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Gwalia Temporary Mobile Crusher Noise Assessment

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1 Introduction

Genesis Minerals Limited (Genesis) are proposing to temporarily use a Metso Jumbo Jaw mobile crusher (C160) at the Leonora operations. The mobile crusher will operate at up to 5 potential locations around site, which have been assessed to determine the potential noise impacts of each position.

This briefing note provides a summary of noise modelling and noise assessment undertaken for the mobile crusher operating at each proposed location.

1.1 Aim

The aim of this study is to predict received noise levels and potential noise impacts from operating the mobile crusher on the nearby sensitive receivers in Leonora and Gwalia.

1.2 Applicable Documents

The following documents are applicable to this briefing note:

[1] Environmental Protection (Noise) Regulations 1997.

[2] DWER Guidance

[3] TN23041-2 Genesis Tower Hill Stage 1 Noise Assessment Report.

2 Mobile Crusher Overview

The proposed mobile crusher is a 250kW Metso Nordberg C160 Jaw Crusher as shown in Figure 2-1 and Figure 2-2, which will be operated at various locations presented in Figure 2-3.

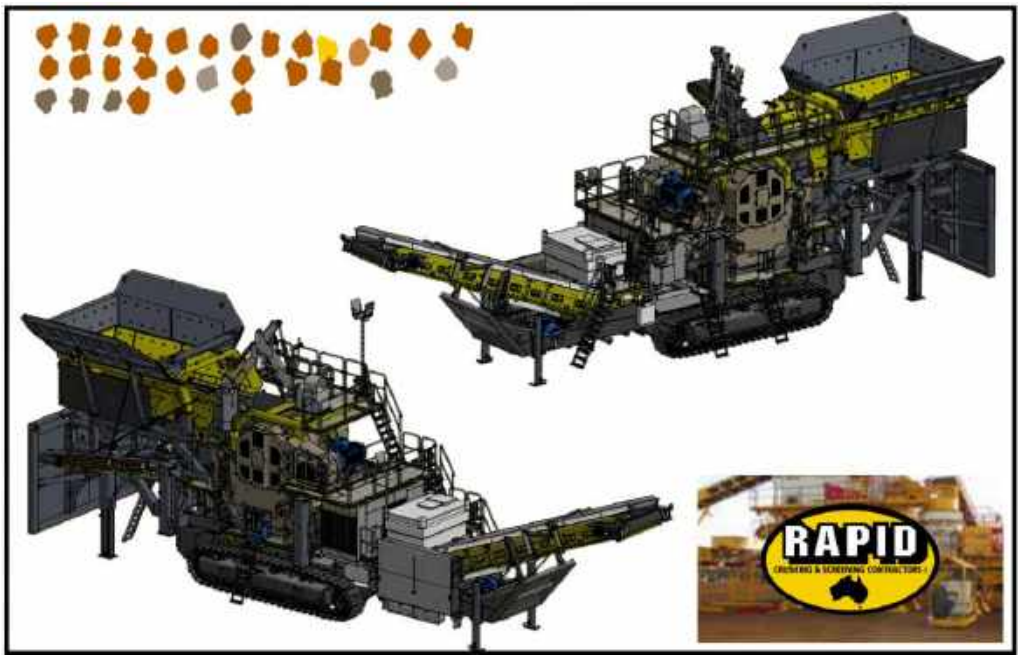

Figure 2-1 Mobile Crusher Drawing

Figure 2-2 Mobile Crusher Photo

Figure 2-3 Proposed Crushing Locations

3 Noise Assessment Criteria

Noise from the existing Leonora operations currently exceeds the assigned noise levels defined in the Environmental Protection (Noise) Regulations 1997 in Gwalia and parts of Leonora. As a result, a Regulation 17 application will be required for Gwalia and some parts of Leonora.

The activities and information required to support an application are being investigated by Genesis. Given that significant effort and time will be required to develop an application, in parallel, this assessment has adopted the following noise management approach:

- **Gwalia** – determine the change in overall noise impacts of the existing operations when the crusher is added.

- **Leonora** - The Regulatory assigned noise levels have been used to assess the impact of the mobile crusher on Leonora. In cases where the existing operations exceed the assigned levels, the Gwalia methodology has been adopted

Table 3-1 summarises the assigned levels (including influencing factors) at each noise sensitive receiver assessed, and the existing operations noise levels. These are consistent with previous assessments including [3].

