external)	50	45	40
Passive recreation area (external)	50	50	50
Active recreation area (external)	55	55	55
Place of worship (internal)	40	40	40
Place of worship (external) [1]	50	50	50

Notes:

1. *10 dB adjustment applied to obtain equivalent external amenity noise level.*

An adjustment of 10 dB has been applied to internal amenity noise levels for a place of worship to obtain an equivalent external value. This adjustment is consistent with standard practice, and in keeping with Section 2.6 of the NPfI that recommends that in cases where gaining internal access for monitoring is difficult, then external noise levels 10 dB above the internal levels apply.

3.4.3 Project Amenity Noise Levels

Recommended amenity noise levels represent the objective for **total** industrial noise at a receptor location. The NPfI also defines a **project amenity noise level**, which represents the objective for noise from a single industrial development at a receptor location. As stated in the NPfI the project amenity noise level is determined as follows:

> **Project amenity noise level for industrial developments = recommended amenity noise level (Table 2.2) minus 5 dB(A)**

The NPfI provides exceptions for when the project amenity noise level does not apply, which are:

1. in areas with high traffic noise levels;
2. in proposed developments in major industrial clusters;
3. where the resultant project amenity noise level is 10 dB or more lower than the existing industrial noise level; and
4. where cumulative industrial noise is not a necessary consideration because no other industries are present in the area, or likely to be introduced into the area in the future.

These exceptions are not applicable to the MCCO Project. Project amenity noise levels are determined in Section 3.4.5 of this report.

3.4.4 $L_{Aeq,period}$ to $L_{Aeq,15minute}$ Adjustment

Intrusiveness and amenity noise levels each use the L_{Aeq} descriptor; however, intrusiveness noise levels are averaged over a 15-minute duration whilst amenity noise levels are averaged over an assessment period (day, evening or night). The NPfI provides a method to standardise the time periods, which involves applying an adjustment factor of plus 3 dB to $L_{Aeq,period}$ noise levels to obtain equivalent $L_{Aeq,15minute}$ noise levels. Conversely, an adjustment factor of minus 3 dB can be applied to an $L_{Aeq,15minute}$ noise level to obtain an equivalent $L_{Aeq,period}$ noise level.

3.4.5 Project Noise Trigger Levels

In determining PNTL from RBL, 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 during the less sensitive daytime period. Therefore, in determining PNTL for a particular development, it is generally recommended that the project intrusiveness noise level for evening be set at no greater than the project intrusiveness noise level for daytime. The project intrusiveness noise level for night-time should be no greater than the project intrusiveness noise level for day or evening.

Table 3.4 provides calculated PNTL determined in accordance with the NPfI for private residential receptors.

It should be noted that PNTL are used in this assessment to evaluate significance of residual noise impacts. Mangoola propose to retain acquisition and mitigation rights for receptors previously determined to be impacted by the existing Approved Project Area. It is understood Wybong Hall has not previously been assessed. A project amenity noise level (recommended amenity noise level minus 5 dB) of $L_{Aeq,period}$ 45 dB is applicable for Wybong Hall and the Anglican Church, which has an

equivalent $L_{Aeq,15minute}$ noise level of 48 dB.

Table 3.4: PROJECT NOISE TRIGGER LEVELS – PRIVATE RESIDENTIAL RECEPTORS

Step	Calculation Stage	Descriptor	Day	Evening	Night
1	RBL [1]	L_{A90}	35	30	30
2	Intrusiveness noise level	$L_{Aeq,15minute}$	40	35	35
3	Recommended amenity level	$L_{Aeq,period}$	50	45	40
4	Project amenity level adjustment [2]	dB(A)	-5	-5	-5
5	Project amenity level	$L_{Aeq,period}$	45	40	35
6	$L_{Aeq,15minute}$ to $L_{Aeq,period}$ adjustment [3]	dB(A)	3	3	3
7	Project amenity level	$L_{Aeq,15minute}$	48	43	38
8	PNTL (minimum of 2 and 7)	$L_{Aeq,15minute}$	40	35	35

Notes:

1. *RBL refers to Rating Background Level. Default minimums are L_{A90} 35, 30 and 30 dB for the day, evening and night periods respectively;*
2. *Adjustment is from Section 2.4 of the NPfI; and*
3. *$L_{Aeq,15minute}$ to $L_{Aeq,period}$ adjustment of 3 dB sourced from the NPfI.*

3.5 Voluntary Land Acquisition and Mitigation Policy

In September 2018, the NSW government published the Voluntary Land Acquisition and Mitigation Policy (the VLAMP) for State Significant Mining, Petroleum and Extractive Industry Developments (NSW Government, 2018). This document describes the NSW Government's policy for voluntary mitigation and land acquisition to address noise impacts from state significant mining, petroleum and extractive industry developments.

The 2018 VLAMP supersedes the previous version which was dated 15 December 2014. In relation to assessment of residual noise impact for the MCCO Project, there is no material difference between the two documents. The night period is the governing period for characterisation of residual noise impact, as model predictions are greater for night than for either day or evening due to noise enhancing conditions that occur at night. Night period mitigation and acquisition criteria are essentially the same in both the 2014 and 2018 VLAMP documents. Whilst there are some differences between the two documents for the day and evening periods, these do not affect MCCO Project outcomes due to the night period governing residual noise impact.

The 2018 VLAMP affords a higher level of protection than the NPfI for private residences in areas with low background noise levels. For the night period, the 'significant' residual noise impact category in accordance with the NPfI procedure, at which voluntary acquisition rights become applicable, is $L_{Aeq,15minute}$ 44 dB. Under the VLAMP procedure, voluntary acquisition rights become applicable at $L_{Aeq,15minute}$ 41 dB. The VLAMP is applied in this assessment.

3.5.1 Mitigation and Acquisition Criteria

The VLAMP provides the following guidance on the applicability of noise mitigation and acquisition criteria:

A consent authority can apply voluntary mitigation and voluntary land acquisition rights to reduce:

- *operational noise impacts of a development on privately owned land; and*
- *rail noise impacts of a development on privately owned land near a non-network rail line (private rail line), that is on, or exclusively servicing an industrial site (see Appendix 3 of the RING);*

But not:

- *construction noise impacts, as these impacts are shorter term and can be controlled;*
- *noise impacts on the public road or rail network; or*
- *modifications of existing developments with legacy noise issues, where the modification would have beneficial or negligible noise impacts.*

3.5.2 Voluntary Mitigation Rights

The VLAMP states:

A consent authority should only apply voluntary mitigation rights where, even with the implementation of best practice management at the mine site:

- *the noise generated by the development would meet the requirements in Table 1 (see following page), such that the impacts would be characterised as marginal, moderate or significant, at any residence on privately owned land; or*
- *the development would increase the total industrial noise level at any residence on privately owned land by more than 1 dB(A) and noise levels at the residence are already above the recommended amenity noise levels in Table 2.2 of the Noise Policy for Industry; or*
- *the development includes a private rail line and the use of that private rail line would cause exceedances of the recommended acceptable levels in Table 6 of Appendix 3 of the RING by greater than or equal to 3 dB(A) at any residence on privately owned land.*

All noise levels must be calculated in accordance with the NPfI or RING (as applicable).

3.5.3 Voluntary Land Acquisition Rights

The VLAMP states:

A consent authority should only apply voluntary land acquisition rights where, even with the implementation of best practice management:

- *the noise generated by the development would be characterised as significant, according to Table 1 (see following page), at any residence on privately owned land; or*
- *the noise generated by the development would contribute to exceedances of the acceptable noise levels plus 5dB in Table 2.2 of the NPfI on more than 25% of any privately-owned land where there is an*

existing dwelling or where a dwelling could be built under existing planning controls [2]; or

- *the development includes a private rail line and the use of that private rail line would cause exceedances of the recommended maximum criteria in Table 6 of Appendix 3 of the RING at any residence on privately owned land.*

All noise levels must be calculated in accordance with the NPfI or RING (as applicable).

Table 1 of the VLAMP outlines a procedure for characterising noise impact and provides examples of potential receptor-based treatments that could be used to mitigate residual noise impact; this table is reproduced below.

When assessing the difference between predicted noise level and PNTL, the VLAMP uses the categories 0-2 dB, 3-5 dB, and >5 dB. For the night period, when PNTL is equal to 35 dB as is the case for the MCCO Project, these ranges become $L_{Aeq,15minute}$ 35-37 dB for 'negligible' impact, $L_{Aeq,15minute}$ 38 to 40 dB for 'marginal' or 'moderate' impact, and $L_{Aeq,15minute}$ 41 dB and above for 'significant' impact. In accordance with Section 2.2 of the NPfI, all model predictions in this NIA are rounded to the nearest integer.

[2] *Voluntary land acquisition rights should not be applied to address noise levels on vacant land other than to vacant land specifically meeting these criteria.*

Table 1 – Characterisation of noise impacts and potential treatments[16]

If the predicted noise level minus the project noise trigger level[17] is:	And the total cumulative industrial noise level is:	Characterisation of impacts:	Potential treatment:
All time periods 0-2dB(A)	Not applicable	Impacts are considered to be **negligible**	The exceedances would not be discernable by the average listener and therefore would not warrant receiver based treatments or controls
All time periods 3-5dB(A)	• ≤ recommended amenity noise level in Table 2.2 of the NPfI; or • > recommended amenity noise level in Table 2.2 of the NPfI, but the increase in total cumulative industrial noise level resulting from the development is ≤1dB	Impacts are considered to be **marginal**	Provide mechanical ventilation / comfort condition systems to enable windows to be closed without compromising internal air quality / amenity.
All time periods 3-5dB(A)	> recommended amenity noise level in Table 2.2 of the NPfI, and the increase in total cumulative industrial noise level resulting from the development is >1dB	Impacts are considered to be **moderate**	As for marginal impacts but also upgraded façade elements like windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels.
Day and evening >5dB(A)	≤ recommended amenity noise levels in Table 2.2 of the NPfI	Impacts are considered to be **moderate**	As for marginal impacts but also upgraded façade elements like windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels.
Day and evening >5dB(A)	> recommended amenity noise levels in Table 2.2 of the NPfI	Impacts are considered to be **significant**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.
Night >5dB(A)	Not applicable	Impacts are considered to be **significant**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.

Figure 16 - Table 1 of the VLAMP (NSW Government, 2018)

3.6 Residual Noise Impacts

Residual noise impacts occur when the best achievable noise levels predicted for a private residential receptor are greater than PNTL, and all source and pathway feasible and reasonable noise mitigation measures have been considered. The significance of any residual impact can be used to assess the need for receptor-based treatment options. In extreme cases, significant levels of residual noise impact may result in voluntary acquisition status.

Both the NPfI and VLAMP provide guidance on procedures for determining the significance of residual noise impacts. When assessing total cumulative industrial noise level against recommended amenity noise levels, "< recommended amenity noise level" used in the NPfI is taken as "less than or equal to recommended amenity noise level", which is consistent with Table 1 of the VLAMP.

As noted in Section 3.5 the method of assessing residual noise impact differs between the NPfI and the VLAMP. Assessment of residual noise impact is included in Section 4.3.2 of this report, and includes both methods.

3.6.1 NPfI Significance of Residual Noise Impact

Section 4 of the NPfI provides guidance for determining the significance of residual noise impacts. Table 4.1 of the NPfI outlines a procedure for allocating residual noise impact significance levels for each receptor on a case by case basis. Table 4.2 of the NPfI then provides examples of receptor-based treatments that could be used to mitigate residual noise impact. These tables are reproduced below.

Table 4.1: Significance of residual noise impacts.

If the predicted noise level minus the project noise trigger level is:	And the total cumulative industrial noise level is:	Then the significance of residual noise level is:
≤ 2 dB(A)	Not applicable	Negligible
≥ 3 but ≤ 5 dB(A)	< recommended amenity noise level or > recommended amenity noise level, but the increase in total cumulative industrial noise level resulting from the development is less than or equal to 1dB	Marginal
≥ 3 but ≤ 5 dB(A)	> recommended amenity noise level and the increase in total cumulative industrial noise level resulting from the development is more than 1 dB	Moderate
> 5 dB(A)	≤ recommended amenity noise level	Moderate
> 5 dB(A)	> recommended amenity noise level	Significant

Note: This approach is designed for new and substantially-modified developments and should be applied with caution to assessments of existing operations.

Table 4.2: Examples of receiver-based treatments to mitigate residual noise impacts.

Significance of residual noise level	Example of potential treatment
Negligible	The exceedances would not be discernible by the average listener and therefore would not warrant receiver-based treatments or controls.
Marginal	Provide mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity.
Moderate	As for 'marginal', but also upgraded façade elements, such as windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels.
Significant	May include suitable commercial agreements where considered feasible and reasonable.

3.6.2 VLAMP Significance of Residual Noise Impact

The VLAMP method of determining the significance of residual noise impacts is outlined in Section 3.5.2 of this NIA. Table 1 of the VLAMP, reproduced in that section, summarises the assessment method.

3.7 Construction Noise Criteria

Construction noise in NSW is typically regulated in accordance with the Interim Construction Noise Policy (ICNG). However, the ICNG states it is not applicable to construction associated with mining and quarrying activities, which it states should be assessed in accordance with the INP. However, the INP and more recent NPfI specifically exclude construction noise. Due to the lack of clear guidance in NSW guidelines as to how construction noise for mining should be assessed, it has become common practice for such construction to be assessed in accordance with the ICNG. Furthermore, the SEARS for this project specifically reference the ICNG as being applicable for assessment of construction noise, with adequate justification.

Construction activities for the MCCO Additional Project Area are similar in nature to construction activities that are typically assessed in accordance with the ICNG, including road construction, bridge and culvert construction, and earthworks associated with drainage systems. Noise characteristics associated with construction tasks would be similar to 'regular' construction tasks for non-mining works elsewhere in NSW, and are discrete activities that are removed from the Approved Project Area. On this basis, construction noise criteria outlined in the ICNG have been adopted in this NIA.

The 'noise affected' levels for construction work prescribed in the ICNG are:

- $L_{Aeq,15minute}$ equal to background plus 10 dB during standard construction hours; and
- $L_{Aeq,15minute}$ equal to background plus 5 dB for work outside the standard construction hours.

The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq,15minute}$ is greater than the noise affected level, the

proponent should:

- apply all feasible and reasonable work practices to meet the noise affected level; and
- also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

The ICNG also indicates a 'highly noise affected' level of $L_{Aeq,15minute}$ 75 dB. The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:

- times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences; and
- if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

Therefore, adopting default minimum background levels listed in Table 3.1, construction noise criteria presented in Table 3.5 apply for the MCCO Project.

Table 3.5 ICNG CONSTRUCTION NOISE CRITERIA - $L_{Aeq,15minute}$ dB

Construction hours	Noise Affected	Highly Noise Affected
Standard construction hours	45	75
Outside standard construction hours	35	NA [1]

Notes:
1. *Highly noise affected criterion not applicable outside standard construction hours.*

The guideline specifies standard construction hours as:

- Monday to Friday, 7.00 am to 6.00 pm;
- Saturday, 8:00 am to 1:00 pm; and
- No construction work on Sunday and public holidays.

Mangoola are committed to undertaking primary noise generating activities associated with realignment of the intersected portion of Wybong Post Office Road, construction of the Big Flat Creek and Wybong Road Overpass and clean water diversion drains during standard construction hours for which a criterion of $L_{Aeq,15minute}$ 45 dB applies. Mangoola propose to undertake some construction tasks associated with these activities outside standard construction hours and are committed to managing noise such that the cumulative impact from the existing Approved Project Area and construction activities do not exceed the operational noise limits prescribed in PA 06_0014. Mangoola feel that construction outside of standard construction hours is justified, as it would provide reductions to the overall time taken to complete these major tasks. This would in turn provide benefit to the local community though quicker restoration of normal operation of the local road network. PA 06_0014

noise impact assessment criteria would then apply outside of standard construction hours in lieu of the $L_{Aeq,15minute}$ 35 dB indicated in Table 3.5.

Although not expected, it is not yet known if blasting will be required for construction purposes. If required, blasting would be restricted to the hours 9am-5pm Monday to Saturday inclusive, which is in line with PA 06_0014, and will be managed to comply with currently approved blasting limits.

Construction noise impact is assessed in Section 4.4.2 of this report.

3.8 Maximum Noise Level Assessment

Section 2.5 of the NPfI includes a guideline for assessing maximum noise level events that have potential to cause sleep disturbance. According to the NPfI, where the subject development/premises night-time noise levels at a residential location exceed the following trigger levels, a detailed maximum noise level event assessment should be undertaken:

- $L_{Aeq,15minute}$ 40 dB or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- $L_{AF,max}$ 52 dB or the prevailing RBL plus 15 dB, whichever is the greater.

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the RBL, and the number of times this happens during the night-time period.

Assessment of sleep disturbance is included in Section 4.6 of this report.

3.9 Cumulative Noise Criteria

Schedule 3, Conditions 5 and 6 of PA 06_0014 provide cumulative noise criteria for the existing Approved Project Area. These are reproduced below.

Cumulative Noise Criteria

5. The Proponent must take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other mines does not exceed the following amenity criteria on any privately-owned land, excluding the land listed in the table to Table 1 above, to the satisfaction of the Secretary:
   - $L_{Aeq(11\ hour)}$ 50 dB(A) – Day;
   - $L_{Aeq(4\ hour)}$ 45 dB(A) – Evening; and
   - $L_{Aeq(9\ hour)}$ 40 dB(A) – Night.

6. If the cumulative noise generated by the project combined with the noise generated by other mines causes sustained exceedances of the following amenity criteria on any privately-owned land, excluding the land listed in the table to Table 1 above, then upon receiving a written request from the landowner, the Proponent must take all reasonable and feasible measures to acquire the land on as equitable basis as possible with the relevant mines, in accordance with the procedures in conditions 10-11 of schedule 4, to the satisfaction of the Secretary:
   - $L_{Aeq(11\ hour)}$ 53 dB(A) – Day;
   - $L_{Aeq(4\ hour)}$ 48 dB(A) – Evening; and
   - $L_{Aeq(9\ hour)}$ 43 dB(A) – Night.

   Notes:
   - *For the purpose of this condition, the expression "Proponent" in conditions 10-11 of schedule 4 should be interpreted as the Proponent and any other relevant mine owners.*
   - *The cumulative noise generated by the project combined with the noise generated by other mines is to be measured in accordance with the relevant procedures in the NSW Industrial Noise Policy.*

Current project approval amenity criteria listed above are consistent with recommended amenity noise levels for a rural area listed in Table 2.2 of the NPfI and Table 3.3 of this report.

3.10 Corrections for Annoying Noise Characteristics (Modifying Factors)

Fact Sheet C of the NPfI outlines procedures for assessing modifying correction factors. These correction factors, also referred to as modifying factor penalties, are applied to predicted/measured noise levels at the receptor before comparison with relevant noise trigger levels/criteria, to account for the additional annoyance caused by these noise characteristics.

Modifying factors, as they are applicable to industrial noise, are described in more detail below.

3.10.1 Tonality and Intermittent Noise

As defined in the NPfI:

> *Tonal noise contains a prominent frequency and is characterised by a definite pitch.*
>
> *Intermittent noise is noise where the level suddenly drops/increases several times during the assessment period, with a noticeable change in source noise level of at least 5 dB(A); for example, equipment cycling on and off. The intermittency correction is not intended to be applied to changes in noise level due to meteorology.*

Open cut mines are not generally tonal or intermittent in nature as per the intent of the NPfI. No further assessment of these characteristics has been made.

3.10.2 Low Frequency Noise

As defined in the NPfI:

> *Low frequency noise is noise with an unbalanced spectrum and containing major components within the low-frequency range (10 – 160 Hz) of the frequency spectrum.*

The NPfI contains the current method of assessing low frequency noise, which is a 2-step process as detailed below:

> *Measure/assess source contribution C- and A-weighted L_{eq},T levels over the same time period. Correction to be applied where the C minus A level is 15 dB or more and:*
>
> • *where any of the one-third octave noise levels in Table C2 are exceeded by **up to and including** 5 dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period; and*
>
> • *where any of the one-third octave noise levels in Table C2 are exceeded by **more than** 5 dB and cannot be mitigated, a 5 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period and a 2 dB(A) positive adjustment applies for the daytime period.*

Table C2 and associated notes from the NPfI is reproduced below:

Table C2: One-third octave low-frequency noise thresholds.

Hz/dB(Z)	One-third octave $L_{Zeq,15min}$ threshold level												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

Notes:

- dB(Z) = decibel (Z frequency weighted).
- For the assessment of low-frequency noise, care should be taken to select a wind screen that can protect the microphone from wind-induced noise characteristics at least 10 dB below the threshold values in Table C2 for wind speeds up to 5 metres per second. It is likely that high performance larger diameter wind screens (nominally 175 mm) will be required to achieve this performance (Hessler, 2008). In any case, the performance of the wind screen and wind speeds at which data will be excluded needs to be stated.
- Low-frequency noise corrections only apply under the standard and/or noise-enhancing meteorological conditions.
- Where a receiver location has had architectural acoustic treatment applied (including alternative means of mechanical ventilation satisfying the Building Code of Australia) by a proponent, as part of consent requirements or as a private negotiated agreement, alternative external low-frequency noise assessment criteria may be proposed to account for the higher transmission loss of the building façade.
- Measurements should be made between 1.2 and 1.5 metres above ground level unless otherwise approved through a planning instrument (consent/approval) or environment protection licence, and at locations nominated in the development consent or licence.

Low frequency noise is assessed in Section 4.7 of this NIA through evaluation of real-time monitoring data and comparison of one-third octave model predictions against NPfI low frequency noise thresholds.

3.11 Road Traffic Noise Criteria

The NSW Road Noise Policy (RNP) is applicable to road traffic noise generated by the MCCO Project and applies different noise limits dependent upon the development category and receptor type. Access to Mangoola Coal Mine is typically via Denman Road, Bengalla Link Road and Wybong Road. Bengalla Link Road and Wybong Road are designated as local roads in accordance with Section 2.2 of the RNP. Denman Road is designated an arterial road.

Table 3.6 shows applicable residential noise level criteria for local and arterial roads affected by additional traffic generated by land use developments. These are external criteria for assessment against façade corrected noise levels.

Table 3.6: ROAD TRAFFIC NOISE CRITERIA

Development Type/Land Use	Day Criterion	Night Criterion
Local Roads		
Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq,1hour}$ 55 dB	$L_{Aeq,1hour}$ 50 dB
Arterial Roads		

Existing residences affected by additional traffic on existing freeways/arterials/ sub-arterial roads generated by land use developments	$L_{Aeq,15hour}$ 60 dB	$L_{Aeq,9hour}$ 55 dB

Notes:

1. *Day $L_{Aeq,15hour}$ from 7am to 10pm ~ Night $L_{Aeq,9hour}$ from 10pm to 7am.*

Section 2.4 of the RNP states that in addition to the assessment criteria outlined above, any increase in traffic noise level at a location due to a proposed project or traffic generating development must be considered. Residences experiencing increases in total traffic noise level above a relative increase criterion should also be considered for mitigation. Table 3.7 shows relative increase criteria for residential land uses.

Table 3.7: RELATIVE INCREASE CRITERIA FOR RESIDENTIAL LAND USES

Development Type/Land Use	**Total traffic noise level increase - dB(A)**	
	Day 7am to 10pm	**Night 10pm to 7am**
New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road	Existing traffic $L_{Aeq,15hour}$ + 12 dB (external)	Existing traffic $L_{Aeq,9hour}$ +12 dB (external)

The 'existing' traffic noise level refers to the level from all road categories that would occur for the relevant 'no build' option. Where the existing road traffic $L_{Aeq,period}$ is found to be less than 30 dB, it is deemed to be 30 dB.

Section 3.4 of the RNP outlines procedures for applying the assessment and relative increase criteria. Essentially, once the study area is identified, assessment is undertaken to identify if any criterion, either assessment or relative increase, is exceeded. Where any exceedance is determined, feasible and reasonable mitigation measures should be identified and applied.

Where controlling criteria are not achievable, and justification can be provided that reasonable and feasible mitigation measures have been applied, the RNP states:

> *…for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.*

The NSW Roads and Maritime Services (RMS) document Construction Noise and Vibration Guideline (RMS, 2016) provides specific guidance on assessing construction related road traffic noise.

> *… an initial screening test should first be applied by evaluating whether noise levels will increase by more than 2 dBA due to construction traffic or a temporary reroute due to a road closure. Where increases are 2 dBA or less then no further assessment is required. Where noise levels increase by more than 2 dBA (2.1 dBA) further assessment is required using Roads and Maritimes Criteria Guideline. This documents RMS' approach to implementing the Road Noise Policy.*

For assessment of additional road traffic due to MCCO Project construction activities, the allowable increase criterion of 2 dB is deemed applicable, as any increases will be temporary and limited to the construction phase of the project. As noted in Section 3.4 of the RNP, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person. Provision of noise mitigation would not be reasonable, provided increases due to construction related traffic are not greater than 2 dB. Where relative increase is greater than 2 dB, assessment against the relevant criterion is required.

An assessment of road traffic noise is included in Section 4.9 of this report.

4 NOISE IMPACT ASSESSMENT

4.1 Best Management Practise

Noise management at Mangoola Coal Mine uses Best Management Practise (BMP) consistent with contemporary industry standards. Procedures for management and monitoring are outlined in the existing NMP, which includes sections regarding the following:

- Commitment and policy;
- Planning;
- Noise management and mitigation measures;
- Measurement and evaluation;
- Review and improvement;
- Definitions; and
- Accountabilities.

BMP currently implemented at Mangoola Coal include the following.

- Five permanent real-time noise monitoring locations and three mobile units that are relocated on an as needs basis are used for noise management;
- A tiered alarming system that incorporates real-time monitoring and meteorological data is used to notify site personnel when elevated noise levels occur off site. The NMP includes a detailed procedure outlining proactive and reactive management protocols in response to noise trigger levels;
- Monthly attended noise monitoring is used to assess compliance against impact assessment criteria. Monitoring is conducted at nine locations representing potentially affected privately owned residences and the Anglican Church;
- Activities that may have a high risk of increased noise generation are scheduled during the day time where practical;
- Sound power testing is completed annually to ensure equipment noise levels are consistent with modelled levels;
- Noise management and awareness training is provided to all personnel as part of the induction process; and
- A detailed management procedure is in place to ensure any community complaints are recorded, investigated and communicated appropriately.

4.2 Noise Model Parameters

4.2.1 Meteorology

Under various wind and temperature gradient conditions, noise may be increased or decreased compared with still-isothermal conditions – that is, no wind or temperature gradient (also referred to as neutral atmospheric conditions). Atmospheric conditions that most affect noise propagation are temperature and wind velocity gradients. They can both enhance or reduce noise propagation from source to receptor due to refraction of sound propagating through the atmosphere, brought about by a change in sound speed with height.

Noise levels are increased when the wind blows from source to receptor or under temperature inversion conditions (both of which are sometimes referred to as 'adverse weather conditions'), and decreased when the wind blows from receptor to the source or under temperature lapse conditions.

Five years of meteorological data (2012 to 2016) from the Mangoola Coal Mine northern weather station were analysed to determine the frequency of occurrence of each of the modelled meteorological conditions, by season and time period. The Mangoola Coal Mine northern weather station is located north of the existing Approved Project Area, and within the MCCO Additional Project Area. Data recorded at this weather station are considered representative of weather conditions in the region. .

