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Mining & Energy Technical Services Pty Ltd

Spring Creek North Continuation Project

Noise and Vibration Assessment

70B-22-0310-TRP-48941-2

25 September 2023

Job Title: Spring Creek North Continuation Project			
Report Title: Noise and Vibration Assessment			
Document Reference: 70B-22-0310-TRP-48941-2			
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Issued By: Stephen Thomas 25 Sep 2023	 Principal		
Revision History:			
<i>Rev. #</i>	<i>Comments / Details of change(s) made</i>	<i>Date</i>	<i>Revised by:</i>
Rev. 02	Amended issue	25 Sep 2023	JL

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Executive Summary

Glencore Coal Assets Australia (GCAA) is proposing to extend the mining area of the existing Rolleston Open Cut (ROC) coal mine through the Spring Creek North Continuation Project (SCNCP, the Project). The SCNCP will extend the current Spring Creek pit north on mining leases (ML's) 70415 and 70307. A noise and vibration assessment has been conducted for the Project.

Potential worst-case noise levels from operations have been predicted using SoundPlan noise modelling for year 4 under adverse meteorological conditions. Cumulative noise impacts have also been assessed including potential noise from rehabilitation activities associated with the Meteor Downs South mine which will overlap with the project between 2027 and 2030. Noise levels are predicted to comply with the existing Environmental Authority (EA) conditions at noise sensitive receivers. Blasting noise and vibration levels are also predicted to comply with the EA criteria.

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1 Introduction

Vipac has been engaged to conduct a noise and vibration assessment for the Spring Creek North Continuation Project (SCNCP, the Project). Potential impacts from the Project on noise sensitive receivers have been assessed in accordance with the current limits for Noise and Vibration in Environmental Authority condition C1. This report includes the following:

- Reference list of documents and files
- Project description
- Noise and vibration criteria
- Discussion of the noise modelling methodology, parameters, and assumptions
- Assessment of predicted levels against the criteria for
 - Noise from operations
 - Cumulative noise from the nearby Meteor Downs South mine
 - Noise and vibration from blasting
- General recommendations to minimise noise levels

2 References

The following documents and files have been referred to in this report:

- AECOM 'Noise Technical Report', report number 60228842eAKCa.12rp.rev8 dated 26 November 2013
- AECOM 'Blast Technical Report', report number 60228842eAKCa.12rp.blast.rev8 dated 26 November 2013
- ANZEC Guideline, 1990. Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration, Australian and New Zealand Environment Council.
- Australian Standard, 2006. AS 2187: Part 2-2006 Explosives - Storage and Use - Part 2: Use of Explosives, s.l.: Australian Standard.
- Environmental authority EPML00370013 - Rolleston Open Cut, effective 18 October 2022
- Environmental Protection Policy (Noise) 2019
- Department of Transport and Main Roads Code of Practice
- British Standard BS 5228-2:2009 Code of practice for noise and vibration control on construction and open sites
- Names and locations of neighbouring homesteads in email 'FW: 70B-22-0310 - Document from Vipac Engineers & Scientists - Air Quality Assessment', received on 13 March 2023
- 'ROC Elevation Lines' in email 'FW: 70B-22-0310 - Document from Vipac Engineers & Scientists - Air Quality Assessment', received on 23 May 2023
- Fleet numbers and locations included in the email 'RE: 70B-22-0310 - Document from Vipac Engineers & Scientists - Air Quality Assessment', received on 28 April 2023
- Albinia National Park boundaries as shown on the Department of Environment and Science website '<https://wetlandinfo.des.qld.gov.au/wetlands/facts-maps/national-park-albinia/>'
- Meteor Downs South equipment list as provided in email 'SCNCP Sensitive Receptor Assessment (Noise & Air Quality)', received on 31 July 2023

The AECOM report for noise was referred to for noise modelling assumptions and parameters, where information such as equipment noise levels and modelled meteorological conditions were adopted for this assessment for consistency. The AECOM report for blasting was referred to for Rolleston site specific constants for the blasting assessment.

3 Project Description

The Rolleston Open Cut (ROC) thermal coal mine has been in operation since 2005. The Project would extend the mining area of the existing operation by mining north of the current Spring Creek pit on ML's 70415 and 70307 as shown in Figure 3-1.

