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12 November 2021

Rose-Anne Hawkeswood
Department of Planning, Industry & Environment
GPO Box 39
SYDNEY NSW 2000

Dear Rose-Anne

**Re: Sunrise Project Modification 7 – Request for Information (EPA Advice on Submissions Report)**

Thank you for your request for information regarding the Sunrise Project Modification (MOD 7) dated 22 October 2021.

Responses to your queries are provided as follows:

- Attachment 1 – Responses to the air quality matters raised by the Environment Protection Authority.
- Attachment 2 – Responses to the noise matters raised by the Environment Protection Authority.

Please contact me on 0429 066 086 or via email bflynn@sunriseem.com should you have any further queries.

Kind Regards,

BFlynn

**Bronwyn Flynn**
Environment, Approvals & Community Lead
Sunrise Energy Metals Limited

ATTACHMENT 1

RESPONSES TO AIR QUALITY MATTERS

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FINAL

12 November 2021

Ms Bronwyn Flynn
Environment, Approvals and Community Lead
Sunrise Energy Metals Limited
c/o Resource Strategies Pty Ltd

Project Name: Sunrise Project - Project Execution Plan Modification
Project Number: IS366000

Dear Bronwyn

Response to Air Quality-related Matters in the EPA Advice on the Submissions Report

The Modification Report for the Sunrise Project – Project Execution Plan Modification (the PEP Modification) was placed on public exhibition by the Department of Planning, Industry and Environment from 27 July 2021 to 9 August 2021.

The Environment Protection Authority (EPA) provided a submission on the Modification Report via letter on 19 August 2021 which requested additional information regarding the Air Quality Assessment prepared by Jacobs (2021a) (the PEP Modification Air Quality Assessment). Jacobs (2021b) subsequently provided a response to the EPA's submission as part of the Submissions Report for the PEP Modification.

The EPA provided advice on the Submissions Report on 21 October 2021 that requested additional information in regard to the PEP Modification Air Quality Assessment. This letter provides a response to the matters raised by the EPA in its latest advice.

Yours sincerely

Shane Lakmaker
Principal (Air Quality)

# 1. Proposed Use of Auxiliary Diesel Boiler and Diesel-Powered Backup Generator

**The EPA recommends** that Sunrise Energy:

1) Clarify the proposed use of the diesel generators, including but not limited to:

   i. Emergency use vs operational use (start-up or shutdown of the processing facilities)

   ii. Anticipated hours that the diesel generators will be used for, whether it be for emergency purposes or for plant start-up/shutdown periods.

Power for the mine and processing facility is currently approved to be provided by the power plant (including an auxiliary diesel boiler) and a diesel-powered backup generator. As both the diesel-powered backup generator and auxiliary diesel boiler would generate emissions of volatile organic compounds (VOCs), they have both been considered in this response.

The PEP Modification would not change the power plant. The steam for the power plant is approved to be generated through heat recovery from the sulphuric acid plant. Steam generation would also be supported by an auxiliary diesel boiler. The auxiliary diesel boiler would be used when the sulphuric acid plant is not producing sufficient steam or when it is offline (e.g. scheduled shutdowns) and would therefore operate irregularly for short periods of time. An indicative estimate of the auxiliary diesel boiler utilisation is approximately 3% (or 265 hours/year) based on the expected scheduled sulphuric acid plant shutdown and estimated unplanned sulphuric acid plant shutdowns.

The PEP Modification would increase the number of diesel-powered backup generators (and associated stacks) from one to four. The diesel-powered backup generators would be used to provide power for essential equipment at the mine and processing facility in the event of a planned or unplanned power supply disruption (i.e. emergency use). The diesel-powered backup generators would therefore also operate irregularly for short periods of time. An indicative estimate of the diesel-powered backup generator utilisation is approximately 2% (or 170 hours/year) based on the expected planned or unplanned power supply disruption.

## 2. Volatile Organic Compounds (VOCs)

**The EPA recommends** that Sunrise Energy:

2) Demonstrate that the speciated VOCs assessed have the greatest potential for ground level impacts. The EPA recommends additional analysis comparing the magnitude of speciated VOCs with relevant impact assessment criteria to demonstrate the speciated VOCs assessed are representative of worst-case emissions and potential impacts.
3) Revise the Air Quality Impact Assessment to ensure that emissions and potential impacts are based on reasonable worst-case emissions. This includes:
   i. an assessment of the potential impacts of additional VOCs identified through the additional analysis described above.
   ii. consideration of plant specific emission performances.

