

# Cape Preston Master Plan Cumulative Noise Assessment

Commercial-in-Confidence  
Mineralogy Pty Ltd

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# Cumulative Noise Assessment

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## Executive Summary

Mineralogy Pty Ltd engaged AECOM Australia Pty Ltd (AECOM) to carry out an assessment of cumulative noise emissions from existing and proposed mining developments in the Cape Preston area, approximately 80km southwest of Karratha, WA. The assessment incorporates five separate mine pits and associated ore processing, transportation and electricity generation facilities. The mining development comprises Sino Iron Project, Balmoral South Iron Ore Project, Sino Iron Project Extension, Mineralogy Iron Ore Project and Austeel Steel Project.

This report considers the cumulative levels of operational noise during the worst case operating scenario and compares them with the appropriate environmental noise criteria. Potentially affected noise sensitive receivers include the miners' camps located to the north, east and south of the proposed mine, and the public camping area at the mouth of the Fortescue River.

Noise emissions from a typical worst case operational scenario (Year 2018), comprising all five mining stages operating simultaneously at maximum outputs while working at shallowest pit depths has been assessed at nearby noise sensitive receivers. Predicted noise emissions are presented below:

### Predicted Environmental Noise Levels

Receiver Location	Night Time Noise Emission – LA10 dB(A)		
	Predicted Worst Case (Future)	WAEPNR Assigned Noise Level Criteria	EPA Guidance Statement No 8
Miners camp (east)	43	65	50
Miners camp (south)	46	65	50
Miners camp (north)	44	65	50
Public camping area (Fortescue River)	34	35	N/A

The results indicate noise emission criteria are achieved at all sensitive receivers when cumulative operational noise emissions from all five mines are considered. Noise contour plots for the modelled operational scenario are included in Appendix D.

If penalties are applied (particularly for modulation from the tracked dozer “track slap”), then the 30 dB(A) design criterion at the Fortescue River will be exceeded. Noise from tracked dozer operations on the waste mound can be managed in operation. Alternatively, wheeled dozers could be considered for the waste mound.

Based on our understanding that ore mining throughput during the construction phase will be less than that of the modelled worst case scenario, construction noise emission is generally expected to comply with the assigned noise levels.

Construction noise at the Austeel Steel Project may briefly exceed the assigned noise levels at the Fortescue River camping area during the pit construction phase, due to mining plant operating on the surface in close proximity of the receiver. To minimise potential for noise exceedances, a 5 m safety berm should be constructed at the commencement of construction works to break the line of sight between mining plant and the noise sensitive receiver. We note that construction noise does not need to comply with the assigned noise levels, rather, best practices should be used to minimise noise emission during the period. This recommendation to minimise the potential for exceedance is a matter of ‘good neighbour’ courtesy.

Blasting noise at the receiver locations will vary depending on the stage of the mining operations, blast configuration and site specific conditions. The noise from blasting is likely to be higher during construction and the initial stages of mining, and as such, blast levels should be monitored for the initial blasts to determine the typical maximum permissible charge size.

## 1.0 Introduction

AECOM Australia Pty Ltd (AECOM) has been engaged by Mineralogy Pty Ltd to carry out an assessment of cumulative noise emissions from existing and proposed mining developments in the Cape Preston area, approximately 80km southwest of Karratha, WA. The assessment incorporates five separate mine pits and associated ore processing, transportation and electricity generation facilities. The mining developments consist of the following stages:

- Stage 1 – Sino Iron Project
- Stage 2 – Balmoral South Iron Ore Project
- Stage 3 – Sino Iron Project Extension
- Stage 4 – Mineralogy Iron Ore Project
- Stage 5 – Austeel Steel Project

A power station, processing plant and ore transportation infrastructure (conveyers and/or slurry pipes) will be located immediately east of each of the mine pits, with port, stockpiles and additional ore processing facilities located further north. Under the proposal, the sites will operate 24 hours per day, 7 days per week. Operational details of the proposed sites are summarised in the Table 1.