Sigma-theta data was analysed, in accordance with procedures in Section D1.4 of the NPfI, to determine the appropriate stability class and associated vertical temperature gradient for each weather record. A vertical temperature gradient of 4 degrees C per 100 metres was adopted for atmospheric stability class F to capture predictions for the upper end of the range specified in Table D2 of the NPfI.

Analysis of meteorological data indicates that wind from the north to northwest occurs most commonly during the night period in winter. Outside of winter, the frequency occurrence of this wind direction is low, and south to southeast winds prevail. Therefore, receptors that are located south to southeast of the mine are generally predicted to receive the highest noise levels during winter, while receptors located north to northwest of the mine are generally predicted to receive the highest noise levels outside of winter.

Appendix D lists the 260 meteorological conditions included in the assessment.

4.2.2 Mining Scenarios

Four operational stages were modelled representing Year 1, Year 3, Year 5 and Year 8 of the MCCO Project. Separate day and evening/night scenarios were developed for each stage. Plant quantities were generally similar for day and evening/night scenarios, with the exception that a scraper and mobile crusher with associated front end loader were included for the day period.

Numerous refinements of each scenario were made to determine the most efficient mine layout with regard to managing noise emission. Further details of proposed noise mitigation measures are provided in Section 4.2.4 of this NIA.

Haul road alignments were optimised to provide topographical shielding and to avoid haulage of coal and overburden in exposed areas as far as practicable. Those modelled are indicative to allow for

assessment and actual road alignments may vary as is usual practice for mining operations. Mangoola have committed to review alternate alignments of primary haul roads prior to construction to ensure noise emission remains similar to that predicted in this NIA.

All known major noise sources were included in model scenarios. Plant (other than locomotives which were modelled as idling on the rail loop) was modelled at maximum sound power, and assuming all plant operates continuously and simultaneously. In reality, this rarely occurs; as such, modelled results are considered conservative. Modelled plant quantities represent in-service levels and include an allowance for availability and utilisation.

Table 4.1 lists representative typical plant quantities included in each model stage. These are indicative quantities to allow for assessment. Actual quantities will be determined by production requirements and may increase or decrease relative to those assessed. Operations will be monitored and modified as required to ensure the site operates within approved limits. Table 4.2 lists Coal Handling and Preparation Plant (CHPP) plant included in all model stages.

Figure B.1 to Figure B.5 in Appendix B show modelled plant locations and mine plan topography.

Table 4.1: OPEN CUT PLANT ITEMS INCLUDED IN MODELS

Equipment		Quantities			
Category	**Representative Type**	**Year 1**	**Year 3**	**Year 5**	**Year 8**
600t excavator	Liebherr 996	3	3	2	2
400t excavator	Liebherr 9400	1	1	1	1
250t excavator	Liebherr 9250	1	1	0	0
230t rear dump truck	Caterpillar 793	20	19	14	13
185t rear dump truck	Caterpillar 789	9	11	7	8
Front end loader	LeTourneau 1850	1	1	1	1
Tracked dozer	Caterpillar D10/D11	7	7	3	3
Rubber tyre dozer	Caterpillar 834	2	2	2	2
Water truck	Caterpillar 777	2	2	2	2
Grader	Caterpillar 16M/24M	3	3	2	2
Blast hole drill	Caterpillar MD6290	2	2	2	2
Scraper [2]	Caterpillar 637	1	1	1	1
Mobile crusher and loader [2]	None specified	1	1	1	1

Notes:

1. *Table shows representative typical plant that may operate at any point in time within the mine to allow for assessment; and*
2. *Operates during the day period only.*

Table 4.2: CHPP PLANT ITEMS INCLUDED IN MODELS (all stages)

Description	Quantity
Coal Processing Plant (CPP)	1
Stockpile/ROM dozers	3
Locomotives on rail loop (idle)	3
ROM bin	1
Reject bin	1
ROM crusher	1
Sizing station	1
Stacker	2
Surge bin	1
Rail load out bin	1
Conveyors	8
Conveyor drives [1]	7

Notes:

1. *Conveyor drives located in close proximity to major noise sources such as crushing plant omitted, as contribution insignificant.*

4.2.3 Plant Sound Power

All acoustically significant noise sources on site are included in the models. Global Acoustics undertakes regular sound power testing of mining equipment at Mangoola Coal Mine. Sound powers used in modelling, provided in Table 4.3, are, where possible based on measured in-service levels of plant operating at Mangoola Coal Mine. Exceptions are:

- sound power for locomotives was sourced from data measured by Global Acoustics at another site in the Hunter Valley (however reflect those used by Mangoola); and
- sound power for the mobile crusher and loader were sourced from the Mangoola Coal Modification 6 Noise and Vibration Assessment (EMM, 2013).

Mining equipment and associated sound power levels presented in Table 4.3 are representative of a typical mining fleet to be used for the MCCO Project for the purposes of noise impact modelling. These sound powers represent current or anticipated fleet average levels. It is normal for equipment within an equipment category to vary, with some equipment having sound power either higher or lower than the fleet average. Mangoola will review available mining equipment and technology, as required, throughout the life of the MCCO Project and may update or replace the mining equipment from time to time, whilst managing noise impacts to within relevant noise impact assessment criteria.

Dozers operating in exposed locations, such as overburden emplacement areas, will be restricted to 1st gear during periods of adverse meteorological conditions; however, this restriction would not be required during all weather conditions, and this management control will be implemented as required to assist with managing noise impacts within relevant noise impact assessment criteria.

Haul truck sound powers were incorporated into haul route strings created for the length of each route.

This method distributes the acoustic energy of vehicles along the length of each route. Routes comprise a string of segments of fixed length, each segment having a sound power determined by the following:

- sound power for type of trucks on route. Trucks travelling down ramps greater than 5% grade were allocated a sound power reduced by 2 dB;
- number of each truck type on route in a 15-minute period, based on loading unit load capacity;
- speed of loaded truck on segment grade toward dump/ROM; and
- speed of empty truck on segment grade from dump/ROM.

Truck speeds are relative to grade in direction of travel and were allocated in accordance with truck speed data collected from mine sites in the Hunter Valley. Speed determines the duration required to traverse each segment, an important variable when calculating L_{Aeq} for a specific time period. Graders and water carts were allocated sound powers in a similar manner. Haul truck and watercart sound powers shown in Table 4.3 are uphill loaded, full power levels.

Train sound powers were incorporated by creating strings of points representing the section of track the train would traverse in a 15-minute period. The sound power of each string point was determined using the speed of the train at each point.

Table 4.3: SOUND POWER DATA

	Representative Sound Power, $L_{eq,15minute}$	
Equipment Category	**Linear (dB)**	**A-weighted (dB(A))**
600t excavator	123	117
400t excavator	122	117
250t excavator	122	117
230t rear dump truck	122	116
185t rear dump truck	123	116
Front end loader	122	117
Tracked dozer, CATD10 or equivalent	122	115
Tracked dozer, CATD11 or equivalent	124	117
Rubber tyre dozer	117	110
Water truck	123	116
Grader, CAT16M or equivalent	112	106
Grader, CAT24M or equivalent	116	109
Blast hole drill	117	112
Scraper	124	116
Mobile crusher and loader	128	113
Coal Processing Plant (CPP)	133	117
Stockpile dozers	124	117
Locomotives on rail loop (idle)	121	105

ROM bin	118	110
Reject bin	112	98
ROM crusher	120	109
Sizing station	128	119
Stacker	112	106
Surge bin	117	105
Rail load out bin	113	110
Conveyor CV102 drive A	108	104
Conveyor CV102 drive B	108	104
Conveyor CV701 drive	107	104
Conveyor CV801 drive	108	104
Conveyor CV803 drive	108	104
Conveyor CV901 drive A	106	102
Conveyor CV901 drive B	106	102
Conveyor CV101 per metre	96	75
Conveyor CV102 per metre	96	76
Conveyor CV103 per metre	89	73
Conveyor CV1101 per metre	102	71
Conveyor CV2101 per metre	100	71
Conveyor CV701 per metre	96	77
Conveyor CV801 per metre	93	83
Conveyor CV803 per metre	93	83
Conveyor CV901 per metre [2]	70-79	60-75

Notes:

1. *Table shows representative typical sound powers to allow for assessment; and*
2. *CV901 has fully enclosed and partially enclosed sections, which have different sound power.*

4.2.4 Feasible and Reasonable Noise Controls

Section 3.4 and Fact Sheet F of the NPfI provide guidance on feasible and reasonable noise mitigation controls.

'Feasible' and 'reasonable' mitigation is defined in the NPfI as follows.

> *A **feasible** mitigation measure is a noise mitigation measure that can be engineered and is practical to build and/or implement, given project constraints such as safety, maintenance and reliability requirements. It may also include options such as amending operational practices (for example, changing a noisy operation to a less-sensitive period or location) to achieve noise reduction.*
>
> *Selecting **reasonable** measures from those that are feasible involves judging whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the mitigation measure.*

The following factors should be considered in deciding whether an option is reasonable:

1. Noise impacts;
2. Noise mitigation benefits;
3. Cost effectiveness of noise mitigation; and
4. Community views.

Further details are included in Fact Sheet F of the NPfI.

Table 4.4 lists possible mitigation options, whether these are feasible and/or reasonable, and provides justification as to why each option was adopted or disregarded. Controls implemented in this NIA are a mix of controls already included in the existing NMP, and others developed during the modelling assessment.

It is Global Acoustics opinion that all feasible and reasonable noise controls have been investigated and, where applicable, included in the assessment. Mangoola's commitments regarding noise control and management are included in Section 6.1 of this NIA.

Table 4.4: FEASIBLE AND REASONABLE NOISE MITIGATION OPTIONS

Mitigation Option	Feasible Mitigation Test	Reasonable Mitigation Test	Justification for adopting or disregarding this option
Mitigation at the source			
Best Available Technology Economically Achievable (BATEA) equipment	yes	yes	Mangoola currently operates a fully attenuated fleet. BATEA sound power has been adopted in this NIA.
Best Management Practice (BMP)	yes	yes	Mangoola currently implements BMP, which is described in Section 4.1 of this NIA. BMP will continue to be applied to the MCCO Project, and is applied where relevant in this NIA.
Scheduling the use of noisy equipment at the least-sensitive time of day	yes	yes	Mobile crushing plant and a scraper were included in day period scenarios only.
Attenuated fixed infrastructure	yes	yes	Significant fixed infrastructure in the CHPP, including the CPP, includes cladding and low noise rollers on some conveyors. Sound power adopted for the MCCO Project reflects this.
Dozers restricted to 1st gear	yes	yes	Restricting dozers to 1st gear operation during enhancing weather conditions is feasible and reasonable. This control was applied to the modelling assessment.
Drill prep dozers not to operate in adverse weather	yes	yes	Shutting down or relocating tracked dozers during enhancing weather conditions is feasible and reasonable. This control was applied to the modelling assessment.
Mitigation in the transmission path to the receptor			
Roadside bunds	yes	Constructing road side bunds on long term haul roads is reasonable. The cost of constructing bunds on short term haul roads is prohibitive.	An 8 metre high roadside bund is to be constructed where practical on the exposed side of the haul road on the southern side of Wybong Road connecting the MCCO Additional Project Area to the Approved Project Area. Other roads are designed to maximise shielding from natural topography and within the mining areas.
Low level dumps	yes	yes	Emplacement areas at varying elevations were

Mitigation Option	Feasible Mitigation Test	Reasonable Mitigation Test	Justification for adopting or disregarding this option
			considered to evaluate benefit of dumping of overburden in more shielded locations.
Fixed infrastructure located in protected area	yes	yes	CHPP fixed infrastructure is located in a suitably protected area with a buffer distance of approximately 4,600 metres to the nearest receptor. No additional fixed noise source infrastructure is required for the MCCO Project.
Mobile crusher in shielded areas	yes	yes	The mobile crusher was assessed in shielded areas of the mining area that provide a good level of shielding in the direction of the nearest receptors.
Barrier wall on rail spur	yes	yes	A 3.5m high barrier wall is installed to sections on the south/southeast side of the rail spur. Some sections are in cuttings.
Overpass barrier wall	yes	no	Modelling assessment of an 8 metre high barrier wall on the western side of the Big Flat Creek/Wybong Road overpass indicated minimal noise benefit would result (site total reductions of less than 0.3 dB). This option is not considered reasonable due to the lack of benefit compared to construction cost.
Mitigation at the receptor			
Mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity	yes	yes	This level of mitigation is feasible and reasonable for receptors predicted to have 'marginal' residual noise impact in accordance with NPfI definitions.
Upgrading façade elements, such as windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels	yes	yes	This level of mitigation is feasible and reasonable for receptors predicted to have 'moderate' and 'significant' residual noise impact in accordance with NPfI definitions.
Voluntary acquisition	yes	yes	Voluntary acquisition rights is feasible and reasonable for receptors predicted to have 'significant' residual noise impact in accordance with NPfI definitions.

4.3 Operational Noise Assessment

4.3.1 Operational A-weighted Predictions

57 private residential receptors have 90th percentile predictions exceeding PNTL. Receptor 164, which has an existing negotiated agreement in place that covers the existing operations along with the proposed MCCO Project, is omitted from these results.

Table 4.5 presents neutral atmospheric conditions and worst-case season 90th percentile operational noise predictions for the four modelled stages. The maximum result for the four stages is also provided for each time period. Results are presented for all receptors (57) with a prediction that exceeds PNTL in any time period. Values in bold type exceed PNTL. Grey highlight indicates the maximum envelope prediction exceeds PNTL by more than 5 dB. Results are presented in the format:

Neutral atmosphere prediction/90th percentile prediction.

Neutral atmosphere predictions for all receptors are less than $L_{Aeq,15minute}$ 30 dB, indicating that during periods with no atmospheric enhancement, noise impact should be minimal, and in many cases the MCCO Project Area would be inaudible.

A complete set of 90th percentile predictions for all receptors is presented in Appendix A, Table A.1.

Maximum envelope model predictions for Wybong Hall and the Anglican Church are $L_{Aeq,15minute}$ 42 and 38 dB respectively. In both cases, predictions are less than the PNTL for these receptors, which is $L_{Aeq,15minute}$ 48 dB (refer to Section 3.4.5 of this NIA).

Figure 17 illustrates indicative maximum envelope $L_{Aeq,15minute}$ noise contours. These contours represent the maximum envelope predicted for all stages, and all time periods. A complete set of noise contour figures for each individual stage is presented in Appendix C.

Table 4.5: OPERATIONAL NOISE PREDICTIONS – $L_{Aeq,15minute}$ dB

Receptor ID	PNTL			Year 1			Year 3			Year 5			Year 8			Maximum Envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
66	40	35	35	24/40	24/**40**	24/**44**	25/**41**	25/**41**	25/**44**	23/38	23/**37**	23/**39**	23/38	23/**40**	23/**43**	25/**41**	25/**41**	25/**44**
83	40	35	35	27/39	26/**39**	26/**43**	26/39	26/**38**	26/**41**	23/38	23/35	23/**40**	19/35	19/35	19/**37**	27/39	26/**39**	26/**43**
130	40	35	35	24/40	24/**40**	24/**41**	24/**41**	24/**41**	24/**42**	25/38	25/**38**	25/**40**	21/36	21/35	21/**38**	25/**41**	25/**41**	25/**42**
148	40	35	35	25/40	24/**40**	24/**42**	25/40	25/**40**	25/**42**	25/40	25/**40**	25/**42**	22/36	22/**36**	22/**39**	25/40	25/**40**	25/**42**
139	40	35	35	27/35	27/**36**	27/**39**	28/37	28/**37**	28/**40**	29/37	29/**37**	29/**40**	26/37	26/**37**	26/**42**	29/37	29/**37**	29/**42**
110	40	35	35	22/40	22/**39**	22/**41**	24/40	24/**40**	24/**41**	23/38	23/**38**	23/**41**	21/35	21/34	21/**37**	24/40	24/**40**	24/**41**
205	40	35	35	17/39	17/**39**	17/**41**	19/36	19/35	19/**37**	19/37	18/**37**	18/**39**	20/35	20/**37**	20/**41**	20/39	20/**39**	20/**41**
144	40	35	35	14/38	14/**38**	14/**40**	17/36	16/**38**	16/**39**	16/36	15/**38**	15/**39**	19/33	19/34	19/**37**	19/38	19/**38**	19/**40**
170	40	35	35	20/34	19/35	19/**37**	20/37	20/**38**	20/**39**	19/36	18/**36**	18/**40**	20/37	20/**37**	20/**40**	20/37	20/**38**	20/**40**
171	40	35	35	17/34	17/34	17/**39**	19/35	19/33	19/**38**	19/38	18/**37**	18/**40**	21/34	21/34	21/**38**	21/38	21/**37**	21/**40**
176	40	35	35	26/38	26/**38**	26/**40**	24/37	24/**37**	24/**39**	22/35	22/33	22/**36**	22/32	22/32	22/33	26/38	26/**38**	26/**40**
263	40	35	35	17/35	17/**36**	17/**39**	18/35	17/34	17/**37**	17/36	17/**36**	17/**38**	18/36	18/35	18/**38**	18/36	18/**36**	18/**39**
109A	40	35	35	18/38	18/**38**	18/**39**	19/38	19/**38**	19/**39**	21/38	21/**37**	21/**39**	18/35	18/35	18/**37**	21/38	21/**38**	21/**39**
109B	40	35	35	23/38	23/**38**	23/**39**	22/38	22/**38**	22/**39**	23/38	23/**37**	23/**39**	20/35	20/35	20/**37**	23/38	23/**38**	23/**39**
109C	40	35	35	23/38	23/**38**	23/**39**	22/38	22/**38**	22/**39**	23/38	23/**37**	23/**39**	20/35	20/35	20/**37**	23/38	23/**38**	23/**39**
109D	40	35	35	23/38	23/**38**	23/**39**	22/38	22/**38**	22/**39**	23/38	23/**37**	23/**39**	20/35	20/35	20/**37**	23/38	23/**38**	23/**39**
109E	40	35	35	23/38	23/**38**	23/**39**	22/38	22/**38**	22/**39**	23/38	23/**37**	23/**39**	20/35	20/35	20/**37**	23/38	23/**38**	23/**39**
109F	40	35	35	23/38	23/**38**	23/**39**	22/38	22/**38**	22/**39**	23/38	23/**37**	23/**39**	20/35	20/35	20/**37**	23/38	23/**38**	23/**39**
134A	40	35	35	22/38	22/**38**	22/**39**	23/38	23/**38**	23/**39**	22/37	22/**37**	22/**39**	20/34	20/35	20/**38**	23/38	23/**38**	23/**39**
25	40	35	35	26/35	26/33	26/**38**	26/34	26/33	26/**38**	25/34	25/32	25/**37**	25/33	25/31	25/**36**	26/35	26/33	26/**38**
128	40	35	35	17/33	17/34	17/**37**	19/35	19/**36**	19/**38**	17/35	17/35	17/**38**	20/35	20/**36**	20/**38**	20/35	20/**36**	20/**38**
154	40	35	35	24/37	24/**37**	24/**38**	24/36	23/**36**	23/**38**	23/35	23/35	23/**37**	22/34	22/34	22/35	24/37	24/**37**	24/**38**

Receptor ID	PNTL			Year 1			Year 3			Year 5			Year 8			Maximum Envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
193	40	35	35	26/36	26/**36**	26/38	26/36	26/**36**	26/**37**	26/35	26/35	26/**37**	26/35	26/35	26/**36**	26/36	26/**36**	26/**38**
261	40	35	35	16/36	16/**36**	16/**38**	17/34	17/34	17/**36**	17/35	16/34	16/**37**	16/35	16/35	16/**37**	17/36	17/**36**	17/**38**
125A	40	35	35	24/35	24/35	24/**38**	24/34	24/35	24/**37**	23/34	23/35	23/**37**	23/34	23/35	23/**37**	24/35	24/35	24/**38**
182B	40	35	35	28/36	28/**36**	28/**38**	28/35	28/**36**	28/**37**	27/35	27/35	27/**37**	27/35	27/35	27/**36**	28/36	28/**36**	28/**38**
54	40	35	35	17/36	17/34	17/**37**	16/34	16/32	16/34	14/31	14/30	14/32	13/31	13/30	13/31	17/36	17/34	17/**37**
79	40	35	35	17/36	16/33	16/**37**	16/35	16/32	16/**36**	15/33	15/32	15/34	14/32	14/31	14/32	17/36	16/33	16/**37**
114	40	35	35	17/36	17/34	17/**37**	17/35	16/32	16/35	15/33	14/31	14/33	13/31	13/30	13/32	17/36	17/34	17/**37**
141	40	35	35	17/35	17/32	17/**37**	17/35	17/32	17/35	16/33	16/31	16/33	15/32	15/31	15/33	17/35	17/32	17/**37**
151	40	35	35	17/36	17/34	17/**37**	16/34	16/32	16/35	15/32	15/31	15/33	14/31	14/30	14/32	17/36	17/34	17/**37**
192	40	35	35	26/35	26/35	26/**37**	26/35	26/35	26/**36**	26/34	26/34	26/**36**	26/34	26/34	26/**36**	26/35	26/35	26/**37**
206	40	35	35	14/32	14/32	14/34	17/33	17/33	17/**36**	17/34	16/34	16/**37**	17/31	17/31	17/34	17/34	17/34	17/**37**
321	40	35	35	18/35	18/**36**	18/**37**	18/33	18/33	18/35	18/34	17/34	17/**36**	16/34	16/34	16/**36**	18/35	18/**36**	18/**37**
125C	40	35	35	26/34	26/35	26/**37**	25/34	25/35	25/**37**	25/34	25/35	25/**37**	25/34	25/35	25/**37**	26/34	26/35	26/**37**
182A	40	35	35	26/35	26/**36**	26/**37**	26/35	26/35	26/**37**	26/34	26/35	26/**36**	26/34	26/34	26/**36**	26/35	26/**36**	26/**37**
241A	40	35	35	25/34	25/35	25/**37**	25/34	25/34	25/**36**	25/33	25/34	25/**36**	25/33	25/34	25/**36**	25/34	25/35	25/**37**
241C	40	35	35	26/35	26/35	26/**37**	26/35	26/35	26/**37**	26/34	26/35	26/**36**	26/34	26/34	26/**36**	26/35	26/35	26/**37**
190	40	35	35	27/35	27/**36**	27/**37**	26/35	26/35	26/**37**	26/34	26/35	26/**36**	26/34	26/34	26/**36**	27/35	27/**36**	27/**37**
157	40	35	35	21/31	20/31	20/34	24/32	23/31	23/**37**	24/32	23/31	23/**36**	25/31	25/31	25/35	25/32	25/31	25/**37**
165	40	35	35	12/33	12/33	12/35	14/32	14/33	14/**36**	14/31	13/32	13/**36**	15/30	15/30	15/33	15/33	15/33	15/**36**
177	40	35	35	19/35	19/33	19/**36**	19/34	19/33	19/35	18/33	18/31	18/34	18/32	18/31	18/33	19/35	19/33	19/**36**
106B	40	35	35	17/36	17/34	17/**36**	17/34	17/33	17/35	16/33	16/31	16/33	15/32	15/30	15/32	17/36	17/34	17/**36**
104	40	35	35	25/35	25/35	25/**36**	25/34	25/35	25/**36**	25/34	25/34	25/35	25/33	25/34	25/35	25/35	25/35	25/**36**
166	40	35	35	17/35	17/34	17/**36**	16/33	16/32	16/34	14/31	14/30	14/32	13/30	13/29	13/31	17/35	17/34	17/**36**

Receptor ID	PNTL			Year 1			Year 3			Year 5			Year 8			Maximum Envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
178	40	35	35	21/35	21/33	21/**36**	21/34	21/32	21/34	21/32	21/31	21/33	20/32	20/31	20/32	21/35	21/33	21/**36**
251	40	35	35	20/34	20/34	20/**36**	20/34	20/34	20/35	20/33	20/33	20/35	19/32	19/33	19/34	20/34	20/34	20/**36**
253	40	35	35	17/35	17/32	17/**36**	17/34	17/31	17/34	16/32	16/31	16/33	15/31	15/30	15/32	17/35	17/32	17/**36**
260	40	35	35	15/31	15/31	15/34	17/32	17/32	17/35	16/34	16/34	16/**36**	17/29	17/29	17/32	17/34	17/34	17/**36**
112B	40	35	35	18/35	18/33	18/**36**	17/33	17/32	17/34	16/31	15/30	15/32	14/30	14/29	14/31	18/35	18/33	18/**36**
183C	40	35	35	24/34	24/35	24/**36**	24/34	24/34	24/35	24/33	24/33	24/35	24/33	24/33	24/34	24/34	24/35	24/**36**
184A	40	35	35	21/35	21/35	21/**36**	21/34	21/34	21/35	21/33	21/33	21/35	21/33	21/33	21/34	21/35	21/35	21/**36**
147	40	35	35	17/35	17/32	17/**36**	17/34	17/32	17/34	17/32	16/31	16/33	16/31	16/30	16/32	17/35	17/32	17/**36**
112A	40	35	35	18/35	18/33	18/**36**	18/33	17/32	17/34	16/31	15/30	15/32	14/30	14/29	14/31	18/35	18/33	18/**36**
112C	40	35	35	18/35	17/33	17/**36**	17/33	17/32	17/34	15/31	15/30	15/32	14/30	14/29	14/30	18/35	17/33	17/**36**
240	40	35	35	23/33	23/34	23/**36**	23/33	23/34	23/**36**	22/33	22/34	22/**36**	22/33	22/34	22/35	23/33	23/34	23/**36**
241B	40	35	35	25/33	25/34	25/**36**	25/33	25/34	25/**36**	25/33	24/34	24/**36**	24/33	24/34	24/35	25/33	25/34	25/**36**

Notes:

1. *Values in bold type exceed PNTL; and*
2. *Grey highlight indicates maximum envelope prediction exceeds PNTL by more than 5 dB.*

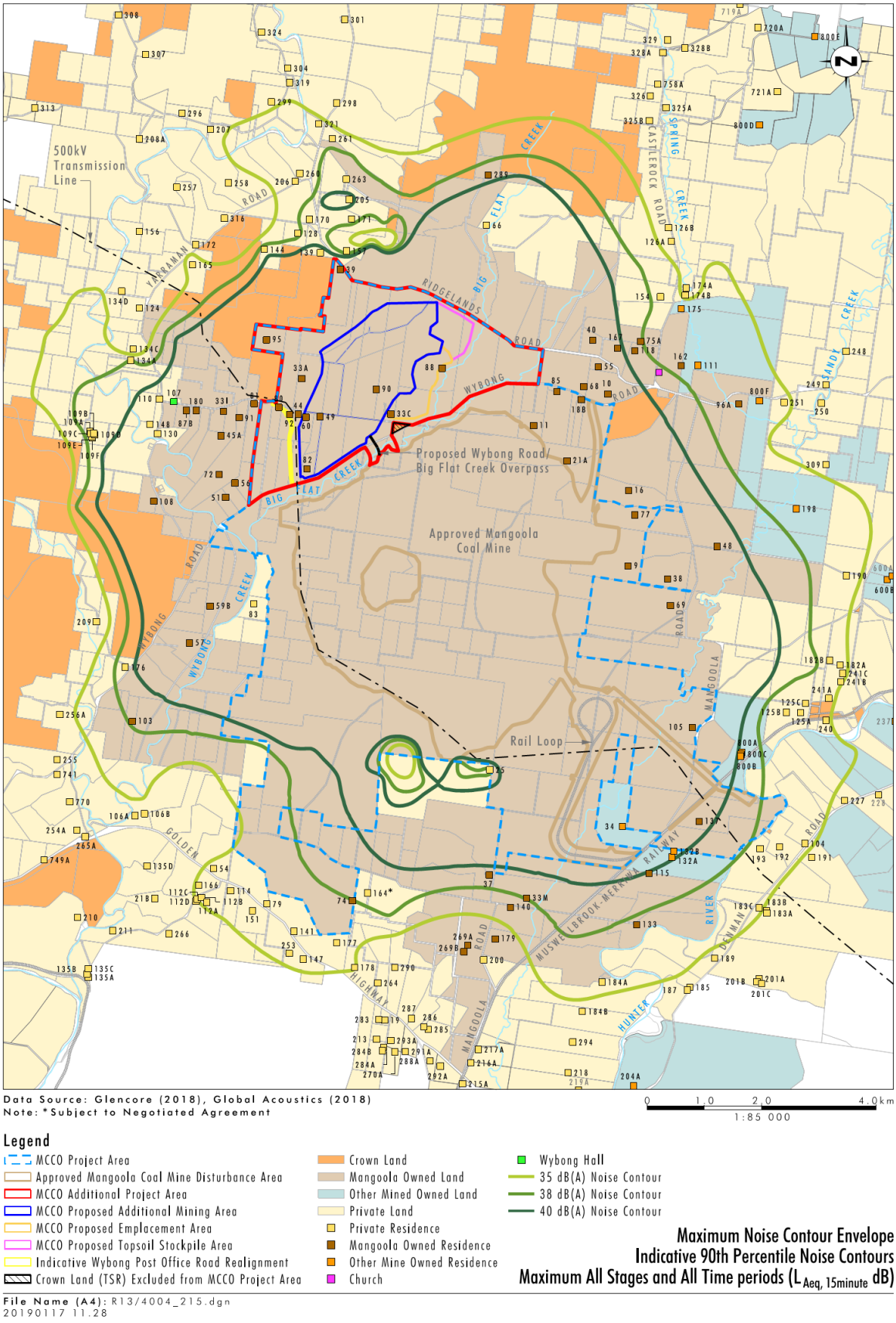

Figure 17: Indicative 90th Percentile Noise Contours – Maximum Envelope of all Stages

4.3.2 Residual Noise Impact Assessment

As discussed in Section 4.2.4 all reasonable and feasible mitigation controls are applied to the MCCO Project. Therefore, any predicted exceedances of PNTL can be considered residual noise impact.

