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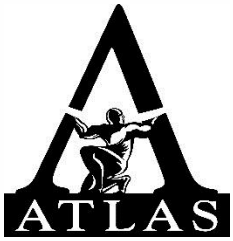
Environmental Noise Impact Assessment

Corunna Downs



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Name	Position	File Reference
Granger Bennett	Noise Section Lead	TN16005 Atlas Iron Corunna Downs Environmental Noise Assessment Rev2.0
Signature		

Executive Summary

This report provides an environmental noise assessment for Atlas Iron's proposed Corunna Downs operations.

The objectives of this assessment were to quantify the noise impacts of the Corunna Downs mining and road haulage operations on the surrounding sensitive receivers.

Findings

Mining Noise

- Table E 1 provides a summary of the predicted received noise levels from mining operations at the sensitive receivers.
- It was found that the predicted received noise levels from mining operations comply with the Regulatory assigned levels at all sensitive receivers.

Road Haulage Noise

- Table E 2 provides a summary of the predicted received noise levels from road haulage operations at the sensitive receivers.
- It was found that the predicted received noise levels comply with State Planning Policy 5.4 (SPP5.4) '**noise limit**' criteria at all sensitive receivers.
- It was found that the predicted received noise levels exceed the SPP5.4 '**noise target**' criteria at the Marble Bar Residence (R2) and Historic Gold Mine (R3).

Table E 1 Modelling Results – Mining

Sensitive Receiver	LA10 Noise Model Prediction	LA10 Assigned Noise Level	Exceedance in dB
R1 Marble Bar Roadhouse	4.0	35	0
R2 Marble Bar Residence	4.0		0
R3 Historic Gold Mine	0		0

Table E 2 Modelling Results – Road Haulage

Sensitive Receiver	LAeq Noise Model Prediction	SPP5.4 Noise Target	SPP5.4 Noise Limit	Exceedance in dB
R1 Marble Bar Roadhouse	47.9	50	55	0
R2 Marble Bar Residence	50.7			0.7
R3 Historic Gold Mine	54.9			4.9

Recommendations

- Noise control options for Road Haulage be considered and investigated for the Marble Bar Residence (R2) and Historic Gold Mine (R3) during the more detailed planning phases of Corunna Downs.

- A noise management plan be developed that specifies the mitigation measures that will be implemented to reduce noise at R2 and R3 to below SPP5.4 'noise target'.

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1 Introduction

Talis Consultants (Talis) have been engaged by Atlas Iron to undertake an environmental noise assessment for the proposed Corunna Downs mining and road haulage operations.

This report summarises the method, results, compliance assessment and recommendations for the project.

1.1 Objectives

The objectives of this assessment were to quantify the noise impacts from the proposed Corunna Downs mining and road haulage operations on the surrounding sensitive receivers.

1.2 Scope

The scope of this document includes an environmental noise assessment of the Corunna Downs mining and road haulage operations on noise sensitive receivers at Marble Bar and the Historic Gold Mine under worst case operational and meteorological conditions.

1.3 Applicable Documents

The documents applicable for this assessment were as follows;

- Environmental Protection Act 1986.
- Environmental Protection (Noise) Regulations 1997.
- State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning.
- Implementation Guidelines for State Planning Policy 5.4.
- Draft Guideline on Environmental Noise for Prescribed Premises.

2 Project Description

Corunna Downs is Atlas Iron's proposed new iron ore operations, which will involve conventional open pit mining methods and fixed plant.

The equipment used in the mining operation includes mobile equipment (diggers, haul trucks and ancillary equipment) and fixed plant (primary crushing, secondary crushing and screening). Once processed, the crushed ore will then be transported, via quad trailer road trains, to the Port Hedland port facility.

The Corunna Downs mining operations are located approximately 33 kilometres south of Marble Bar, with sensitive receivers located in proximity to the mining operation and the haulage route.

An overview of the mining development envelope, pits and transport corridor is presented in Figure 1. Details of the receiver locations are presented in section 4.

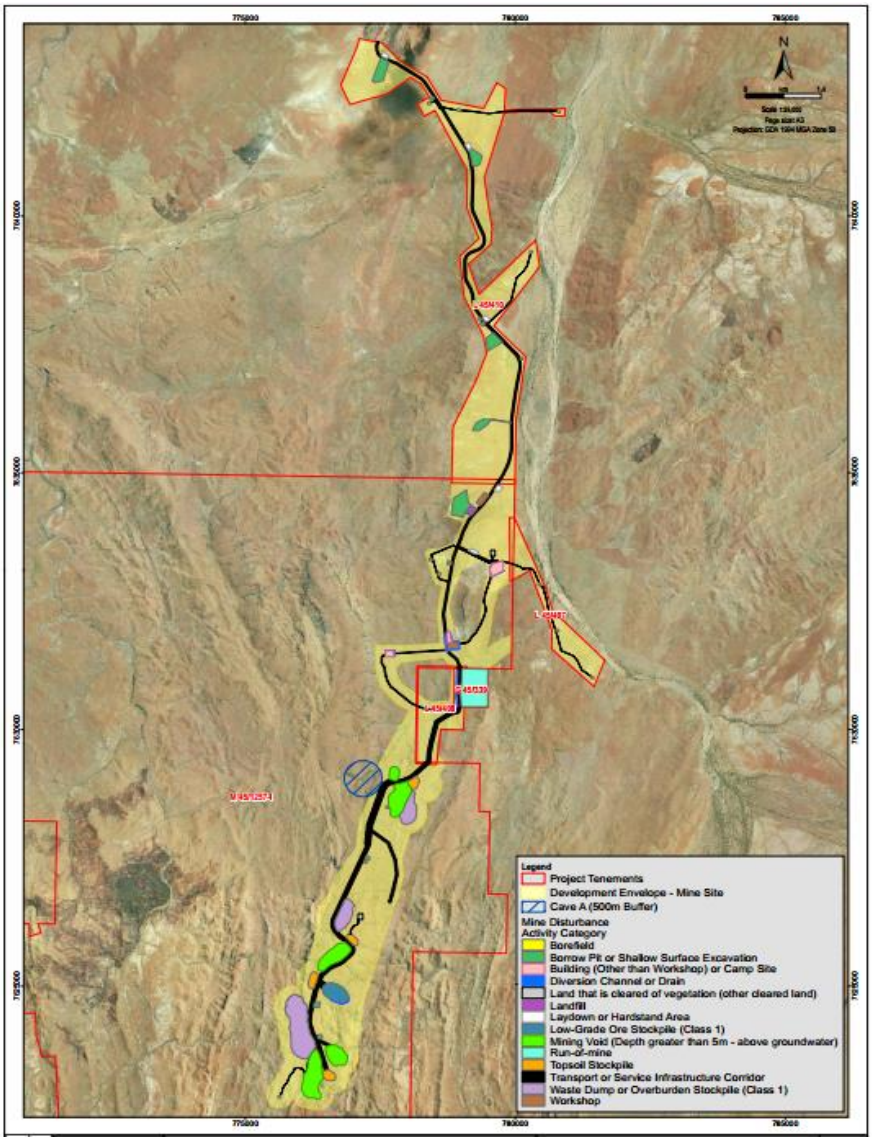

Figure 1 Corunna Downs Mining Envelope

3 Summary of Legislation

Two legislative documents are applicable to the Corunna Downs operations. These are;