**Table 1: Approved and proposed Cape Preston mine site operations**

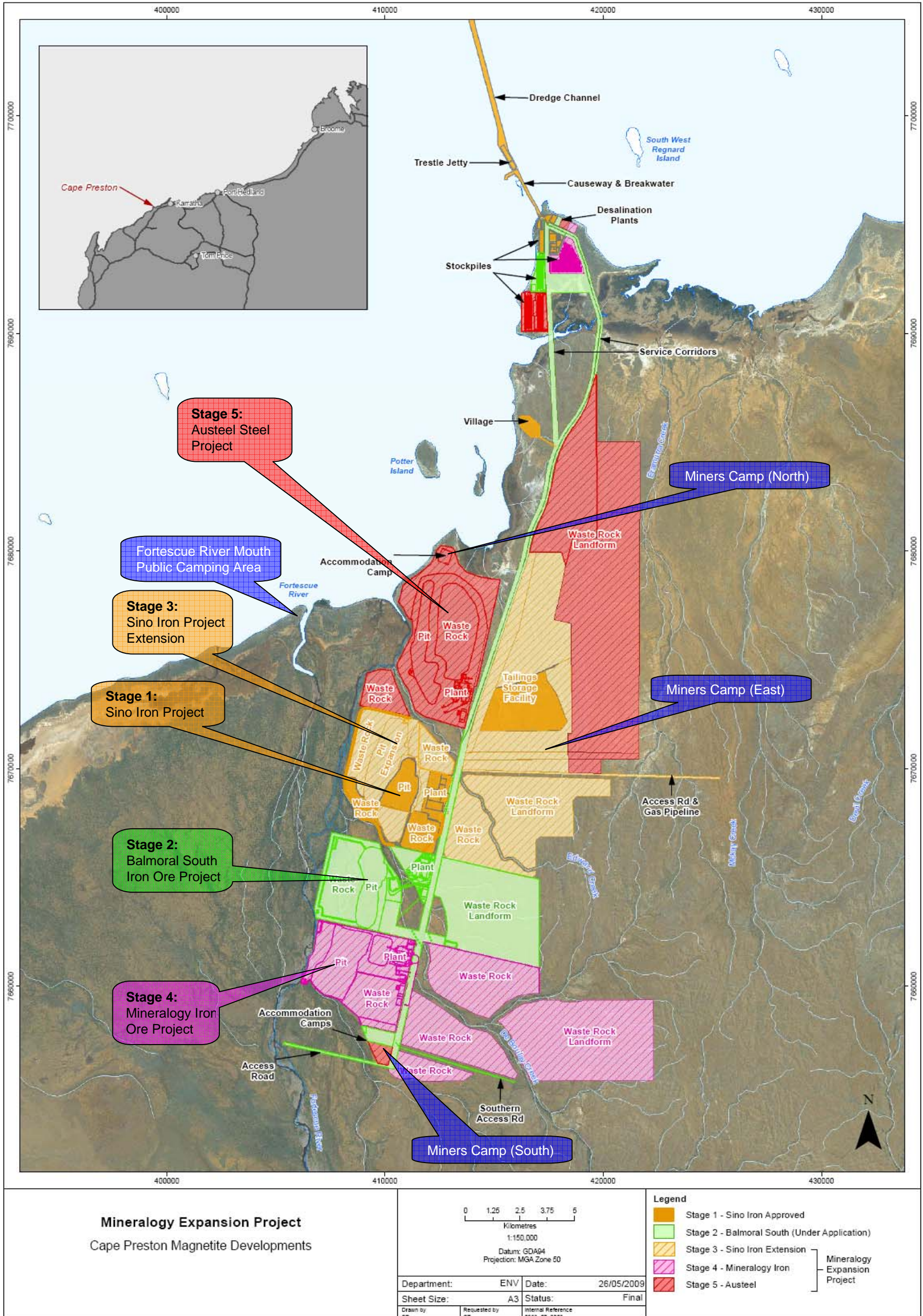
Project Characteristic	Original Proposal as Implemented	Balmoral South Proposal	Mineralogy expansion Proposal (MEP)			
	Stage 1 - Sino Iron Project (Approved current)	Stage 3 - Sino Iron Project Extension (Increase on Stage 1)	Stage 2 - Balmoral South Iron Ore Project	Stage 4 - Mineralogy Iron Ore Project	Stage 5 - Austeel Steel Project	Total (MEP)
Proponent*	Mineralogy (Mineralogy)	Mineralogy (Mineralogy)	International Minerals (Mineralogy)	Mineralogy (Mineralogy)	Austeel (Mineralogy)	
Construction	Commenced	2010	2010	2015	2015	
Ore mining rate	95 Mtpa	39 Mtpa	80 Mtpa	80 Mtpa	80 Mtpa	374 Mtpa
Pit depth	220 m	350 m	350 m	350 m	350 m	
Dewatering rate	4 GLpa	No change	4 GLpa	4 GLpa	4 GLpa	16
Dewatering disposal	Process water and dust suppression	No change	Process water and dust suppression	Process water and dust suppression	Process water and dust suppression	
Total Production (ore concentrate)	27.6 Mtpa	12.4 Mtpa	24 Mtpa	24 Mtpa	24 Mtpa	112 Mtpa
Pellet Production	6 Mtpa	No change	14 Mtpa	14 Mtpa	14 Mtpa	48 Mtpa