For receptors listed in Table 4.5, residual noise impact significance levels have been determined in accordance with both Section 4 of the NPfI, and, the VLAMP (refer to Section 3.6 for more detail). Assessment outcomes are presented in Table 4.7. Each column included in Table 4.7 is explained in Table 4.6.

Table 4.6: EXPLANATION OF Table 4.7 HEADINGS

Column Heading	Explanation
Maximum Envelope Prediction	The maximum envelope 90th percentile prediction for all stages and time periods. It is governed by the night period prediction in all cases.
Maximum Exceedance of PNTL	The highest predicted exceedance of PNTL due to the maximum envelope 90th percentile prediction.
Recommended Amenity Level	The night period recommended amenity noise level for a rural area from Table 2.2 of the NPfI.
Total Cumulative Industrial Level	The total cumulative industrial noise level is the maximum envelope 90th percentile prediction, adjusted by 3 dB in accordance with the NPfI to obtain an equivalent $L_{Aeq,period}$ level. The total cumulative industrial noise level would be attributable to Mangoola Coal alone, as the most impacted receptors are located north through west of the mine, and no other industrial noise sources contribute in those areas. For receptors located east through south of Mangoola Coal, atmospheric enhancement that increases noise from Mangoola Coal would mitigate noise from other industrial sites, and vice versa. Therefore, if elevated noise levels occur at these receptors, it would be due to either Mangoola Coal, or, a different operation, but would not be due to both at the same time.
Cumulative Industrial Level > Recommended Amenity Level Test	"yes" if total cumulative industrial noise level is greater than the recommended amenity noise level, otherwise "no".
NPfI Residual Noise Significance Level	The residual noise significance level determined in accordance with Table 4.1 of the NPfI.
VLAMP Residual Noise Significance Level	The residual noise significance level determined in accordance with the VLAMP. Where the total cumulative industrial noise level is less than the recommended amenity noise level, and the 90th percentile prediction exceeds PNTL by 3 to 5 dB, the marginal category is deemed to apply, as the total cumulative industrial noise level is well below the amenity criterion in all cases.

As noted previously, the NPfI and VLAMP methods for determining residual noise significance categories differ. The VLAMP method is more conservative as it affords voluntary acquisition rights to the seven receptors with 90th percentile predictions exceeding PNTL by more than 5 dB. It is expected voluntary acquisition rights will be offered to these seven receptors in accordance with the VLAMP.

Table 4.7: RESIDUAL NOISE SIGNIFICANCE LEVEL EVALUATION

Receptor ID	Maximum Envelope Prediction $L_{Aeq,15minute}$ dB	Maximum Exceedance of PNTL dB(A)	Recommended Amenity Level $L_{Aeq,period}$ dB	Total Cumulative Industrial Level $L_{Aeq,period}$ dB	Cumulative Industrial Level > Recommended Amenity Level Test	NPfI Residual Noise Significance Level	VLAMP Residual Noise Significance Level
66	44	9	40	41	yes	Significant	Significant
83 [2]	43	8	40	40	no	Moderate	Significant
130	42	7	40	39	no	Moderate	Significant
148	42	7	40	39	no	Moderate	Significant
139	42	7	40	39	no	Moderate	Significant
110	41	6	40	38	no	Moderate	Significant
205	41	6	40	38	no	Moderate	Significant
144	40	5	40	37	no	Marginal	Marginal
170	40	5	40	37	no	Marginal	Marginal
171	40	5	40	37	no	Marginal	Marginal
176	40	5	40	37	no	Marginal	Marginal
263	39	4	40	36	no	Marginal	Marginal
109A	39	4	40	36	no	Marginal	Marginal
109B	39	4	40	36	no	Marginal	Marginal
109C	39	4	40	36	no	Marginal	Marginal
109D	39	4	40	36	no	Marginal	Marginal
109E	39	4	40	36	no	Marginal	Marginal
109F	39	4	40	36	no	Marginal	Marginal
134A	39	4	40	36	no	Marginal	Marginal
25 [2]	38	3	40	35	no	Marginal	Marginal
128	38	3	40	35	no	Marginal	Marginal

Receptor ID	Maximum Envelope Prediction $L_{Aeq,15minute}$ dB	Maximum Exceedance of PNTL dB(A)	Recommended Amenity Level $L_{Aeq,period}$ dB	Total Cumulative Industrial Level $L_{Aeq,period}$ dB	Cumulative Industrial Level > Recommended Amenity Level Test	NPfI Residual Noise Significance Level	VLAMP Residual Noise Significance Level
154	38	3	40	35	no	Marginal	Marginal
193	38	3	40	35	no	Marginal	Marginal
261	38	3	40	35	no	Marginal	Marginal
125A	38	3	40	35	no	Marginal	Marginal
182B	38	3	40	35	no	Marginal	Marginal
54	37	2	40	34	no	Negligible	Negligible
79	37	2	40	34	no	Negligible	Negligible
114	37	2	40	34	no	Negligible	Negligible
141	37	2	40	34	no	Negligible	Negligible
151	37	2	40	34	no	Negligible	Negligible
192	37	2	40	34	no	Negligible	Negligible
206	37	2	40	34	no	Negligible	Negligible
321	37	2	40	34	no	Negligible	Negligible
125C	37	2	40	34	no	Negligible	Negligible
182A	37	2	40	34	no	Negligible	Negligible
241A	37	2	40	34	no	Negligible	Negligible
241C	37	2	40	34	no	Negligible	Negligible
190	37	2	40	34	no	Negligible	Negligible
157	37	2	40	34	no	Negligible	Negligible
165	36	1	40	33	no	Negligible	Negligible
177	36	1	40	33	no	Negligible	Negligible
106B	36	1	40	33	no	Negligible	Negligible

Receptor ID	Maximum Envelope Prediction $L_{Aeq,15minute}$ dB	Maximum Exceedance of PNTL dB(A)	Recommended Amenity Level $L_{Aeq,period}$ dB	Total Cumulative Industrial Level $L_{Aeq,period}$ dB	Cumulative Industrial Level > Recommended Amenity Level Test	NPfI Residual Noise Significance Level	VLAMP Residual Noise Significance Level
104	36	1	40	33	no	Negligible	Negligible
166	36	1	40	33	no	Negligible	Negligible
178	36	1	40	33	no	Negligible	Negligible
251	36	1	40	33	no	Negligible	Negligible
253	36	1	40	33	no	Negligible	Negligible
260	36	1	40	33	no	Negligible	Negligible
112B	36	1	40	33	no	Negligible	Negligible
183C	36	1	40	33	no	Negligible	Negligible
184A	36	1	40	33	no	Negligible	Negligible
147	36	1	40	33	no	Negligible	Negligible
112A	36	1	40	33	no	Negligible	Negligible
112C	36	1	40	33	no	Negligible	Negligible
240	36	1	40	33	no	Negligible	Negligible
241B	36	1	40	33	no	Negligible	Negligible

Notes:

1. *Grey highlight indicates maximum envelope prediction exceeds PNTL by more than 5 dB; and*
2. *Receptor currently has voluntary acquisition rights under PA 06_0014. Acquisition and mitigation rights are to be retained.*

A summary of receptors allocated to each residual noise significance category, for both the NPfI and VLAMP methods, is provided in Table 4.8. Table 4.2 of the NPfI provides examples of receptor-based treatments that could be used to mitigate residual noise impact. That table is reproduced in Section 3.6.1 of this report. These treatments are generally consistent with Table 1 of the VLAMP, with the exception that the VLAMP also recommends residence mitigation where the residual impact category is significant.

Table 4.8: RESIDUAL NOISE SIGNIFICANCE LEVELS SUMMARY

Significance Category	Receptors Based on NPfI Method	Receptors Based on VLAMP Method
Significant	66	66, 83, 110, 130, 139, 148, 205
Moderate	83, 110, 130, 139, 148, 205	-
Marginal	25 [1], 128, 144, 154, 170, 171, 176, 193, 261, 263, 109A, 109B, 109C, 109D, 109E, 109F, 125A, 134A, 182B	25 [1], 128, 144, 154, 170, 171, 176, 193, 261, 263, 109A, 109B, 109C, 109D, 109E, 109F, 125A, 134A, 182B
Negligible	54, 79, 104, 114, 141, 147, 151, 157, 165, 166, 177, 178, 190, 192, 206, 240, 251, 253, 260, 321, 106B, 112A, 112B, 112C, 125C, 182A, 183C, 184A, 241A, 241B, 241C	54, 79, 104, 114, 141, 147, 151, 157, 165, 166, 177, 178, 190, 192, 206, 240, 251, 253, 260, 321, 106B, 112A, 112B, 112C, 125C, 182A, 183C, 184A, 241A, 241B, 241C

Notes:

1. *Receptor 25 is to retain acquisition and mitigation rights in accordance with PA 06_0014 despite allocation of marginal residual noise impact due to the MCCO Project.*

4.4 Land Area Assessment

4.4.1 Private Land Areas

As described in Section 3.5 an assessment of operational noise impact over contiguous privately owned landholdings (vacant or otherwise) is required in accordance with the VLAMP. Noise contours were generated over contiguous private lot areas for each of the four modelled stages. From these, the maximum envelope of predicted noise emission was determined for each time period to determine the maximum extent of noise impact over the life of the MCCO Project. Two properties (66 and 83) had portions of their contiguous land holdings with areas exceeding the night period acceptable amenity noise level plus 5 dB (Table 2.2 of the NPfI). Single point predictions at the residence on each of these properties exceed PNTL by more than 5 dB. Therefore, these properties are classified as having 'significant' residual noise impact in accordance with the VLAMP, and will likely be entitled to voluntary acquisition rights.

For each time period, the relevant noise contour corresponding to the acceptable amenity noise level from Table 2.2 of the NPfI plus 5 dB was used to calculate the percentage of area exceeding the relevant amenity noise level. Results were determined for the night period, as it has the highest model predictions and lowest amenity noise levels.

Results presented in Table 4.9 show the percentage of private land exceeding the acceptable amenity noise level plus 5 dB is less than 25 percent in both cases.

Table 4.9: PRIVATE LAND ASSESSMENT RESULTS

Owner ID	Lot	DP	Amenity Noise Level + 5 dB $L_{Aeq,period}$ dB [1]	Percentage Area Exceeding Amenity Noise Level + 5 dB
66	122	585122	45	7%
83	9	750968	45	7%
	47	750968		
	48	750968		
	504	521969		

Notes:

1. *Night period acceptable amenity noise level plus 5 dB from Table 2.2 of the NPfI.*

4.4.2 Recreation Land Areas

Maximum envelope $L_{Aeq,period}$ noise contours were generated over the three blocks of crown land that have a recreational land use (refer to Section 3.2 of this NIA for details). Maximum envelope model predictions do not exceed either the passive or active recreation area amenity noise levels on any portion of the three blocks, indicating noise amenity for recreational land use should be preserved in accordance with the intentions of the NPfI.

4.5 Construction Noise Assessment

Construction noise criteria and proposed construction hours are presented in Section 3.6 of this report. The following sections describe construction tasks required, scenarios assessed, and impact assessment outcomes.

4.5.1 Construction Activities

The following primary construction tasks are proposed for the MCCO Additional Project Area:

1. Establishment of construction access, temporary office/equipment laydown areas and relocation of transmission lines within the MCCO Additional Project Area;

2. Construction of a haul road overpass over Big Flat Creek and Wybong Road to connect the Approved Project Area to the MCCO Additional Project Area;

3. Realignment of a portion of Wybong Post Office Road to the west of the MCCO Proposed Additional Mining Area; and

4. Construction of a water management system, including construction of dams and clean water diversion drains up catchment of the MCCO Proposed Additional Mining Area.

Figure 18 illustrates the conceptual construction plan. Construction will be conducted over an approximate 12-16 month period prior to Project Year 1.

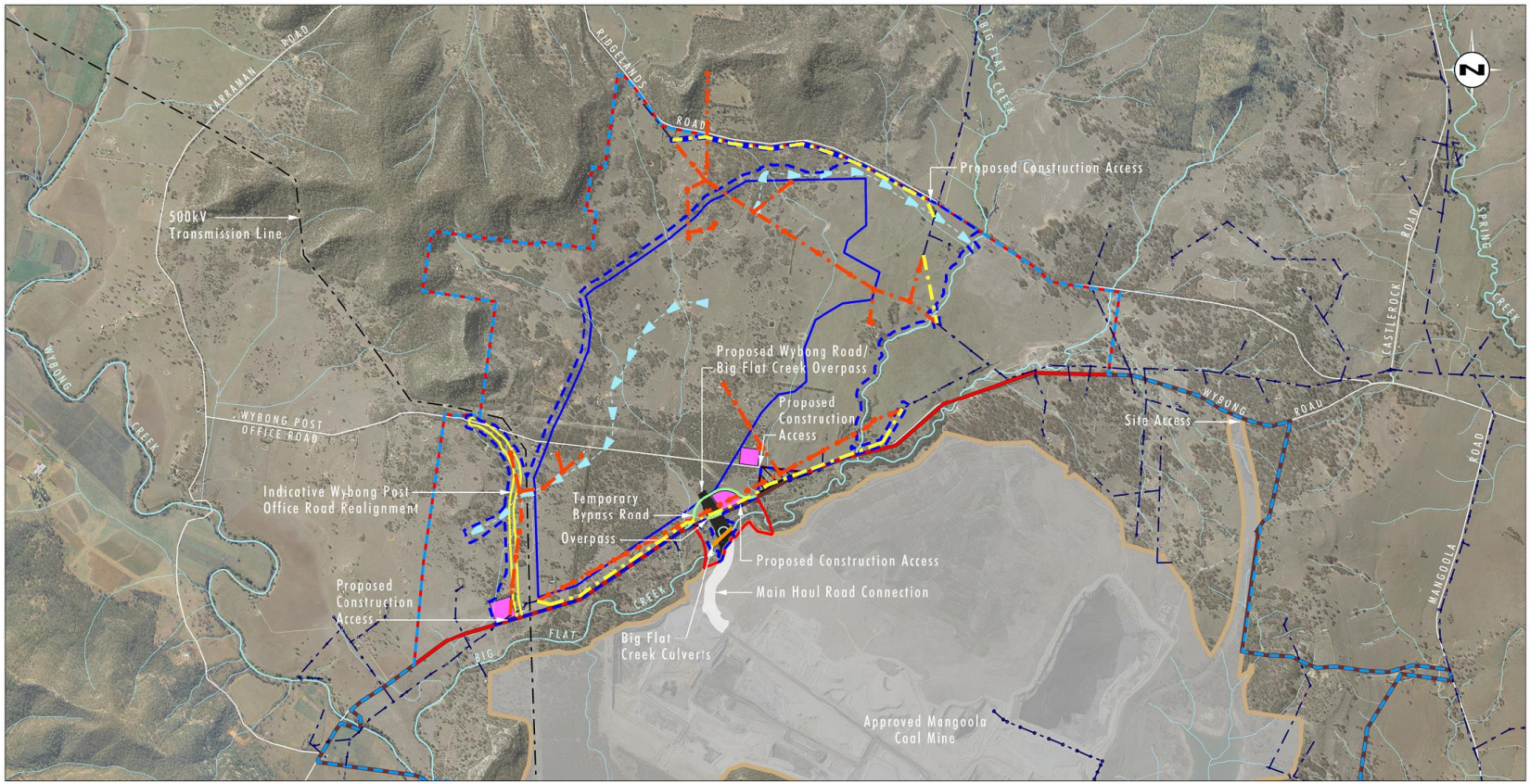

Figure 18: Conceptual Construction Plan

4.5.2 Construction Scenario

Mangoola provided an indicative construction schedule which detailed work areas, construction activities, likely personnel requirements, and, typical equipment types, operating hours and quantities for each task. From this schedule, a period of peak production activity was determined, and a construction scenario developed that represents a typical worst-case configuration of equipment and usage, both in terms of equipment quantity and geographical location.

Week 28 of the construction phase was identified as typical of a peak construction period. Figure 19 shows indicative total machine operating hours over the construction phase, peaking in Week 28. Week 18, and weeks 23 to 28 are the most intensive construction periods; machine hours outside of those week are more than 20 percent lower.

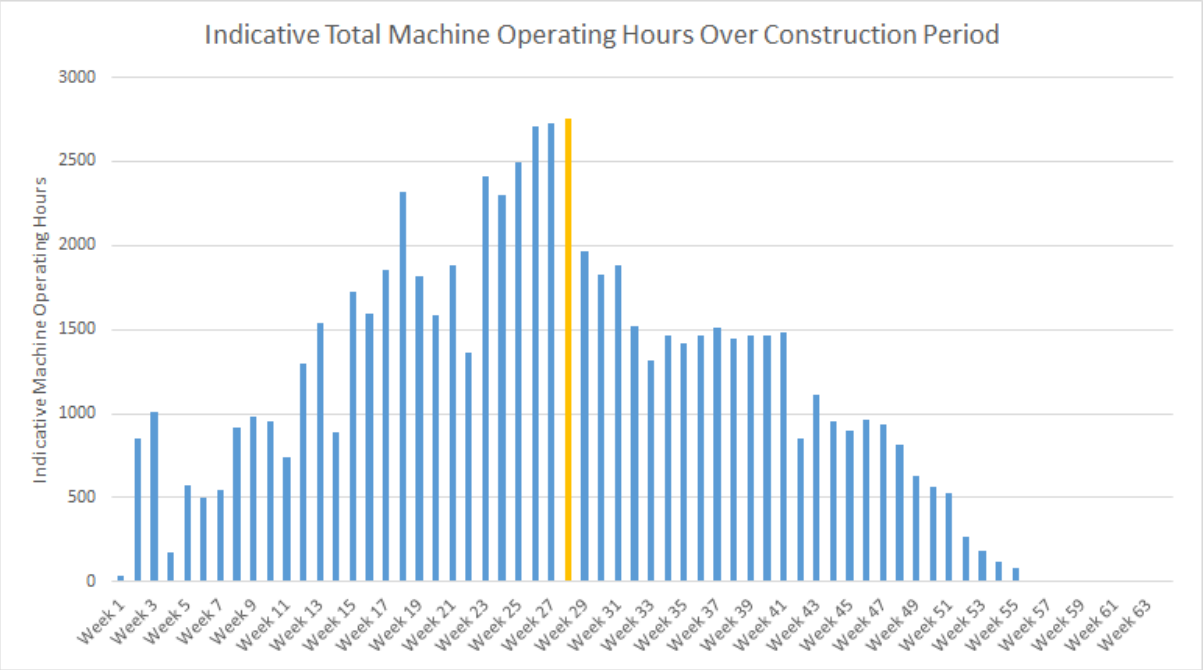

Figure 19 - Indicative Total Construction Hours

The following three primary work areas were identified for Week 28, with associated construction tasks at that stage for each area as follows:

1. Wybong Road crossing and Big Flat Creek culvert construction, including:
    a. bridge foundations formwork;
    b. bridge foundations steelwork;
    c. Big Flat Creek culvert temporary diversion drainage; and
    d. Big Flat Creek culvert foundations excavation.
2. Wybong Post Office Road realignment, including:

a. establish road sub base and base;

b. drains and culverts; and

c. Wybong Post Office Road & Wybong Road intersection.

3. Water management system construction:

a. clean water drain construction; and

b. site dams.

Table 4.10 lists the work areas and construction tasks assessed, and, equipment types, sound power, quantities and acoustic utilisation rates for each task. Note that these parameters are representative of equipment typically used for such tasks, however, alternative or additional equipment may be utilised depending on final construction design.

Table 4.10: CONSTRUCTION SCENARIO DETAILS

Task	Equipment Type	Equipment Quantity	Acoustic Usage %	Sound Power $L_{Aeq,15minute}$ dB
Wybong Road Crossing and Big Flat Creek Culvert Construction				
Bridge foundations formwork	Light vehicle (4WD)	2	70	93
Bridge foundations steelwork	Franna crane	1	70	109
BFC Culvert temporary diversion drainage	Light vehicle (4WD)	3	70	93
	D8 dozer	2	70	107
	Truck - large	4	70	114
	Truck - small	1	70	104
	Water cart	1	70	100
	Bobcat	1	70	103
	Lighting plant	2	100	99
	Excavator – 20t	1	100	104
BFC Culvert foundations excavation	Light vehicle (4WD)	2	70	93
	Truck - large	2	70	114
	Excavator – 20t	1	1.0	104
Wybong Post Office Road Realignment				
Establish sub base and base	Light vehicle (4WD)	4	70	93
	D8 dozer	2	70	107
	Truck - large	6	70	114
	Grader	1	70	108
	Water cart	2	70	100
	Bobcat	2	70	103
	Lighting plant	4	1	99

	Excavator – 20t	3	1	104
	Compactor - small	1	70	108
	Compactor - large	1	70	113
	Roller - large	1	70	110
Drains and Culverts	Light vehicle (4WD)	3	70	93
	Truck - large	2	70	114
	Grader	1	70	108
	Water cart	2	70	100
	Bobcat	2	70	103
	Excavator – 20t	1	100	104
	Excavator – 5t	2	100	101
	Compactor - small	2	70	108
WPO Rd & Wybong Rd intersection	Light vehicle (4WD)	2	70	93
	Truck - large	2	70	114
	Grader	1	70	108
	Water cart	1	70	100
	Bobcat	1	70	103
	Lighting plant	2	100	99
	Compactor - small	1	70	108
	Roller - large	1	70	110
Water Management System Construction				
Build Site Dams and Drain	Light vehicle (4WD)	8	70	93
	D8 dozer	3	70	107
	D10 dozer	2	70	116
	Truck - small	3	70	104
	Truck - large	6	70	114
	Grader	1	70	108
	Water cart	4	70	100
	Bobcat	2	70	103
	Lighting plant	4	100	99
	Excavator – 50t	2	100	108
	Excavator – 20t	2	100	104
	Excavator – 5t	2	100	101
	Compactor - small	1	70	108
	Compactor - large	1	70	113
	Roller - large	1	70	110

Equipment is modelled with acoustic energy distributed over the length of each work area as appropriate. Work that is confined to a local area such as the Wybong Road crossing and Wybong/Wybong Post Office Road intersection is modelled within each local area. As the clean water

diversion drain construction covers a relatively long operating strip, equipment is modelled in six distinct areas along the length of the drain. Results are presented as a range of predictions for each receptor, indicating the lowest and highest predictions for each of the six drain construction areas.

To account for noise that may be generated concurrently by the Approved Project Area, it is conservatively assumed that it would be operating at current project approval limits. That is, model predictions for the construction scenario were logarithmically added to the approved PA 06_0014 noise impact assessment criterion for each receptor to obtain a cumulative noise level including both operational and construction noise.

4.5.3 Construction Noise Impact Assessment

Construction noise impact assessment predictions are presented in Table 4.11. Results are provided for both non-enhancing and enhancing weather conditions, which are based on neutral atmospheric conditions and 90th percentile construction noise predictions (for the worst case season) respectively. Results are provided for any receptor with a 90th percentile construction noise prediction exceeding $L_{Aeq,15minute}$ 40 dB, which is the day period PNTL. All other receptors have construction noise predictions less than or equal to 40 dB. Rows with grey highlight indicate receptors for which the maximum envelope operational noise prediction exceeds PNTL by more than 5 dB.

Three receptors have 90th percentile construction noise predictions exceeding the standard hours 'noise affected' construction criterion, but well less than the ICNG 'highly noise affected' criterion of 75 dB. Each of these receptors has an operational noise maximum envelope prediction that exceeds PNTL by more than 5 dB, and may be afforded acquisition rights based on predicted operational noise impact (refer to Section 4.3.2 of this NIA).

Nine receptors have 90th percentile construction noise predictions exceeding the day period PNTL of $L_{Aeq,15minute}$ 40 dB, but less than the standard hours 'noise affected' construction criterion of $L_{Aeq,15minute}$ 45 dB. All of these receptors have an operational noise maximum envelope prediction that is $L_{Aeq,15minute}$ 38 dB or higher, and therefore may be entitled to voluntary mitigation rights due to operational noise (refer to Sections 4.3.2 and 5.1 of this NIA).

It should be noted that these are worst case construction noise predictions that may occur during strongly enhancing weather conditions during the peak of the construction period. During non-enhancing weather conditions, and outside the peak construction period, construction noise should be well below the 'noise affected' construction criterion at all receptor locations. For the majority of receptors, construction noise is predicted to be less than PNTL. All receptors where construction noise predictions exceed PNTL may be entitled to voluntary mitigation or acquisition rights due to operational noise. Therefore, construction noise is not predicted to increase the zone of affection of the MCCO Project relative to that predicted due to operational noise.