More detailed information on the Regulations [2], assigned levels and influencing factors applied can be found in the noise assessment [3] and Appendix A of this briefing note.

Table 3-1 Noise assessment criteria (night-time LA10)

Receiver	Night-Time Assigned LA10 Level (incl. influencing factor) [2]	Existing Operations [3]
Camp	44	36
Caravan Park	41	36
Hospital	35	40
Lodge	45	38
Leonora East	35	35
Leonora West	43	35
Leonora North	39	36
Nambi Village Community	35	33
Hoover House	42	52
Lot 479	37	56
Lot 481	36	57
Lot 494	36	51
Lot 499	36	50
Lot 541	35	51
Lot 542	35	50
Lot 588	36	52
Lot 856	35	47
Lot 869	35	45
Lot 873	35	46
Lot 913	35	43
Lot 936	36	46
Lot 1267	35	43
State Hotel	41	65

4 Noise Modelling Overview

4.1.1 Noise Sensitive Receivers

The noise sensitive receivers listed in Table 3-1 and shown in Figure 4-1 and have been modelled in this noise assessment, which are consistent with the previous assessment [3]. .

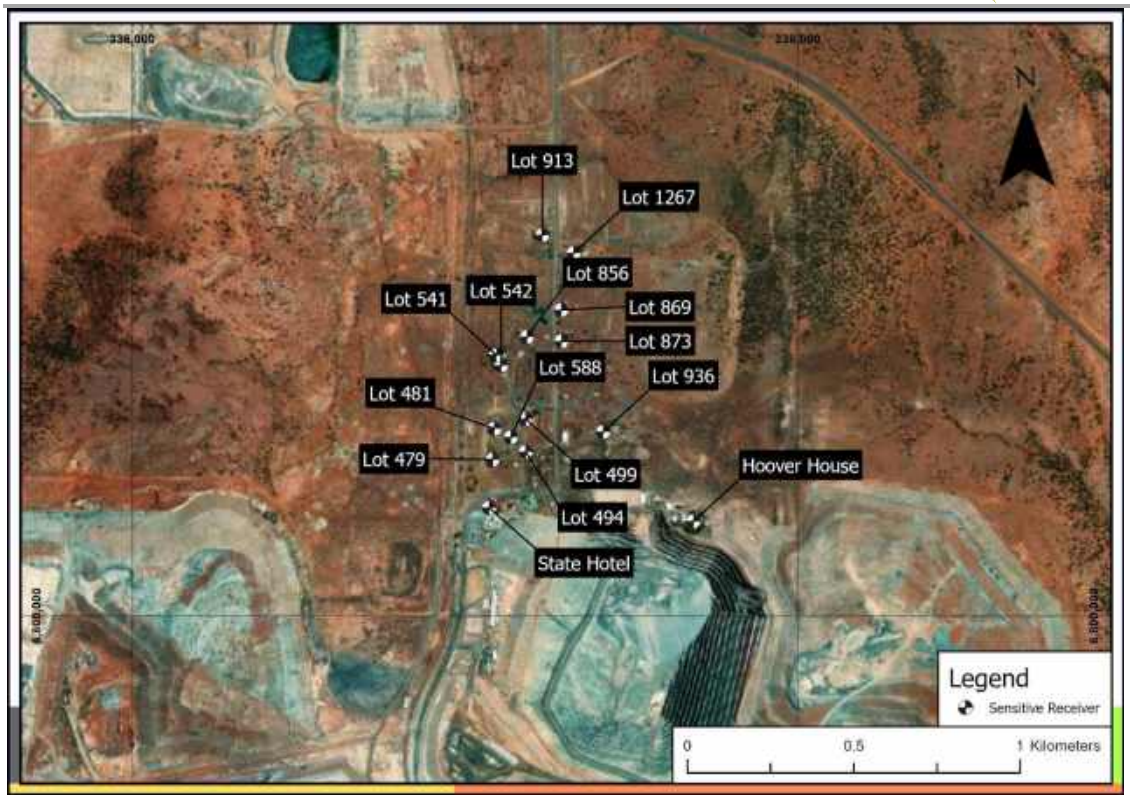

Figure 4-1 Gwalia modelled receivers

Figure 4-2 Leonora modelled receivers

4.1.2 Topography and Ground Absorption

Topographical data for the area was provided by Genesis, which was used to create a digital ground map for the area.