Project Characteristic	Original Proposal as Implemented	Balmoral South Proposal	Mineralogy expansion Proposal (MEP)			
	Stage 1 - Sino Iron Project (Approved current)	Stage 3 - Sino Iron Project Extension (Increase on Stage 1)	Stage 2 - Balmoral South Iron Ore Project	Stage 4 - Mineralogy Iron Ore Project	Stage 5 - Austeel Steel Project	Total (MEP)
Tailings disposal	67.4 Mtpa	26.6 Mtpa	56 Mtpa	56 Mtpa	56 Mtpa	262 Mtpa
Power	Up to 640 MW capacity gas fired combined cycle power station	No change	600 MW installed capacity gas fired combined cycle power station	600 MW installed capacity gas fired combined cycle power station	600 MW installed capacity gas fired combined cycle power station	2440 MW
Conveyance to port stockyards	Slurry pipeline	No change	Conveyors or slurry pipelines	Conveyors or slurry pipelines	Conveyors or slurry pipelines	
Water supply	44 GLpa desalination plant and 4 GLpa pit dewatering	30 GLpa desalination plant No change to pit dewatering	40 GLpa desalination plant and 4 GLpa pit dewatering	40 GLpa desalination plant and 4 GLpa pit dewatering	40 GLpa desalination plant and 4 GLpa pit dewatering	194 GLpa
Port	Yes	NA	NA	NA	NA	
Sewage	Package treatment plant	25% increase in capacity	Package treatment plant	Package treatment plant	Package treatment plant	
Construction personnel	Up to 5000	No change	Up to 4000	Up to 4000	Up to 4000	Up to 17000
Permanent personnel	Up to 600	200	Up to 1500	Up to 1500	Up to 1500	Up to 5300
Accommodation	On-site for entire workforce	No change	On-site for entire workforce	On-site for entire workforce	On-site for entire workforce	
Area of terrestrial disturbance	2435 ha	5370 ha	5280 ha	6540 ha	8540 ha	28,165 ha
Area of marine disturbance	126 ha	NA	NA	NA	NA	126 ha

The assessment considers the cumulative levels of operational noise during the worst case operating scenario and compares them with the appropriate environmental noise criteria. Potentially affected noise sensitive receivers include the miners' camps located to the north, east and south of the proposed mine, and the public camping area at the mouth of the Fortescue River (refer Figure 1).

Nomenclature relevant to this report has been included in Appendix A.

Figure 1: Cape Preston Area Iron Ore Projects - Locality Map



## 2.0 Criteria

### 2.1 Environmental Noise Criteria

The Western Australian *Environmental Protection (Noise) Regulations (1997)*, WAEPNR, made pursuant to the *Environmental Protection Act 1986*, specify allowable noise emissions as shown in Table 2.