Construction noise predictions presented in Table 4.11 are for the typical worst case construction scenario described in Section 4.5.2 of this NIA, which would only occur during standard construction hours. As discussed in Section 3.6 of this NIA, Mangoola propose to undertake some construction tasks outside standard construction hours and are committed to managing noise such that the cumulative impact from the existing Approved Project Area and construction activities do not exceed the operational noise limits prescribed in PA 06_0014 outside standard construction hours.

Table 4.11: CONSTRUCTION NOISE ASSESSMENT PREDICTIONS – $L_{Aeq,15minute}$ dB

Receptor ID	Construction Criteria		Non-Enhancing Weather [3]		Enhancing Weather [4]	
	Standard Hours [1]	Outside Standard Hours [2]	Prediction	Exceedance	Prediction	Exceedance
66	45	37	37-41	Nil	39-47	2
148	45	37	38-38	Nil	45-47	2
130	45	37	37-38	Nil	44-46	1
110	45	37	37-37	Nil	43-45	Nil
83	45	35	36-36	Nil	42-44	Nil
134A	45	35	35-35	Nil	42-44	Nil
109A-F	45	35	35-36	Nil	41-43	Nil
170	45	35	35-35	Nil	38-43	Nil
139	45	35	35-36	Nil	37-42	Nil
261	45	35	35-35	Nil	38-42	Nil
263	45	35	35-35	Nil	37-42	Nil
205	45	35	35-35	Nil	38-41	Nil

Notes:

1. *Standard construction hours in accordance with the ICNG, described in Section 3.7 of this report;*
2. *The assumption is, outside standard construction hours, PA 06_0014 noise impact assessment criteria would still apply;*
3. *Non-enhancing weather predictions are based on neutral atmospheric conditions;*
4. *Enhancing weather predictions are based on 90th percentile results for the worst-case season; and*
5. *Grey highlight indicates operational noise maximum envelope prediction exceeds PNTL by more than 5 dB.*

4.6 Sleep Disturbance Assessment

4.6.1 Sleep Disturbance Methodology

Potential sleep disturbance impact was assessed by predicting noise levels from plant items known to generate noise levels that at times stand out above the general mining continuum. Excavator bucket noise, first pass loads into empty truck bodies, rear dump truck exhaust, and dozer track noise are recognised as sources that can generate high, short term noise levels that may cause sleep disturbance.

The following sources were modelled to assess sleep disturbance:

- Impact noise generated by excavator buckets impacting truck bodies or hard ground material, or rocks impacting the bottom of empty haul truck trays was modelled at each dig location. A linear sound power L_{max} 131 dB and A-weighted sound power of L_{Amax} 125 dB was modelled for each impact event;

- Dozer track slap was modelled at each exposed dozer operating location, typically overburden emplacement areas. A linear sound power L_{max} 127 dB and A-weighted sound power of L_{Amax} 122 dB representing dozer operation in 1st gear reverse was modelled; and

- Haul truck exhaust surges were modelled by assessing a maximum sound power event of

L_{max} 127 dB (linear) and L_{Amax} 119 dB (A-weighted) at each overburden emplacement area, and, at exposed sections along haul routes. This sound power is an addition of 5 dB to the full rated power, uphill loaded sound power spectrum in engine and exhaust frequencies (31.5 to 500 Hz).

Assessment of sleep disturbance for each model stage involved modelling each of these sources, and then combining the highest source prediction with results for the remainder of operational plant to obtain an estimate of possible short-term maximum noise emission.

4.6.2 Sleep Disturbance Results

Table 4.8 presents 90th percentile sleep disturbance results for the four modelled stages. Results are included for any receptor with a prediction greater than or equal to L_{Amax} 40 dB.

Rows highlighted grey indicate receptors with maximum envelope operational noise predictions exceeding $L_{Aeq,15minute}$ 40 dB, which is one of the maximum noise event trigger levels. Each of these may be afforded voluntary acquisition rights due to intrusive noise impact (refer to Section 4.3.2 of this NIA), therefore sleep disturbance criteria are not considered applicable.

Sleep disturbance model predictions are less than the L_{Amax} trigger level for all receptors. As such, there is no sleep disturbance impact predicted.

Table 4.12: SLEEP DISTURBANCE PREDICTIONS – L_{Amax} dB

Receptor ID	Criterion	Year 1	Year 3	Year 5	Year 8	Maximum Envelope
66	52	47	46	44	45	47
139	52	40	41	47	47	47
83	52	46	42	41	41	46
148	52	43	43	45	43	45
205	52	45	38	44	45	45
170	52	40	39	44	45	45
144	52	44	43	43	41	44
171	52	43	38	44	42	44
128	52	40	39	43	44	44
130	52	43	43	41	43	43
263	52	43	40	42	42	43
110	52	42	42	42	41	42
109D	52	40	40	42	40	42
109F	52	40	40	42	40	42
134A	52	40	40	40	42	42
176	52	41	41	37	35	41
109A	52	40	40	41	40	41
109B	52	40	40	41	40	41
109C	52	40	40	41	40	41

109E	52	40	40	41	40	41
261	52	41	39	40	40	41
25	52	39	40	38	37	40
154	52	40	39	39	37	40
321	52	40	38	39	39	40

Notes:

1. *Grey highlight indicates operational noise maximum envelope prediction exceeds $L_{Aeq,15minute}$ 40 dB.*

4.7 Low Frequency Noise Assessment

Mangoola Coal Mine has a fully attenuated mining fleet, and all major fixed plant infrastructure, including the CPP includes cladding in accordance with industry best practise. As a result of these mitigation measures, Mangoola Coal Mine does not typically attract modifying factor adjustments in the region of the CHPP, as evidenced by the analysis of real-time monitoring data below. Continued use of the existing infrastructure area is proposed, and the same mining fleet will be retained until replacement is required. Replacement mining fleet will have noise mitigation included which is consistent with or better than the current fleet. On this basis, low frequency noise emission from the MCCO Project should not increase as a result of the MCCO Additional Project Area relative to the existing operation.

4.7.1 Real-time Monitor Data Analysis

For the Approved Project Area, the CPP is the highest source of low frequency noise, with a linear sound power of 133 dB. Significant one-third octave sound power components are evident at 16, 25 and 50 Hz. The CHPP includes other screening and crushing plant, which also emits higher levels of low frequency noise than attenuated mobile equipment. Therefore, receptors located nearest the CHPP have the greatest potential to be impacted by low frequency noise.

Three months of noise monitoring data measured during the winter months of 2017 at the two real-time noise monitors located nearest the CHPP were analysed to evaluate how often low frequency noise modifying factor adjustments applied during that period for the Approved Project Area. The two monitoring locations, NC03 and NC05, are shown in Figure 8, which is sourced from the existing NMP.

Weather data and relationships between statistical noise metrics were used to filter records to remove those likely to be affected by extraneous noise sources, and those that were measured during meteorological conditions for which project approval criteria were not applicable. Measured 1/3 octave spectra were compared with NPfI low frequency thresholds to determine how often low frequency noise modifying factor adjustments would have applied during winter 2017.

The analysis focusses on the night period from 10pm to 5am, as this period has the greatest potential for noise propagation, is typically less affected by extraneous noise than the day or evening periods, and typically causes the greatest reaction from affected community. Road traffic noise often increases after 5am, so the period 5am to 7am was excluded to minimise any influence from road traffic. Results of this analysis indicate the following:

- At NC03, NPfI low frequency noise thresholds were exceeded 0.7 percent of the time; and
- At NC05, NPfI low frequency noise thresholds were exceeded 0.3 percent of the time.

It should be noted that despite the filtering process applied, measured noise levels cannot be definitively attributed to Mangoola Coal Mine. Other low frequency noise sources such as breeze on the microphone, road traffic noise and trains may be responsible for some records that were higher than NPfI low frequency noise thresholds.

NC03 is located approximately 3,300 metres from the CPP. The nearest receptors in that direction (receptors 125B and 182B) are located approximately 4,600 and 5,200 metres from the CPP respectively. Based on distance loss relationships alone, received noise levels would be at least 2 to 4 dB lower at these receptor locations than measured at NC03. Applying a conservative 2 dB reduction to measured spectra, a modifying factor applicability rate of 0.2 percent applies at the nearest receptors, conservatively assuming all exceedances of the NPfI low frequency noise threshold are attributable to Mangoola Coal Mine.

NC05 is located approximately 5,700 metres from the CPP. The nearest receptor in that direction (receptor 200) is located a similar distance from the CPP; therefore results for NC05 are considered representative of the nearest receptor in that direction.

A low frequency noise modifying adjustment applicability rate of 0.2 percent at the nearest receptors is considered insignificant. As mining progresses into the MCCO Additional Project Area, low frequency noise modifying factor adjustment applicability in the area near the CHPP should only decrease, as less mobile equipment will operate in the Approved Project Area. The CHPP is located at sufficient distance from receptors located near the MCCO Additional Project Area that low frequency noise contributions would be insignificant.

4.7.2 Noise Modelling Analysis

The Year 1 stage plan typically represents the worst case in terms of predicted noise levels for the most impacted receptors. For receptors to the south, southeast and southwest of the mine, this is due to continued mining in the Approved Project Area. For receptors to the north, northeast and northwest of the mine, this is due to mining in the MCCO Proposed Additional Mining Area occurring close to natural surface level. For all receptors, the early stages (Year 1 and Year 3) include more operational mining equipment, including five excavators and associated fleet compared to three excavators in the later stages.

To inform a prediction-based assessment of low frequency noise modifying factor adjustment applicability, the Year 1 stage plan was modelled in ENM using one-third octave sound power inputs in order to obtain one-third octave model predictions. Nine receptors with high operational noise predictions and/or those located nearest the mine in each direction were assessed. These receptors are 66, 130, 170, 171, 176, 193, 109D, 125B and 182B.

Predicted one-third octave L_{Aeq} spectra for each of the 260 modelled meteorological conditions were evaluated directly against NPfI low frequency noise thresholds. All results were below NPfI thresholds,

meaning low frequency noise modifying factor adjustment applicability is not predicted.

The receptor with the highest absolute model predictions in this NIA is receptor 66; this receptor has the greatest potential to have low frequency noise modifying factor adjustments applied due to operations within the MCCO Additional Project Area.

Figure 20 and Figure 21 show, graphically, predicted L_{Aeq} spectra and NPfI thresholds for receptor 66 for noise enhancing weather conditions consisting of source to receiver wind at 3 m/s, and, strong temperature inversion conditions of 4 degrees C per 100m with calm wind, respectively. Figure 22 and Figure 23 show results for the same weather conditions for receptor 182B, which is representative of the potentially most affected receptors in the vicinity of the CHPP due to proximity and relatively elevated position.

In all cases, audible L_{Ceq} minus L_{Aeq} is well less than 15 dB, which is the first stage test outlined in Section 3.10.2 , and, predicted one-third octave L_{Aeq} are less than NPfI thresholds at all frequencies.

Of note, frequencies less than 80 Hz are predicted to be below the threshold of audibility.

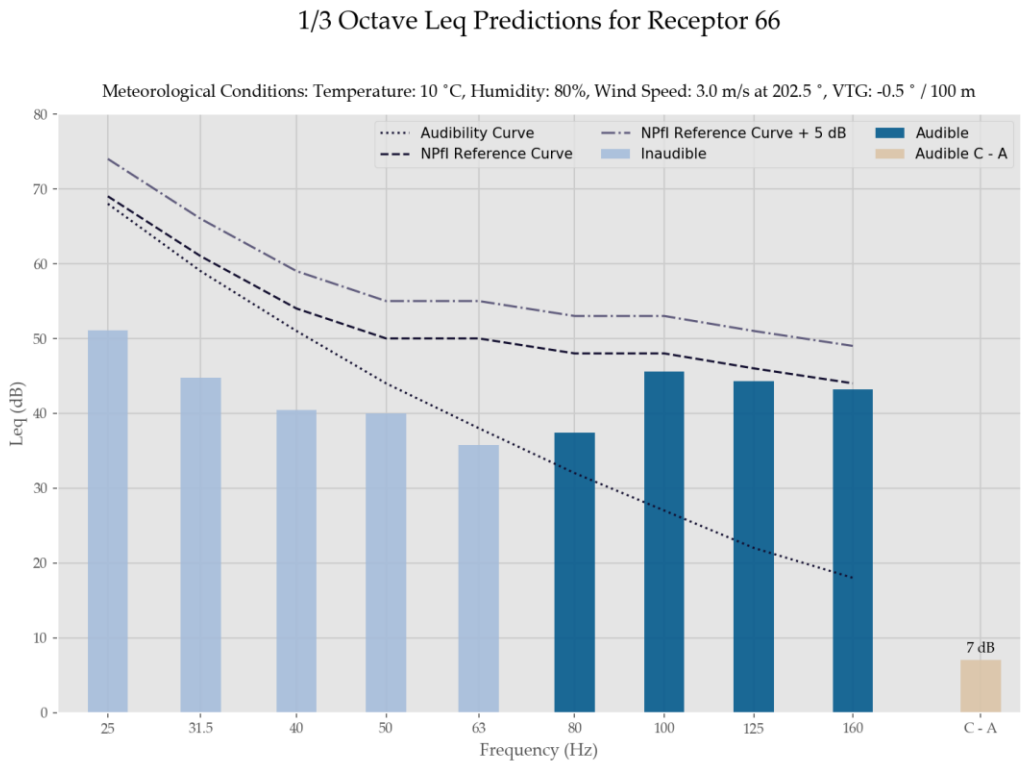

Figure 20 - Receptor 66 Low Frequency Noise Evaluation, Gradient Wind Conditions

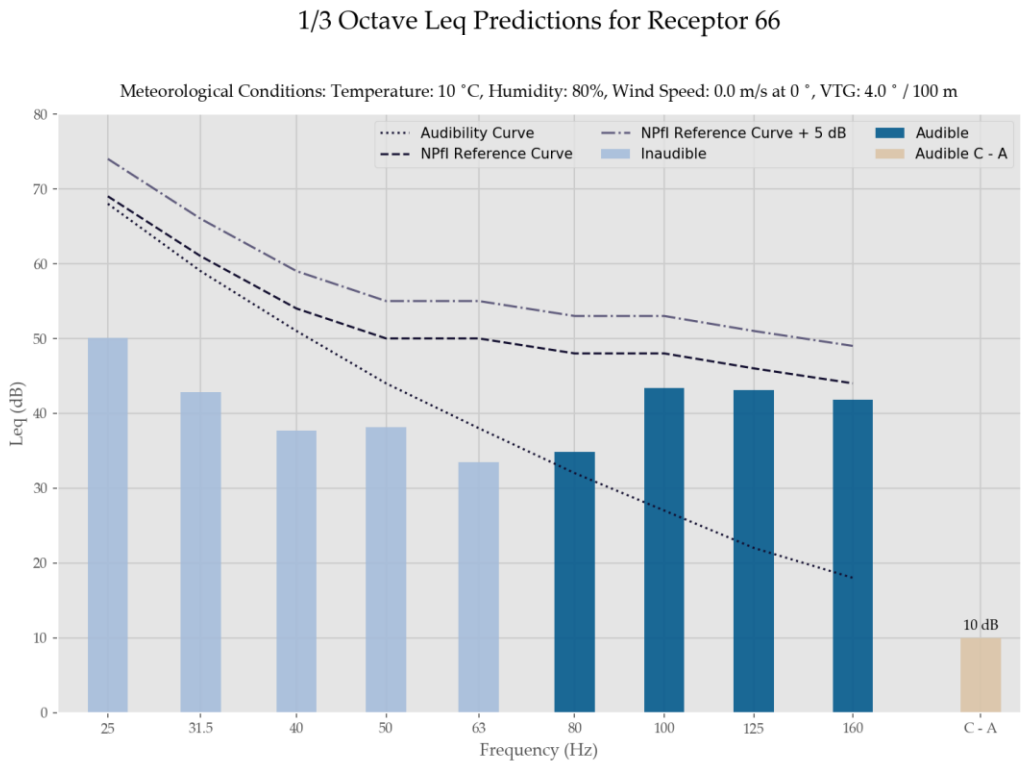

Figure 21 - Receptor 66 Low Frequency Noise Evaluation, Temperature Inversion Conditions

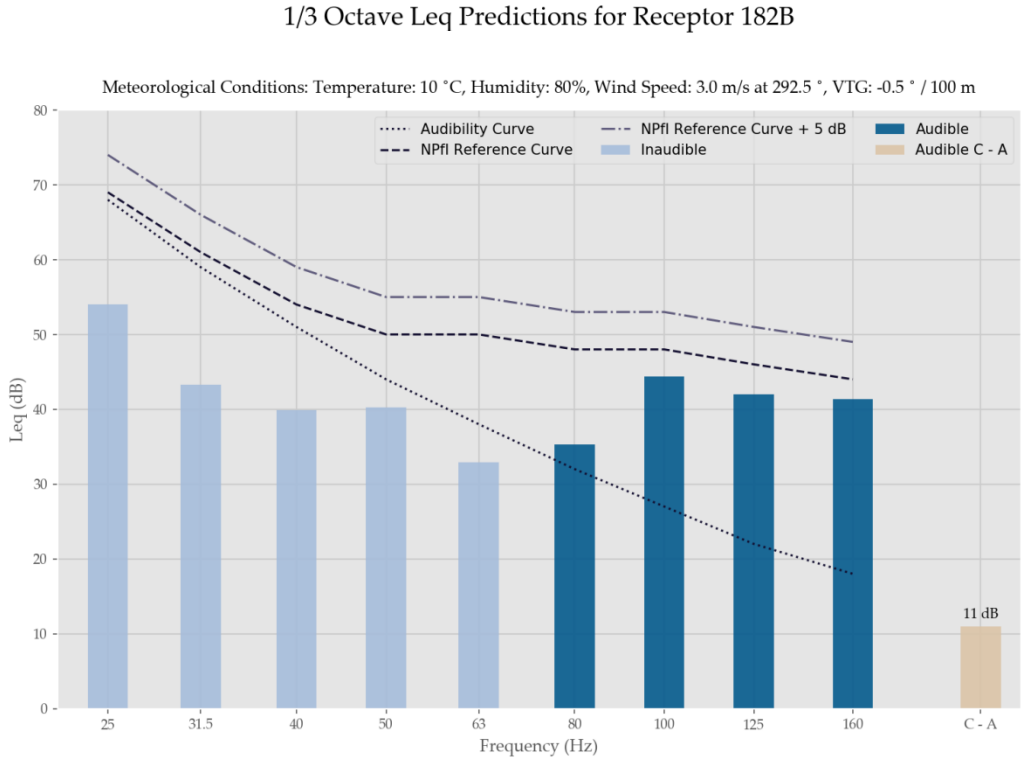

Figure 22 - Receptor 182B Low Frequency Noise Evaluation, Gradient Wind Conditions

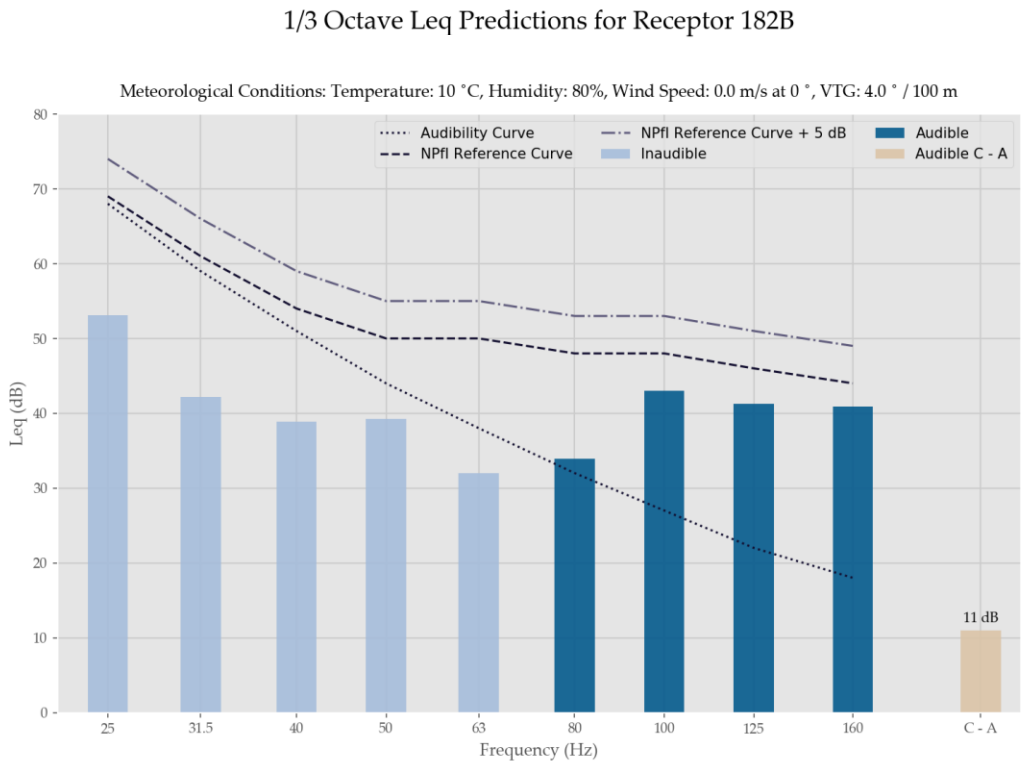

Figure 23 - Receptor 182B Low Frequency Noise Evaluation, Temperature Inversion Conditions

4.8 Cumulative Noise Assessment

Cumulative noise involving significant contributions from the Mangoola Coal Mine does not occur due to noise from other mines being mitigated by weather effects when noise is enhanced from Mangoola Coal Mine, and vice versa (refer to Section 3.1 for further detail). No further assessment of cumulative noise is required.

4.9 Road Traffic Noise Assessment

4.9.1 Traffic Impact Assessment

GHD has undertaken a traffic and transport impact assessment (TTIA) for the MCCO Project. Traffic volumes and distribution on the road network used for assessment of noise impact is based on data provided in the TTIA.

The following extracts are sourced directly from the TTIA:

> *As there is no change proposed to the currently approved maximum rate of production (13.5 Mtpa) or the existing approved operational workforce, the operational traffic volumes are not expected to change as a result of the MCCO Project. As the operational traffic volumes are not expected to change, the TTIA has only been undertaken for the construction phases of the MCCO Project.*

The MCCO Project construction workforce will peak at approximately 145 workers. The assumed heavy vehicle activity associated with the MCCO Project is expected to generate:

- *An average of approximately 31 heavy vehicle movements (inbound and outbound) per day over the course of the construction period.*
- *A peak of approximately 70 heavy vehicle movements (inbound and outbound) per day.*

This includes heavy vehicle activity associated with 28 tonne gravel trucks, primarily related to the construction of the proposed Wybong Road Overpass. The majority of gravel is proposed to be sourced "internally" from within the Mangoola Coal Mine.

It is anticipated that workers will arrive at the site in the morning peak and exit the site in the afternoon peak, while the heavy vehicle activity will occur over the course of the day. For the purpose of analysis it has been assumed that up to five heavy vehicles will be on site at any one time.

For the purposes of this assessment, the highest peak hour traffic generation for the mine under the peak construction scenario was assumed to be 169 vehicle trips in total, which would consist of the following:

- *AM peak hour:*

  –Six inbound heavy vehicle movements and six outbound heavy vehicle movements (external).
  –Six inbound heavy gravel truck movements and six outbound gravel truck movements (internal).
  –145 inbound worker movements (light vehicles).

- *PM peak hour:*

  –Six inbound heavy vehicle movements and six outbound heavy vehicle movements (external).
  –Six inbound heavy gravel truck movements and six outbound gravel truck movements (internal).
  –145 outbound worker movements (light vehicles).

  There may be opportunities for construction workers to car share, however to provide conservative assessment of the MCCO Project, a car occupancy of one person per car has been assumed for worker trips.

Table 3.2 of the TTIA provides the anticipated construction worker residential distribution, and associated traffic movements. The TTIA also states that workers residing in Denman and Merriwa would access the MCCO Project via the Golden Highway and Wybong Road (west of the Mangoola Coal Mine Access Road), while all other workers would access the MCCO Project via various road networks that access Wybong Road to the east of the Mangoola Coal Mine Access Road. Table 3.2 of the TTIA indicates Denman and Merriwa residents would generate an additional 29 light vehicle movements on Wybong Road west of the Mangoola Coal Mine Access Road.

In accordance with PA 06_0014, all heavy vehicles will access/egress the MCCO Project via Wybong

Road to the east of the Mangoola Coal Mine Access Road. Therefore, no additional heavy vehicle traffic would use Wybong Road to the west of the Mangoola Coal Mine Access Road beyond the access points to the construction zones located on Wybong Road and Wybong Post Office Road.

The expected construction trip distribution is included in Appendix B of the TTIA for two scenarios:

- a 'no-build' scenario, accounting for the background traffic growth; and
- a 'build' scenario accounting for the background traffic volumes and the construction trips associated with the MCCO Project.

Traffic volumes on each road segment were determined using intersection traffic quantities for light and heavy vehicles presented in Appendix B of the TTIA.

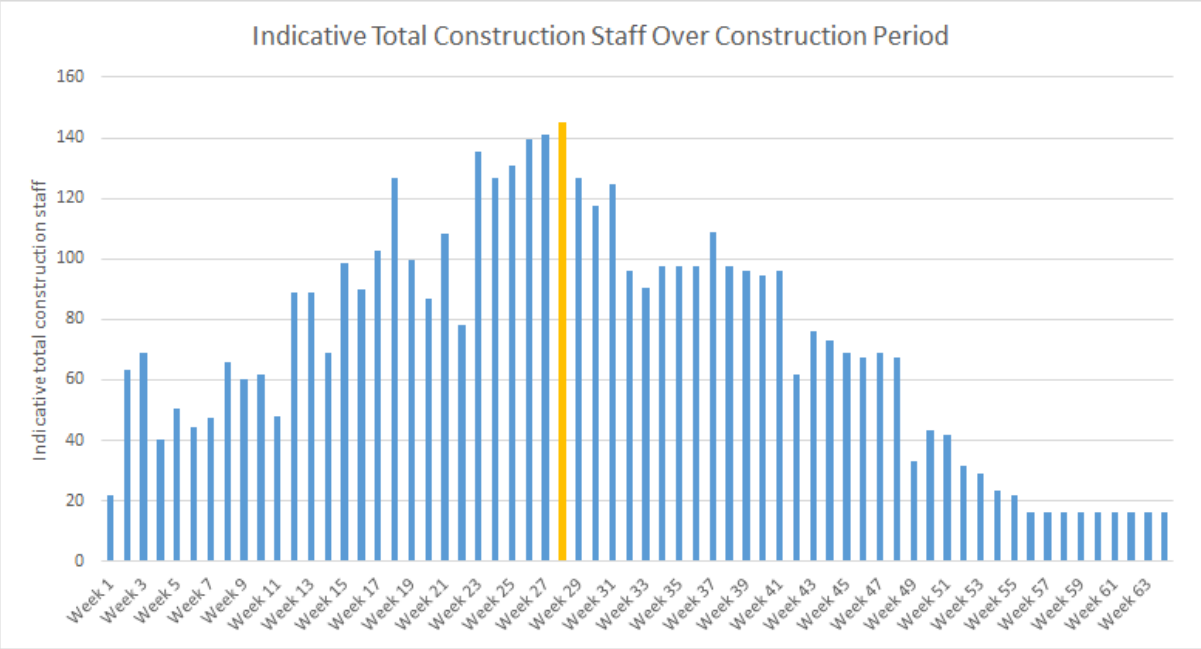

Figure 24 - Indicative Construction Staff

4.9.2 Construction Road Traffic Noise Assessment

Road traffic noise criteria are outlined in Section 3.11 of this report. Previous NIA for Mangoola Coal Mine have indicated that road traffic noise in the morning peak hour exceeds RNP criteria. Table 5.1 of the Mangoola Coal Mine Modification 7 Environmental Assessment (EMM, 2016) provides a comparison of road traffic noise model predictions from previous NIA. This is reproduced below.