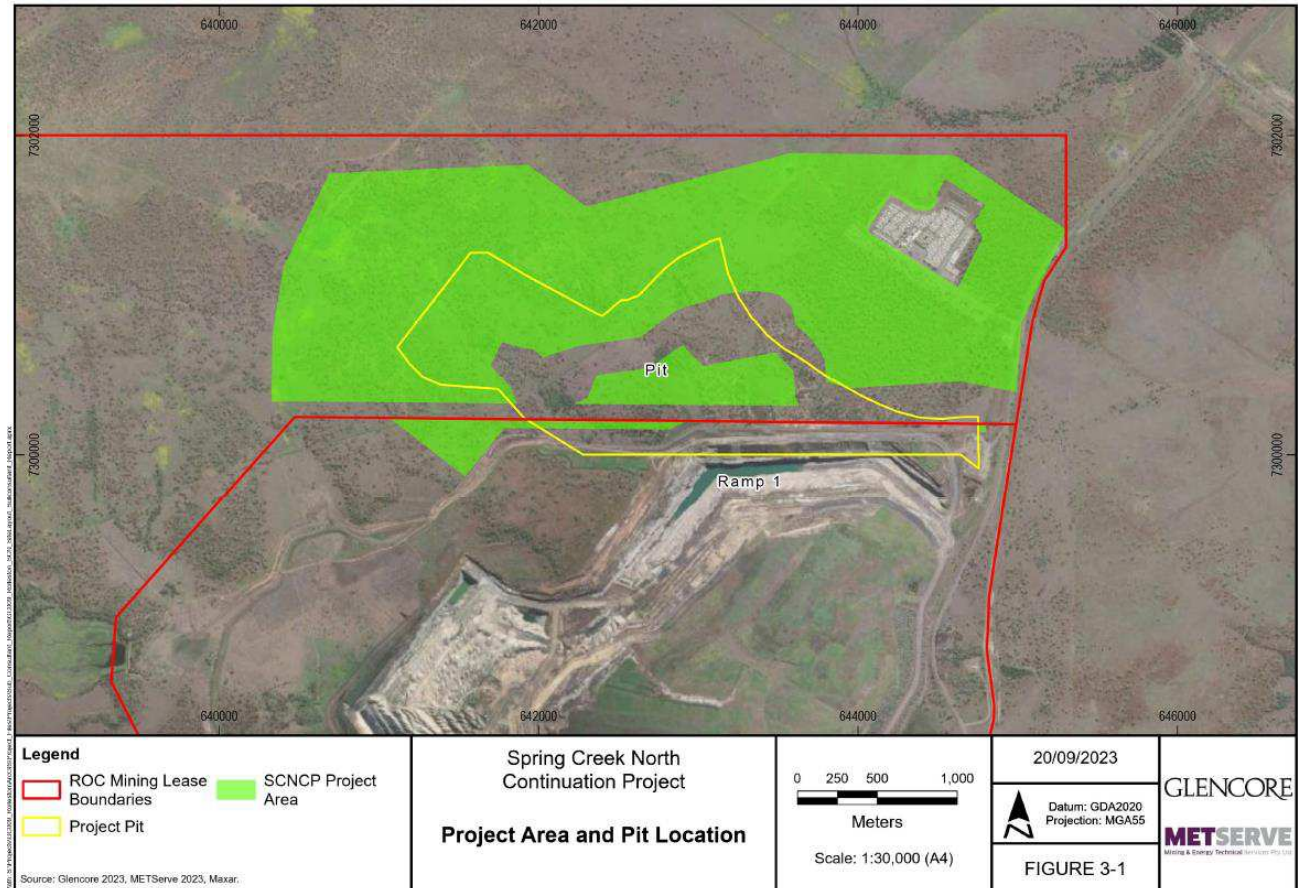


Figure 3-1 Project Area and Pit Location

The Project will not increase the mine's production rate or extend the life of the mine. No change in the method of mining is proposed and operating hours will remain unchanged with the mine operating 24 hours per day, 7 days per week. The Project proposes to utilise existing infrastructure, and noise contribution from mine infrastructure noise sources are expected to remain unchanged. On this basis noise levels will be predominantly from the movement of mobile equipment in the Project area.

Year 4 has been identified by the proponent to be representative of the worst-case scenario for potential noise and vibration levels with a dragline and three other excavation machines active in the SCNCP.

Although not a part of the Project, potential noise from the nearby Sojitz Blue operated Meteor Downs South mine has also been included as part of a cumulative impact assessment. Information provided by Meteor Downs South mine indicated there will not be operational overlap with the Project, but rehabilitation activities would occur during the day-time only between 2027 and 2030. This period is earlier than the worst case year 4 identified for the project, but potential cumulative noise levels have been assessed as a conservative scenario.

4 Noise Sensitive Receivers

The nearest noise sensitive receivers consist of homesteads and Albinia National Park. Locations are shown in Figure 4-1, and Figure 4-2.

Table 4-1 Nearest Noise Sensitive Receivers

Noise Sensitive Receiver	Distance from Project (km)	UTM Zone 55S	
		East (m)	South (m)
Meteor Downs	5.5	635124	7302750
Albinia Downs	5.7	650271	7298160
Inderi	7.3	644889	7308673
Croydon Hills	10.6	630818	7305673
Springwood	17.4	634445	7283926
Bottle Tree Downs	14.4	650168	7287015
Belmundi	12.3	634426	7312367
Maria Downs	13	633990	7312989
Myrtle Vale	14.6	634474	7314944
Canopus Park	10.4	638217	7311895
Orana Downs	14.1	639828	7315824
Wandana	14	640337	7315780
Starlee	12	656300	7306109
Karonga	9.9	643371	7311792
Cambridge Downs	13	645299	7314743
Maxmoor	14.7	650490	7315396
Carnarvan View	14.7	659268	7297067
The Pocket	14.3	655717	7290964
Albinia National Park	9.5	652317	7293882