**Table 2: Assigned levels by the Western Australian Environmental Protection (Noise) Regulations 1997**

Type of premise receiving noise	Time of Day	Assigned Level (dB)		
		L <sub>A10</sub>	L <sub>A1</sub>	L <sub>Amax</sub>
Noise sensitive premises at locations within 15m from a building directly associated with a noise sensitive use	7:00 to 19:00 Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	9:00 to 19:00 Sundays and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor
	19:00 to 22:00 any day	40 + influencing factor	50 + influencing factor	55 + influencing factor
	22:00 on any day to 7:00 Monday to Saturday and 9:00 Sunday and public holidays	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises at locations further than 15m from a building directly associated with a noise sensitive use	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and Utility premises	All hours	65	80	90

The influencing factor is applied to account for higher noise areas as a result of nearby industrial and commercial areas and major roads. The influencing factor is determined by considering the land use within two circles having a radius of 100m and 450m from the noise sensitive premises of concern.

Cumulative noise emissions from all nearby sources should not exceed the assigned noise levels (refer Table 2) at any of the surrounding noise receivers.

Penalties for the character of the noise may be applicable according to the policy. A 5 dB(A) penalty is to be applied for each of the characteristics of tone and modulation, and a 10 dB(A) penalty is applied impulsiveness. The noise emission is expected to be broadband in nature and hence no penalty is warranted. However, "track slap" can be produced by the tracked dozers which would attract a penalty for modulation. This can be minimised with operational management, for example, by restricting the dozers to 2<sup>nd</sup> gear in reverse, and therefore no penalty has been applied. Another management alternative is not to operate tracked dozers at night in exposed locations such as for example the top of stockpiles or waste mounds.

We note that the above regulations do not apply to noise emissions from safety warning devices fitted to motor vehicles, mining and earth moving machinery, vessels and buildings if:

- (i) It is a requirement under another written law that such a device be fitted; and

- (ii) It is not practicable to fit a safety warning device that complies with the written law under which it is required to be fitted and emits noise that complies with these regulations,

The noise criteria will be applicable at the following locations (noise receivers):

- miners camp located to the east of the approved and proposed developments;
- miners camp located to the south of the approved and proposed developments;
- miners camp located to the north of the approved and proposed developments; and
- public camping area located at the mouth of the Fortescue River.

Since the miners camps are associated with the mines, they are considered to be a caretakers premises or the like, attached to or forming part of the mine. Therefore the applicable assigned levels fall under the "Industrial and Utility" category. The design target for the miners camps is therefore  $L_{A10}$  65 dB(A).

The public camping area on the other hand falls under the "noise sensitive" category. The influencing factor of 0 is applicable at this location, since there are no commercial, industrial or transport activities within 450 m of the camping area. The design target for the public camping area is most stringent at night, and as the mine will operate for 24 hours per day the applicable criterion is 35 dB(A), since no influencing factor is applied.

## 2.2 Construction Noise Criteria

The WAEPNR provides guidance for construction noise; however, there are no specific criteria. The guidelines for construction work carried out between 7am and 7pm on any day which is not a Sunday or public holiday are:

- the construction work must be carried out in accordance with control of noise practices set out in section six of Australian Standard 2436-1981 "Guide to Noise Control on Construction, Maintenance and Demolition Sites";
- the equipment used for the construction work must be the quietest reasonably available; and
- the chief executive officer (CEO of the EPA) or authorized representative may request that a noise management plan be submitted for the construction work at any time.

For construction work done outside the hours shown above:

- the work must be carried out in accordance with section six of AS 2436-1981;
- the equipment used must be the quietest reasonably available;
- the proponent must advise any nearby occupants of the work to be done at least 24 hours before it commences;
- the proponent must show that it was reasonably necessary for the work to be done out of hours; and
- the proponent must submit to the CEO of the EPA (or their representative) a noise management plan at least seven days before the work starts, and the plan must be approved by the CEO.

Given that there are no occupants in the surrounding area, the applicable construction noise goals would be the same as the operational (environmental) noise criteria, unless exceedances are predicted, in which case an application for an exemption should be submitted to the EPA.

## 2.3 Blasting Noise Criteria

The WAEPNR specifies allowable airblast levels resulting from blasting when received at any other noise sensitive premises.