Table 5.1 Summary of AM peak period road traffic noise level predictions

Assessment location	Nearest road	Distance from road (m)	$L_{Aeq(1\text{-}hour)}$ Noise levels (dB)		
			Anvill Hill Project	Modification 4	Modification 6
10#	Wybong	175	52	-	-
146#	Wybong	100	55	-	-
168#	Wybong	80	**57**	**57**	**55.7**
246^	Wybong	75	**56**	**58**	**57.6**
249	Wybong	80	**56**	**58**	**55.7**
250	Wybong	250	51	51	48.8
251	Wybong	120	53	54	**53.3**
320^	Wybong	350	-	-	46.8
96A#	Wybong	200	53	53	-
96B#	Wybong	90	**56**	**56**	**56.1**
203F#	Bengalla Link	65	55	55	-
203G#	Bengalla Link	50	**57**	**57**	-
203H#	Bengalla Link	120	5	51	-
203I#	Bengalla Link	220	49	49	-
203K#	Bengalla Link	210	49	49	-

Notes: = not assessed; # - mine owned; ^ - afforded acquisition rights by the Mount Pleasant Project, ***bold*** *= exceeds relevant criterion*

Figure 25 - Extract from Mangoola Coal Mine Modification 7 NIA (EMM, 2016)

Modification 7 was an administrative modification to amend project approval conditions relating to road traffic to better reflect land ownership and mine operations and remove an unnecessary non-compliance reporting loop. As a result, road traffic noise conditions were removed from PA 06_0014, acknowledging that road traffic noise exceeds RNP criteria, and that mitigation is already provided for the most impacted receptors by way of noise mitigation rights.

PA 06_0014 currently affords noise mitigation rights to receptors 246, 249 and 251 due to impact from road traffic noise, and states that the Proponent must implement additional noise mitigation measures such as double glazing, insulation, and/or air conditioning at any residence on the land in consultation with the landowner (if requested). The MCCO Project will not generate any additional operational traffic relative to that previously approved. Therefore, continued entitlement to noise mitigation is recommended for these three receptors, as operational road traffic noise should not change.

Other than receptors 246, 249 and 251, the nearest private receptor to Wybong Road on the section between the mine access road and Denman Road (east of the mine access road) is receptor 250, which is located approximately 230 metres from Wybong Road.

On the section between the mine access road and the Golden Highway (west of the mine access road), the nearest private receptor is 176, which is located approximately 70 metres from Wybong Road. As discussed in Section 4.9.1 of this NIA, an additional 29 light vehicle are expected to use Wybong Road west of the Mangoola Coal Mine Access Road. It is anticipated that no heavy vehicles will operate beyond the access points to the construction zones located on Wybong Road and Wybong Post Office Road. The assessment of the predicted increase to road traffic noise in the vicinity of receptor 176 is based on an additional 29 light vehicle movements in each of the AM and PM peak hour periods.

Table 4.13 presents $L_{Aeq,1hour}$ AM and PM peak hour road traffic predictions for both the 'no build' and

'build' scenarios. These were calculated using the US Federal Highways algorithm (FWHA). As noted in the RNP, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person. All predicted increases are 2 dB or less (relative increase values are rounded up in all cases), except for the PM peak for receptor 250. However, the actual prediction is 5 dB less than the day period criterion of $L_{Aeq,1hour}$ 55 dB, so relative increase becomes irrelevant.

It is noted that this is a conservative assessment, and construction generated traffic at the peak flows considered would only be temporary. Construction road traffic noise impact is considered minor, and implementation of noise mitigation would not be reasonable or necessary.

Table 4.13 CONSTRUCTION ROAD TRAFFIC NOISE ASSESSMENT

Vehicle Type	'No build' Traffic Flows[1] vph		'Build' Traffic Flows[1] vph		Increase	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Wybong Road – Mine Access Road to Denman Road (east of mine access road), Receptor 250						
Light	202	126	318	242	116	116
Heavy	19	7	31	25	12	18
Total	221	133	349	267	128	134
$L_{Aeq,1hour}$ **dB**	**49**	**46**	**51**	**50**	**2**	**4**
Wybong Road – Mine Access Road to Golden Highway (west of mine access road), Receptor 176						
Light	74	82	103	111	29	29
Heavy	2	7	2	7	0	0
Total	76	89	101	114	29	29
$L_{Aeq,1hour}$ **dB**	**51**	**53**	**52**	**54**	**1**	**1**

Note: 1. *Peak hourly traffic flows from RTI;*

2. *"vph" denotes vehicles per hour; and*

3. *'Build' construction traffic volumes are 'no build' volumes combined with projected construction generated volumes.*

5 PROPOSED NOISE CRITERIA

Based on outcomes presented in this NIA, recommended noise criteria are outlined in the following sections.

5.1 Operational Noise Criteria

Properties that may be afforded voluntary mitigation and acquisition rights due to intrusive noise impact are listed in Table 5.1. In accordance with the VLAMP, properties afforded voluntary acquisition rights are also entitled to voluntary mitigation to a degree consistent with moderate residual noise impact (refer to Section 3.5 of this NIA for further detail).

Table 5.1: RECEPTORS RECOMMENDED FOR MITIGATION RIGHTS

Mitigation	Property Number
Mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity	128, 144, 154, 170, 171, 176, 193, 261, 263, 109A, 109B, 109C, 109D, 109E, 109F, 125A, 134A, 182B 164^, 177^, 251^, 174A^, 174B^, 157#
As above, but also upgraded façade elements like windows, doors or roof insulation	25*, 66, 83 ~, 110, 130, 139, 148, 205
Voluntary acquisition	25*, 66, 83~, 110, 130, 139, 148, 205

Note: 1. ^ *indicates receptor is not entitled to voluntary mitigation due to the MCCO Project. However, Mangoola will continue to afford mitigation rights in accordance with PA 06_0014;*

2. * *indicates receptor is not entitled to voluntary acquisition due to the MCCO Project. However, Mangoola will continue to afford acquisition rights in accordance with PA 06_0014;*
3. # *indicates receptor is not entitled to voluntary mitigation due to the MCCO Project or in accordance with PA 06_0014. However, Mangoola will continue to afford mitigation rights as currently installed; and*
4. ~ *indicates receptor is currently entitled to voluntary acquisition in accordance with PA 06_0014, so is not additional due to the MCCO Project.*

Table 5.2 lists recommended noise impact assessment criteria.

Table 5.2: RECOMMENDED NOISE IMPACT ASSESSMENT CRITERIA, dB

Day	Evening	Night		
$L_{Aeq,15minute}$	$L_{Aeq,15minute}$	$L_{Aeq,15minute}$	L_{Amax}	Property Number
40	40	40	52	144, 170, 171, 176
40	39	39	52	263, 109A, 109B, 109C, 109D, 109E, 109F, 134A
40	38	38	52	25, 128, 154, 193, 261, 125A, 182B
40	37	37	52	54, 79, 114, 141, 151, 190, 192, 206, 321, 125C, 182A, 241A, 241C
40	36	36	52	104, 147, 157, 165, 166, 177, 178, 240, 251, 253, 260, 106B, 112A, 112B, 112C, 183C, 184A, 241B
40	35	35	52	All other privately owned land
48	48	48	NA	Anglican Church, Castlerock Road [2]

Day	Evening	Night		
$L_{Aeq,15minute}$	$L_{Aeq,15minute}$	$L_{Aeq,15minute}$	L_{Amax}	Property Number
48	48	48	NA	Wybong Hall [1]

Note: 1. Criteria at Wybong Hall and the Anglican Church should only apply when in use.

5.2 Road Traffic Noise Criteria

As discussed in Section 4.9.2 of this NIA, road traffic noise criteria have previously been removed from PA 06_0014, acknowledging that road traffic noise exceeds RNP criteria, and that mitigation is already provided for the most impacted receptors by way of noise mitigation rights. Continued entitlement to noise mitigation is recommended for receptors 246, 249 and 251, as no change to operational road traffic noise is expected.

5.3 Construction Noise Criteria

Recommended construction noise criteria are listed in Table 5.3. Construction noise predictions presented in Section 4.5.3 of this NIA are cumulative noise levels from both construction and operational activities, assuming the Approved Project Area is operating at current project approval limits. To avoid potential difficulties with separating construction and operational noise levels during compliance monitoring at locations north of Wybong Road, it is recommended cumulative noise levels from both construction and operational activities in this area be assessed against criteria listed in Table 5.3.

Table 5.3 RECOMMENDED CONSTRUCTION NOISE CRITERIA - $L_{Aeq,15minute}$ dB

Construction hours	Noise Affected	Highly Noise Affected
Standard construction hours	45	75
Outside standard construction hours	PA 06_0014 noise impact assessment criteria [2]	NA [1]

Notes:

1. *Highly noise affected criterion not applicable outside standard construction hours; and*
2. *Outside standard construction hours, noise levels should not exceed noise impact assessment criteria listed in Table 2 of PA 06_0014.*

Standard construction hours are:

- Monday to Friday, 7.00 am to 6.00 pm;
- Saturday, 8:00 am to 1:00 pm; and
- No construction work on Sunday and public holidays.

The proponent should apply all feasible and reasonable work practices to meet the 'noise affected' level. For short duration, high noise emitting activities, for example should rock breaking be required, the 'highly noise affected' criterion should apply. In this case, the proponent should inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details. Such activities should be scheduled for the least noise sensitive time of day.

6 NOISE MANAGEMENT AND CONTROLS

6.1 Operational Controls

Noise controls and management strategies described in Section 4.2.4 were considered during the modelling assessment. Mangoola is committed to implementing the following noise mitigation controls for the MCCO Project:

- various levels will be provided for overburden emplacement to allow shielded emplacement to occur deeper in the mining area during adverse meteorological conditions;
- haul route alignments within the mining area will maximise the available topographical shielding provided by the mine design where practical;
- mobile equipment will be attenuated to sound power levels consistent with the existing fleet;
- dozers will be restricted to 1st gear operation if required during periods of meteorological enhancement;
- drill pad preparation dozers will be shut down if required during periods of meteorological enhancement;
- an 8 metre high noise bund will be constructed where practical on one side of the haul road on the southern side of Wybong Road connecting the Big Flat Creek/Wybong Road overpass to the Approved Project Area to reduce noise emission to the north and west;
- significant noise generating fixed infrastructure in the CHPP will remain acoustically treated (clad) at current coverage levels;
- mobile crushing plant and a scraper will only operate during the day period;
- mobile crushing plant will be located in shielded locations of the mining areas that provide a good level of shielding in the direction of the nearest receptors; and
- a 3.5m high barrier wall installed to sections of the rail spur will be retained.

6.2 Noise Management

The NMP will be updated to reflect project approval and licence conditions resulting from this application and will include updated management measures to ensure all commitments are implemented, and monitoring is undertaken as required to maintain compliance with approved noise limits.

A review of both real-time and attended compliance monitoring locations will be undertaken once the approval process is complete so that the monitoring network provides adequate coverage of the MCCO Project Area, and the existing NMP will be updated accordingly. The NMP will be updated in consultation with, and will be approved by, the DP&E prior to commencement of the MCCO Project.

A construction noise management plan should be developed by a suitably qualified acoustics consultant. Section 7.2.2 if the ICNG provides guidance on relevant content for construction noise management plans.

7 SUMMARY

This NIA has considered potential noise impacts associated with the MCCO Project Area, including operational noise, construction noise, modifying factor adjustments, sleep disturbance, road traffic noise and rail noise. The assessment was appropriately completed in accordance with relevant NSW guidelines and policies, including the NPfI. The NIA was peer reviewed by EMM Consulting at various stages during the course of the assessment.

7.1 Operational Noise

Four staged operational scenarios were modelled representing the progression of mining operations over the proposed life of mine, with emphasis on targeting the expected highest noise impact and maximum extraction periods. The stages nominally relate to Year 1, Year 3, Year 5 and Year 8 of the Project. All known private residential receptors that may be noise impacted by the MCCO Project Area were modelled. Wybong Hall and The Anglican Church were also assessed. Sound powers used in modelling were primarily based on measured in-service levels of plant operating at Mangoola Coal Mine. Feasible and reasonable noise controls were identified and applied to the modelling assessment.

The cumulative distribution of results method was adopted to account for the effects of noise enhancing meteorological conditions. 90th percentile predictions for the worst case season were used to represent intrusive noise impact. Modifying factor adjustments were evaluated, and found not to apply.

Fifty-seven receptors had a 90th percentile prediction that exceeded PNTL in at least one time period for at least one of the four stages. Seven of these exceeded PNTL by more than 5 dB. Residual noise impact significance levels were determined in accordance with both Section 4 of the NPfI and the VLAMP. The NPfI and VLAMP methods for determining residual noise significance categories differ. The VLAMP method is more conservative as it affords voluntary acquisition rights to the seven receptors with 90th percentile predictions exceeding PNTL by more than 5 dB. It is expected voluntary acquisition rights will be offered to these seven receptors in accordance with the VLAMP. Additionally, one receptor (25) that has acquisition rights in accordance with PA 06_0014 is not entitled to acquisition for the MCCO Project; however, Mangoola propose to retain acquisition rights for this receptor.

In addition to the receptors entitled to acquisition rights under the MCCO Project, eighteen receptors are entitled to mitigation rights based on residual noise impact significance levels (receptor 25 is excluded from this count, as acquisition rights are to be retained). Additionally, six receptors that have mitigation rights in accordance with PA 06_0014 are not entitled to mitigation for the MCCO Project; however, Mangoola propose to retain mitigation rights for these six receptors.

Based on outcomes presented in this NIA, recommended operational noise criteria are outlined in Section 5.1 of this NIA.

7.2 Construction Noise

A worst-case construction scenario that considered all relevant tasks scheduled to occur during the peak construction period was assessed in accordance with the ICNG. For the majority of receptors,

construction noise is predicted to be less than PNTL. All receptors where construction noise predictions exceed PNTL may be entitled to voluntary mitigation or acquisition rights due to operational noise. Therefore, construction noise is not predicted to increase the zone of affection of the MCCO Project relative to that predicted due to operational noise. These are worst case predictions that may occur during strongly enhancing weather conditions. During non-enhancing weather conditions, and outside the peak construction period, construction noise should be well below the 'noise affected' construction criterion at all receptor locations. Recommended construction noise criteria are outlined in Section 5.3 of this NIA.

7.3 Private Land Assessment

Private land was assessed in accordance with the VLAMP to determine whether acceptable amenity noise levels plus 5 dB would be exceeded over more than 25 percent of any property area. The percentage of private land exceeding the night period acceptable amenity noise level plus 5 dB was less than 25 percent in all cases.

7.4 Cumulative Noise

Cumulative noise involving significant contributions from the Mangoola Coal Mine does not occur due to noise from other mines being mitigated by weather effects when noise is enhanced from Mangoola Coal Mine, and vice versa (refer to Section 3.1 for further detail). Cumulative noise impact should not occur.

7.5 Sleep Disturbance

Potential sleep disturbance impact was assessed by predicting levels from plant items known to generate noise that can stand out above the general mining continuum. Shovel and excavator bucket noise, first pass loads into empty truck bodies, rear dump truck exhaust, and dozer track noise are recognised as sources that can generate high, short term noise levels that may cause sleep disturbance.

Sleep disturbance model predictions were less than the L_{Amax} trigger level for all receptors. As such, there is no sleep disturbance impact predicted.

7.6 Road Traffic Noise

The approved maximum ROM coal production rate of 13.5 Mtpa will not change, and no additional staff or traffic associated with the ongoing operation of Mangoola Coal Mine are proposed. As there is no change to operational road traffic volumes associated with the MCCO Project relative to those approved, no change in operational road traffic noise impact relative to the approved operation should occur.

Proposed construction activities will generate additional road traffic on the local road network. Construction road traffic noise impact was quantitatively assessed, for the nearest receptors to Wybong Road in each direction from the mine access point, using projected traffic volumes presented in the TTIA. All predicted increases were less than the relative increase criterion of 2 dB, except for the PM

peak for receptor 250. The corresponding noise level prediction for this receptor was less than the relevant criterion, so relative increase becomes irrelevant. Construction road traffic noise impact is not predicted.

7.7 Rail Noise

Product coal is transported from Mangoola Coal Mine via rail, with an approved capacity of up to 10 trains per day. The approved maximum ROM coal production rate of 13.5 Mtpa will not be modified; therefore, no change to the number of trains required for coal transport, or to previously predicted rail noise impact will occur. Mangoola will continue to operate in accordance with previously approved rail volumes.

Global Acoustics Pty Ltd

8 REFERENCES

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Appendix

A OPERATIONAL NOISE RESULTS

Table A.1: 90th PERCENTILE OPERATIONAL PREDICTIONS- $L_{Aeq,15minute}$ dB

	PNTL			Year 1			Year 3			Year 5			Year 8			Maximum Envelope		
Receptor ID	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night
19	40	35	35	28	25	31	28	25	31	28	25	30	26	22	29	28	25	31
21B	40	35	35	28	27	30	28	26	29	28	25	28	24	22	24	28	27	30
25	40	35	35	35	33	38	34	33	38	34	32	37	33	31	36	35	33	38
54	40	35	35	36	34	37	34	32	34	31	30	32	31	30	31	36	34	37
66	40	35	35	40	40	44	41	41	44	38	37	39	38	40	43	41	41	44
79	40	35	35	36	33	37	35	32	36	33	32	34	32	31	32	36	33	37
83	40	35	35	39	39	43	39	38	41	38	35	40	35	35	37	39	39	43
104	40	35	35	35	35	36	34	35	36	34	34	35	33	34	35	35	35	36
106A	40	35	35	30	28	31	30	28	31	30	28	31	28	26	29	30	28	31
106B	40	35	35	36	34	36	34	33	35	33	31	33	32	30	32	36	34	36
109A	40	35	35	38	38	39	38	38	39	38	37	39	35	35	37	38	38	39
109B	40	35	35	38	38	39	38	38	39	38	37	39	35	35	37	38	38	39
109C	40	35	35	38	38	39	38	38	39	38	37	39	35	35	37	38	38	39
109D	40	35	35	38	38	39	38	38	39	38	37	39	35	35	37	38	38	39
109E	40	35	35	38	38	39	38	38	39	38	37	39	35	35	37	38	38	39
109F	40	35	35	38	38	39	38	38	39	38	37	39	35	35	37	38	38	39
110	40	35	35	40	39	41	40	40	41	38	38	41	35	34	37	40	40	41
112A	40	35	35	35	33	36	33	32	34	31	30	32	30	29	31	35	33	36
112B	40	35	35	35	33	36	33	32	34	31	30	32	30	29	31	35	33	36
112C	40	35	35	35	33	36	33	32	34	31	30	32	30	29	30	35	33	36
112D	40	35	35	35	33	35	33	32	34	31	29	31	30	29	30	35	33	35
114	40	35	35	36	34	37	35	32	35	33	31	33	31	30	32	36	34	37

	PNTL			Year 1			Year 3			Year 5			Year 8			Maximum Envelope		
Receptor ID	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night
124	40	35	35	28	28	31	26	26	28	25	25	27	24	25	26	28	28	31
125A	40	35	35	35	35	38	34	35	37	34	35	37	34	35	37	35	35	38
125B	40	35	35	31	32	34	32	33	35	32	33	34	32	33	34	32	33	35
125C	40	35	35	34	35	37	34	35	37	34	35	37	34	35	37	34	35	37
126A	40	35	35	32	32	34	32	33	34	28	29	31	28	29	31	32	33	34
128	40	35	35	33	34	37	35	36	38	35	35	38	35	36	38	35	36	38
130	40	35	35	40	40	41	41	41	42	38	38	40	36	35	38	41	41	42
134A	40	35	35	38	38	39	38	38	39	37	37	39	34	35	38	38	38	39
134C	40	35	35	29	29	32	28	27	29	28	28	30	27	27	29	29	29	32
134D	40	35	35	33	33	35	32	32	34	30	30	32	29	29	31	33	33	35
135A	40	35	35	21	<20	23	21	<20	23	<20	<20	21	<20	<20	<20	21	<20	23
135D	40	35	35	32	30	33	31	30	32	31	30	32	30	29	30	32	30	33
139	40	35	35	35	36	39	37	37	40	37	37	40	37	37	42	37	37	42
141	40	35	35	35	32	37	35	32	35	33	31	33	32	31	33	35	32	37
144	40	35	35	38	38	40	36	38	39	36	38	39	33	34	37	38	38	40
147	40	35	35	35	32	36	34	32	34	32	31	33	31	30	32	35	32	36
148	40	35	35	40	40	42	40	40	42	40	40	42	36	36	39	40	40	42
151	40	35	35	36	34	37	34	32	35	32	31	33	31	30	32	36	34	37
154	40	35	35	37	37	38	36	36	38	35	35	37	34	34	35	37	37	38
156	40	35	35	33	33	35	33	33	35	33	33	35	32	32	33	33	33	35
157	40	35	35	31	31	34	32	31	37	32	31	36	31	31	35	32	31	37
165	40	35	35	33	33	35	32	33	36	31	32	36	30	30	33	33	33	36
166	40	35	35	35	34	36	33	32	34	31	30	32	30	29	31	35	34	36

	PNTL			Year 1			Year 3			Year 5			Year 8			Maximum Envelope		
Receptor ID	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night
170	40	35	35	34	35	37	37	38	39	36	36	40	37	37	40	37	38	40
171	40	35	35	34	34	39	35	33	38	38	37	40	34	34	38	38	37	40
172	40	35	35	33	33	35	32	33	35	31	32	35	29	30	32	33	33	35
174A	40	35	35	33	34	35	33	33	35	32	32	34	32	32	33	33	34	35
174B	40	35	35	34	34	35	33	33	34	32	32	34	32	32	34	34	34	35
176	40	35	35	38	38	40	37	37	39	35	33	36	32	32	33	38	38	40
177	40	35	35	35	33	36	34	33	35	33	31	34	32	31	33	35	33	36
178	40	35	35	35	33	36	34	32	34	32	31	33	32	31	32	35	33	36
182A	40	35	35	35	36	37	35	35	37	34	35	36	34	34	36	35	36	37
182B	40	35	35	36	36	38	35	36	37	35	35	37	35	35	36	36	36	38
183A	40	35	35	34	34	35	33	34	35	33	33	34	32	33	34	34	34	35
183B	40	35	35	34	34	35	34	34	35	33	33	34	32	33	34	34	34	35
183C	40	35	35	34	35	36	34	34	35	33	33	35	33	33	34	34	35	36
184A	40	35	35	35	35	36	34	34	35	33	33	35	33	33	34	35	35	36
184B	40	35	35	34	34	35	33	33	34	32	32	33	32	32	33	34	34	35
185	40	35	35	33	33	35	33	33	34	32	32	33	31	32	33	33	33	35
187	40	35	35	33	33	35	33	33	34	32	32	33	31	32	33	33	33	35
189	40	35	35	34	34	35	33	33	35	33	33	34	32	32	34	34	34	35
190	40	35	35	35	36	37	35	35	37	34	35	36	34	34	36	35	36	37
191	40	35	35	34	34	35	34	34	35	33	33	34	32	33	34	34	34	35
192	40	35	35	35	35	37	35	35	36	34	34	36	34	34	36	35	35	37
193	40	35	35	36	36	38	36	36	37	35	35	37	35	35	36	36	36	38
195	40	35	35	30	31	32	30	31	32	30	30	32	30	30	31	30	31	32

	PNTL			Year 1			Year 3			Year 5			Year 8			Maximum Envelope		
Receptor ID	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night
200	40	35	35	27	25	30	28	25	31	27	25	30	26	24	29	28	25	31
201A	40	35	35	32	32	34	32	32	33	31	31	32	31	31	32	32	32	34
201B	40	35	35	32	32	34	32	32	33	31	31	32	31	31	32	32	32	34
201C	40	35	35	32	32	33	32	32	33	31	31	32	30	30	32	32	32	33
205	40	35	35	39	39	41	36	35	37	37	37	39	35	37	41	39	39	41
206	40	35	35	32	32	34	33	33	36	34	34	37	31	31	34	34	34	37
207	40	35	35	34	34	35	32	33	34	33	34	35	33	33	35	34	34	35
208A	40	35	35	30	30	31	30	31	32	31	31	32	28	29	31	31	31	32
209	40	35	35	32	31	33	29	29	31	28	28	29	28	27	29	32	31	33
210	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
211	40	35	35	30	28	31	29	27	30	28	26	29	26	24	27	30	28	31
213	40	35	35	31	29	32	30	27	31	28	26	30	27	24	29	31	29	32
214A	40	35	35	29	28	31	29	28	30	28	28	29	28	27	29	29	28	31
215A	40	35	35	31	31	32	30	29	31	29	29	30	29	28	30	31	31	32
216A	40	35	35	32	31	33	31	30	32	30	29	31	30	29	31	32	31	33
217A	40	35	35	33	32	34	32	31	33	31	30	32	30	29	31	33	32	34
218	40	35	35	32	32	33	31	31	32	30	30	31	29	29	31	32	32	33
219A	40	35	35	31	31	32	30	30	31	29	29	30	29	29	30	31	31	32
220A	40	35	35	31	31	32	30	30	31	29	29	30	29	28	30	31	31	32
222	40	35	35	30	30	31	30	29	31	29	28	30	28	28	29	30	30	31
223A	40	35	35	30	30	31	30	29	30	28	28	29	28	28	29	30	30	31
227	40	35	35	33	34	35	33	33	34	32	32	34	31	32	33	33	34	35
228	40	35	35	33	33	34	32	32	33	31	31	33	31	31	32	33	33	34