1) Environmental Protection (Noise) Regulations 1997 - applicable to **mining**.
2) State Planning Policy 5.4 (SPP5.4) "Road and Rail Transport Noise and Freight Considerations in Land Use Planning" - applicable to **road haulage**.

A brief summary of the assessment criteria is presented below. More detailed information can be found in Appendix A.

3.1 Environmental Protection (Noise) Regulations 1997

Noise management in Western Australia is implemented through the Environmental Protection (Noise) Regulations 1997 which operate under the *Environmental Protection Act 1986*. The Regulations specify maximum noise levels (assigned levels), which are the highest noise levels that can be received at noise-sensitive premises, commercial and industrial premises.

For noise sensitive residences, the time of day also affects the assigned levels. The Regulations define three types of assigned noise levels:

- L_{Amax} assigned noise level means a noise level which is not to be exceeded at any time;
- L_{A1} assigned noise level which is not to be exceeded for more than 1% of the time;
- L_{A10} assigned noise level which is not to be exceeded for more than 10% of the time.

The L_{A10} noise limit is the most significant for this study since this is representative of continuous mining operations noise emissions.

3.1.1 Corrections and Influencing Factors

Noise levels determined at the receiver positions are subject to penalty corrections if the noise exhibits intrusive or dominant characteristics, i.e. if the noise is impulsive, tonal or modulating.

As the distance between the mine and the sensitive receivers is greater than 5km, it is expected that the received noise will not have tonal, modulating or impulsive characteristics. Therefore, no corrections or influencing factors have been applied.

3.1.2 Assigned Noise Levels

Considering that there are no influencing factors or corrections, the applicable assigned noise levels are presented in Table 1. As the mining is a continuous operation, the noise modelling results will be assessed against the most stringent L_{A10} night-time level of 35 dB(A).

Table 1 Noise Criteria Applicable at the Sensitive Receivers

Time of Day	LA10 Assigned Noise Level in dB(A)
0700 to 1900 hours Monday to Saturday	45
0900 to 1900 hours Sundays and Public Holidays	40
1900 to 2200 hours all days	40
2200 to 0700 hours all days	**35**

3.2 State Planning Policy 5.4

Road and rail noise in Western Australia is managed through the State Planning Policy 5.4 "*Road and Rail Transport Noise and Freight Considerations in Land Use Planning*" (SPP 5.4 gazetted September 2009) which was developed under the *Planning and Development Act 2005* in consultation with the Department of Environment Regulation (DER), Main Roads WA (MRWA), Public Transport Authority (PTA) and the Western Australia Local Government Association (WALGA).

The SPP5.4 noise assessment criteria are presented in Table 2. These criteria are applicable to the emission of road transport noise received at noise sensitive premises.

As the Corruna Downs operations are continuous throughout the year, the noise modelling results will be assessed against the most stringent night-time levels.

Table 2 SPP5.4 outdoor noise criteria

Time of Day	Noise Target (LAeq)	Noise Limit (LAeq)
Day (0600 to 2200 hours)	55	60
Night (2200 to 0600 hours)	**50**	**55**

The 5 dB difference between the noise target and noise limit represents an acceptable margin for compliance. The actions required as a result of non-compliance are as follows;

- If the noise emissions are expected to be compliant with the 'noise target' then no further measures are required;
- If the noise emissions are expected fall between the 'noise target' and 'noise limit' then mitigation measures should be implemented with the view of compliance with the 'noise target';
- If the noise emissions are expected to exceed the 'noise limit' a detailed noise assessment should be undertaken and noise mitigation measures implemented with the view of compliance with the 'noise target'.

NOTE: The assessed noise levels in SPP5.4 are averaged over 16 or 8 hours. As a result, the noise created by a single road train pass-by is not captured by the modelling. A single pass-by can have an impact on the community during night time haulage operations. This impact is not necessarily identified by the SPP4.4 assessment.

4 Noise Modelling Method

As **mining operations** and **road haulage** are assessed differently, two separate noise models have been created. A summary of the noise modelling method for each is presented in the following sections;

- Section 4.1 – applicable to both models (mining and road)
- Section 4.2 – applicable to mining operations only
- Section 4.3 – applicable to road haulage operations only.

4.1 General

4.1.1 Modelling Software

The desktop noise models were created using the SoundPlan v7.4 software program which calculates sound pressure levels at nominated receiver locations and produces noise contours over a defined area of interest. SoundPlan can be used to model different types of noises, such as industrial noise, traffic noise and aircraft noise, and it has been recognised as accepted software by the Department of Environment Regulation (DER).

The inputs required in SoundPlan are noise sources, ground topographical data, meteorological data and sensitive receiver point locations which are discussed below.

4.1.2 Prediction Algorithms

SoundPlan provides a range of prediction algorithms that can be selected by the user. The following prediction algorithms have been used for the Corunna Downs modelling;

- CONCAWE[1,2] prediction algorithm has been used for the mine model;
- NORD2000 prediction algorithm has been used for the road model.

4.1.3 Noise Sensitive Receivers

Table 3 presents the GPS positions for the sensitive receivers used in this assessment. All of the assessed receivers are within 200m of the proposed haulage route.

Table 3 Noise Sensitive Receivers

Reference	Name	GPS Location
R1	Marble Bar Roadhouse	21° 10'29.71"S, 119° 45'0.38"E
R2	Marble Bar Residence	21° 10'38.78"S, 119° 45'23.40"E
R3	Historical Gold Mine	21° 13'55.39"S, 119° 43'31.87"E

[1] CONCAWE (Conservation of Clean Air and Water in Europe) was established in 1963 by a group of oil companies to carry out research on environmental issues relevant to the oil industry.