For blasting carried out between 7am and 6pm on any day, which is not a Sunday or a public holiday, the airblast level received on any other premises must not exceed:

- 125 dB(LIN)  $L_{peak}$  for any one blast; and
- 120 dB(LIN)  $L_{peak}$  for nine in any 10 consecutive blasts (irrespective of interval between blasts).

For blasting carried out between 7am and 6pm on a Sunday or public holiday, the airblast level received on any other premises must not exceed:

- 120 dB(LIN)  $L_{peak}$  for any one blast; and
- 115 dB(LIN)  $L_{peak}$  for nine in any 10 consecutive blasts (irrespective of interval between blasts).

The airblast level is limited to 90 dB(LIN) for any period outside these specified times.

## 2.4 EPA Guidance Statement No 8 Criteria

The aspirational goal recommended in EPA Guidance Statement No.8 for a construction camp located on the same premises as the proposal should be used as the design target for the miners' camps. According to the Guidance Statement, the aspirational goal based on indoor levels inside the accommodation sleeping areas of  $L_{A10}$  40dB(A) and  $L_{Amax}$  50dB(A) should be considered. For the general building structure of a operation camp, this goal normally equates to  $L_{A10}$  50dB(A) and  $L_{Amax}$  60dB(A) outside. IM should revise the assessment criteria and design objectives for the operation camps, in accordance with EPA Guidance Statement No.8.

The applicable external noise criteria in accordance to the EPA Guidance Statement No 8 are therefore as shown in Table 3 below.

**Table 3: EPA Guidance Statement – External Noise Criteria**

Receiver Location	EPA Guidance Statement No 8 Noise Criteria (dB(A))	
	$L_{A10}$	$L_{Amax}$
Miners camp (north)	50	60
Miners camp (east)	50	60
Miners camp (south)	50	60
Public camping area (Fortescue River)	N/A	N/A

## 3.0 Noise assessment

### 3.1 Assessment Methodology

Noise emissions from the mining operations will be the greatest when all five mine stages are in operation at full capacity. Furthermore, the closer to the surface the pit operations are, the greater the noise emissions from a particular mine are.

A typical worst case operational scenario would therefore comprise all five mining stages operating simultaneously at maximum outputs while working at shallowest pit depths. Mining schedule for the region provided by Mineralogy (refer Appendix C) indicates the worst case operational scenario occurs in Year 2018, the first year when all stages are operational. This scenario was therefore selected for cumulative noise modelling representative of worst case noise emissions. Mine pit depths for year 2018 are presented in Table 4.

**Table 4: Year 2018 Mine pit depths<sup>1</sup>**

Year	Sino Iron		Balmoral South	Sino Iron Expansion	Mineralogy	Austeel
	Pit Depth (m)		Pit Depth (m)	Pit Depth (m)	Pit Depth (m)	Pit Depth (m)
	NE	SE				
2018	-216	-96	-96	-38	-44	-38

Pit designs were modelled conservatively by assuming that the footprint of the final pit design has been excavated to the above depths.

Three dimensional pit designs for Mineralogy Iron Ore Mine and Austeel Steel Project were not available at the time of modelling. Our assessment is therefore based on a 2 dimensional layout map provided by Mineralogy and 3 dimensional topographical data and plant and mine layout data for the Balmoral South Project. 3D Balmoral South pit design was replicated at the proposed Mineralogy Iron Ore Mine and Austeel Steel project their depth adjusted to -38 m in accordance with the Year 2018 pit schedules.

Substituting Balmoral South pit design for Mineralogy and Austeel mines is considered to be conservative due to the change in the modelled pit orientations. The substitution is expected to slightly overpredict noise levels at the noise sensitive public camping location and slightly underpredict at the Mining camp (north) location.

In addition, noise shielding effects provided by a 3 m high safety berm around the mine pits have been incorporated into the model.

### 3.2 Operational noise sources

Balmoral South Iron ore mine was modelled based on information regarding worst case operating conditions provided to us by Mineralogy Pty Ltd for our *“International Minerals (Balmoral South) Iron Ore Mine – Environmental Noise Assessment”* report, dated 25 November 2008.

Operations at Mineralogy Iron Ore Mine and Austeel Steel projects have both been based on the Balmoral South operating conditions, as all mines have the same operating characteristics.