	PNTL			Year 1			Year 3			Year 5			Year 8			Maximum Envelope		
Receptor ID	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night
230A	40	35	35	32	32	33	31	32	33	30	31	32	30	30	31	32	32	33
230B	40	35	35	31	32	33	31	31	32	30	30	31	29	30	31	31	32	33
231	40	35	35	31	31	33	30	31	32	30	30	31	29	30	31	31	31	33
238	40	35	35	29	30	32	29	30	32	29	30	31	29	29	31	29	30	32
240	40	35	35	33	34	36	33	34	36	33	34	36	33	34	35	33	34	36
241A	40	35	35	34	35	37	34	34	36	33	34	36	33	34	36	34	35	37
241B	40	35	35	33	34	36	33	34	36	33	34	36	33	34	35	33	34	36
241C	40	35	35	35	35	37	35	35	37	34	35	36	34	34	36	35	35	37
242	40	35	35	28	28	30	27	28	29	27	28	30	27	28	29	28	28	30
243	40	35	35	33	33	34	32	33	34	32	32	33	31	31	32	33	33	34
245	40	35	35	29	29	30	28	29	30	28	29	30	28	29	30	29	29	30
246	40	35	35	30	30	31	30	30	31	29	29	30	29	29	30	30	30	31
248	40	35	35	30	30	31	29	29	30	29	29	30	29	29	30	30	30	31
249	40	35	35	31	31	33	30	31	32	31	31	32	30	30	31	31	31	33
250	40	35	35	32	32	34	31	31	33	31	31	33	31	31	32	32	32	34
251	40	35	35	34	34	36	34	34	35	33	33	35	32	33	34	34	34	36
253	40	35	35	35	32	36	34	31	34	32	31	33	31	30	32	35	32	36
254	40	35	35	34	32	34	33	32	33	31	30	31	29	29	30	34	32	34
255	40	35	35	30	29	32	30	29	31	30	29	31	29	27	29	30	29	32
256A	40	35	35	34	34	35	33	32	34	31	31	32	30	29	30	34	34	35
257B	40	35	35	29	29	30	27	28	29	25	26	27	24	25	26	29	29	30
258	40	35	35	31	32	34	32	33	35	31	33	34	31	31	33	32	33	35
260	40	35	35	31	31	34	32	32	35	34	34	36	29	29	32	34	34	36

	PNTL			Year 1			Year 3			Year 5			Year 8			Maximum Envelope		
Receptor ID	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night
261	40	35	35	36	36	38	34	34	36	35	34	37	35	35	37	36	36	38
263	40	35	35	35	36	39	35	34	37	36	36	38	36	35	38	36	36	39
264	40	35	35	24	21	26	23	21	26	25	22	26	21	<20	22	25	22	26
265A	40	35	35	34	32	34	33	32	33	31	30	31	29	29	30	34	32	34
266	40	35	35	31	29	32	29	27	30	25	22	26	23	20	24	31	29	32
270A	40	35	35	31	30	32	30	29	32	29	28	30	29	27	30	31	30	32
275	40	35	35	29	29	30	28	28	29	27	28	29	27	27	28	29	29	30
283	40	35	35	29	25	31	28	25	31	28	25	30	27	23	29	29	25	31
284A	40	35	35	31	29	32	30	28	31	29	26	30	28	25	29	31	29	32
285	40	35	35	28	25	31	28	25	30	27	25	29	26	23	28	28	25	31
286	40	35	35	27	25	31	28	25	30	27	25	29	25	23	27	28	25	31
287	40	35	35	28	25	31	28	25	30	27	25	29	25	23	27	28	25	31
288A	40	35	35	28	26	31	28	26	30	28	26	30	26	24	29	28	26	31
290	40	35	35	23	21	26	23	21	26	25	21	26	20	<20	20	25	21	26
291A	40	35	35	30	29	32	30	29	32	30	29	31	29	28	30	30	29	32
292A	40	35	35	30	29	32	30	29	31	29	28	30	28	27	29	30	29	32
293A	40	35	35	31	29	32	30	28	31	29	27	30	28	26	29	31	29	32
294	40	35	35	33	33	34	32	32	33	31	31	32	31	30	32	33	33	34
295	40	35	35	28	29	30	28	29	30	28	29	30	28	28	30	28	29	30
296	40	35	35	33	33	33	32	32	33	32	32	33	32	32	33	33	33	33
298	40	35	35	28	28	30	27	27	30	27	27	30	26	25	27	28	28	30
299	40	35	35	34	34	35	33	33	35	33	33	35	33	33	35	34	34	35
301	40	35	35	25	25	27	24	24	26	24	24	26	23	23	24	25	25	27

	PNTL			Year 1			Year 3			Year 5			Year 8			Maximum Envelope		
Receptor ID	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night
303	40	35	35	28	28	30	26	26	28	26	25	27	26	26	27	28	28	30
304	40	35	35	33	33	34	32	32	35	32	32	34	32	32	34	33	33	35
307	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
308	40	35	35	26	26	27	25	26	26	24	25	26	23	24	25	26	26	27
309	40	35	35	34	34	35	33	34	35	33	33	35	33	33	34	34	34	35
313	40	35	35	27	27	27	26	26	27	25	26	27	25	25	26	27	27	27
316	40	35	35	<20	<20	20	20	20	21	<20	<20	20	21	21	22	21	21	22
319	40	35	35	33	34	35	32	32	35	33	33	34	32	32	34	33	34	35
321	40	35	35	35	36	37	33	33	35	34	34	36	34	34	36	35	36	37
324	40	35	35	21	21	23	21	21	22	21	21	22	21	21	22	21	21	23
325A	40	35	35	30	30	32	31	31	32	29	28	30	29	29	30	31	31	32
325B	40	35	35	30	31	33	31	32	33	30	29	30	29	30	31	31	32	33
326	40	35	35	29	30	32	30	31	33	29	29	30	29	29	31	30	31	33
328A	40	35	35	29	29	30	30	29	31	28	27	29	27	27	30	30	29	31
328B	40	35	35	29	29	30	30	29	31	28	27	29	27	27	30	30	29	31
329	40	35	35	28	28	30	30	29	31	27	27	29	27	27	29	30	29	31
330	40	35	35	28	28	29	27	27	28	26	26	27	26	26	27	28	28	29
331A	40	35	35	28	28	30	28	28	29	28	27	29	26	26	27	28	28	30
331B	40	35	35	28	28	29	28	28	29	27	27	28	26	26	27	28	28	29
336A	40	35	35	28	28	29	28	28	29	29	28	29	27	27	28	29	28	29
336B	40	35	35	28	28	29	28	28	29	29	28	29	28	27	29	29	28	29
337A	40	35	35	28	27	28	28	28	29	28	27	28	27	27	28	28	28	29
338	40	35	35	28	28	29	26	26	28	26	25	27	26	26	27	28	28	29

	PNTL			Year 1			Year 3			Year 5			Year 8			Maximum Envelope		
Receptor ID	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night	Day	Eve.	Night
710	40	35	35	29	29	30	29	29	30	28	28	29	26	27	28	29	29	30
717	40	35	35	29	29	30	29	29	30	29	29	30	27	28	29	29	29	30
718	40	35	35	29	30	31	29	30	31	29	29	31	28	29	30	29	30	31
719A	40	35	35	25	26	27	27	27	28	25	25	26	25	25	26	27	27	28
720A	40	35	35	25	25	27	26	26	28	26	25	26	25	26	27	26	26	28
721A	40	35	35	28	28	29	28	28	29	26	26	27	26	26	27	28	28	29
732A	40	35	35	30	30	31	29	30	31	28	29	30	28	28	30	30	30	31
732B	40	35	35	30	30	31	29	30	31	28	29	30	28	28	30	30	30	31
741	40	35	35	30	29	32	29	28	30	29	28	30	29	27	29	30	29	32
749A	40	35	35	32	31	33	31	30	32	29	28	30	28	27	28	32	31	33
758A	40	35	35	29	30	31	31	31	32	29	28	30	29	29	30	31	31	32
760A	40	35	35	27	27	28	25	25	27	25	25	27	24	24	27	27	27	28
770	40	35	35	33	32	34	32	31	32	30	28	30	29	28	29	33	32	34
771	40	35	35	29	29	30	30	30	31	29	29	30	28	28	30	30	30	31

APPENDIX

B MODELLED SOURCE LOCATIONS

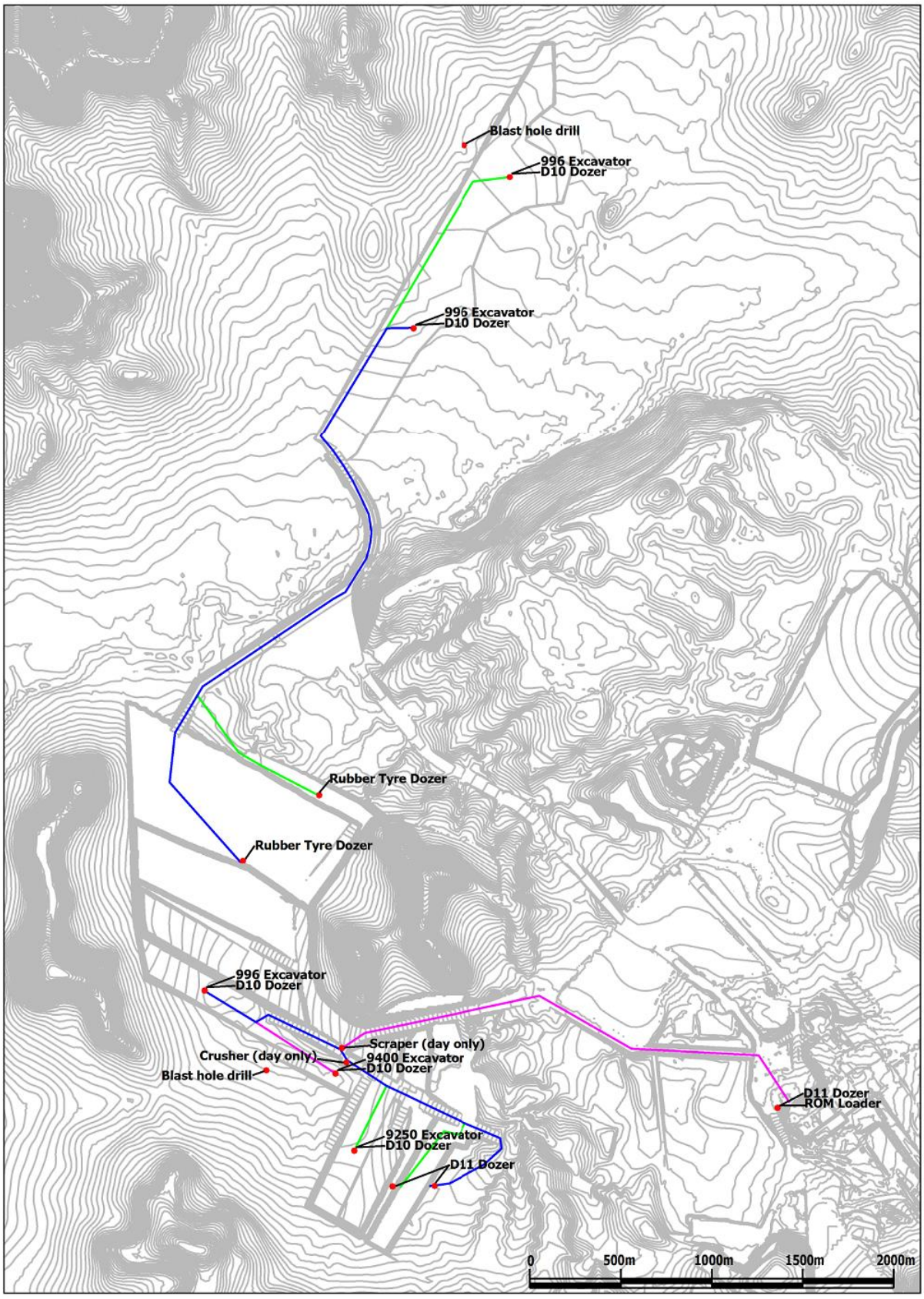


Figure B-1 Modelled Source Locations - Year 1

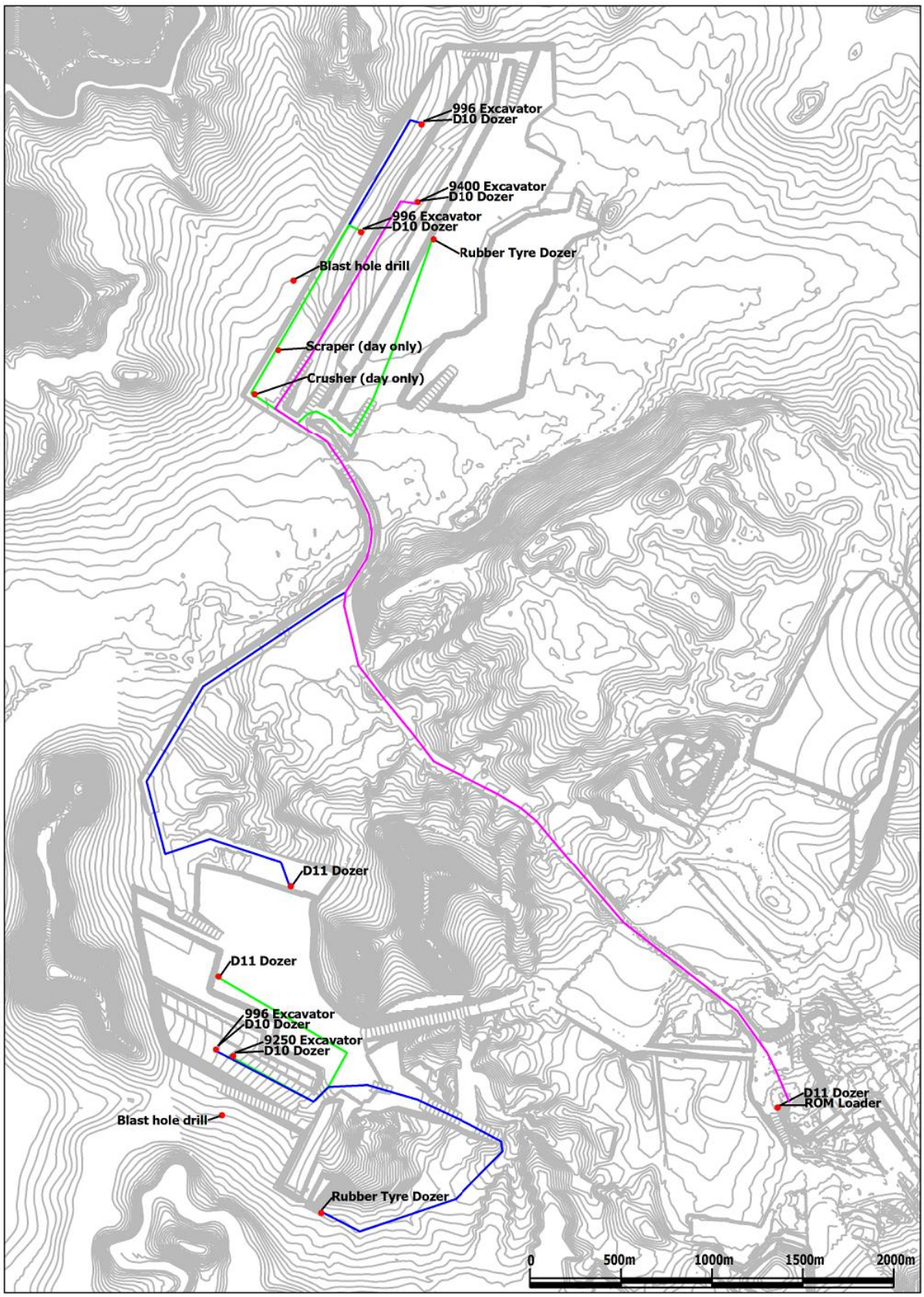


Figure B-2 Modelled Source Locations – Year 3

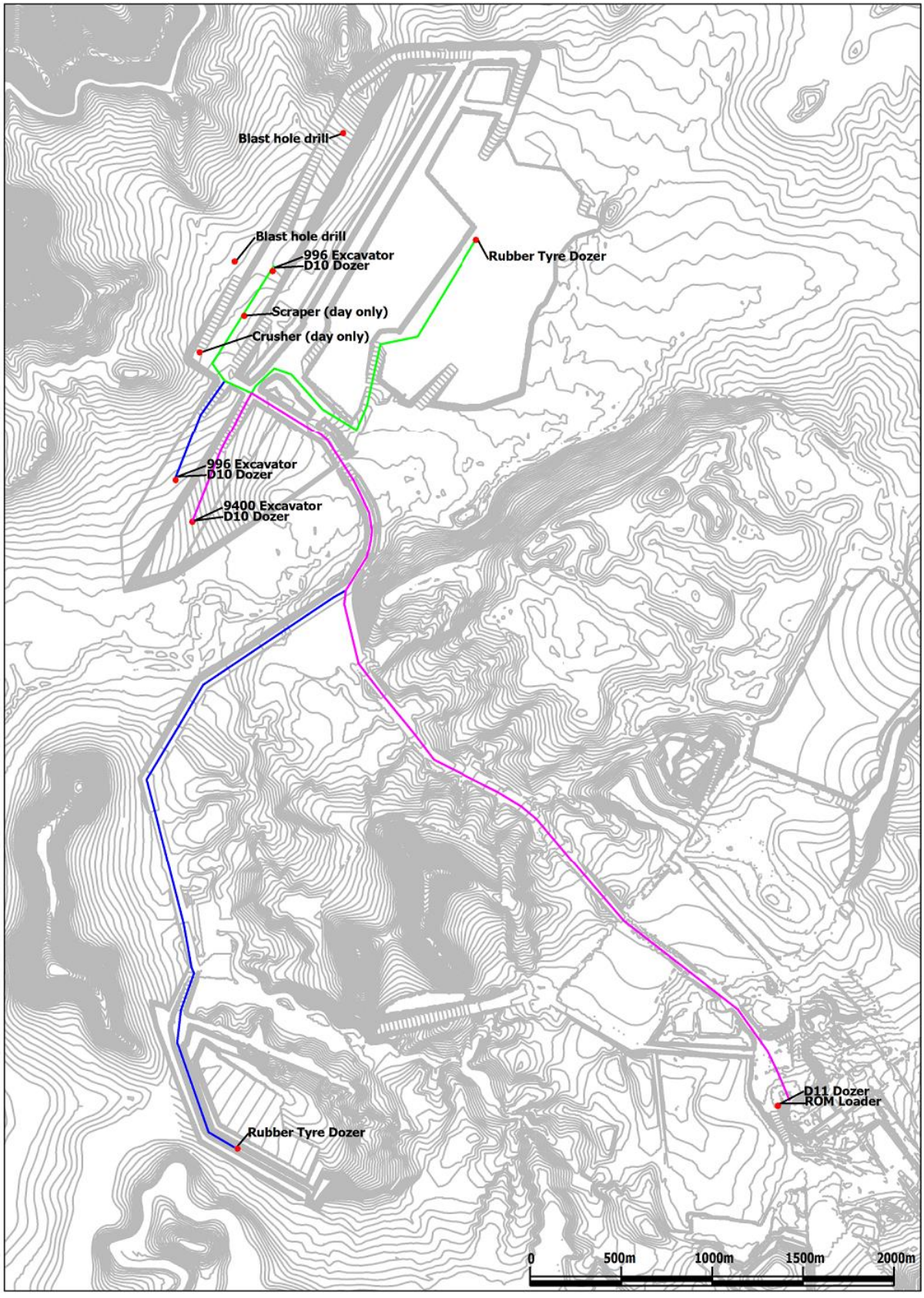


Figure B-3 Modelled Source Locations – Year 5

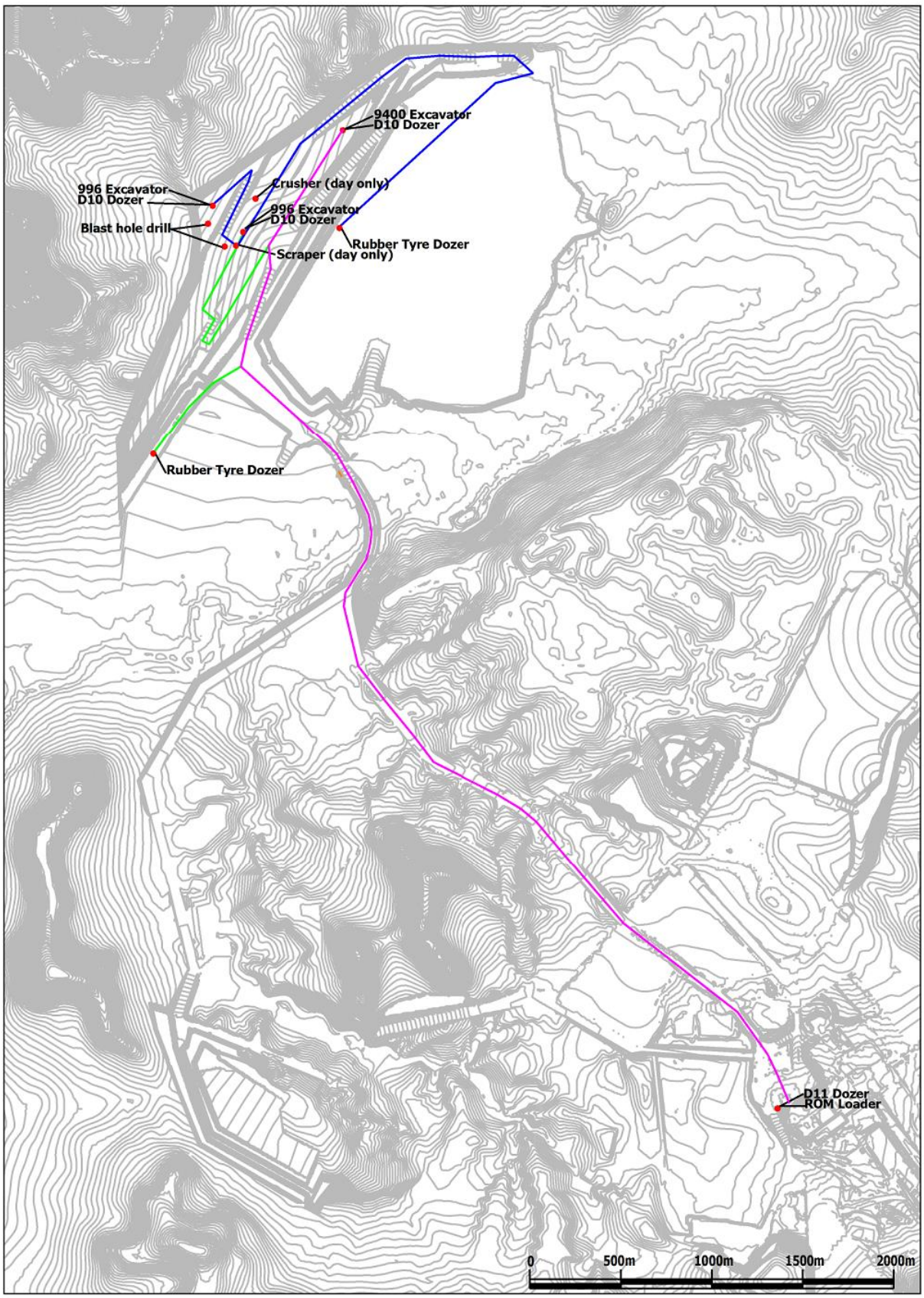


Figure B-4 Modelled Source Locations – Year 8

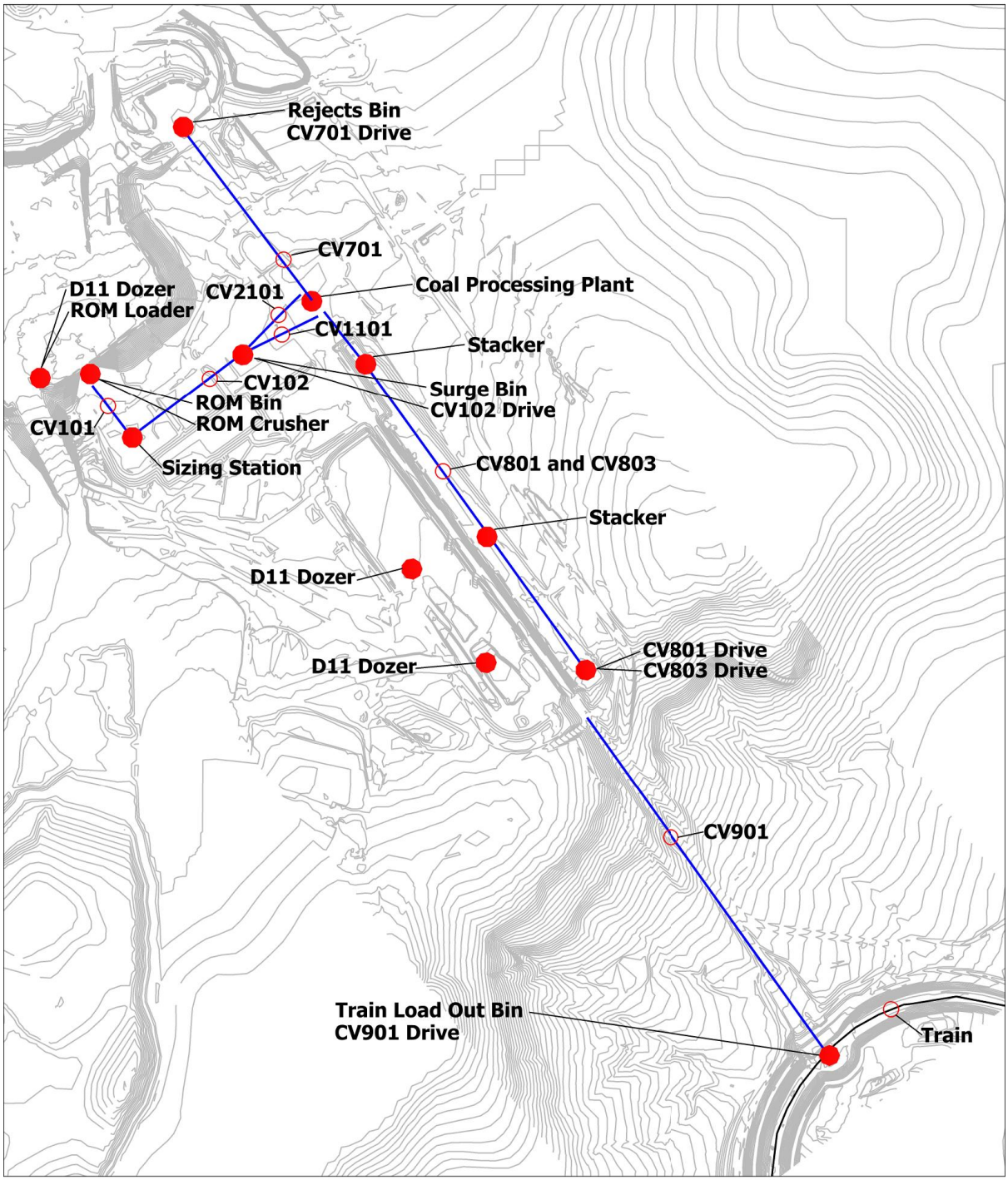
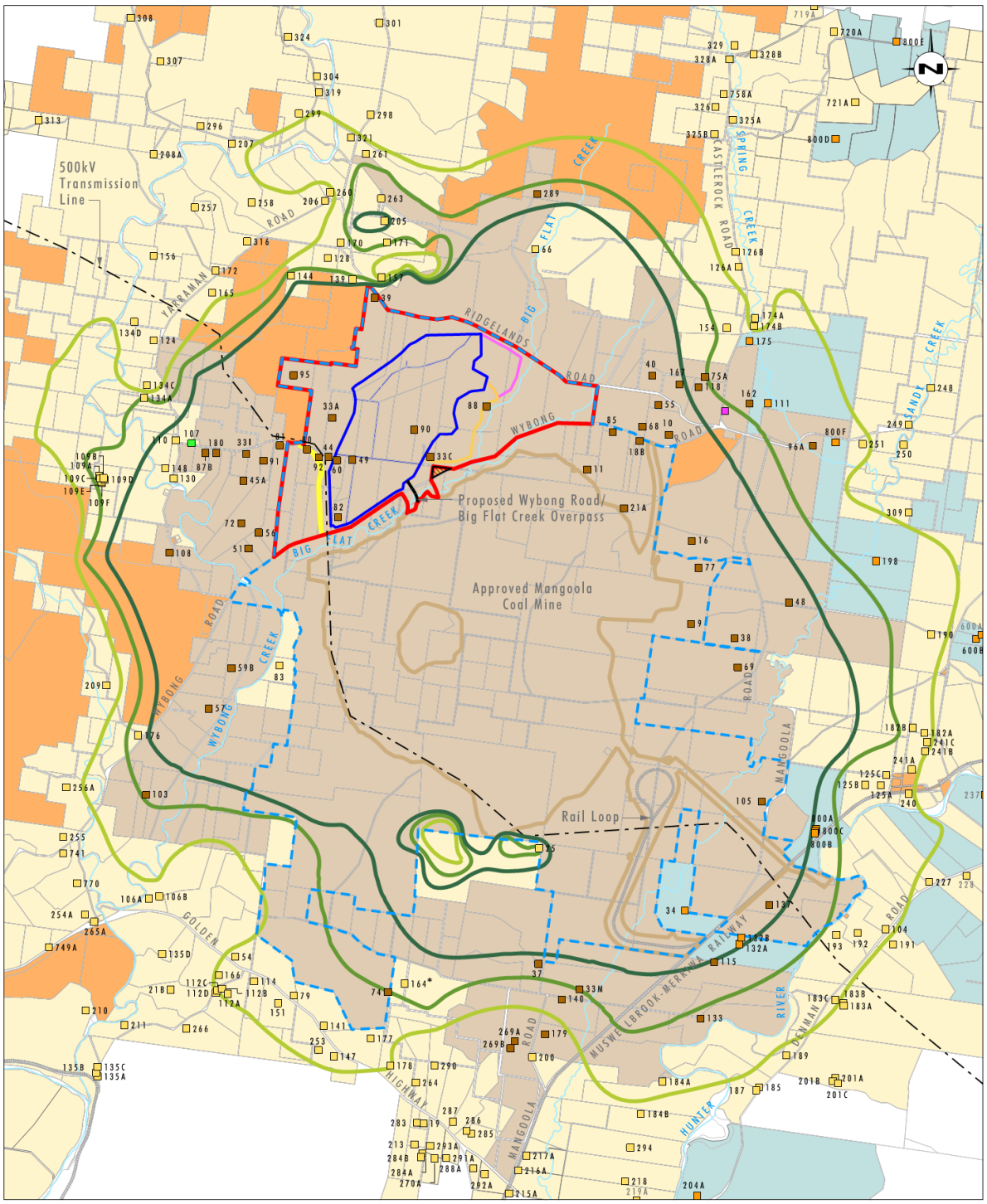