The acoustic properties of the ground surface influence noise propagation. Flat non-porous surfaces such as concrete, asphalt and water are more reflective whereas soft, porous surfaces such as foliage and grass are more absorptive. A CONCAWE ground factor of 0.5 was applied to the model, which is hard ground, and is considered representative of the area.

4.1.3 Meteorological Conditions

SoundPlan calculates noise levels for defined meteorological conditions. Temperature, relative humidity, wind speed and direction data are required as inputs to the model. **Error! Reference source not found.** summarises the worst-case night-time meteorological conditions applied to the model, as defined by DWER.

Table 4-1 : Worst-Case Meteorological Conditions applied to the model

Time of day	Temperature	Relative Humidity	Wind Speed	Wind Direction	Pasquil Stability Category (PSC)
Night (19:00 - 07:00)	15° Celsius	50%	3 m/s	worst case	F

4.1.4 Noise Source Levels

Table 4-2 presents the noise Sound Power Level (SWL) applied to the model for the mobile crusher, which was calculated using a combination of data provided by Genesis, and previous measurements of mobile crushing plants. The source height applied was 2.5m above the relative ground height.

The crusher was placed at various different locations around site to represent the various potential operating locations.

Table 4-2 Noise source SWL applied to the model

Type	Overall SWL dBA	Quantity
Metso Jumbo Jaw - C160 Mobile Crusher	117	1

4.2 Noise Model Scenarios

Five noise modelling scenarios were run to represent the mobile crusher operating at each location defined in Figure 2-3. The scenarios modelled include:

- Scenario 1 – Top of ROM
- Scenario 2 – Bottom of ROM Next to Primary Crusher
- Scenario 3 – Southern Laydown
- Scenario 4 – Eastern Laydown
- Scenario 5 – Western Laydown

5 Noise Model Results

5.1 In-isolation results

Table 5-1 presents the model results for the mobile crusher operating by itself (in-isolation with all other facility items switched off) at each location 1 to 5. Each scenario is run under worst case weather conditions.

Figure 5-1 to Figure 5-5 present noise contour maps for each scenario.

Table 5-1 Predicted levels for mobile crusher in isolation

Receiver	Assigned LA10 Level	Predicted Levels (LAeq)				
		Scenario 1 Top of ROM	Scenario 2 Bottom of ROM	Scenario 3 South Laydown	Scenario 4 East Laydown	Scenario 5 West Laydown
Camp	44	19	5	20	19	7
Caravan Park	41	20	5	21	20	7
Hospital	35	23	9	25	12	8
Leonora East	35	17	4	20	17	5
Leonora North	39	15	2	18	15	4
Leonora NW	43	17	3	19	17	6
Lodge	45	22	7	24	23	9
Nambi Village	35	15	1	18	14	3
Hoover House	42	41	23	41	45	16
Lot 479	37	42	24	40	42	20
Lot 481	36	41	23	39	41	20
Lot 494	36	35	24	25	42	19
Lot 499	36	40	23	26	41	19
Lot 541	35	38	21	37	39	19
Lot 542	35	38	22	37	39	19
Lot 588	36	41	24	36	41	19
Lot 856	35	37	21	36	38	18
Lot 869	35	28	20	36	37	17
Lot 873	35	30	20	37	38	17
Lot 913	35	34	18	35	35	16
Lot 936	36	39	23	33	34	17
Lot 1267	35	34	18	35	35	16
State Hotel	41	46	26	41	25	21

5.2 Cumulative Results

When added to the existing facility, the crusher does not increase the cumulative facility noise levels by a reportable amount (≤0.1dB).

5.3 Noise Contour Maps

Figure 5-1 to Figure 5-5 present noise contour maps for each scenario.