Albinia National Park covers a large area east of Rolleston Coal Mine

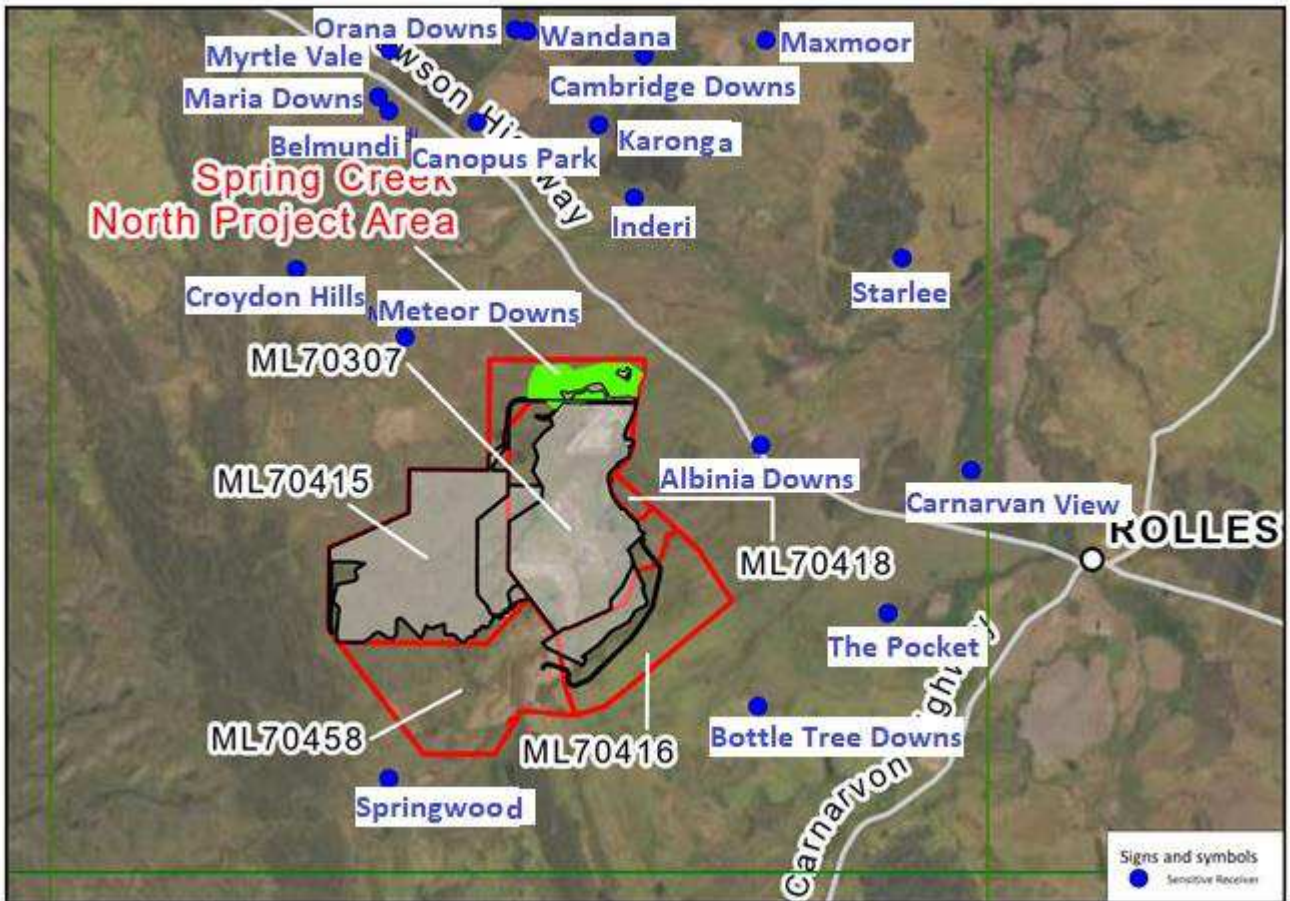


Figure 4-1 Nearest Noise Sensitive Receivers (Homesteads)



Figure 4-2 Sensitive Place - Albinia National Park (identified as the white triangle)

5 Existing Noise Environment

Noise surveys of the existing environment were beyond the scope of this assessment. Previous survey results in AECOM's report provided a description of the noise environment at noise sensitive receivers. Noise measurements conducted in December 2009 and January 2010 indicated that the ambient noise environment was dominated by birds and insects typical of summer periods, and noise levels during colder months may result in lower recorded levels. The report noted no mining noise was audible during the day time at the nearest noise sensitive receivers. Night time measurements were conducted at Meteor Downs and Albinia Downs indicated mining noise was audible at both locations. The report provided a conservative estimate of mining noise at the nearest noise sensitive receivers of LAeq,1h 27dB(A).

6 Noise and Vibration Criteria

Legislation, standards, and guidelines referred to for this assessment are discussed below including Environmental Authority EPML00370013.

6.1 Environmental Authority EPML00370013

The current Environmental Authority (EA) conditions are from the AECOM 'Noise Technical Report' which considered the Environmental Protection Act 1994, Environmental Protection (Noise) Policy 2008, and the guideline 'Planning for Noise Control'. The current 2019 Environmental Protection (Noise) Policy contains the same acoustic quality objectives referred to in the Environmental Protection (Noise) Policy 2008.

EA Table C1 contains noise limits for the existing mining operation. In addition to Table C1, Table C2 'Airblast Overpressure and Vibration Level' contains criteria for blasting.

Tables C1 and C2 in the EA have been reproduced below in Table 6-1 and Table 6-2 respectively.

Table 6-1 Noise Limits (from EA Table C1)

Noise Level dB(A)	Monday to Sunday (including Public Holidays)		
	7am – 6pm	6pm – 10pm	10pm – 7am
L _{Aeq} (1hr) dB(A)	45	40	35

Table 6-2 Airblast Overpressure and Vibration (from EA Table C2)

	Airblast Overpressure Measured/Vibration Measure
Airblast Overpressure	Air blast overpressure level of 115dB (Linear) peak for 9 out of 10 consecutive blasts initiated and not greater than 120dB (Linear) peak at any time.
Ground Vibration Peak Particle Velocity	5mm/s peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10mm/s peak particle velocity at any time.

6.2 ANZEC Guideline and AS 2187

The ANZEC guidelines and standard AS2187.2 have overpressure criterion of 115 dBL L_{peak} is a strict limit for human comfort (for 95% of blasts in a 12 month period), with a maximum limit up to 120 dBL L_{peak} for no more than 5% of blasts.

The ground vibration PPV limit of 5 mm/s is a strict limit for human comfort (for 95% of blasts), with a maximum limit up to 10 mm/s for no more than 5% of blasts. These levels are reflected in the EA conditions.

6.3 TMR Code of Practice and British Standard 5228-2

The Department of Transport and Main Roads (TMR) Code of Practice (CoP) and British Standard 5228-2:2009 for construction vibration have been referred to for addressing human comfort with regard to vibration from general mining activities other than blasting. Lower and upper limits are provided where the lower limits are generally considered to be perceptible if exceeded, and the upper limits are considered likely to cause annoyance if exceeded. The relevant section is shown below in Table 6-3.

Table 6-3 Vibration Limits for Annoyance from General Mining Activities

Building	Work Period	Resultant PPV, mm/s	
		Lower limit	Upper limit
Dwellings (including hotels and motels)	Standard hours	1.0	2.0
	Non-Standard hours – evening	0.3	1.0
	Non-Standard hours – night time		

The nearest homesteads are more than 5km away from the Project pit. At these distances, vibration levels generated by general mine operations (other than blasting) would be imperceptible, and below the lower limit of 0.3mm. Vibration levels from general operation are expected to be compliant with criteria for human comfort, and vibration from non-blasting activities has not been further discussed in this report.

6.4 Criteria Used in this Assessment

The Project area is situated within ML's 70415 and 70307 (which are included in EA EPML00370013), however it is understood that the Project area has not been previously assessed for mining. Nevertheless, the EA criteria have been considered appropriate for assessing potential noise from the Project in this report given that the Project only involves an extension of mining activities north of the current Spring Creek pit within a mining lease covered under the EA. In addition, the Project is not proposed to increase production or extend the mine's life and use existing mine infrastructure.

7 Noise Modelling

SoundPlan 8.1 noise modelling software was used to model the following:

- Year 2034 of the Project operations
- Cumulative scenario for noise from the project and Meteor Downs South mine rehabilitation activities

The following sections include the list of equipment, fleet numbers, equipment sound power levels, and modelling parameters used to predict noise levels.