[2] The propagation of noise from petroleum and petrochemical complexes to neighbouring communities, CONCAWE Report 4/81, 1981

4.1.4 Topography

Topography provided by Atlas was imported into the model to create a digital ground map for the study area. All trucks and mobile equipment were assumed on ground surface (i.e. not in a pit). This is considered worst case because if pits were included they would offer some shielding.

4.1.5 Ground Absorption

The acoustic properties of the ground surface can have a considerable effect on the propagation of noise. Flat non-porous surfaces such as concrete, asphalt, buildings and calm water are highly reflective whereas soft, porous surfaces such as foliage and soft grass are highly absorptive.

For analysis under CONCAWE the ground factor (G) varies from G=1 (totally reflective) to G=0 (totally adsorptive).

For analysis under NORD2000 the ground absorption is defined in terms of Effective Flow Resistivity (EFR) where EFR=20000 $kNsm^{-4}$ represents a highly reflective surface and EFR=12.5 $kNsm^{-4}$ represents a highly absorptive surface.

In order to represent the hard rock and sparse vegetation of the study area, the ground surface applied to the model was G=0.8 (CONCAWE) and EFR=1250 $kNsm^{-4}$ (NORD2000).

4.1.6 Meteorological Conditions

Table 4 presents the worst case meteorological conditions applied to the model, as defined in the Department of Environment Regulation (DER) "Draft Guideline on Environmental Noise for Prescribed Premises".

Table 4 Worst-case meteorological conditions for noise propagation

Time of day	Temperature	Relative Humidity	Wind Speed	Pasquil Stability Category (PSC)
Night (22:00 - 07:00)	15° Celsius	50%	3 m/s	F

4.2 Mine Model

A mining noise model was created using an equipment list and mine plan provided by Atlas Iron. The model included Fixed Plant and Mobile Equipment, modelled simultaneously to represent 'worst case' operational conditions.

Due to the distance between the fixed plant and receivers, the fixed plant items listed in Appendix B were consolidated into 1 single point source, while the mobile equipment were distributed between the pits, haul roads and ROM.

The equipment quantities and noise source levels are presented in Appendix B. The noise source levels applied are based on measurements previous performed on similar equipment.

The mine noise model layout is presented in Figure 2.

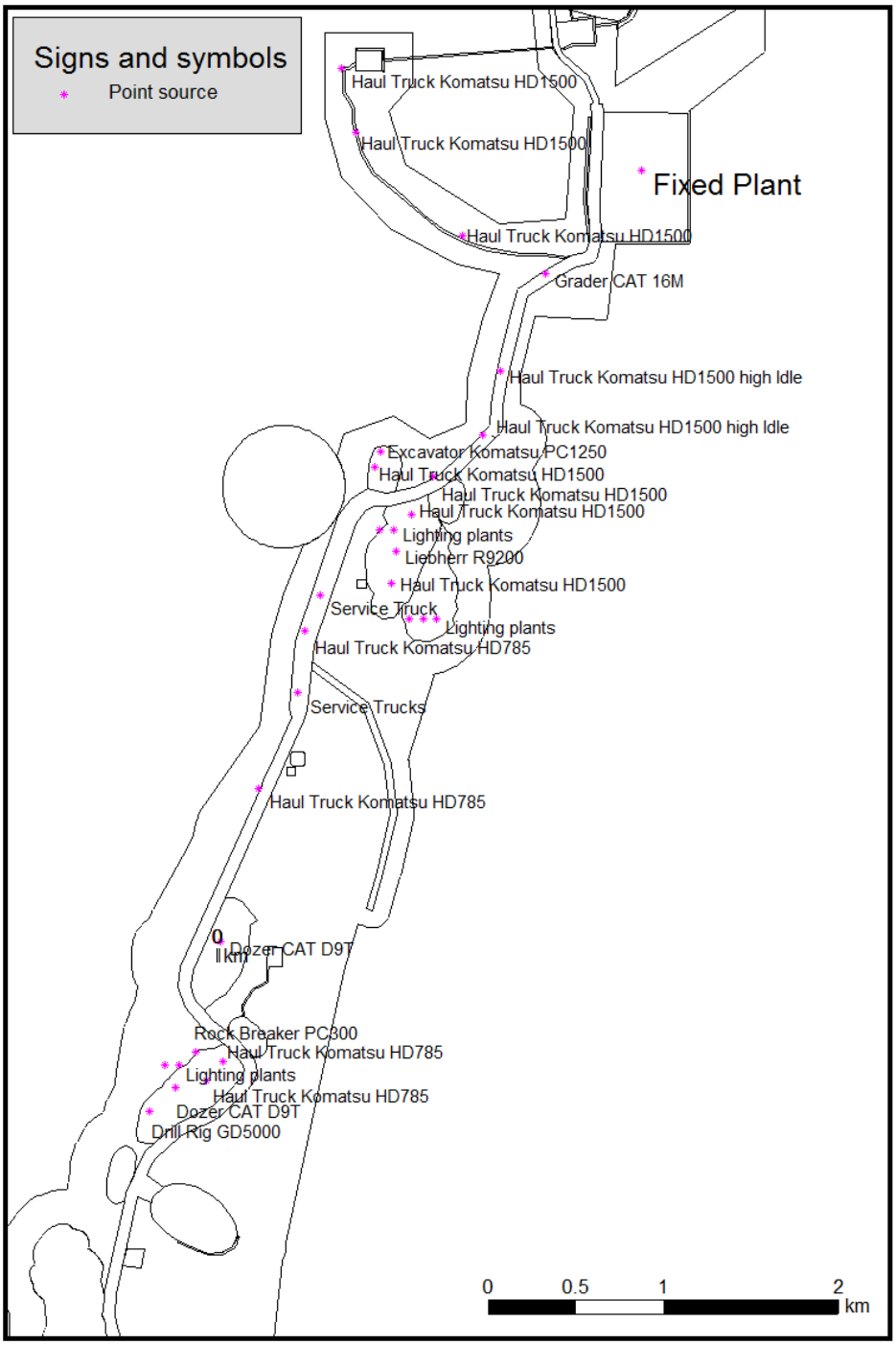

Figure 2 MINING Noise Model Layout

4.3 Road Model

A road noise model was created to predict the noise impacts from the proposed haulage route on sensitive receivers at Marble Bar and the Historic Gold Mine. The road model was setup with 192 quad trailer road trains per day (i.e. ≈4 inbound and 4 outbound every hour). Details of the road model setup are presented in Table 5.