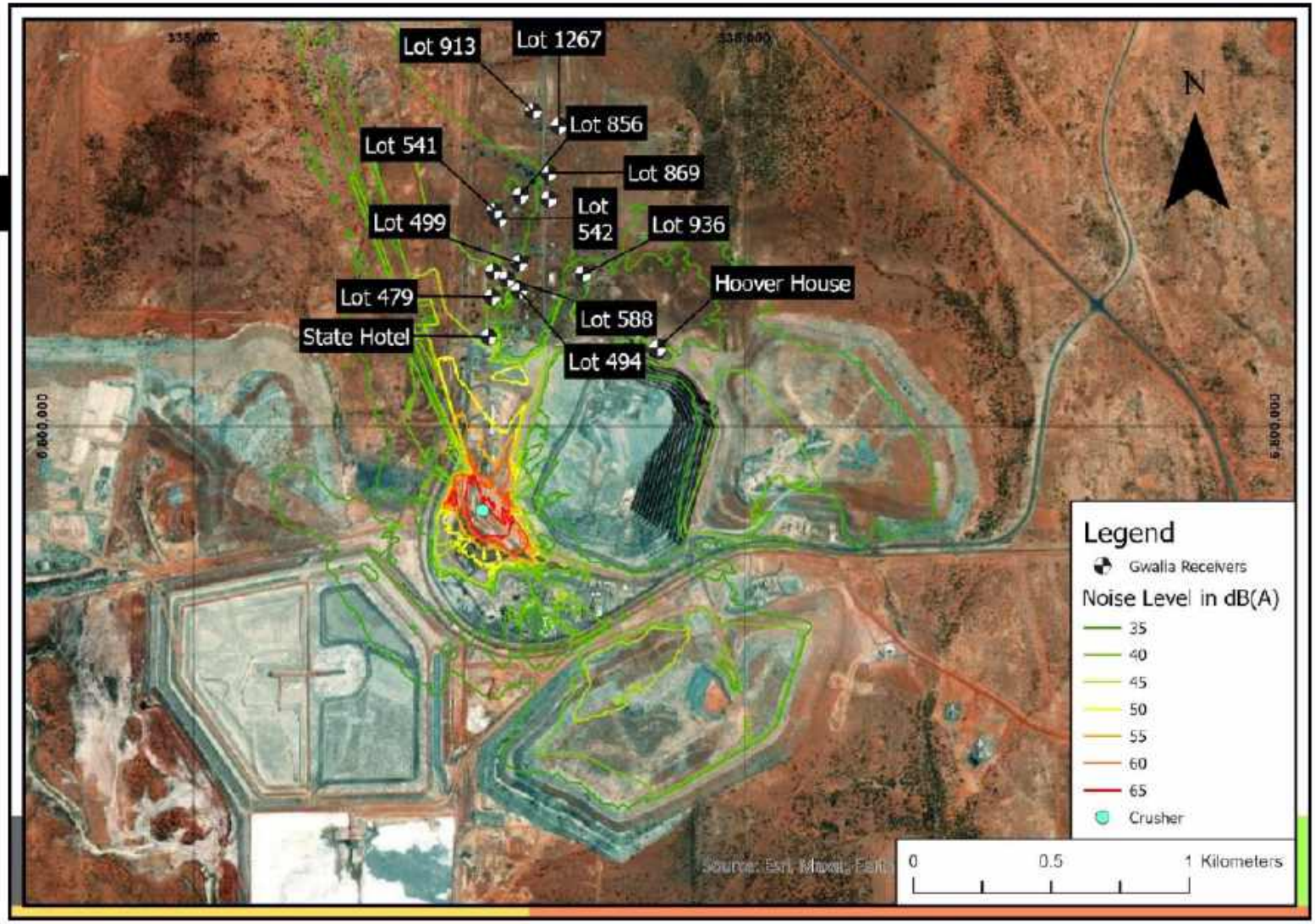

Figure 5-1 Mobile Crusher In-isolation ROM – Scenario 1 (Upper ROM)