7.1 List of Equipment

The list of equipment is shown below in Table 7-1 for SCNCP, as well as RW1 and RW2. Noise data and modelled heights were adopted from the AECOM 'Noise Technical Report'. Sound power levels by octave bands have been included in Appendix A. All sources were modelled at 5m above ground level.

Table 7-1 List of Equipment

LOCATION	MACHINE	TASK	TRUCK #	TRUCK TYPE	DIGGER Depth from Topo	INDICATIVE TRUCK Locations
SCN\49\9\230\OB	SH01	Prestrip	6.0	Caterpillar 793F_220t	~31 m	1 x Digger, 1 x Dump face 1 x Queue, 2 x loaded haul, 1 x empty haul
SCN\50\9\250\OB	EX06	Prestrip	4.0	Caterpillar 793F_220t	~10m	1 x Digger, 1 x Dump face, 1 x loaded haul, 1 x empty haul
SCN\45\10\2\B	EX07	Coal	6.0	Caterpillar 789C Flat Floor_190t	~70m	1 x Digger, 1 x lowwall ramp, 1 x ROM, 2 x Loaded haul, 1 x empty haul
SCN\45\8\1\DL	DL02	Interburden			~75m	
RW2_1\12\7\240\OB	EX04	Prestrip	5.0	Caterpillar 793F_220t	~5m	1 x Digger, 1 x Dump face, 2 x loaded haul, 1 x empty haul
RW2_1\11\6\230\OB	SH02	Prestrip	9.0	Caterpillar 795F-AC_313t	~15m	1 x Digger, 1 x Dump face, 1 x Queue, 4 x loaded haul, 2 x empty haul
RW1_C\5\7\2\B	EX03	Coal	6.0	Caterpillar 789C Flat Floor_190t	~60m	1 x Digger, 1 x Ramp, 2 x Loaded haul, 1 x Rom, 1 x empty haul
RW1_C\8\7\230\OB	SH03	Prestrip	7.0	Caterpillar 795F-AC_313t	~25m	1 x Digger, 1 x Dump face, 1 x Queue, 2 x loaded haul, 1 x empty haul
RW1_C\4\5\1\D	DL01	Interburden			~50m	
TOTAL:			43.0	Mixed Fleet		

*DL: Dragline, SH: Shovel, EX: Excavator

The applicable mining scenario is shown in Figure 7-1, showing approximate equipment locations in SCNCP, Rolleston West 1 (RW1), and Rolleston West 2 (RW2).

For the cumulative noise scenario the following additional equipment have been modelled as operating around the Meteor Downs South mine:

- Excavator (Cat 6040)
- Trucks x 4 (Cat 789)
- Dozers x 4 (Cat D10, Cat D11)

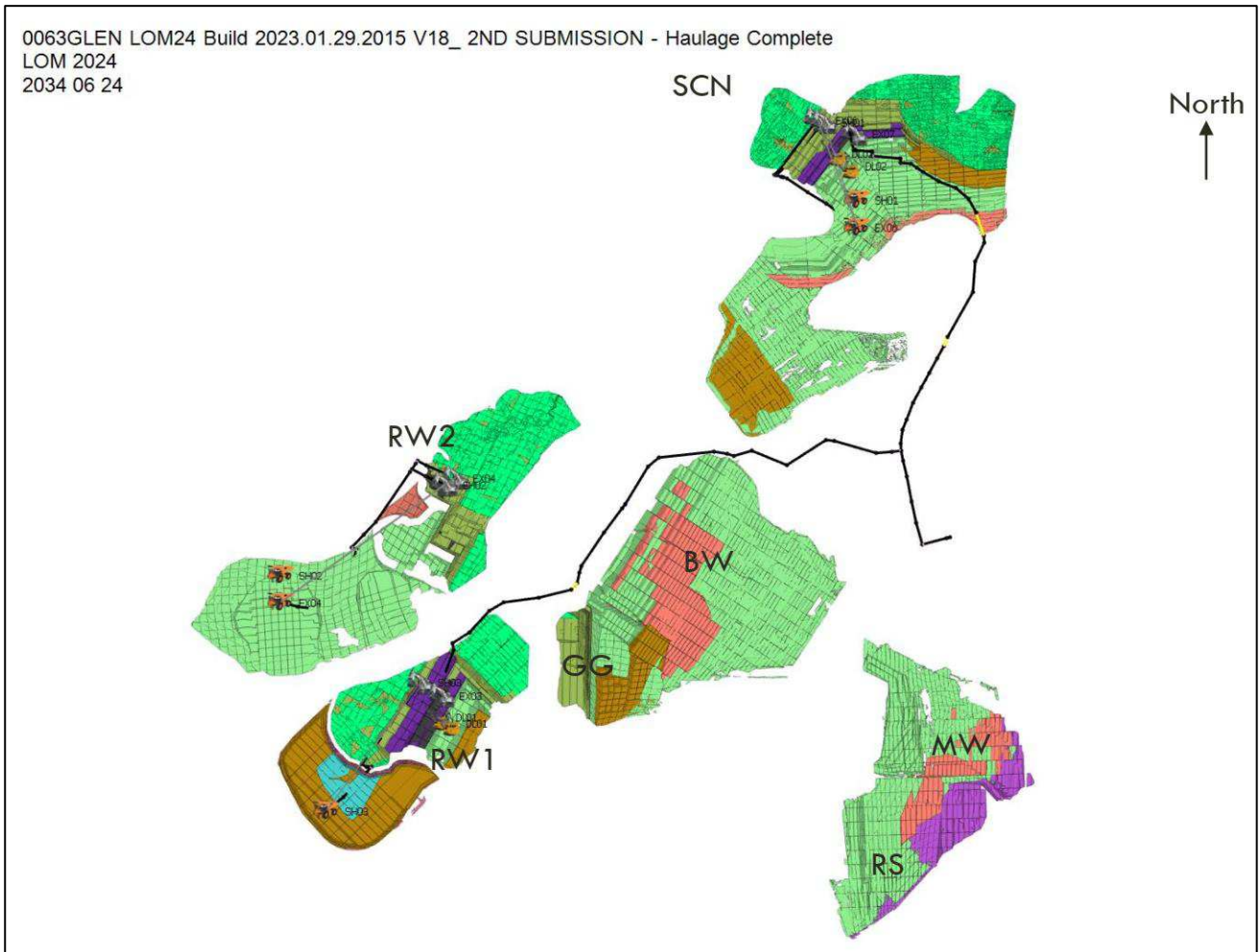


Figure 7-1 Mining Scenario June 2034

7.2 Modelling Parameters

Noise Modelling has incorporated the following parameters and assumptions consistent with previous noise modelling conducted by AECOM:

- CONCAWE noise propagation algorithm
- Worst case weather conditions of Pasquil Stability Class F, with calm conditions
- Ground absorption coefficient of 0.9
- Sensitive receiver heights of 1.8m above ground level

The Dragline, excavator, and shovels were modelled as operating within the pit bench/ floor. Coal and overburden dump trucks were modelled in and around the pit, haul roads, and ROM.