Table 5 Road Noise Model Parameters

Quantity of Road Trains (/day)	192 (96 inbound, 96 outbound)
Speed (km/hr)	40
Trailers	Quad

4.3.1 Noise Source Levels

The Sound Power Levels (SWLs) of the quad trailer road trains were calculated from pass-by measurements taken in the Port Hedland area. These SWLs are consistent with those previously used for the Port Hedland Industrial Council (PHIC) noise modelling.

NOTE: It has been assumed that the trucks are operating at a constant speed. Also, no air braking or gear changing (up or down) has been included.

4.3.2 Model Layout

The road model layout at the Marble Bar receivers (R1 and R2) is shown in Figure 3 and at the Historic Gold Mine (R3) is presented in Figure 4.

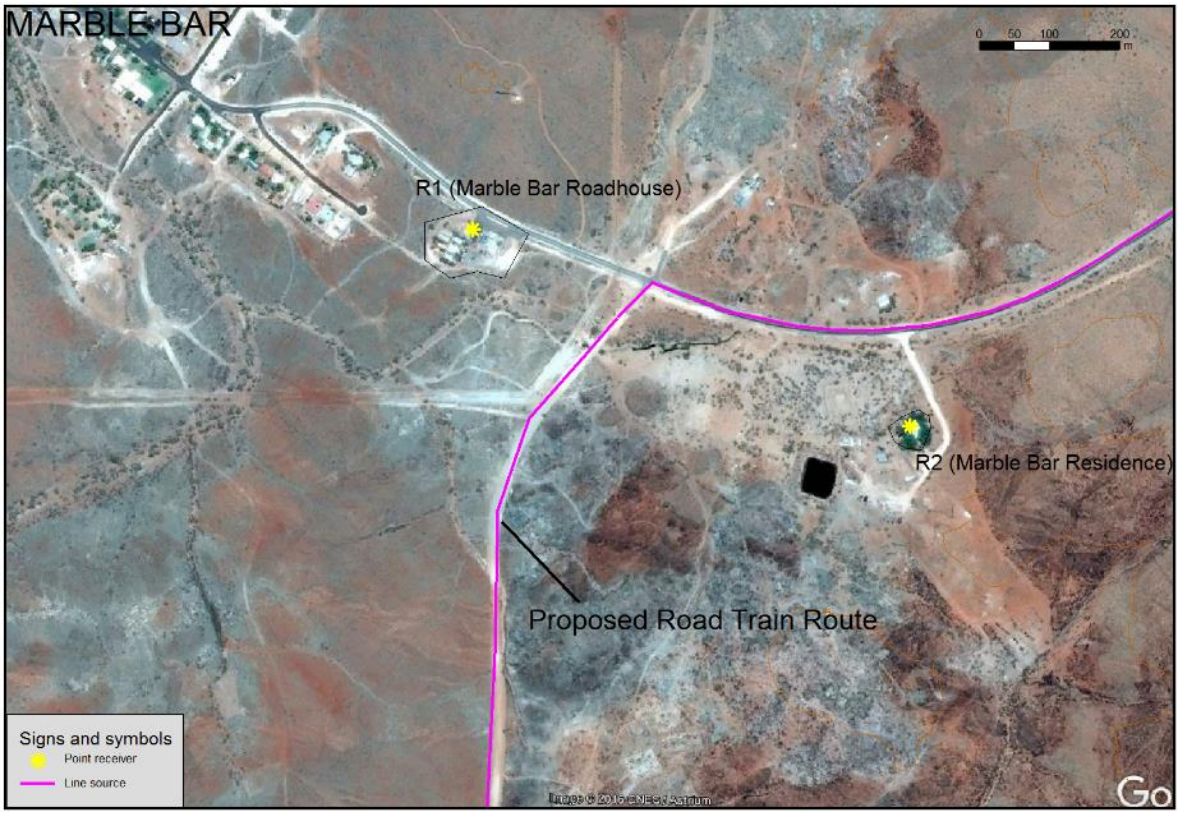

Figure 3 Road Model Layout at Marble Bar Receivers (R1 and R2)

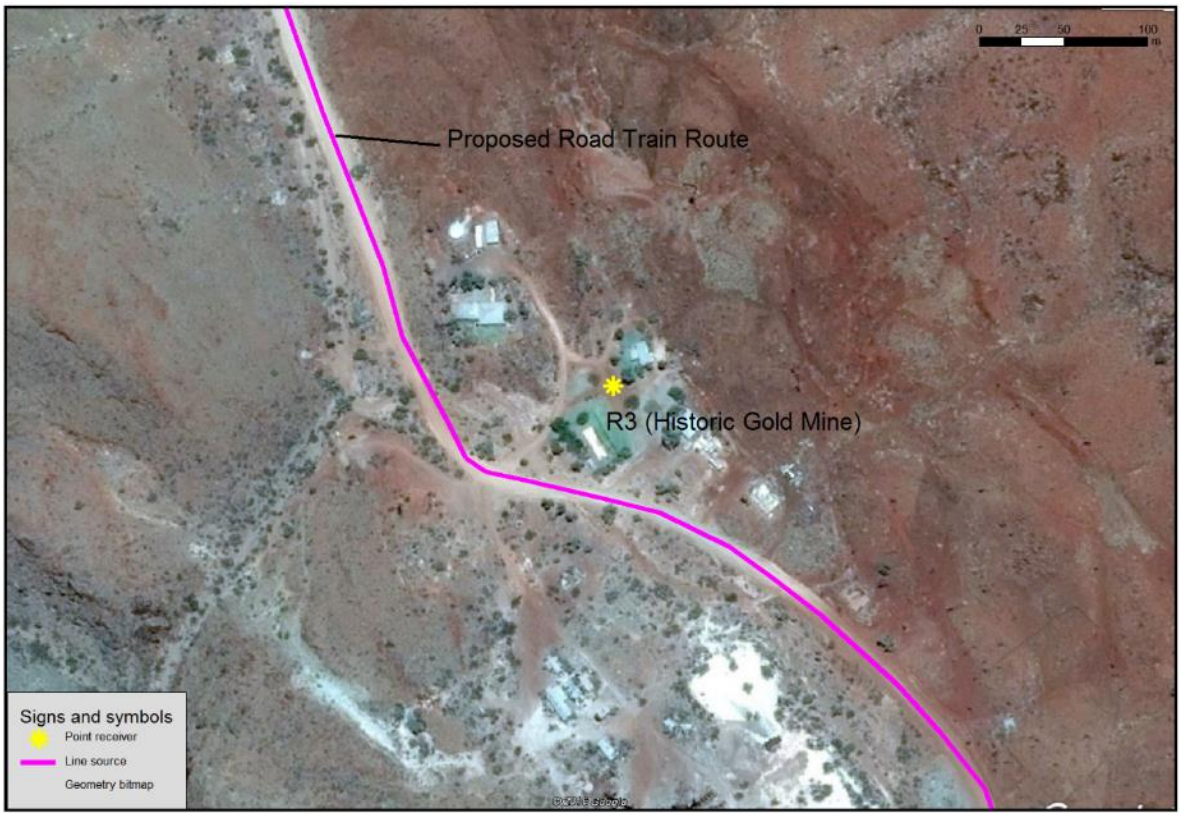

Figure 4 Road Model Layout at Historic Gold Mine (R3)

5 Noise Modelling Results

The following sections present the results of the mining noise model (section 5.1) and road haulage noise model (section 5.2) under worst case meteorological conditions.