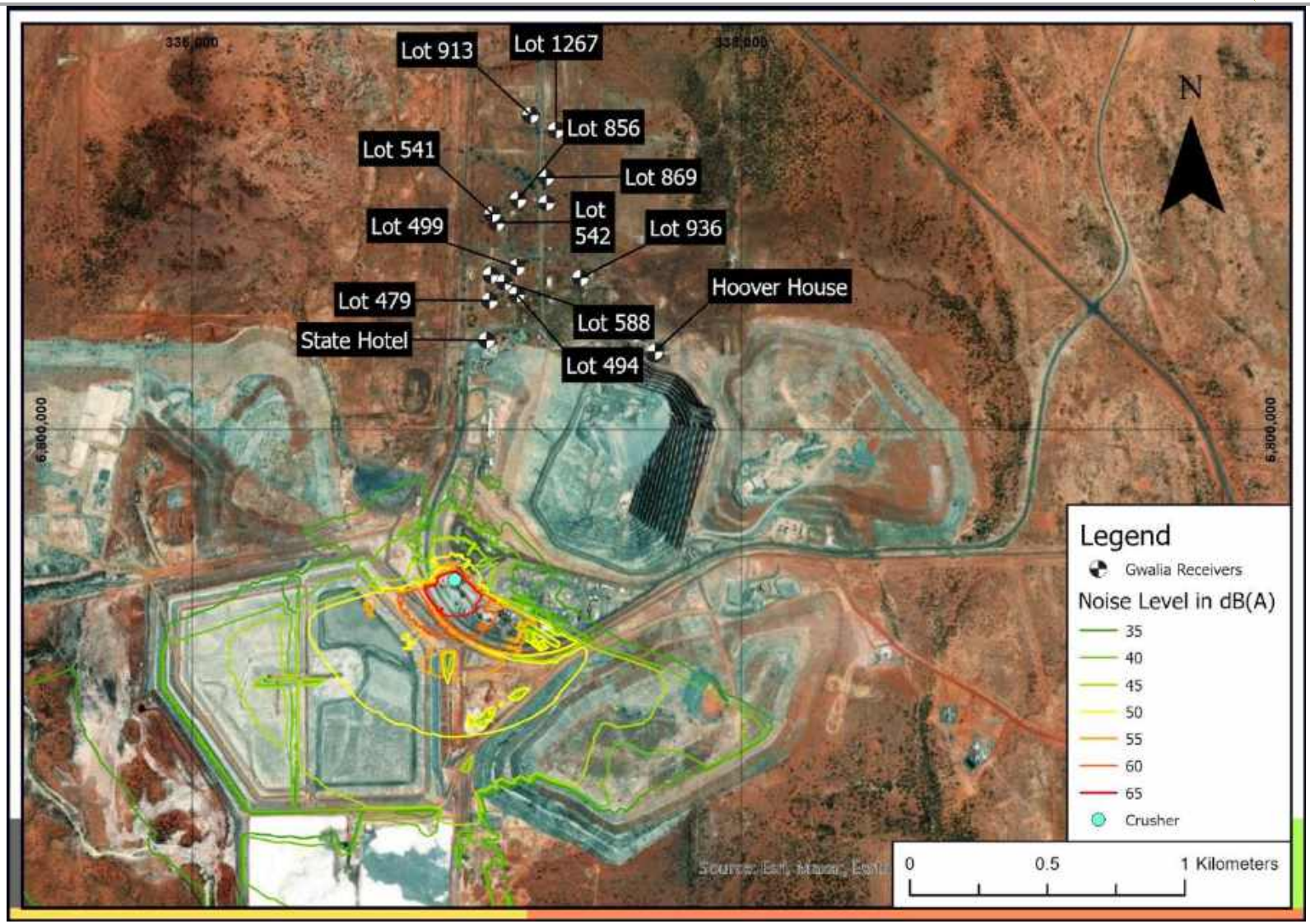

Figure 5-2 Mobile Crusher In-isolation Primary Crusher Area – Scenario 2 (Lower ROM)