For the cumulative scenario, the Meteor Downs South equipment have been modelled at operating mostly around the pit and overburden dump.

Locations of noise sources used in noise modelling have been included in Appendix C.

8 Noise Assessment

Noise from the project operations and cumulative noise levels have been predicted below.

8.1 Project Operations

Potential worst case noise levels for year 4 have been predicted at noise sensitive receivers and compared against noise criteria as discussed in Section 6.4.

Predicted noise levels have been compared against the EA noise criteria in Table 8-1.

Table 8-1 Predicted Noise Levels

Noise Sensitive Receiver	Predicted Noise Level LAeq dB(A)	EA Noise Criteria LAeq,1h dB(A)	Compliance
Albinia Downs	32	7am – 6pm 45 dB(A) 6pm – 10pm 40 dB(A) 10pm – 7am 35 dB(A)	Yes
Belmundi	25		Yes
Bottle Tree Downs	27		Yes
Cambridge Downs	24		Yes
Canopus Park	26		Yes
Carnarvan View	25		Yes
Croydon Hills	28		Yes
Inderi	28		Yes
Karonga	26		Yes
Maria Downs	25		Yes
Maxmoor	23		Yes
Meteor Down	33		Yes
Myrtle Vale	24		Yes
Orana Downs	24		Yes
Springwood	29		Yes
Starlee	25		Yes
The Pocket	24		Yes
Wandana	24		Yes
Albinia National Park	29		Yes

Noise levels are predicted to comply with the EA noise criteria at all neighbouring homesteads, with noise levels of up to 33 dBA Leq,T predicted at Meteor Downs.

Noise levels are not predicted to cause significant impacts to the above sensitive places near the project. No significant impacts are expected at sensitive places further away beyond the areas assessed in this report.

A noise map of year 4 has been included in Appendix B. Noise maps were generated for 50m grid spacing at 1.8m above ground level.

8.2 Cumulative Noise Levels

Potential cumulative noise levels from the project and Meteor Downs South rehabilitation activities have been compared against the day time EA noise criterion in Table 8-2 as discussed in Section 3.

Table 8-2 Predicted Cumulative Noise Levels

Noise Sensitive Receiver	Predicted Noise Level LAeq dB(A)	EA Noise Criteria LAeq,1h dB(A)	Compliance
Albinia Downs	33	7am – 6pm 45 dB(A)	Yes
Belmundi	26		Yes
Bottle Tree Downs	27		Yes
Cambridge Downs	25		Yes
Canopus Park	27		Yes
Carnarvan View	25		Yes
Croydon Hills	29		Yes
Inderi	29		Yes
Karonga	27		Yes
Maria Downs	26		Yes
Maxmoor	24		Yes
Meteor Down	35		Yes
Myrtle Vale	25		Yes
Orana Downs	25		Yes
Springwood	30		Yes
Starlee	25		Yes
The Pocket	24		Yes
Wandana	24		Yes
Albinia National Park	29		Yes

Noise levels are predicted to comply with the daytime EA noise criterion at all sensitive places, with noise levels of up to 35 dBA Leq,T predicted at Meteor Downs.

A noise map of the cumulative scenario has been included in Appendix B. Noise maps were generated for 50m grid spacing at 1.8m above ground level.

9 Blasting Noise and Vibration

Blasting will be used for the removal of overburden. It is expected that there will be an average of three blasts per month, however with a maximum of six blasts per month.

Estimations of potential blasting vibration and airblast overpressure levels have been made based on Australian Standard AS2187.2-2006 with the following parameters:

- Maximum instantaneous charge: 2,267kg
- Average depth of hole: 42m
- Blast hole diameter (typical): 0.270m
- Explosive type: Fortan 13 (coal13) = 1.28 g/cc, Fortan 12 (coal12) = 1.20 g/cc, Fortis Coal = 1.20 g/cc
- For ground vibration, a site exponent of -1.6 and a site constant of 2,350 (adopted from the AECOM report)
- For airblast overpressure, a site exponent of -1.2 and a site constant of 3.3 (adopted from the AECOM report)

Predicted ground vibration levels have been assessed against the criteria in Table 9-1. Predicted airblast overpressure levels have been assessed against the criteria in Table 9-2.

Table 9-1 Predicted Ground Vibration Levels

Noise Sensitive Receiver	Approximate Distance from Project Area km	Predicted Ground Vibration PPV mm/s	Criteria mm/s	Compliance
Albinia Downs	5.7	1.1	5 (10 absolute maximum)	Yes
Belmundi	12.3	0.3		Yes
Bottle Tree Downs	14.4	0.3		Yes
Cambridge Downs	13	0.3		Yes
Canopus Park	10.4	0.4		Yes
Carnarvan View	14.7	0.2		Yes
Croydon Hills	10.6	0.4		Yes
Inderi	7.3	0.7		Yes
Karonga	9.9	0.5		Yes
Maria Downs	13	0.3		Yes
Maxmoor	14.7	0.2		Yes
Meteor Down	5.5	1.2		Yes
Myrtle Vale	14.6	0.2		Yes
Orana Downs	14.1	0.3		Yes
Springwood	17.4	0.2		Yes
Starlee	12	0.3		Yes
The Pocket	14.3	0.3		Yes
Wandana	14	0.3		Yes
Albinia National Park	9.5	0.5		Yes

Table 9-2 Predicted Airblast Overpressure Levels

Noise Sensitive Receiver	Approximate Distance from Project Area km	Predicted Airblast Overpressure dB(Linear)	Criteria dB(Linear)	Compliance
Albinia Downs	5.7	101	115 (120 absolute maximum)	Yes
Belmundi	12.3	93		Yes
Bottle Tree Downs	14.4	91		Yes
Cambridge Downs	13	92		Yes
Canopus Park	10.4	95		Yes
Carnarvan View	14.7	91		Yes
Croydon Hills	10.6	95		Yes
Inderi	7.3	98		Yes
Karonga	9.9	95		Yes
Maria Downs	13	92		Yes
Maxmoor	14.7	91		Yes
Meteor Down	5.5	101		Yes
Myrtle Vale	14.6	91		Yes
Orana Downs	14.1	92		Yes
Springwood	17.4	89		Yes
Starlee	12	93		Yes
The Pocket	14.3	91		Yes
Wandana	14	92		Yes
Albinia National Park	9.5	96		Yes

Blasting is predicted to comply with the EA ground vibration and airblast overpressure criteria at the nearest sensitive places.