5.1 Mining Noise Model Results

Table 6 presents the predicted noise levels for the mining noise model and a compliance assessment against the assigned noise levels.

As can be seen from the results, the mining model is predicted to comply with the assigned noise levels at all sensitive receivers (R1, R2 and R3).

Table 6 Mining Noise Model Results

Sensitive Receiver	LA10 Noise Model Prediction	LA10 Assigned Noise Level	Exceedance in dB
R1 Marble Bar Roadhouse	4.0	35	0
R2 Marble Bar Residence	4.1		0
R3 Historic Gold Mine	0		0

5.1.1 Noise Contour Maps

Figure 5 presents the mining model noise contour map.

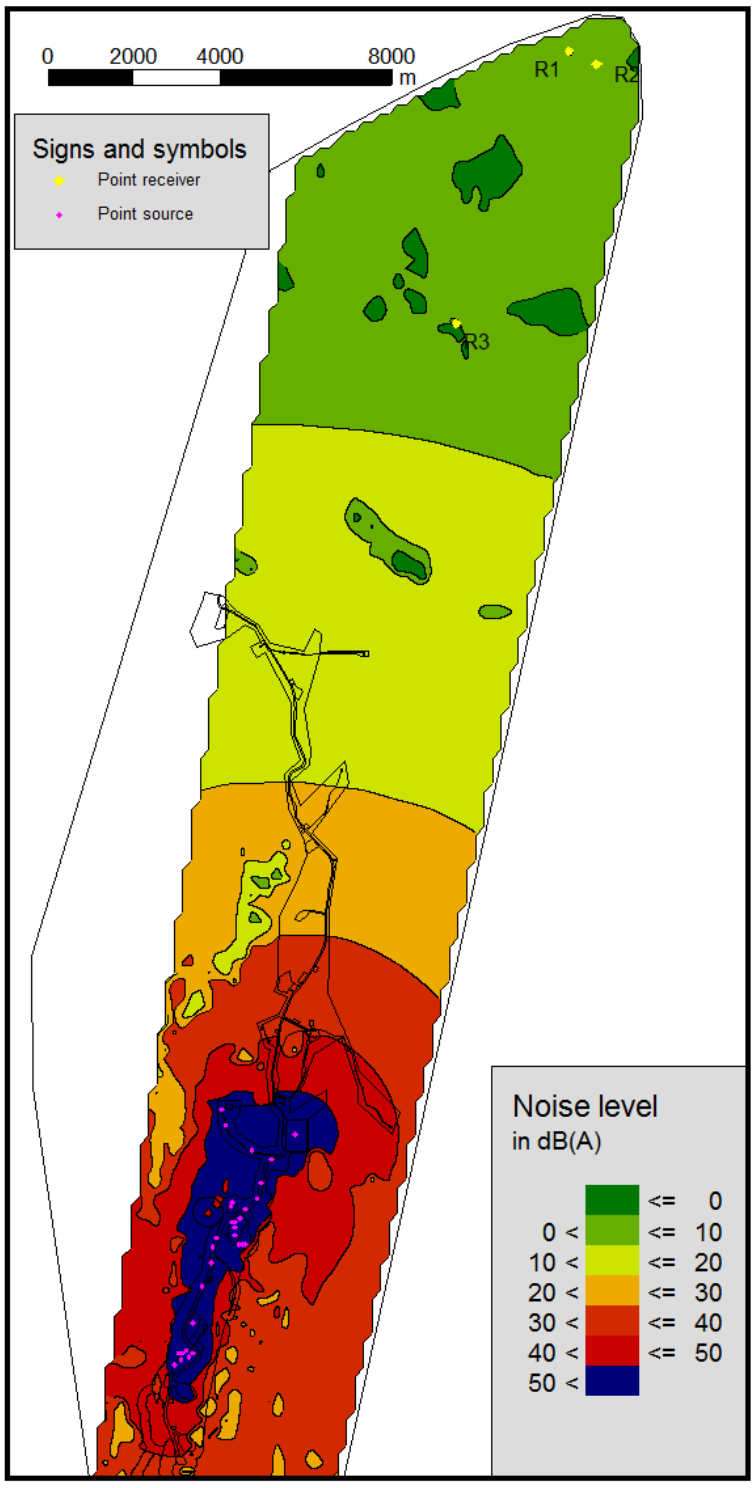

Figure 5 MINING Noise Contour Map – All Receivers (R1-R3)

5.2 Road Noise Model Results

Table 7 presents the predicted noise levels for the Road noise model and a compliance assessment against SPP5.4.

Table 7 Road Noise Model Results

Sensitive Receiver	LAeq Noise Model Prediction	SPP5.4 LAeq Noise Target	SPP5.4 LAeq Noise Limit	Exceedance in dB
R1 Marble Bar Roadhouse	47.9	50	55	0
R2 Marble Bar Residence	50.7			0.7
R3 Historic Gold Mine	54.9			4.9

5.2.1 Conclusions

The following conclusions have be made from the road haulage results;

- Received noise levels from road haulage is predicted to comply with the SPP5.4 'noise limit' criteria at all sensitive receivers.
- Received noise levels from road haulage is predicted to exceed the SPP5.4 'noise target' criteria at the Marble Bar Residence (R2) and at the Historic Gold Mine (R3).
- Noise mitigation options should be investigated and considered for the Marble Bar Residence (R2) and the Historic Gold Mine (R3) with the view to comply with the SPP5.4 target level. Possible noise control options that can be considered are listed in section 6.

5.2.2 Noise Contour Maps

Figure 6 and Figure 7 present the road noise contour maps.