Figure B-5 Modelled Source Locations – CHPP, All Stages

APPENDIX

C NOISE CONTOUR FIGURES



Data Source: Glencore (2018)
Note: *Subject to Negotiated Agreement

0 1.0 2.0 4.0km
1:85 000

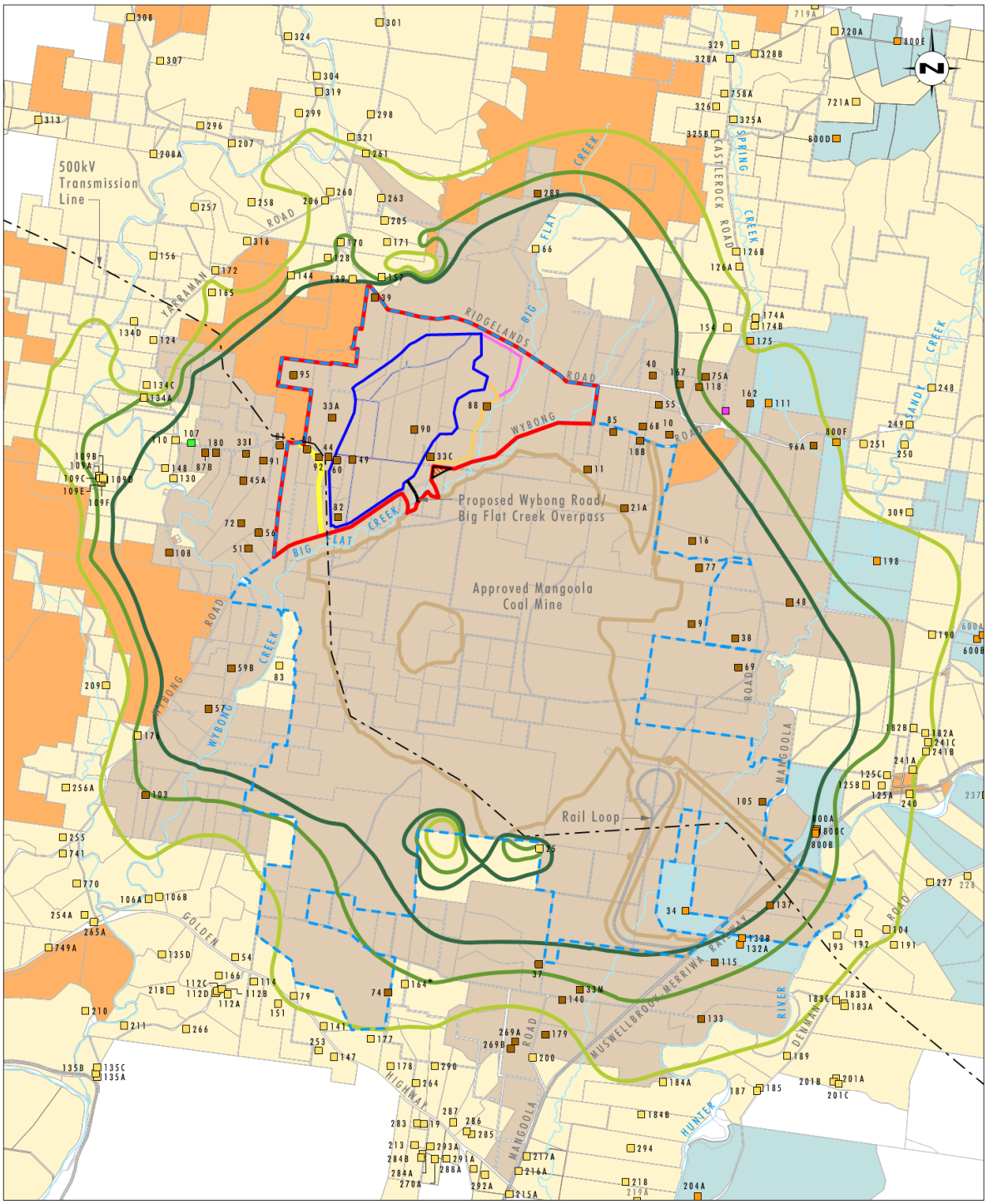
Legend

- MCCO Project Area
- Approved Mangoola Coal Mine Disturbance Area
- MCCO Additional Project Area
- MCCO Proposed Additional Mining Area
- MCCO Proposed Emplacement Area
- MCCO Proposed Topsoil Stockpile Area
- Indicative Wybong Post Office Road Realignment
- Crown Land (TSR) Excluded from MCCO Project Area
- Crown Land
- Mangoola Owned Land
- Other Mined Owned Land
- Private Land
- Private Residence
- Mangoola Owned Residence
- Other Mine Owned Residence
- Church
- Wybong Hall
- 35 dB(A) Noise Contour
- 38 dB(A) Noise Contour
- 40 dB(A) Noise Contour

Project Year 1
Indicative 90th Percentile Noise Contours
Maximum All Time Periods ($L_{Aeq, 15minute}$ dB)

File Name (A4): R13/4004_202.dgn
20190117 11.12

umwelt



Data Source: Glencore (2018), Global Acoustics (2018)
Note: *Subject to Negotiated Agreement

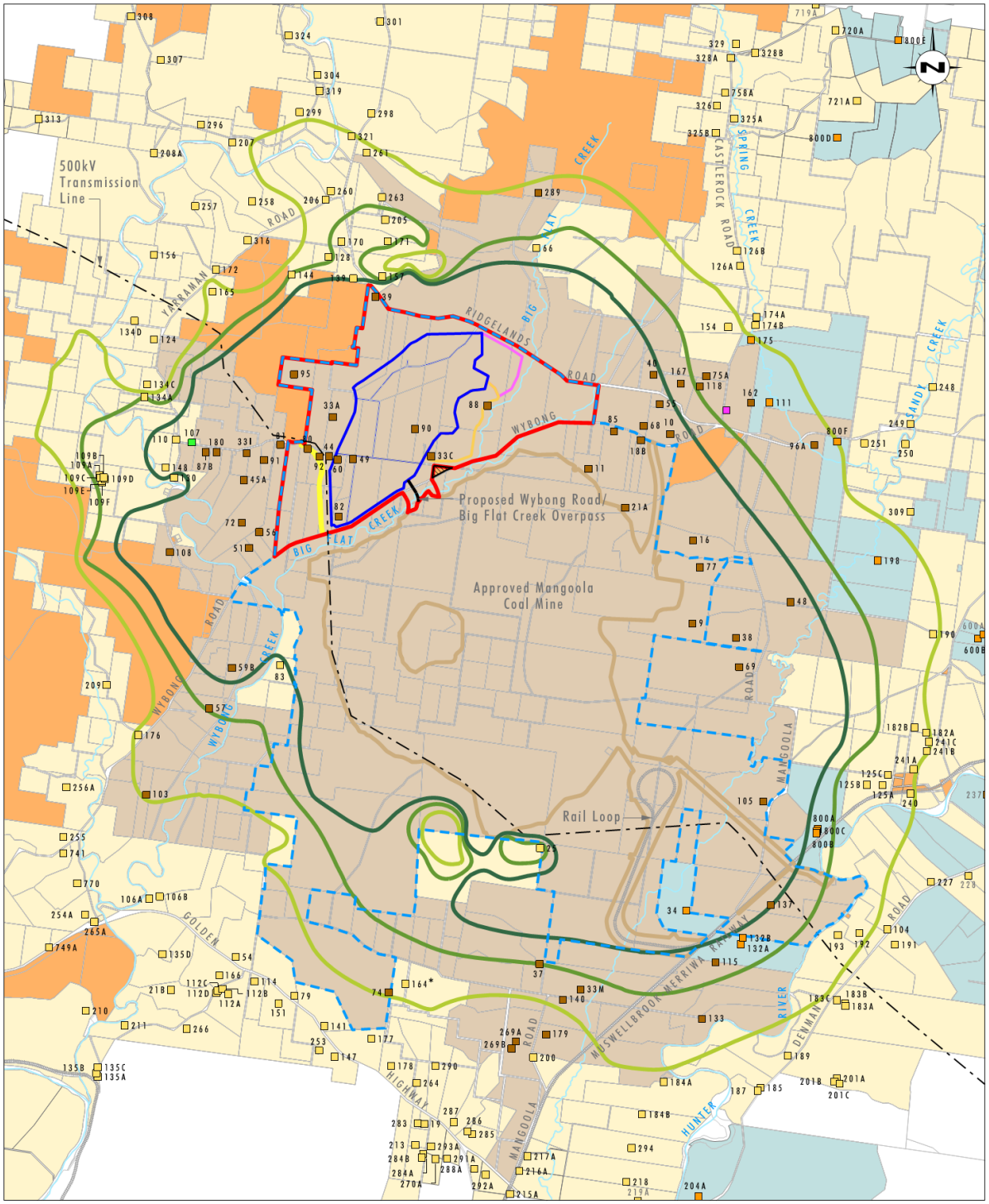
0 1.0 2.0 4.0km
1:85 000

Legend

- MCCO Project Area
- Approved Mangoola Coal Mine Disturbance Area
- MCCO Additional Project Area
- MCCO Proposed Additional Mining Area
- MCCO Proposed Emplacement Area
- MCCO Proposed Topsoil Stockpile Area
- Indicative Wybong Post Office Road Realignment
- Crown Land (TSR) Excluded from MCCO Project Area
- Crown Land
- Mangoola Owned Land
- Other Mined Owned Land
- Private Land
- Private Residence
- Mangoola Owned Residence
- Other Mine Owned Residence
- Church
- Wybong Hall
- 35 dB(A) Noise Contour
- 38 dB(A) Noise Contour
- 40 dB(A) Noise Contour

Project Year 3
Indicative 90th Percentile Noise Contours
Maximum All Time Periods ($L_{Aeq, 15minute}$ dB)

File Name (A4): R13/4004_209.dgn
20190117 11.16



Data Source: Glencore (2018), Global Acoustics (2018)
Note: *Subject to Negotiated Agreement

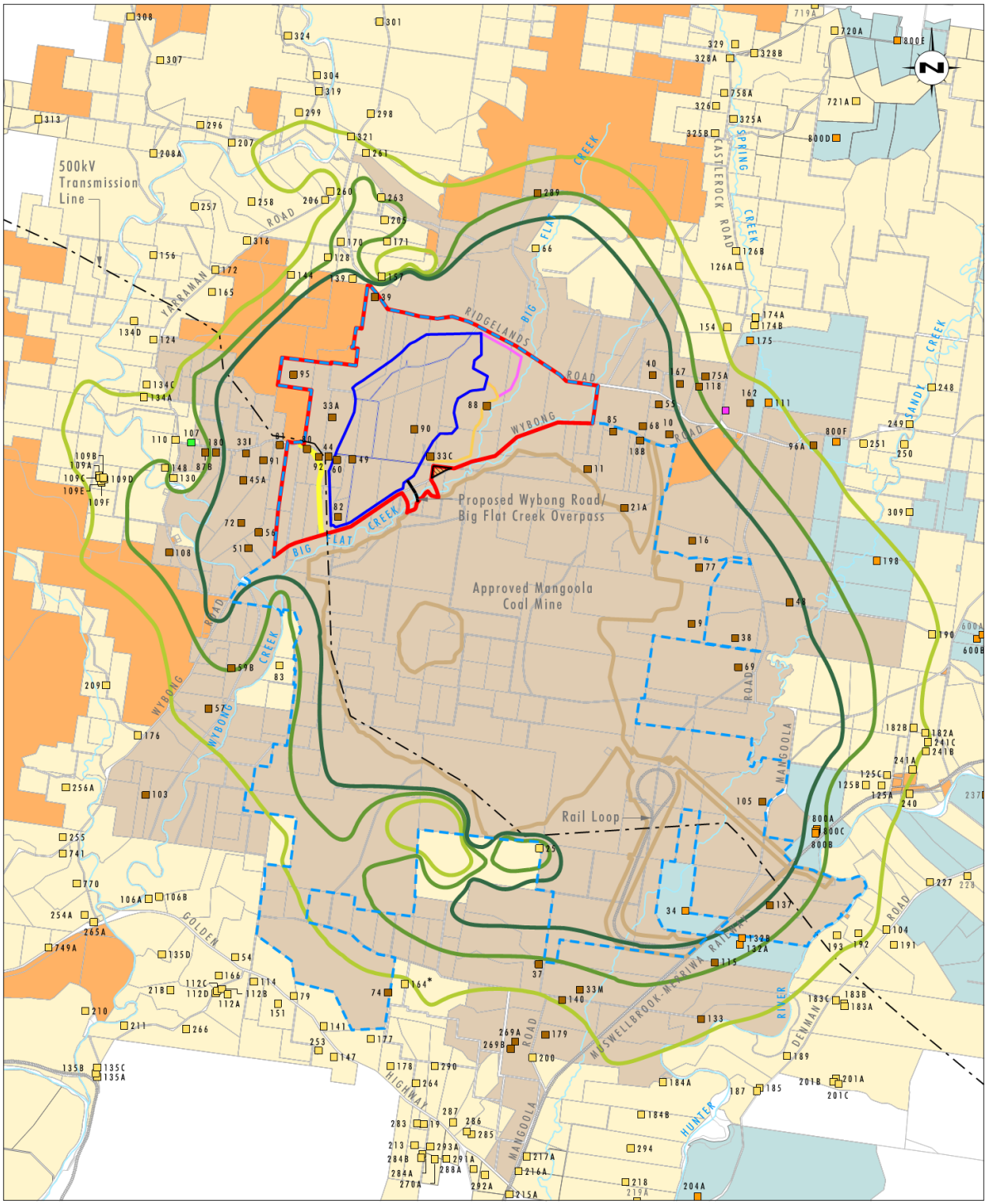
0 1.0 2.0 4.0km
1:85 000

Legend

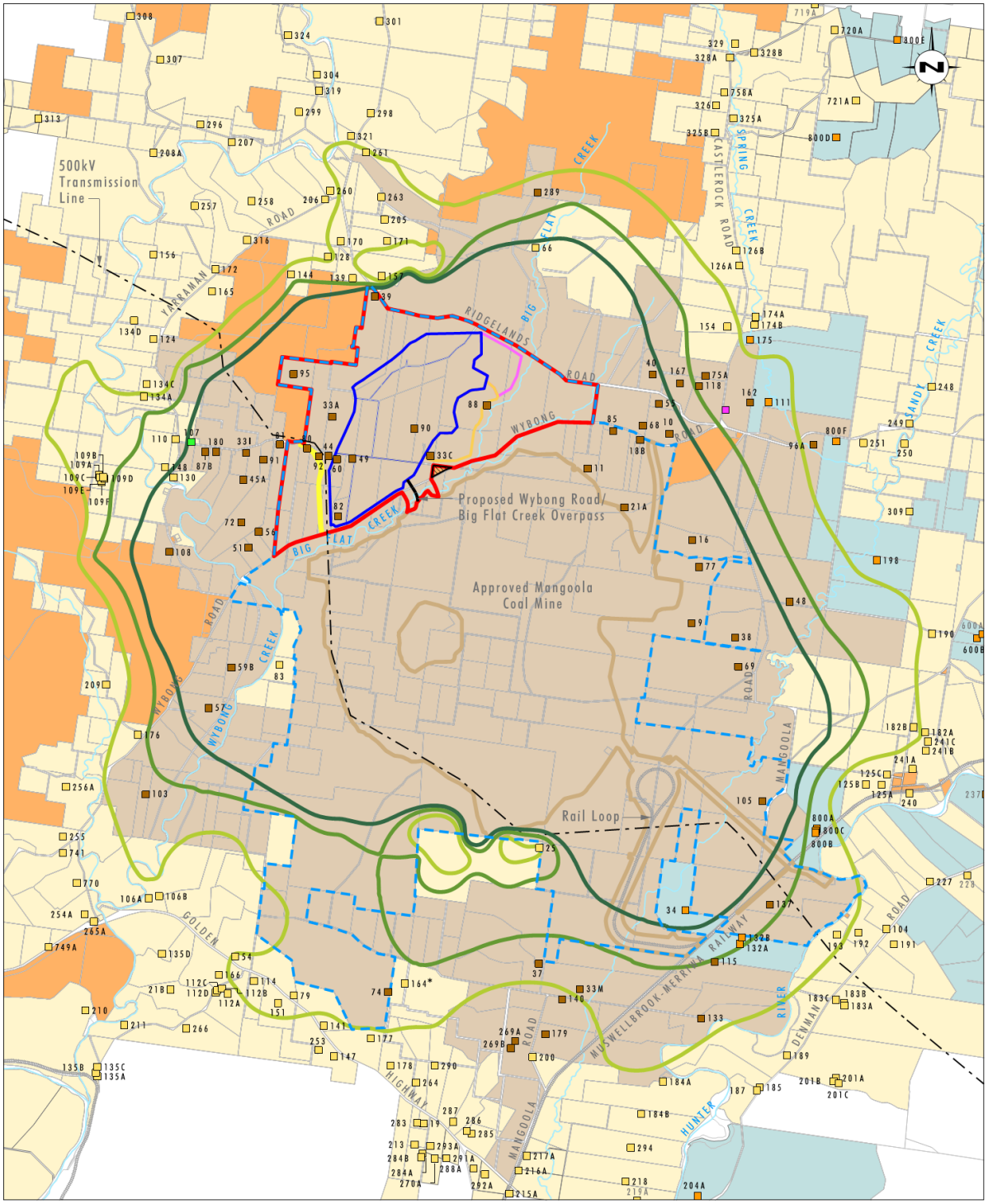
- MCCO Project Area
- Approved Mangoola Coal Mine Disturbance Area
- MCCO Additional Project Area
- MCCO Proposed Additional Mining Area
- MCCO Proposed Emplacement Area
- MCCO Proposed Topsoil Stockpile Area
- Indicative Wybong Post Office Road Realignment
- Crown Land (TSR) Excluded from MCCO Project Area
- Crown Land
- Mangoola Owned Land
- Other Mined Owned Land
- Private Land
- Private Residence
- Mangoola Owned Residence
- Other Mine Owned Residence
- Church
- Wybong Hall
- 35 dB(A) Noise Contour
- 38 dB(A) Noise Contour
- 40 dB(A) Noise Contour

Project Year 5
Indicative 90th Percentile Noise Contours
Maximum All Time Periods ($L_{Aeq, 15minute}$ dB)

File Name (A4): R13/4004_210.dgn
20190117 11.18


500kV Transmission Line
Proposed Wybong Road/ Big Flat Creek Overpass
Approved Mangoola Coal Mine
Rail Loop
Data Source: Glencore (2018), Global Acoustics (2018)
Note: *Subject to Negotiated Agreement
0 1.0 2.0 4.0km
1:85 000
Legend
MCCO Project Area
Approved Mangoola Coal Mine Disturbance Area
MCCO Additional Project Area
MCCO Proposed Additional Mining Area
MCCO Proposed Emplacement Area
MCCO Proposed Topsoil Stockpile Area
Indicative Wybong Post Office Road Realignment
Crown Land (TSR) Excluded from MCCO Project Area
Crown Land
Mangoola Owned Land
Other Mined Owned Land
Private Land
Private Residence
Mangoola Owned Residence
Other Mine Owned Residence
Church
Wybong Hall
35 dB(A) Noise Contour
38 dB(A) Noise Contour
40 dB(A) Noise Contour
Project Year 8
Indicative 90th Percentile Noise Contours
Maximum All Time Periods (LAeq, 15minute dB)
File Name (A4): R13/4004_211.dgn
20190117 11.20

umwelt



Data Source: Glencore (2018), Global Acoustics (2018)
Note: *Subject to Negotiated Agreement

0 1.0 2.0 4.0km
1:85 000

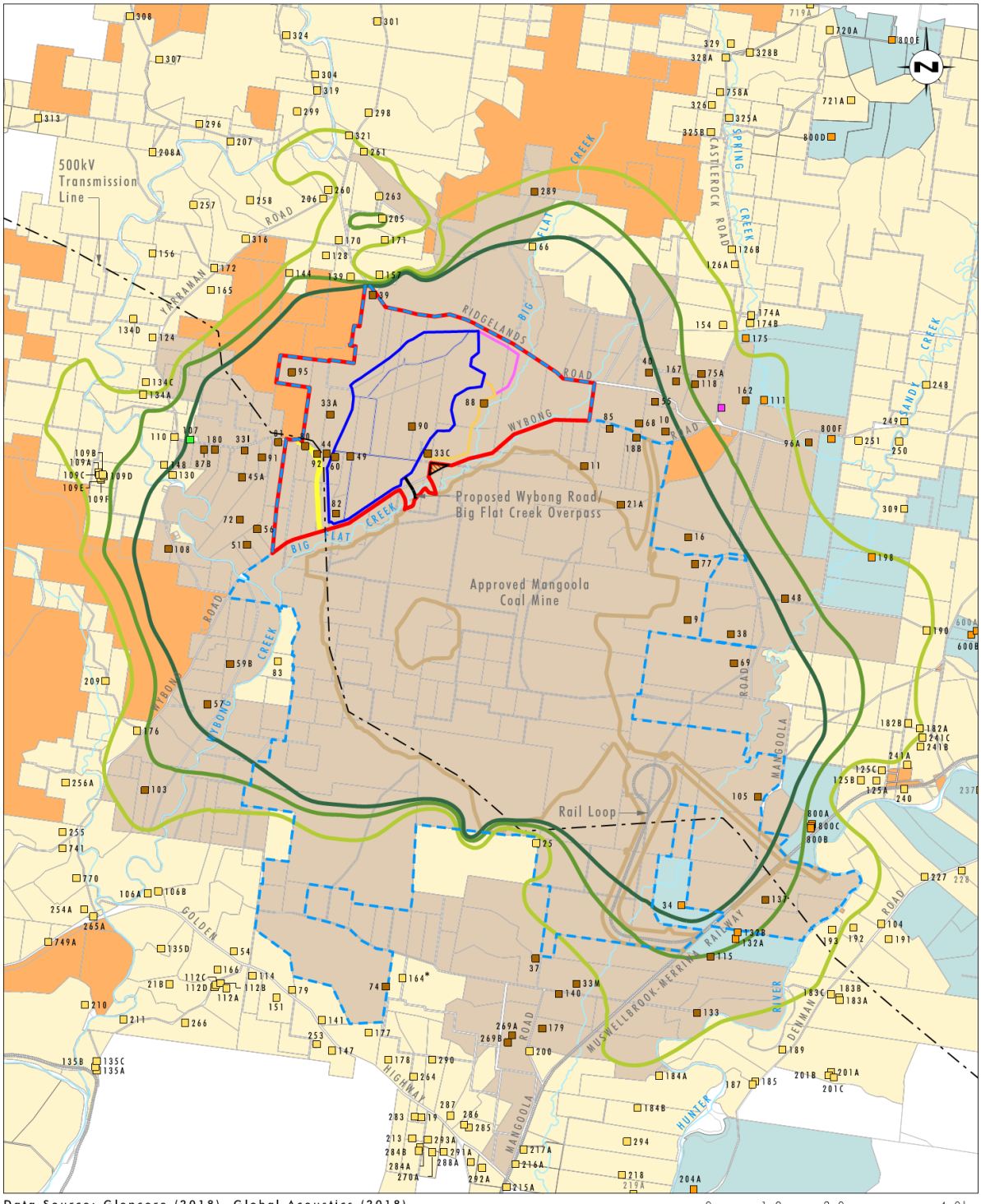
Legend

- MCCO Project Area
- Approved Mangoola Coal Mine Disturbance Area
- MCCO Additional Project Area
- MCCO Proposed Additional Mining Area
- MCCO Proposed Emplacement Area
- MCCO Proposed Topsoil Stockpile Area
- Indicative Wybong Post Office Road Realignment
- Crown Land (TSR) Excluded from MCCO Project Area
- Crown Land
- Mangoola Owned Land
- Other Mined Owned Land
- Private Land
- Private Residence
- Mangoola Owned Residence
- Other Mine Owned Residence
- Church
- Wybong Hall
- 35 dB(A) Noise Contour
- 38 dB(A) Noise Contour
- 40 dB(A) Noise Contour

Day Period
Indicative 90th Percentile Noise Contours
Maximum All Stages ($L_{Aeq, 15minute}$ dB)