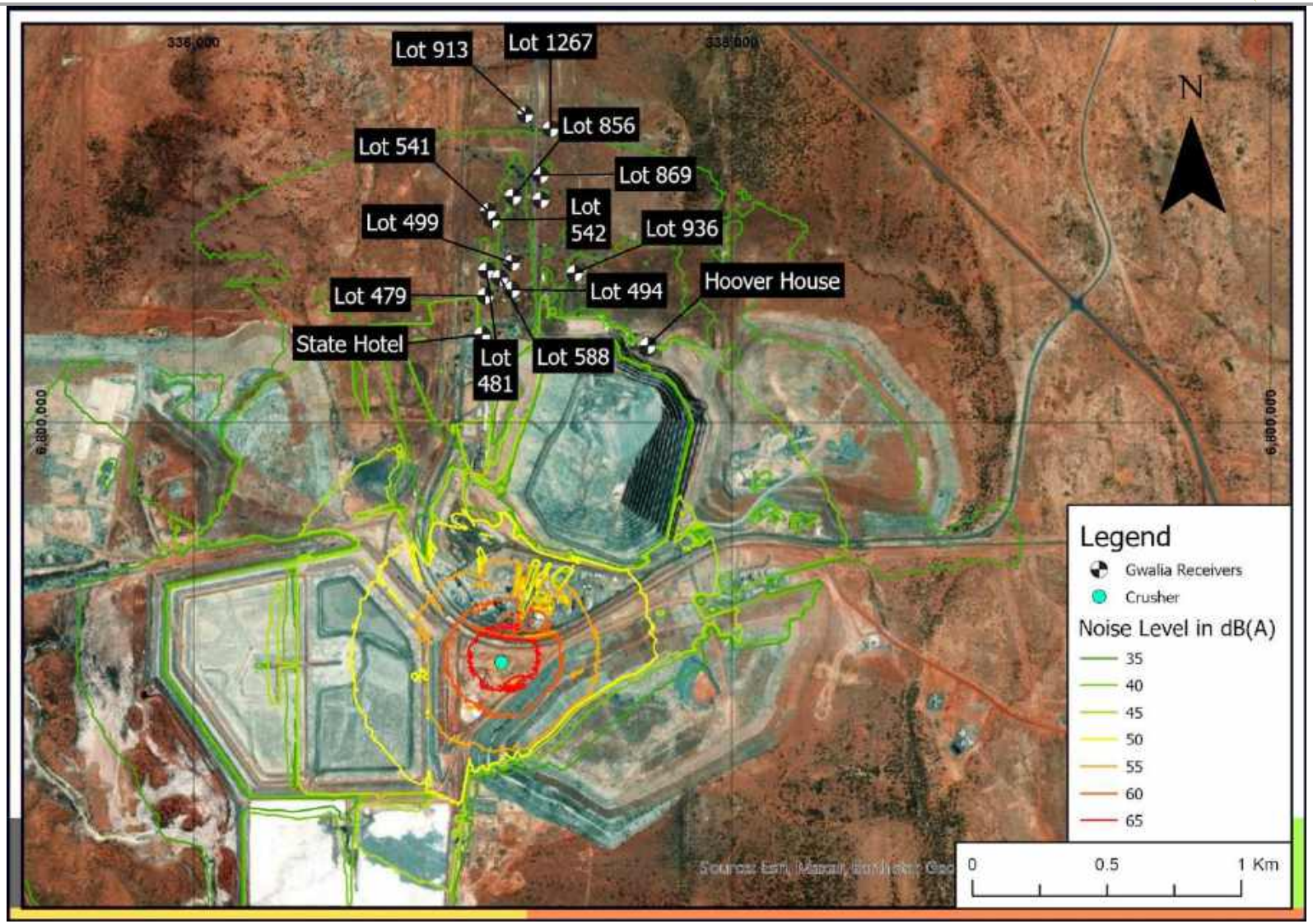

Figure 5-3 Mobile Crusher In-isolation Southern Laydown Area – Scenario 3 (South of ROM)