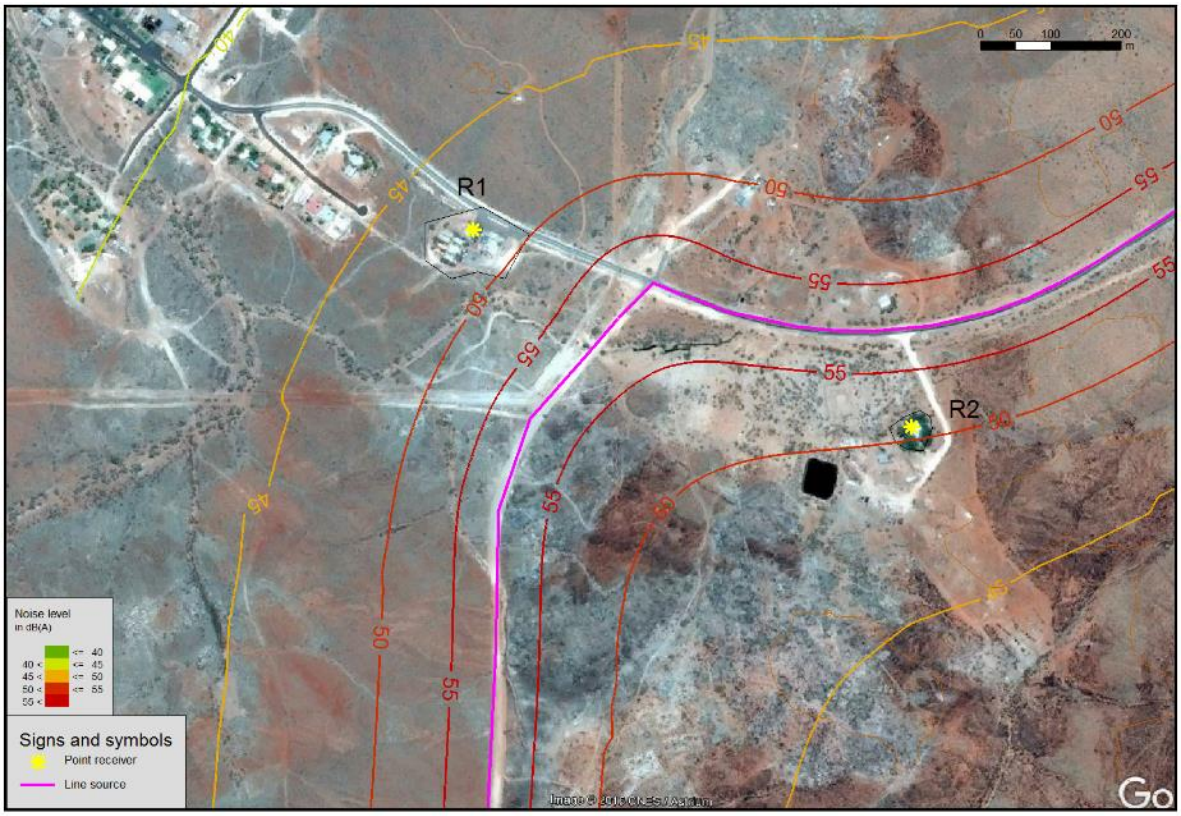

Figure 6 ROAD Noise Contour Map – Marble Bar (R1, R2)

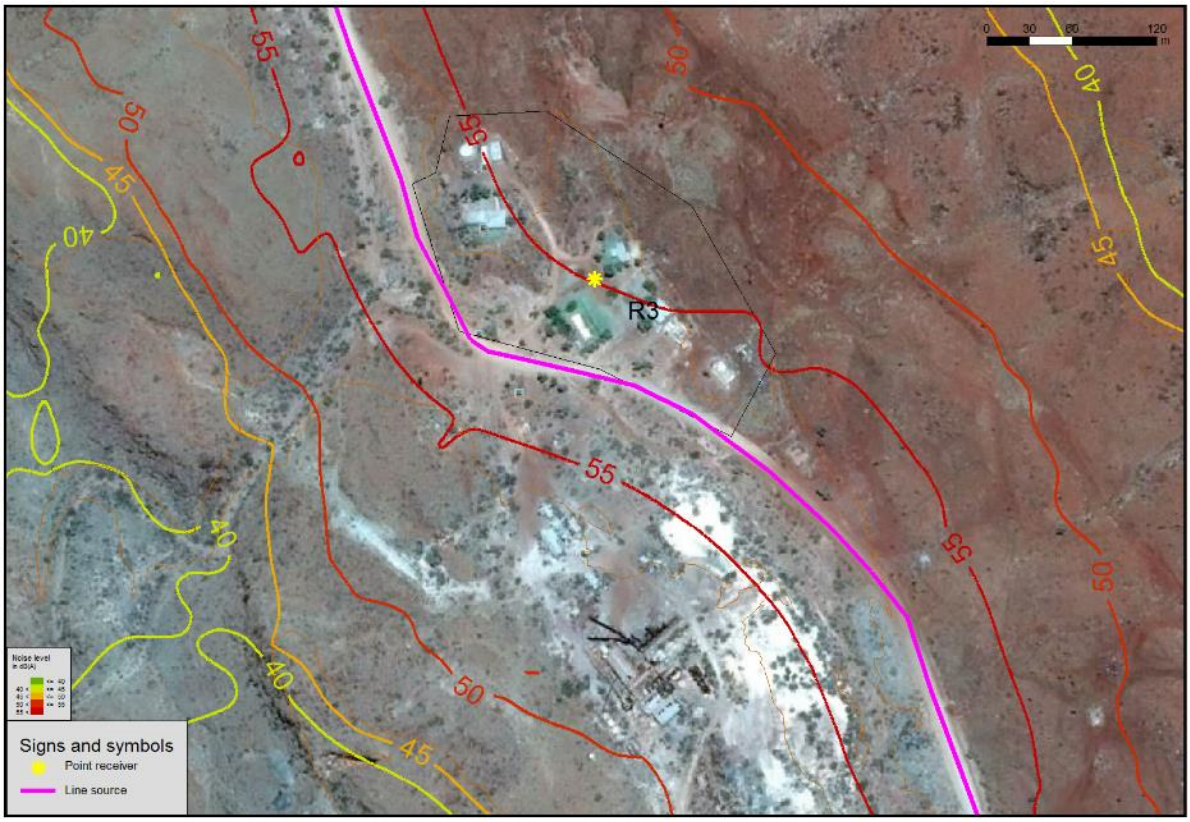

Figure 7 ROAD Noise Contour Map – Historic Gold Mine (R3)

6 Noise Control and Management

6.1 Mining Noise

The proposed mining is predicted to comply with the assigned noise levels at all sensitive receivers. Therefore, no noise control actions have been proposed.