Sino Iron Project and Sino Iron Expansion (Stage1 and Stage 3) operating conditions have been scaled proportionally from Balmoral South operations based on their respective ore mining rates. Modelling inputs for each of the mine sites are detailed in Table 5.

<sup>1</sup> As supplied by Mineralogy in 'Mine Schedule Final June 2009.xls' document via email on 16 June 09 – Refer Appendix C for full schedule  
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**Table 5: Modelling Inputs**

Plant Description	Plant Quantity				
	Sino Iron	Balmoral South	Sino Iron Expansion	Mineralogy	Austeel
<b>Mine Pit</b>					
Off-Highway Trucks (218t)	31	26	13	26	26
Production Drills	29	24	12	24	24
Tracked Dozers	10	8	4	8	8
Face Shovels	10	8	4	8	8
Water carts	7	6	3	6	6
Graders	7	6	3	6	6
Large Front End Loaders	2	2	1	2	2
<b>Waste Area (approx 25 m above natural ground level)</b>					
Off-Highway Trucks (218t)	10	8	4	8	8
Tracked Dozers	2	2	1	2	2
<b>Processing Plant</b>					
Gas Fired Power Station	1	1	0	1	1
Primary Crusher	1	1	0	1	1
Secondary Crushers	2	2	0	2	2
High Pressure Grinding Rolls	4	4	0	4	4
Concentrator Plant	4	4	0	4	4
Pelletising Plant	0	6	0	6	6
Direct Reduction Iron Plant	1	0	0	0	0
<b>Primary Crusher (approx 20 m above natural ground level)</b>					
Off-Highway Trucks (218t)	8	8	0	8	8
Large Front End Loaders	1	1	0	1	1
Wheeled Dozers	1	1	0	1	1
<b>Sources Located at the cape</b>					
Conveyor Belts – Mine to Port ore transportation	0 <sup>1</sup>	1	0 <sup>1</sup>	1	1
Stockpiles – Large Front End Loaders	1	1	0	1	1
Pellet Plant	6	0	0	0	0
Ship loaders	1	1	0	1	1

Notes: 1.). Slurry pipes used to transport ore from mine site to stockpiles / port area

Source sound power data for all plant and equipment has been sourced from previous reports carried out for the CPMM Central Block Project by Lloyd Acoustics Pty Ltd. These reports are “Noise Impact Assessment, Mineralogy Project, Iron Ore Mine and Processing Plant, Cape Preston, Western Australia” dated January 2005 and April 2005.

Sound power levels for all sources used in the modelling are listed in Appendix B.

### 3.3 Modelling Methodology

The environmental noise emission was predicted using CONCAWE<sup>2</sup> algorithms in the SoundPLAN<sup>3</sup> noise propagation software, in line with Guidance No. 8. Noise levels were predicted for “worst case” night time meteorological conditions as required by the Western Australian Environmental Protection (Noise) Regulations. The modelled weather conditions are: 3m/s wind speed blowing from source to receiver, 15°C temperature, 50% relative humidity, 1013mbar atmospheric pressure, Pasquill Stability Category ‘F’.

### 3.4 Assessment Results

Based on the operational noise sources and modelling methodology described in previous sections, and sound power levels specified in Appendix B, noise emission levels have been predicted at each of the noise sensitive receivers and presented along with applicable criteria in Table 6.

**Table 6: Predicted Environmental Noise Levels**

Receiver Location	Night Time Noise Emission – LA10 dB(A)		
	Predicted Worst Case (Future)	WAEPNR Assigned Noise Level Criteria	EPA Guidance Statement No 8
Miners camp (east)	43	65	50
Miners camp (south)	46	65	50
Miners camp (north)	44	65	50
Public camping area (Fortescue River)	34	35	N/A

Table 6 indicates that the noise emission criteria are achieved at all sensitive receivers for the proposed mine operations. Noise contour plots for the worst case (night time) operational scenario is provided in Appendix C.

The highest contributions at the Fortescue River public camping area come from conveyor belts connecting mine site processing areas to stockpiles and shiploading facilities followed by plant associated with the Austeel Steel project.