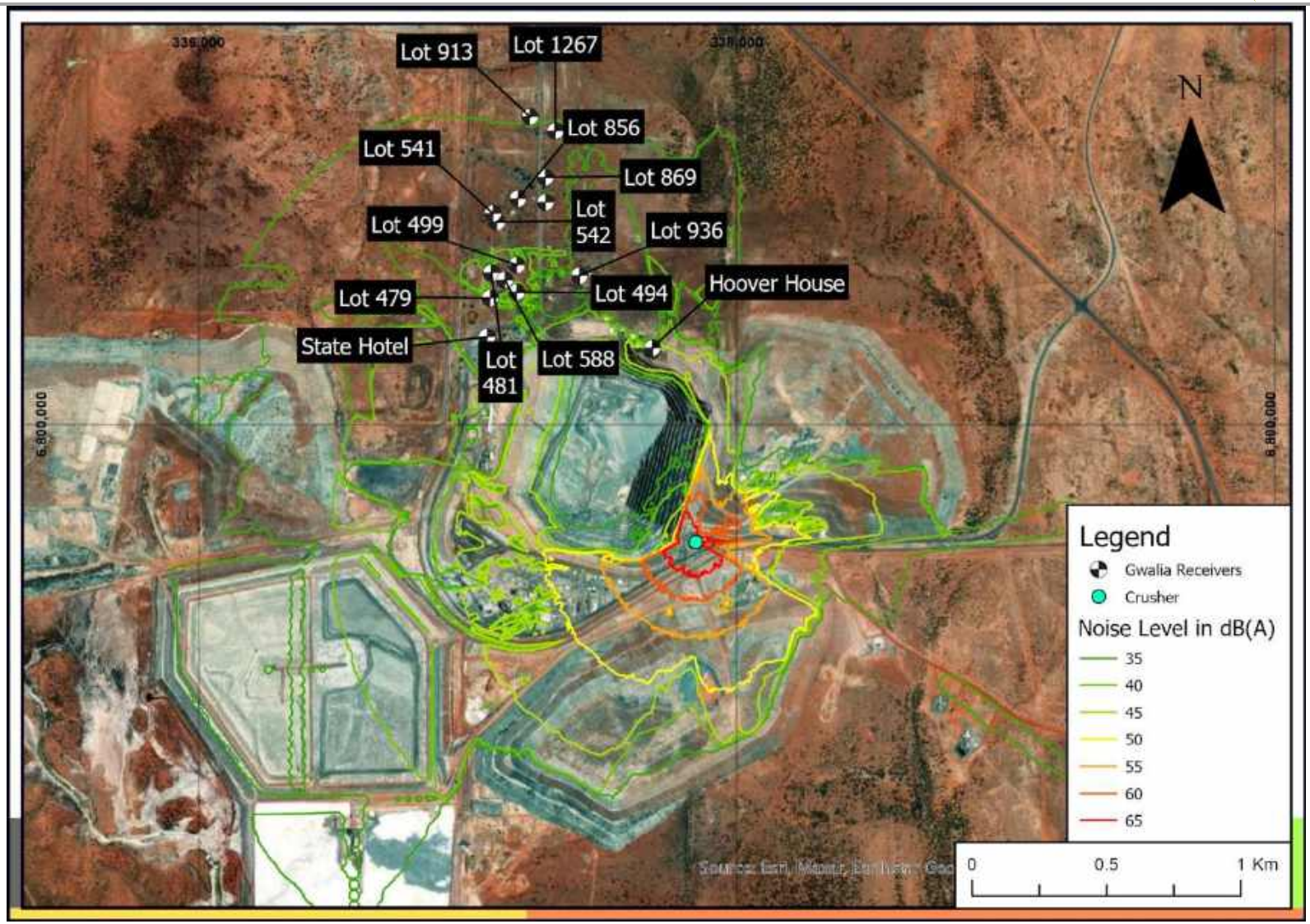

Figure 5-4 Mobile Crusher In-isolation Eastern Laydown Area – Scenario 4 (East of ROM)

Figure 5-5 Mobile Crusher In-isolation Western Laydown Area – Scenario 5 (West of ROM)

6 Findings

From the model results and analysis, the following has been found:

- When operating in-isolation, the crusher noise levels:
  - [redacted]e assigned noise levels at all Leonora receivers.
  - Exceed the assigned noise levels at some receivers in Gwalia, when crushing at locations 1 (Top of ROM), 3 (Southern laydown) and 4 (Eastern laydown).
- When added to the existing facility noise levels, the crusher does not make a significant or reportable difference to the existing noise levels.

Based on the above findings, the crusher should be operated at locations 2 or 5.

To reduce the noise impacts on Gwalia, noise control is required when the ROM, Southern and Eastern Laydown areas are utilised.

7 Noise Control

[redacted]

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8 Conclusions

Based on the findings of the modelling, location 2 (Bottom of ROM) and 5 (West Laydown) are the preferred crushing locations to minimise noise impacts.

If locations 1, 3 and 4 are preferred for operational reasons, noise shielding in the form of earthen bunds or sea container shielding walls should be utilised for these locations.

Yours sincerely

[redacted]

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APPENDIX A

Noise Assessment Criteria

[redacted]

Noise management in Western Australia is implemented via the Environmental Protection (Noise) Regulations 1997 (the Regulations), which operate under the Environmental Protection Act 1986.

The Regulations define maximum allowable noise levels, termed assigned level, which apply to noise received at noise sensitive premises, such as residential areas. These are determined by a combination of a base noise level plus an Influencing Factor (IF).

The assigned noise levels include L_{A1}, L_{A10} and L_{AMAX} noise parameters, defined as:

- L_{ASMAX} means an assigned level which is not to be exceeded at any time.
- L_{AS1} means an assigned level which is not to be exceeded for more than 1% of time.
- L_{AS10} means an assigned level which is not to be exceeded for more than 10% of time.

For noise sensitive premises, the time of day also affects the assigned noise levels. As the mobile crusher will operate 24 hours a day, 7 days a week, the L_{A10} noise emissions have been assessed against the most stringent night-time assigned levels.