6.2 Road Noise

Received noise levels from road haulage is predicted to exceed the SPP5.4 'noise target' at the Marble Bar Residence (R2) at Historic Gold Mine (R3).

SPP5.4 states that;

1. *"If the noise emissions are expected fall between the 'noise target' and 'noise limit' then mitigation measures should be implemented with the view of compliance with the noise target".*

2. Where noise levels are determined to exceed the noise target, a noise management plan is required to be developed. This plan is to specify the noise mitigation measures that will be implemented to reduce noise to below the noise target level.

There are a number of noise control options that could be implemented to reduce received road noise to below the noise target. Some of these include;

- Screening - walls, barriers, berms.
- Distancing – increase distance between the transport corridor and sensitive receiver.
- House/Building acoustic improvements.
- Low noise road surface (e.g. open grade asphalt)
- Administrative controls (such as slowing truck speeds, limiting air braking etc.) particularly at night-time.

The following actions are recommended;

1. Noise control options for Road Haulage be considered and investigated for the Marble Bar Residence (R2) and Historic Gold Mine (R3) during the more detailed planning phases of Corunna Downs.

2. A noise management plan be developed in accordance with the requirements of SPP5.4 and SPP5.4 implementation guidelines.

7 Conclusions and Recommendations

Based on the results of this environmental noise assessment, the following has been concluded;

- Mining – Received noise levels from mining operations are predicted to comply with the assigned levels at all assessed sensitive receivers.

- Road Haulage – Received noise levels from Road Haulage is predicted to exceed the SPP5.4 'noise target' level at the Marble Bar Residence (R2) and Historic Gold Mine (R3).

7.1 Recommendations

- Noise control options be considered and investigated for the Marble Bar Residence (R2) and the Historic Gold Mine (R3) during the more detailed planning phases of Corunna Downs.

- A noise management plan be developed that specifies the mitigation measures that will be implemented to reduce noise at R2 and R3 to below the 'noise target' level.

Appendix A **Noise Legislation**

Appendix A1 Environmental Protection (Noise) Regulations 1997

Noise management in Western Australia is implemented through the Environmental Protection (Noise) Regulations 1997 which operate under the Environmental Protection Act 1986. The Regulations specify maximum noise levels (assigned levels), which are the highest noise levels that can be received at noise sensitive premises, commercial premises and industrial premises.

Assigned noise levels have been set differently for the different types of premises. For noise sensitive premises, i.e. residences, an 'influencing factor' is incorporated into the assigned noise levels.

The regulations define three types of assigned noise level:

- L_{Amax} assigned noise level is a noise level which is not to be exceeded at any time;
- L_{A1} assigned noise level is not to be exceeded for more than 1% of the time;
- L_{A10} assigned noise level is not to be exceeded for more than 10% of the time.

The LA10 noise limit is the most significant for this study since this is representative of continuous noise emissions from the mining operations. Table A1 shows the assigned noise levels for noise sensitive premises. As can be seen from the table the time of day also affects the assigned levels for noise sensitive residences.

Table A1 : Assigned Noise Levels for Noise Sensitive Receivers

Type of premises receiving noise	Time of day	Assigned Levels (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area	0700 to 1900 hours Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sunday and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and utility premises	All hours	65	80	90

Received noise levels are subject to penalty corrections if the noise exhibits intrusive or dominant characteristics, i.e. if the noise is impulsive, tonal or modulated. That is, the measured or predicted noise levels are increased by the applicable penalties, and the adjusted noise levels must comply with the assigned noise levels. Regulation 9 sets out objective tests to assess whether the noise is taken to be free of these characteristics. Table A2 lists these penalties.

Table A2 : Assigned penalties for intrusive or dominant noise characteristics

Adjustment where noise emission is not music. These adjustments are cumulative to a maximum of 15 dB		
Where tonality is present	Where modulation is present	Where impulsiveness is present
+5 dB	+5 dB	+10 dB

Regulation 9 amended in Gazette 5 Dec 2013 p. 5656 7.

Influencing Factors

The influencing factor depends on land use zonings within 100 metres and 450 metres radius from the noise receiver. The value is dependent on:

- the proportion of industrial land use zonings;
- the proportion of commercial zonings; and
- the presence of major roads within the radius circles.

The influencing factor applied to receivers for this study is shown in Table A3.

Table A3 : Influencing factor for each receiver

Residential area	Influencing factor
None	None

Environmental Protection (Noise) Regulations 1997

Appendix A2 State Planning Policy 5.4

Rail and road noise in Western Australia is managed through the State Planning Policy 5.4 "*Road and Rail Transport Noise and Freight Considerations in Land Use Planning*" (SPP 5.4 gazetted September 2009) which was developed under the *Planning and Development Act 2005* in consultation with the Department of Environment and Conservation (DEC), Main Roads WA (MRWA), Public Transport Authority (PTA) and the Western Australia Local Government Association (WALGA).

The policy states that it is only triggered by certain activities as follows;

- New passenger and freight rail infrastructure projects;
- Major redevelopments of railways; and
- Minor redevelopments that are likely to adversely affect a noise-sensitive land use.

The policy defines a major redevelopment of a railway as follows:

- A proposed substantial realignment, either inside or outside the existing corridor, or
- A rail duplication; or
- Works that significantly increase capacity.

For the purpose of this policy, a minor redevelopment of a railway means minor works such as crossovers, sidings, turnouts, yards, loops, and refuges, relief lines, straightening of curves, re-sleepering or the installation of track signalling devices.

The SPP5.4 noise assessment criteria are presented in Table A1. These criteria are applicable to the emission of road and rail transport noise received at noise sensitive premises. When predicting transport noise levels under this policy a +2.5dB façade correction is to be applied as explained in section 3.1 (page 5) of the "*Implementation Guidelines*" for State Planning

Policy 5.4 "*Road and Rail Transport Noise and Freight Considerations in Land Use Planning*". This +2.5dB façade correction is used to standardise free field noise measurements with noise measurements undertaken at facades of houses/sensitive premises, making the policy applicable in both instances.