### 3.5 Construction Noise

Based on our understanding that ore mining throughput during the construction phase will be less than that of the modelled worst case scenario, construction noise emission is generally expected to be less than the predicted noise levels and therefore comply with the assigned noise levels.

Construction noise at the Austeel Steel Project may briefly exceed the assigned noise levels at the Fortescue River camping area during the pit construction phase, due to mining plant operating on the surface in close proximity of the receiver. To minimise potential for noise exceedances, a 5 m safety berm should be constructed at the commencement of construction works to break the line of sight between mining plant and the noise sensitive receiver. We note that construction noise does not need to comply with the assigned noise levels, rather, best practices should be used to minimise noise emission during the period.

### 3.6 Blasting Noise

Blasting noise at the receiver locations will vary depending on the stage of the mining operations, blast configuration and site specific conditions. The noise from blasting is likely to be higher during

<sup>2</sup> CONCAWE – The oil companies’ international study group for conservation of clean air and water – Europe (established in 1963) Report 4/81 “The propagation of noise from petroleum and petrochemical complexes to neighbouring communities”.

<sup>3</sup> SoundPLAN 6.5 is a software suite widely used for noise propagation modelling in Australia.

construction and the initial stages of mining, and as such, blast levels should be monitored for the initial blasts to determine the typical maximum permissible charge size. Blast overpressure is manageable in operation within the Regulation limits.

## 4.0 Conclusion

An assessment of cumulative operational noise emissions has been undertaken from the mining activities at the Cape Preston area. This assessment has considered the applicable criteria based on the Western Australian Environmental Protection (Noise) Regulations (1997) (WAEPNR) as well as the EPA Guidance Statement No.8 noise goals for construction camps.

Based on the number of sources and sound power data listed in Section 3.2 and Appendix B, the combined operational noise of all five projects will comply with the relevant criteria at the miners' camps and the public camping area at the Fortescue River.

If penalties are applied (particularly for modulation from the tracked dozer "track slap"), then the 35 dB(A) assigned noise level at the Fortescue River will be exceeded. Noise from tracked dozer operations on the waste mound can be managed in operation. Alternatively, wheeled dozers could be considered for the waste mound operations at night.

Construction noise does not need to comply with the assigned noise levels, rather, best practices should be used to minimise noise emission during the period. Construction noise at the Austeel Steel Project may briefly exceed the assigned noise levels at the Fortescue River camping area during the pit construction phase, due to mining plant operating on the surface in close proximity of the receiver. To minimise potential for noise exceedances, a 5 m safety berm should be constructed at the commencement of construction works to break the line of sight between mining plant and the noise sensitive receiver.

Blasting noise will vary and as such should be monitored during the construction and initial operational stages to determine the typical maximum charges sizes for compliance.

## 5.0 References

Lloyd Acoustics Pty Ltd report "Noise Impact Assessment, Mineralogy Project, Iron Ore Mine and Processing Plant, Cape Preston, Western Australia" dated January 2005.

Lloyd Acoustics Pty Ltd report "Noise Impact Assessment, Mineralogy Project, Iron Ore Mine and Processing Plant, Cape Preston, Western Australia" dated April 2005.

Bassett Acoustics report "International Minerals (Balmoral South) Iron Ore Mine – Environmental Noise Assessment" dated 25 November 2008(Report Ref. 60020375-BS003 REP-Rev5.doc)

## Appendix A Nomenclature

## Appendix A Nomenclature

A-Weighting	The “A” weighting scale is designed to adjust the absolute sound pressure levels to correspond to the subjective response of the human ear.
dB(A)	A-Weighted sound pressure level measured in decibels.
dB(LIN)	Unweighted sound pressure level measured in decibels.
$L_{A1}$	The A-weighted sound level exceeded for 1% of a time period.
$L_{A10}$	The A-weighted sound level exceeded for 10% of a time period.
$L_{Amax}$	The maximum A-weighted sound level in dB(A).
$L_{peak}$	Peak sound pressure level measured in decibels. When followed by dB(LIN) it represents the linear (un-weighted) peak sound pressure level.
Influencing factor	The influencing factor is calculated for each noise-sensitive premises receiving noise. It takes into account the amount of industrial and commercial land and the presence of major roads within a 450m radius around the noise receiver.