Assigned Noise Levels

Table A 1 presents the assigned noise levels defined in the Regulations.

Table A 1 Environmental Protection (Noise) Regulations - Assigned Noise Levels

Sensitive Receiver	Time of day	Assigned Levels (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise Sensitive Premises	0700 to 1900 hours Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sundays 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
Industry Boundary	all times	65	80	90

Influencing Factors

The Influencing Factor (IF) is based on the surrounding land use adjacent to each of the noise sensitive receivers, including the amount (%) of industrial and commercial premises as well as the number and proximity of major and secondary roads.

Table A 2 presents a summary of the IF's calculated for Leonora, and the IF's for Gwalia are as defined in the previous Regulation 17 application.

Table A 2 Calculated Influencing Factors and Assigned Levels

Receivers	Base LA10 Assigned Level	Influencing Factor (IF)	Assigned LA10 Level
Leonora			
Hospital, Leonora East, Nambi Village Community	35	0	35
Camp	35	9	44
Caravan Park	35	6	41
Leonora Lodge	35	10	45
Leonora West	35	8	43
Leonora North	35	4	39
Gwalia			
Lot 479	35	2	37
Hoover House	35	7	42
State Hotel	35	6	41
Lot 481, 494, 499, 588, 936	35	1	36
Lot 541, 542, 856, 869, 873, 913, 1267	35	0	35

8.1.1 Adjustments for intrusive or dominant characteristics

Received noise levels are subject to adjustments if the noise exhibits intrusive or dominant characteristics i.e. if the noise is impulsive, tonal or modulating. These adjustments, shown in Table 8-1, are cumulative up to a maximum of 15 dB.

Section 9 of the Regulations sets out objective tests to assess whether the received noise is free of these characteristics.

Table 8-1 Adjustments for intrusive or dominant characteristics

Tonality	Modulation	Impulsiveness
+ 5dB	+5 dB	+10 dB

Due to historic reasons, there is limited buffer between the mining operations and the Towns of Gwalia and Leonora. There are various existing noise sources which emit tonal characteristics include underground ventilation fans, power station, trucks and fixed crushing and screening plant.

Noise measurements taken in 2024 confirm the presence of tonality in Gwalia and Leonora. As a result, a tonal adjustment has been applied to both Gwalia and Leonora results.

Applicable Noise Criteria

There is limited buffer between the existing Leonora operations and residential areas which has resulted in existing operations (which precede the Regulations) exceeding the assigned levels.

Table A 3 shows the night-time assigned levels and predicted noise levels from the existing operations in the Town of Leonora and Gwalia. The noise criteria applied to each receiver in this assessment is shown in the last column of Table A 3 with bolded values.

Table A 3 Applicable Night-Time Assigned Levels (LA10)

Receiver	Existing Operations[1]	Assigned LA10 Noise Level			Assessed Noise Criteria
		Night-Time Assigned Level (Base)	Influencing Factor (IF)	Night-Time Assigned Level (Base + IF)	
Leonora					
Camp	38	35	9	44	**44**
Caravan Park	39	35	6	41	**41**
Hospital	42	35	0	35	**42**
Leonora Lodge	41	35	10	45	**45**
Leonora East	38	35	0	35	**38**
Leonora West	37	35	8	43	**43**
Leonora North	36	35	4	39	**39**
Nambi Village	36	35	0	35	**36**
Gwalia					
Hoover House	56	42	7	42	**56**
Lot 479	51	37	2	37	**51**
Lot 481	54	36	1	36	**54**
Lot 494	50	36	1	36	**50**
Lot 499	49	36	1	36	**49**
Lot 541	51	35	1	35	**51**
Lot 542	50	35	0	35	**50**
Lot 588	54	36	1	36	**54**
Lot 856	49	35	0	35	**49**

[1] Includes +5dB tonality penalty.

Receiver	Existing Operations[1]	Assigned LA10 Noise Level			Assessed Noise Criteria
		Night-Time Assigned Level (Base)	Influencing Factor (IF)	Night-Time Assigned Level (Base + IF)	
Lot 869	49	35	0	35	49
Lot 873	49	35	0	35	49
Lot 913	49	35	0	35	49
Lot 936	52	36	1	36	52
Lot 1267	49	35	0	35	49
State Hotel	56	41	6	41	56