10 General Noise and Vibration Control Measures

Noise and vibration from the Project are predicted to comply with the EA criteria at nearby homesteads. The following general noise control measures may be considered to further minimise noise where practicable:

- Avoiding unnecessary revving of engines and switch off equipment when not required
- Keeping internal roads well maintained
- Using rubber linings in or constrained layer damping on, for example, chutes and dumpers to reduce impact noise
- Minimising the drop heights of materials
- Employing audible reversing warning systems on mobile plant and vehicles that are of a type that have minimal noise impact. This may include alarms that automatically adjust volumes based on the surrounding noise environment or alarms that are non-tonal in nature (such as broadband or 'quack' alarms)
- Enclosing sources of significant noise where practicable. A typical enclosure may provide 10 to 20 dB(A) of noise reduction depending on the material

11 Conclusion

A noise and vibration assessment has been conducted for the Project. Cumulative noise impacts have also been assessed for potential noise from rehabilitation activities associated with the Meteor Downs South mine which will overlap with the project between 2027 and 2030.

Noise levels for both scenarios are predicted to comply with the EA noise criteria at sensitive places. Blasting noise and vibration levels are predicted to comply with the EA criteria.

Appendix A Equipment Sound Power Levels

Equipment	Unit	31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz	Sum
Excavator (Hitachi 5500 or similar)	dB(A)/ Lw/unit	74.6	95.8	103.9	106.4	113.8	115.0	113.2	106.0	93.9	119.4
Dump Truck (Cat 789, 793F, 795F or similar)	dB(A)/ Lw/unit	82.6	95.8	110.9	112.4	113.8	116.0	116.2	109.0	100.9	121.6
Dragline (Bucyrus 2570W or similar)	dB(A)/ Lw/unit	79.6	97.8	105.9	110.4	118.8	118.0	114.2	108.0	90.9	122.7
Shovel (P&H 4100A or similar)	dB(A)/ Lw/unit	72.6	85.8	105.9	109.4	113.8	116.0	111.2	105.0	102.9	119.8

*Note the sound power levels for the shovel and excavator are different to those shown in the AECOM report as the AECOM report showed incorrect total sound power levels for these two items. Octave band noise sound power levels are the same.

^Noise data in the above table were adopted for the cumulative noise assessment.