## Appendix B Operational noise source data

## Appendix B Operational noise source data

The sound power characteristics of individual operational noise sources that were used in the model are listed in the table below. The numbers of items of plant included in the model are listed in Section 3.0.

Source	Source Height (m)	Sound Power Level (dB re 10-12W) at Octave Band Centre Frequency (Hz)								Overall Noise Level dB(A)
		31.5	63	125	250	500	1k	2k	4k	
<b>Mine Area</b>										
Excavator	4	121	118	117	114	112	110	106	102	115
Off Highway Truck	4	110	112	121	118	115	109	106	101	116
Production Drill	4	90	109	111	118	116	112	108	103	117
Wheeled FEL	3	107	106	112	109	110	107	106	98	112
Large FEL	4	106	111	117	110	110	107	105	98	113
Watercart	3	110	111	116	106	102	104	105	99	110
Grader	3	106	104	105	103	106	106	104	98	110
Wheeled Dozer	3	107	106	112	109	110	107	106	98	112
Tracked Dozer	3	107	111	120	122	110	110	104	102	116
Face Shovel	4	125	122	122	119	117	115	111	107	120
Crusher	5	100	120	117	113	114	113	111	107	118
Conveyors (/m)	1	-	84	89	82	86	83	79	74	88
<b>Processing / Concentrator Plant</b>										
Grinding Mills	5	118	122	123	119	121	113	111	103	121
Fans/Pumps	5	84	90	93	102	109	99	92	98	108
Crushers	5	100	120	117	113	114	113	111	107	118
<b>Pellet Plant</b>										
Fans/Pumps	5	81	87	90	99	106	96	89	95	105
<b>Power Station</b>										
Power Station	10	86	98	103	106	108	111	105	102	114
<b>Port</b>										
Shiploader	15*	114	111	108	108	109	110	104	100	113
Wheeled FEL	3	107	106	112	109	110	107	106	98	112
Conveyors (/m)	1		84	89	82	86	83	79	74	88
Desal Plant	5	81	87	90	99	106	96	89	95	105

\* Height above sea level

## Appendix C Mine pit schedule

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Year	Mineralogy			Sino Iron and Expansion			Balmoral South				Austeel			
	Stage	1	2	3	NE	SE	W	1	2	3	4	1	2	3
2011				-24										
2012				-24										
2013				-60										
2014				-96										
2015				-144	-24	-24								
2016				-168	-24	-24								
2017	-14			-168	-60	-60	-20							
2018	-38			-216	-96	-96	-44	4				-38		
2019	-62			-216	-120	-120	-68	-8				-62		
2020	-86			-240	-144	-144	-104	-44				-86		
2021	-110			-240	-144	-144	-140	-68	4			-110		
2022	-134			-240	-144	-144	-188	-92	-32			-134		
2023	-158	-26		-240	-144	-144	-224	-116	-56			-158		
2024	-182	-50		-240	-144	-144		-152	-92			-194	-26	
2025	-218	-74		-240	-168	-156		-176	-128	28		-242	-50	
2026	-266	-98		-240	-168	-156		-200	-164	16		-290	-74	
2027	-338	-122		-240	-168	-186		-224	-188	-8			-98	
2028	-386	-146		-240	-168	-186		-248	-224	-56			-122	
2029		-170	10	-240	-168	-186		-260	-248	-92			-146	
2030		-194	-14	-240	-204	-216		-272	-260	-140			-182	
2031		-230	-38	-240	-204	-216			-272	-188			-230	-50
2032		-278	-62	-264	-244	-240			-272	-212			-278	-74
2033		-338	-86	-264	-244	-240				-248			-290	-98
2034			-110	-264	-244	-240				-272				-122
2035			-134	-282	-282	-264				-272				-146
2036			-158											-170
2037			-194											
2038			-242											
2039			-314	-282	-282	-264								
2040			-362											
2041			-386											
2042														

## Appendix D Noise Contour Plot

## Appendix D Noise Contour Plot