File Name (A4): R13/4004_212.dgn
20190117 11.21

umwelt



Data Source: Glencore (2018), Global Acoustics (2018)
Note: *Subject to Negotiated Agreement

0 1.0 2.0 4.0km
1:85 000

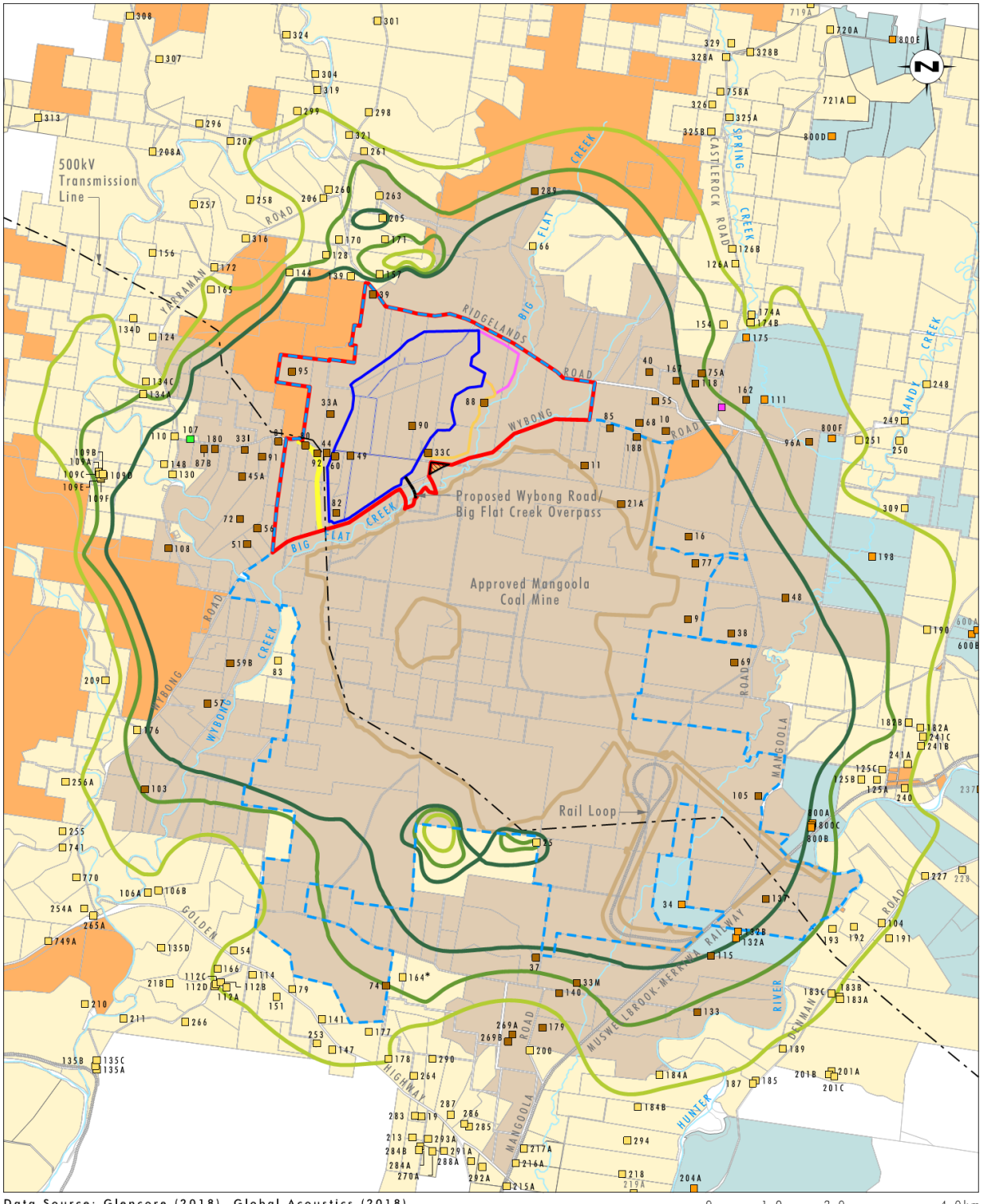
Legend

- MCCO Project Area
- Approved Mangoola Coal Mine Disturbance Area
- MCCO Additional Project Area
- MCCO Proposed Additional Mining Area
- MCCO Proposed Emplacement Area
- MCCO Proposed Topsoil Stockpile Area
- Indicative Wybong Post Office Road Realignment
- Crown Land (TSR) Excluded from MCCO Project Area
- Crown Land
- Mangoola Owned Land
- Other Mined Owned Land
- Private Land
- Private Residence
- Mangoola Owned Residence
- Other Mine Owned Residence
- Church
- Wybong Hall
- 35 dB(A) Noise Contour
- 38 dB(A) Noise Contour
- 40 dB(A) Noise Contour

Evening Period
Indicative 90th Percentile Noise Contours
Maximum All Stages ($L_{Aeq, 15minute}$ dB)

File Name (A4): R13/4004_213.dgn
20190117 11.22

Global Acoustics Pty Ltd | PO Box 3115 | Thornton NSW 2322
Telephone +61 2 4966 4333 | Email global@globalacoustics.com.au
ABN 94 094 985 734



Data Source: Glencore (2018), Global Acoustics (2018)
Note: *Subject to Negotiated Agreement

0 1.0 2.0 4.0km
1:85 000

Legend

- MCCO Project Area
- Approved Mangoola Coal Mine Disturbance Area
- MCCO Additional Project Area
- MCCO Proposed Additional Mining Area
- MCCO Proposed Emplacement Area
- MCCO Proposed Topsoil Stockpile Area
- Indicative Wybong Post Office Road Realignment
- Crown Land (TSR) Excluded from MCCO Project Area
- Crown Land
- Mangoola Owned Land
- Other Mined Owned Land
- Private Land
- Private Residence
- Mangoola Owned Residence
- Other Mine Owned Residence
- Church
- Wybong Hall
- 35 dB(A) Noise Contour
- 38 dB(A) Noise Contour
- 40 dB(A) Noise Contour

Night Period
Indicative 90th Percentile Noise Contours
Maximum All Stages ($L_{Aeq, 15minute}$ dB)

File Name (A4): R13/4004_214.dgn
20190115 17.01

APPENDIX

D MODELLED METEOROLOGICAL CONDITIONS

Table D.1: MODELLED METEOROLOGICAL CONDITIONS

Temperature ^{0}C	Humidity %	Wind Speed m/s	Wind Direction (degrees)	VTG ^{0}C/100m
10	80	0	-	-1.5
10	80	0	-	-0.5
10	80	0	-	1.5
10	80	0	-	4
10	80	0.75	0	-1.5
10	80	0.75	22.5	-1.5
10	80	0.75	45	-1.5
10	80	0.75	67.5	-1.5
10	80	0.75	90	-1.5
10	80	0.75	112.5	-1.5
10	80	0.75	135	-1.5
10	80	0.75	157.5	-1.5
10	80	0.75	180	-1.5
10	80	0.75	202.5	-1.5
10	80	0.75	225	-1.5
10	80	0.75	247.5	-1.5
10	80	0.75	270	-1.5
10	80	0.75	292.5	-1.5
10	80	0.75	315	-1.5
10	80	0.75	337.5	-1.5
10	80	1.5	0	-1.5
10	80	1.5	22.5	-1.5
10	80	1.5	45	-1.5
10	80	1.5	67.5	-1.5
10	80	1.5	90	-1.5
10	80	1.5	112.5	-1.5
10	80	1.5	135	-1.5
10	80	1.5	157.5	-1.5
10	80	1.5	180	-1.5
10	80	1.5	202.5	-1.5
10	80	1.5	225	-1.5
10	80	1.5	247.5	-1.5
10	80	1.5	270	-1.5
10	80	1.5	292.5	-1.5
10	80	1.5	315	-1.5
10	80	1.5	337.5	-1.5

Temperature ^{0}C	Humidity %	Wind Speed m/s	Wind Direction (degrees)	VTG ^{0}C/100m
10	80	2.25	0	-1.5
10	80	2.25	22.5	-1.5
10	80	2.25	45	-1.5
10	80	2.25	67.5	-1.5
10	80	2.25	90	-1.5
10	80	2.25	112.5	-1.5
10	80	2.25	135	-1.5
10	80	2.25	157.5	-1.5
10	80	2.25	180	-1.5
10	80	2.25	202.5	-1.5
10	80	2.25	225	-1.5
10	80	2.25	247.5	-1.5
10	80	2.25	270	-1.5
10	80	2.25	292.5	-1.5
10	80	2.25	315	-1.5
10	80	2.25	337.5	-1.5
10	80	3	0	-1.5
10	80	3	22.5	-1.5
10	80	3	45	-1.5
10	80	3	67.5	-1.5
10	80	3	90	-1.5
10	80	3	112.5	-1.5
10	80	3	135	-1.5
10	80	3	157.5	-1.5
10	80	3	180	-1.5
10	80	3	202.5	-1.5
10	80	3	225	-1.5
10	80	3	247.5	-1.5
10	80	3	270	-1.5
10	80	3	292.5	-1.5
10	80	3	315	-1.5
10	80	3	337.5	-1.5
10	80	0.75	0	-0.5
10	80	0.75	22.5	-0.5
10	80	0.75	45	-0.5
10	80	0.75	67.5	-0.5
10	80	0.75	90	-0.5

Temperature ^{0}C	Humidity %	Wind Speed m/s	Wind Direction (degrees)	VTG ^{0}C/100m
10	80	0.75	112.5	-0.5
10	80	0.75	135	-0.5
10	80	0.75	157.5	-0.5
10	80	0.75	180	-0.5
10	80	0.75	202.5	-0.5
10	80	0.75	225	-0.5
10	80	0.75	247.5	-0.5
10	80	0.75	270	-0.5
10	80	0.75	292.5	-0.5
10	80	0.75	315	-0.5
10	80	0.75	337.5	-0.5
10	80	1.5	0	-0.5
10	80	1.5	22.5	-0.5
10	80	1.5	45	-0.5
10	80	1.5	67.5	-0.5
10	80	1.5	90	-0.5
10	80	1.5	112.5	-0.5
10	80	1.5	135	-0.5
10	80	1.5	157.5	-0.5
10	80	1.5	180	-0.5
10	80	1.5	202.5	-0.5
10	80	1.5	225	-0.5
10	80	1.5	247.5	-0.5
10	80	1.5	270	-0.5
10	80	1.5	292.5	-0.5
10	80	1.5	315	-0.5
10	80	1.5	337.5	-0.5
10	80	2.25	0	-0.5
10	80	2.25	22.5	-0.5
10	80	2.25	45	-0.5
10	80	2.25	67.5	-0.5
10	80	2.25	90	-0.5
10	80	2.25	112.5	-0.5
10	80	2.25	135	-0.5
10	80	2.25	157.5	-0.5
10	80	2.25	180	-0.5
10	80	2.25	202.5	-0.5

Temperature ^{0}C	Humidity %	Wind Speed m/s	Wind Direction (degrees)	VTG ^{0}C/100m
10	80	2.25	225	-0.5
10	80	2.25	247.5	-0.5
10	80	2.25	270	-0.5
10	80	2.25	292.5	-0.5
10	80	2.25	315	-0.5
10	80	2.25	337.5	-0.5
10	80	3	0	-0.5
10	80	3	22.5	-0.5
10	80	3	45	-0.5
10	80	3	67.5	-0.5
10	80	3	90	-0.5
10	80	3	112.5	-0.5
10	80	3	135	-0.5
10	80	3	157.5	-0.5
10	80	3	180	-0.5
10	80	3	202.5	-0.5
10	80	3	225	-0.5
10	80	3	247.5	-0.5
10	80	3	270	-0.5
10	80	3	292.5	-0.5
10	80	3	315	-0.5
10	80	3	337.5	-0.5
10	80	0.75	0	1.5
10	80	0.75	22.5	1.5
10	80	0.75	45	1.5
10	80	0.75	67.5	1.5
10	80	0.75	90	1.5
10	80	0.75	112.5	1.5
10	80	0.75	135	1.5
10	80	0.75	157.5	1.5
10	80	0.75	180	1.5
10	80	0.75	202.5	1.5
10	80	0.75	225	1.5
10	80	0.75	247.5	1.5
10	80	0.75	270	1.5
10	80	0.75	292.5	1.5
10	80	0.75	315	1.5

Temperature ^{0}C	Humidity %	Wind Speed m/s	Wind Direction (degrees)	VTG ^{0}C/100m
10	80	0.75	337.5	1.5
10	80	1.5	0	1.5
10	80	1.5	22.5	1.5
10	80	1.5	45	1.5
10	80	1.5	67.5	1.5
10	80	1.5	90	1.5
10	80	1.5	112.5	1.5
10	80	1.5	135	1.5
10	80	1.5	157.5	1.5
10	80	1.5	180	1.5
10	80	1.5	202.5	1.5
10	80	1.5	225	1.5
10	80	1.5	247.5	1.5
10	80	1.5	270	1.5
10	80	1.5	292.5	1.5
10	80	1.5	315	1.5
10	80	1.5	337.5	1.5
10	80	2.25	0	1.5
10	80	2.25	22.5	1.5
10	80	2.25	45	1.5
10	80	2.25	67.5	1.5
10	80	2.25	90	1.5
10	80	2.25	112.5	1.5
10	80	2.25	135	1.5
10	80	2.25	157.5	1.5
10	80	2.25	180	1.5
10	80	2.25	202.5	1.5
10	80	2.25	225	1.5
10	80	2.25	247.5	1.5
10	80	2.25	270	1.5
10	80	2.25	292.5	1.5
10	80	2.25	315	1.5
10	80	2.25	337.5	1.5
10	80	3	0	1.5
10	80	3	22.5	1.5
10	80	3	45	1.5
10	80	3	67.5	1.5

Temperature ^{0}C	Humidity %	Wind Speed m/s	Wind Direction (degrees)	VTG ^{0}C/100m
10	80	3	90	1.5
10	80	3	112.5	1.5
10	80	3	135	1.5
10	80	3	157.5	1.5
10	80	3	180	1.5
10	80	3	202.5	1.5
10	80	3	225	1.5
10	80	3	247.5	1.5
10	80	3	270	1.5
10	80	3	292.5	1.5
10	80	3	315	1.5
10	80	3	337.5	1.5
10	80	0.75	0	4
10	80	0.75	22.5	4
10	80	0.75	45	4
10	80	0.75	67.5	4
10	80	0.75	90	4
10	80	0.75	112.5	4
10	80	0.75	135	4
10	80	0.75	157.5	4
10	80	0.75	180	4
10	80	0.75	202.5	4
10	80	0.75	225	4
10	80	0.75	247.5	4
10	80	0.75	270	4
10	80	0.75	292.5	4
10	80	0.75	315	4
10	80	0.75	337.5	4
10	80	1.5	0	4
10	80	1.5	22.5	4
10	80	1.5	45	4
10	80	1.5	67.5	4
10	80	1.5	90	4
10	80	1.5	112.5	4
10	80	1.5	135	4
10	80	1.5	157.5	4
10	80	1.5	180	4

Temperature ^{0}C	Humidity %	Wind Speed m/s	Wind Direction (degrees)	VTG ^{0}C/100m
10	80	1.5	202.5	4
10	80	1.5	225	4
10	80	1.5	247.5	4
10	80	1.5	270	4
10	80	1.5	292.5	4
10	80	1.5	315	4
10	80	1.5	337.5	4
10	80	2.25	0	4
10	80	2.25	22.5	4
10	80	2.25	45	4
10	80	2.25	67.5	4
10	80	2.25	90	4
10	80	2.25	112.5	4
10	80	2.25	135	4
10	80	2.25	157.5	4
10	80	2.25	180	4
10	80	2.25	202.5	4
10	80	2.25	225	4
10	80	2.25	247.5	4
10	80	2.25	270	4
10	80	2.25	292.5	4
10	80	2.25	315	4
10	80	2.25	337.5	4
10	80	3	0	4
10	80	3	22.5	4
10	80	3	45	4
10	80	3	67.5	4
10	80	3	90	4
10	80	3	112.5	4
10	80	3	135	4
10	80	3	157.5	4
10	80	3	180	4
10	80	3	202.5	4
10	80	3	225	4
10	80	3	247.5	4
10	80	3	270	4
10	80	3	292.5	4

Temperature ^{0}C	Humidity %	Wind Speed m/s	Wind Direction (degrees)	VTG ^{0}C/100m
10	80	3	315	4
10	80	3	337.5	4

APPENDIX

E MODELLED RECEPTOR LOCATIONS

Table E.1: MODELLED RECEPTOR LOCATIONS

ID	Owner	Easting	Northing
19	Quinn	281396	6417142
21B	Sormaz	277388	6419263
25	Withers KL, LA, RIC & PJ Ray	283234	6421511
54	Upper Hunter Holdings P/L	278413	6419788
66	Le Breton	283176	6431023
79	Perfrement	279340	6419169
83	Ray	279112	6424411
104	Wilks, R.	288733	6420224
106A	Vinegold Projects P/L	277039	6420712
106B	Vinegold Projects P/L	277205	6420744
109A	Sandleton Investments P/L	276249	6427420
109B	Sandleton Investments P/L	276298	6427304
109C	Sandleton Investments P/L	276287	6427334
109D	Sandleton Investments P/L	276338	6427362
109E	Sandleton Investments P/L	276267	6427378
109F	Sandleton Investments P/L	276319	6427387
110	Campbell	277467	6427987
112A	Carter	278295	6419196
112B	Carter	278201	6419278
112C	Carter	278126	6419254
112D	Carter	278102	6419218
114	Castle	278710	6419398
124	Blackhall	277117	6429575
125A	Lawson	288661	6422508
125B	Lawson	288413	6422516
125C	Lawson	288746	6422673
126A	Gowing, R.	286406	6430740
128	Hamson	279877	6430877
130	Henderson	277433	6427382
134A	Hunter Group Holdings P/L	276963	6428659
134C	Hunter Group Holdings P/L	277008	6428862
134D	Hunter Group Holdings P/L	276808	6429869
135A	Golden Grove Stud P/L	276224	6417890
135D	Golden Grove Stud P/L	277249	6419831
139	Johnstone	280275	6430540
141	Laing	279817	6418691
144	Manwarring	279299	6430596

ID	Owner	Easting	Northing
147	Thompson and Pasco	279976	6418205
148	McIntosh	277301	6427544
151	Cooper	279089	6419049
154	Perkins	286214	6429772
156	Rawnsley & Manning	277115	6430913
157	Nightingale	280731	6430570
165	Vincent	278041	6430328
166	Warby	278155	6419494
170	Clay	280086	6431120
171	Orr	280817	6431127
172	Buckman & Bailey	278097	6430681
174A	Jennar	286664	6429921
174B	Jennar	286647	6429797
176	Swann	276868	6423302
177	Medhurst	280562	6418490
178	Lorieri	280873	6418060
182A	Brown, P.	289352	6423342
182B	Brown, P.	289169	6423423
183A	Burgmann	288072	6419006
183B	Burgmann	288065	6419049
183C	Burgmann	287935	6419101
184A	Dunbier Pastoral P/L	285193	6417804
184B	Dunbier Pastoral P/L	284850	6417293
185	Falvey	286725	6417716
187	Byrne	286681	6417667
189	Upper Hunter Resources P/L	287161	6418219
190	Merrick	289459	6424901
191	Paulsen	288859	6419980
192	Phillips	288291	6420166
193	Jones	287951	6420133
195	Peel	290894	6426165
200	Worth	283128	6418193
201A	Blakefield P/L	287937	6417863
201B	Blakefield P/L	287901	6417808
201C	Blakefield P/L	287981	6417777
205	Shewan	280780	6431467
206	White	279834	6431791
207	Van Den Heuvel	278356	6432696

ID	Owner	Easting	Northing
208A	Thommo's Aust P/L	277116	6432526
209	Leslie	276366	6424097
210	Shepherdson	276036	6418935
211	Conybeare	276652	6418703
213	Van Der Vliet	281257	6416807
214A	Denman Property Investments P/L	282234	6415555
215A	Vicary	282758	6416028
216A	Feeney	282905	6416394
217A	Keegan	283033	6416628
218	Parker	284600	6416224
219A	Borg	284783	6415917
220A	Parker	284437	6415739
222	Sowter	285290	6415543
223A	Gageler	285378	6415473
227	Macpherson	289429	6420974
228	Turner	290020	6421071
230A	Duncan	290712	6421461
230B	Duncan	290919	6421265
231	Denton	290867	6421542
238	Walsh	290614	6422533
240	Meyer	289106	6422377
241A	Markham	289150	6422761
241B	Markham	289361	6423047
241C	Markham	289393	6423193
242	Roots	290949	6423467
243	Ellis, P.	290652	6425667
245	Murray	291000	6426005
246	Strachan	291273	6428280
248	Lonergan	289455	6428820
249	Smith and Balmer	289101	6428234
250	Parkinson	289023	6427914
251	Googe, F. & W.	288372	6427928
253	McWilliams	279732	6418305
254	O'Leary	276028	6420455
255	Duggan	275681	6421690
256A	Walters	275728	6422476
257B	Wybong Estate P/L	277750	6431801
258	Dimmock	278672	6431759

ID	Owner	Easting	Northing
260	Weir	279866	6431880
261	Hurst	280487	6432532
263	Morgan	280728	6431827
264	Sant	281281	6417791
265A	Seagrave	276170	6420341
266	Woodruff	277634	6418648
270A	Larkin	281579	6416584
275	Rankin	292322	6421879
283	Ronen	281298	6417148
284A	Lee	281385	6416662
285	Barwick	282161	6416979
286	Celik	282085	6417021
287	Bray, L.	281870	6417165
288A	Collins	282194	6416427
290	Hollingshed	281575	6418057
291A	Stocks	281761	6416590
292A	O'Hara	282372	6416334
293A	Rolfe	281505	6416784
294	Thrift	284683	6416756
295	Lane	291301	6426071
296	Fellowes	277860	6432976
298	Anshaw	280562	6433154
299	Hayne	279423	6433174
301	Googe, D.K.	280700	6434611
303	Googe, S. & N.	280685	6435707
304	Hayne and Munn	279709	6433763
307	Barby	277224	6434000
308	Holt	276752	6434692
309	McNeill	289107	6426837
313	Rawnsley	275290	6433067
316	Vero	278602	6431142
319	Power	279740	6433511
321	Raines	280247	6432790
324	Munn	279250	6434389
325A	Pratt	286311	6433071
325B	Pratt	286021	6432847
326	Collins, T.K.	286038	6433277
328A	Keast, Gary Thomas	286642	6434116

ID	Owner	Easting	Northing
328B	Keast, G.	286642	6434116
329	Keast, R.	286337	6434254
330	Wolfgang, M.	286145	6414121
331A	Googe, J.	280691	6436062
331B	Googe, J.	280698	6436238
336A	Googe, M.	280398	6436571
336B	Googe, M.	280513	6436579
337A	Googe, Neil	280259	6436888
338	Googe	280651	6435493
710	Bates, B.	291274	6429620
717	Moore, Jonothan	291386	6428706
718	Ellis	290986	6426450
719A	Mitchell	287600	6434884
720A	McManus	287914	6434470
721A	Wright	288255	6433351
732A	Latham	291485	6421935
732B	Latham	291432	6421732
741	Kilby	275678	6421431
749A	Kidd	275451	6419938
758A	Brabant and Hansford	286167	6433484
760A	Baynes	278804	6435178
770	Collins	275901	6420951
771	Bray, G.	279788	6435799

APPENDIX

F PEER REVIEW

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9 May 2019

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Re: Peer review of noise impact assessment of Mangoola Coal Continued Operations (MCCO) prepared by Global Acoustics

1 Introduction

I have been engaged to conduct a peer review of the noise impact assessment (NIA) completed by Global Acoustics Pty Ltd for the Mangoola Coal Continue Operations (MCCO) Project. This letter describes the issues covered in the review and my conclusions.

2 Approach overview

The peer review process has been undertaken in two key stages as the work was completed. The first stage involved the review of key assessment inputs such as how the noise criteria and sensitive receptors were defined. It also included a review of the proposed methodology and modelling setup and inputs. The second stage involved a review of two revisions of the draft NIA report and covered noise criteria, sensitive receptors, noise modelling inputs and methods, impact assessment findings, mitigation and management measures and recommendations.

The above aspects were reviewed to determine whether the assessment was technically sound, including whether appropriate models were used and applied appropriately. I have also reviewed the NIA with respect to the Secretary's Environmental Assessment Requirements (SEARs).

The documents reviewed as part of the process include:

- The original Secretary's Environmental Assessment Requirements (SEARs) 22 August 2017;
- Global Acoustics Pty Ltd, 5 April 2018, Mangoola Coal Continued Operations Project, Briefing Note 8;
- Global Acoustics Pty Ltd, 12 September 2018, Mangoola Coal Continued Operations Project, Environmental Noise Impact Assessment (draft);
- The reissued SEARs 15 February 2019; and
- Global Acoustics Pty Ltd, 20 March 2019, Mangoola Coal Continued Operations Project, Noise Impact Assessment (draft), which is an updated draft of their 12 September 2018 report. This included subsequent updates to sections of this report conveyed through email correspondence following my requests for further clarifications in May 2019.

Other information was also exchanged through email and phone conversations throughout the process.

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3 Findings

My findings are summarised as follows:

- The NIA has adopted noise policies and guidelines referenced in the SEARs.
- Adoption of minimum baseline noise levels and derivation of project noise trigger levels (PNTL) are consistent with the Noise Policy for Industry (NPfI) and result in the lowest possible (strictest) criteria under NSW EPA policy, i.e. providing the highest level of protection for the community that is possible under the current policy.
- Adoption of the EPA's Interim Construction Noise Guideline (ICNG) for proposed construction works as part of an active mine site in our experience has been met with mixed responses from regulators. However, the approach of modelling proposed construction and approved operational plant concurrently, and having ICNG target noise criteria apply only for standard hours is considered appropriate for the necessary construction works for the MCCO project. This means the more sensitive evening and night periods will continue to be managed using the current approval conditions.
- The NIA has adopted good practice noise modelling techniques to provide representative impacts from proposed activities (construction and operations). The modelling adopted four representative stages of proposed future mining activities spanning eight years; Year 1, Year 3, Year 5 and Year 8 were assessed in detail. This number of modelling stages is greater than typically adopted for an eight year period and is likely to have considered the maximum potential impacts. The emission factors used as input to the modelling are consistent with our expectations and are primarily based on onsite measurement data, which is best practice in this regard.
- The road traffic noise elements of the MCCO project have been appropriately addressed and assessed against relevant NSW EPA noise policy.
- For the proposed operational stages of the MCCO project, a total of 57 residential properties have been identified as potentially impacted above noise trigger levels, 26 of which are moderately impacted and hence eligible for at-dwelling treatment, while 7 properties are predicted to be significantly impacted and hence entitled to acquisition in accordance with the Voluntary Land Acquisition and Mitigation Policy 2018 (VLAMP).
- The Project will adopt current good practice noise mitigation and management consistent with the current site's practices. These will be extended to include feasible and reasonable measures relevant to the new mining area and haul roads.

4 Conclusion

In my opinion the noise impact assessment provides a detailed investigation of the likely noise from the proposed MCCO project and can be relied upon to assess the proposal.

Yours sincerely

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