Appendix B Noise Map for Year 4

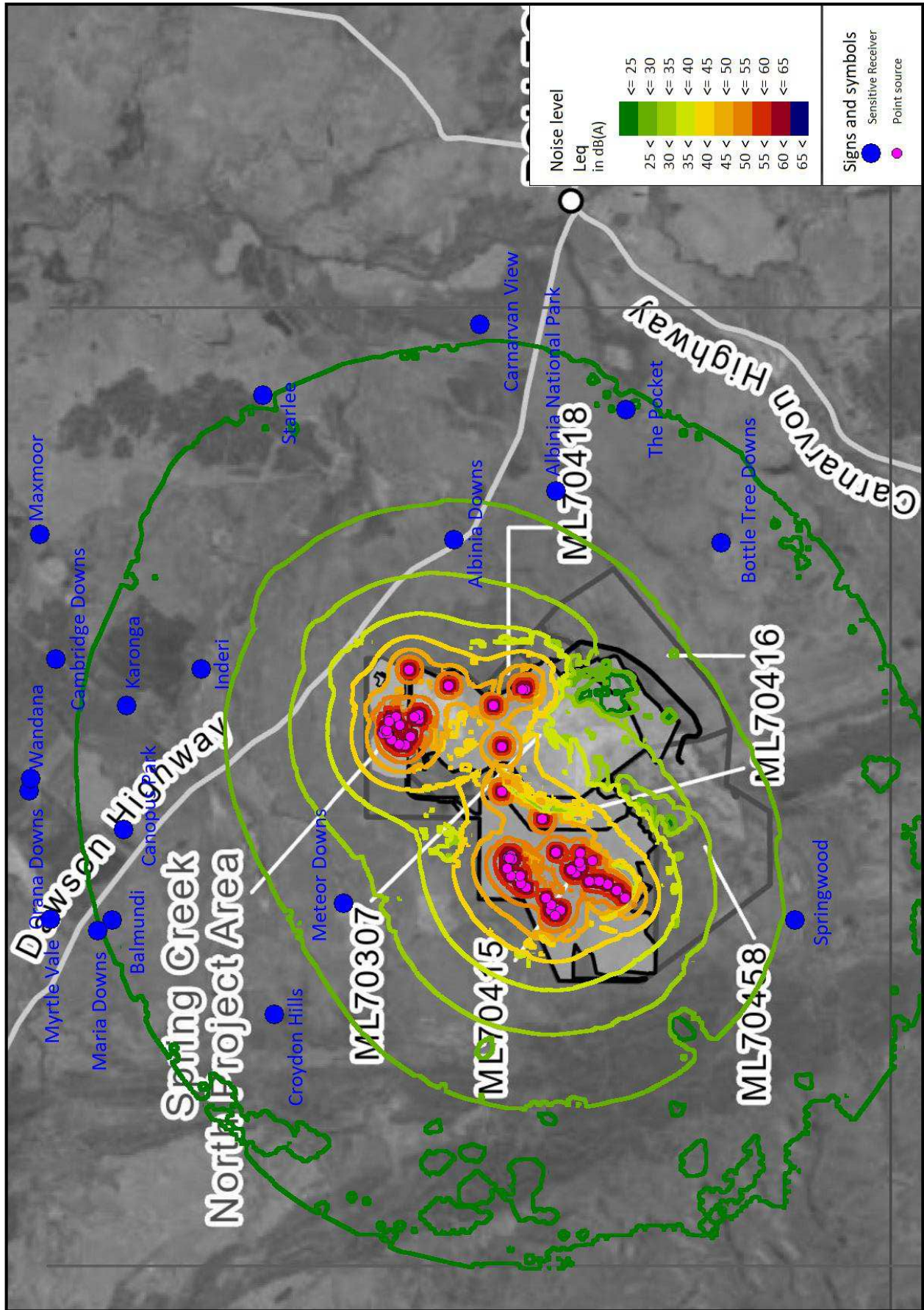


Figure B-1 Noise Map for Year 2034

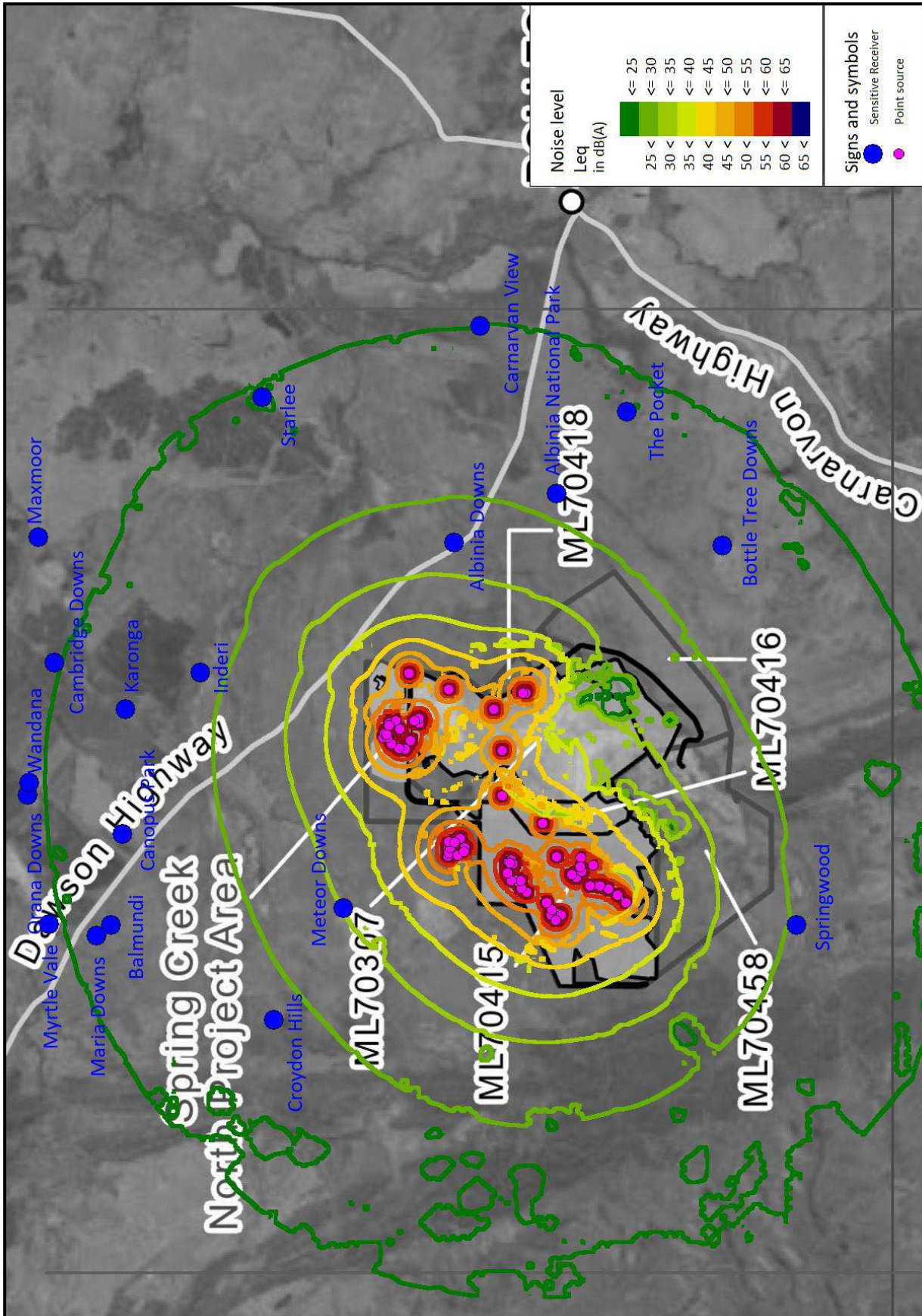


Figure B-2 Noise Map for the Cumulative Scenario