Table A 1 State Planning Policy 5.4 Outdoor Noise Criteria

Time of Day	Noise Target (L_{Aeq})	Noise Limit (L_{Aeq})
Day (0600 to 2200 hours)	55	60
Night (2200 to 0600)	50	55

The 5 dB difference between the noise target and noise limit represents an acceptable margin for compliance. In most situations where either the noise-sensitive land use or major railway already exists, it should be practicable to achieve outdoor noise levels within this acceptable margin. The following actions are required as a result of compliance/non-compliance with the criteria;

- If the noise emissions are expected to be compliant with the 'noise target' then no further measures are required;
- If the noise emissions are expected fall between the 'noise target' and 'noise limit' then mitigation measures should be implemented by the developer with the view of compliance with the 'noise target';
- If the noise emissions are expected to exceed the 'noise limit' a detailed noise assessment should be undertaken and noise mitigation measures implemented with the view of compliance with the 'noise target'.

The policy recognises that in a number of instances it may not be reasonable and practicable to meet the noise target criteria. Where transport noise is above the target level, measures are expected to be implemented that best balance reasonable and practicable considerations, such as noise cost/benefit, feasibility, community preferences, amenity impacts, safety, security and conflict with other planning and transport policies. In these cases the community should also be consulted to assist in identifying best overall solutions.

Appendix B **Modelled Equipment Noise Source Data**

Table B 1 Modelled equipment, Sound Power Levels (SWLs) and Quantity

Equipment Item	Quantity[3]	Overall SWL in dB(A)	SWL/ Item	Octave Band Levels, Hz in dB(A)								
				31.5	63	125	250	500	1k	2k	4k	8k
Fixed Plant												
Primary Crusher	1	117.0	117.0	91	95.9	104.3	108.4	111.8	111.4	109.0	104.8	95.2
Secondary Crusher	2	115.3	112.2	90.1	93.6	98.3	104.1	107.1	106.2	104.4	102.4	98.1
Screens	3	119.2	114.5	89.7	95.0	102.8	106.6	110.4	109.3	105.2	100.0	93.3
Conveyor CV2	24	99.8	86.0	43.5	60.9	75.5	80.3	81.0	79.6	75.9	70.2	62.6
Conveyor CV3	24	99.8	86.0	43.5	60.9	75.5	80.3	81.0	79.6	75.9	70.2	62.6
Conveyor CV4	24	99.8	86.0	43.5	60.9	75.5	80.3	81.0	79.6	75.9	70.2	62.6
Conveyor CV5	24	99.8	86.0	43.5	60.9	75.5	80.3	81.0	79.6	75.9	70.2	62.6
Conveyor CV6	24	99.8	86.0	43.5	60.9	75.5	80.3	81.0	79.6	75.9	70.2	62.6
Conveyor CV11	24	99.8	86.0	43.5	60.9	75.5	80.3	81.0	79.6	75.9	70.2	62.6
Conveyor CV13	24	99.8	86.0	43.5	60.9	75.5	80.3	81.0	79.6	75.9	70.2	62.6
Conveyor CV15	24	99.8	86.0	43.5	60.9	75.5	80.3	81.0	79.6	75.9	70.2	62.6
Conveyor CV16	24	99.8	86.0	43.5	60.9	75.5	80.3	81.0	79.6	75.9	70.2	62.6
Conveyor CV17	24	99.8	86.0	43.5	60.9	75.5	80.3	81.0	79.6	75.9	70.2	62.6
Conveyor CV18	24	99.8	86.0	43.5	60.9	75.5	80.3	81.0	79.6	75.9	70.2	62.6
Conveyor CV21	24	99.8	86.0	43.5	60.9	75.5	80.3	81.0	79.6	75.9	70.2	62.6
Conveyor CV22	24	99.8	86.0	43.5	60.9	75.5	80.3	81.0	79.6	75.9	70.2	62.6
Conveyor CV24	24	99.8	86.0	43.5	60.9	75.5	80.3	81.0	79.6	75.9	70.2	62.6
Conveyor CV25	24	99.8	86.0	43.5	60.9	75.5	80.3	81.0	79.6	75.9	70.2	62.6
Conveyor CV26	45	102.5	86.0	43.5	60.9	75.5	80.3	81.0	79.6	75.9	70.2	62.6
Conveyor CV27	45	102.5	86.0	43.5	60.9	75.5	80.3	81.0	79.6	75.9	70.2	62.6
Conveyor Drives	17	113.7	101.4	60.8	71.7	77.6	85.6	96.4	96.4	96.5	83.0	74.8
Mobile Equipment												
Excavator Leibherr R9200	1	123.8	123.8	62.4	78.8	98.4	111.8	113.7	118.3	118.7	116.6	109.5
Digger Komatsu PC1250	1	115.1	115.1	47.8	62.9	62.3	74.5	74.4	78.4	86.8	98.0	93.7
Haul Truck (max revs) Komatsu HD1500	5	126.7	119.7	52.5	63.9	67.0	70.7	80.0	92.3	92.1	95.6	101.4

[3] Conveyor quantity = length (m), whereas mobile equipment quantity = number of items.

Equipment Item	Quantity[3]	Overall SWL in dB(A)	SWL/ Item	Octave Band Levels, Hz in dB(A)								
				31.5	63	125	250	500	1k	2k	4k	8k
Haul Truck (idle) Komatsu HD1500	4	112.6	106.6	71.0	85.6	89.6	94.7	98.4	103.5	99.7	90.0	74.1
Haul Truck (max revs) Komatsu HD785	2	123.8	120.8	52.9	75.0	68.9	82.2	85.1	86.7	90.2	102.1	102.5
Haul Truck (idle) Komatsu HD785	2	105.9	76.3	92.0	90.5	93.9	100.2	101.5	99.2	88.7	82.4	0.0
Dozer CAT D9T	2	120.2	117.2	52.9	56.1	63.3	69.0	72.7	81.7	92.2	94.0	108.1
Grader CAT 16M	1	108.6	108.6	40.4	54.5	55.7	62.1	68.6	73.9	83.2	86.1	82.6
Ancillary Equipment												
Drill Rig GD5000	1	120.1	120.1	81.6	97.8	106.9	106.4	115.8	114	113.2	108	99.9
Rock Breaker PC300	1	122.4	122.4	77.6	85.8	92.9	102.4	113.8	11	118.2	118	112.9
Lighting Plant	7	111.8	103.3	90.9	99.2	82.7	97.9	87.6	84.6	84.2	98.3	89.4
Service Trucks	2	101.7	98.65	54.2	75.6	91.8	85.1	87.6	93.0	93.9	85.8	78.9

Table B 2 HAULAGE Sound Power Level (SWL)

Equipment Item (quantity)	Overall SWL in dB(A)	Octave Band Levels, Hz in dB(A)								
		31.5	63	125	250	500	1k	2k	4k	8k
Road Train (quad trailer)	115.3	31.3	63.8	83.8	97.6	97.5	104.8	106.9	94.9	81.3

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