Appendix C Noise Sources Locations Used in Noise Modelling

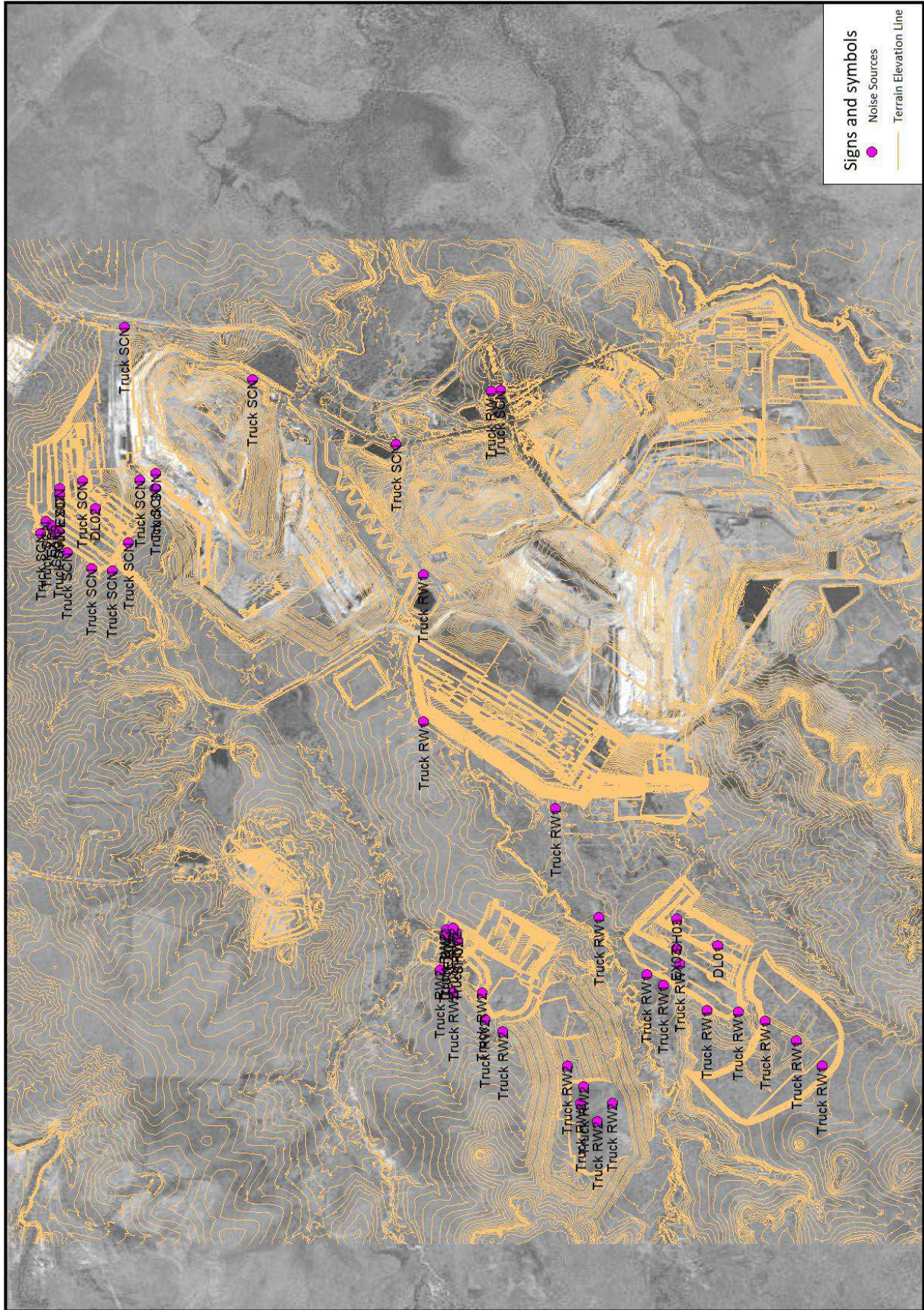


Figure C-1 Equipment Locations for Project Operations Year 2034

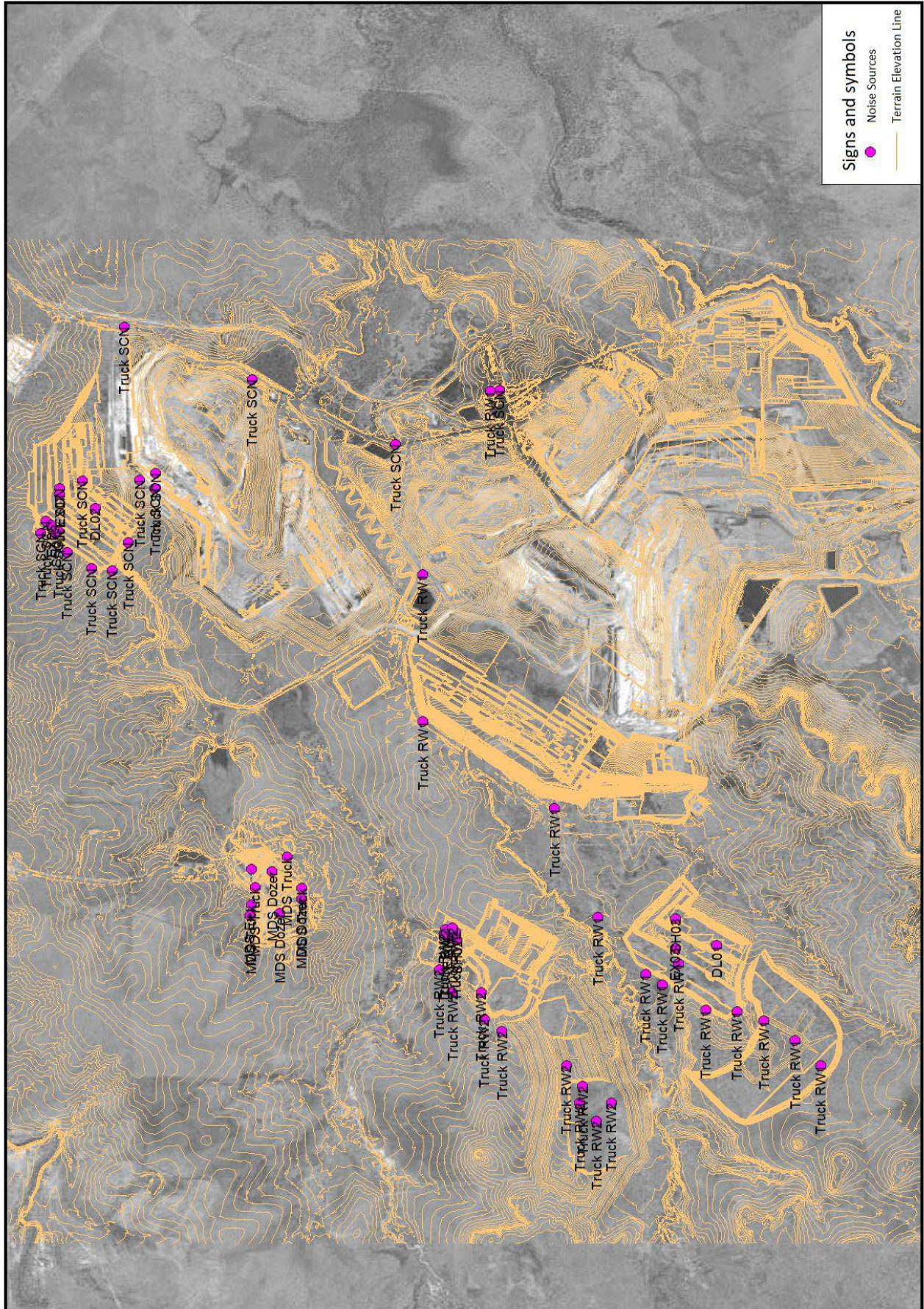


Figure C-2 Equipment Locations for Cumulative Scenario