*Volatile Organic Compounds (VOC) Speciation*

The PEP Modification Air Quality Assessment (Jacobs, 2021a) assessed benzene and 1,3-butadiene as they were considered to be the volatile organic compounds (VOCs) associated with the Project to have the greatest potential for ground level impacts. This approach was consistent with the Air Quality Assessment (Ramboll Environ, 2017) for the approved Project which also only assessed benzene and 1,3-butadiene.

Notwithstanding the above, as requested by the EPA, further consideration of speciated VOCs is provided below. Table 1 shows the speciated VOCs that are identified in the "*National Pollutant Inventory Emission Estimation Technique Manual for Combustion Engines*" (Australian Department of Environment, Water, Heritage and the Arts, 2008) for stationary large diesel engines[1] that have assessment criteria in the "*Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (EPA, 2016) (the Approved Methods).

Table 1 Speciated VOCs for stationary large diesel engines

| Substance | Description | Emission factor ($kg/m^3$) | Emission as a percentage of the total VOC emission (%) |
|---|---|---|---|
| Benzene | Principal toxic air pollutant | 0.013 | 1.00% |
| 1,3 butadiene | | 0.00064* | 0.05% |
| Formaldehyde | | 0.0013 | 0.10% |
| Acetaldehyde | Odorous air pollutant | 0.00041 | 0.03% |
| Toluene | | 0.0046 | 0.35% |
| Xylenes | | 0.0032 | 0.25% |

Source: Department of Environment, Water, Heritage and the Arts (2008).

* 1,3 butadiene emission factor based on small engines as no data available for large engines.

[1] The auxiliary diesel boiler and diesel-powered backup generators would produce more than 450 kW.

*Relevant Air Quality Criteria*

Development Consent (DA 374-11-00) states that all gaseous emissions from the mine and processing facility must comply with the Approved Methods and the *Protection of the Environment Operations (Clean Air) Regulation 2010* (PoEO [Clean Air] Regulation).

The Approved Methods assessment criteria for benzene,1,3-butadiene, formaldehyde, acetaldehyde, toluene and xylenes are provided in Table 2.

Table 2 Air quality assessment criteria

| Air quality indicator | Type | Averaging time | Criterion | Application |
|---|---|---|---|---|
| Benzene | Principal toxic air pollutant | 1-hour | 29 µg/m$^3$ | 99.9$^{th}$ percentile, incremental at boundary |
| 1,3-butadiene | | | 40 µg/m$^3$ | |
| Formaldehyde | | | 20 µg/m$^3$ | |
| Acetaldehyde | Odorous air pollutant | 1-hour | 42 µg/m$^3$ | 99.9$^{th}$ percentile, incremental at sensitive receptor |
| Toluene | | | 360 µg/m$^3$ | |
| Xylenes | | | 190 µg/m$^3$ | |

Source: EPA (2016)

The PEP Modification Air Quality Assessment (Jacobs, 2021a) adopted a VOC in-stack concentration for the auxiliary diesel boiler and diesel-powered backup generators based on the Group 6 concentration for "Electricity Generation" in Schedule 3 of the PoEO (Clean Air) Regulation (i.e. 40 mg/Nm$^3$). The EPA has indicated that the higher VOC Group 6 in-stack concentration for "Stationary Reciprocating Internal Combustion Engines Using Liquid Fuel" in Schedule 4 of the PoEO (Clean Air) Regulation (i.e. 1,140 mg/Nm$^3$) is applicable for the diesel generators.

Based on the EPA's recommendation that Schedule 4 of the PoEO (Clean Air) Regulation is applicable, the VOC Group 6 in-stack concentration for "Any activity or plant involving combustion, except as listed below" in Schedule 4 of the PoEO (Clean Air) Regulation (i.e. 40 mg/Nm$^3$) has been adopted for the auxiliary diesel boiler.

*Air Quality Modelling*

The VOC emissions from the auxiliary diesel boiler and diesel-powered backup generators have been remodelled based on an in-stack concentration equal to the relevant Group 6 in-stack concentrations in Schedule 4 of the PoEO (Clean Air) Regulation. As Development Consent (DA 374-11-00) requires all gaseous emissions from the mine and processing facility to comply with the PoEO (Clean Air) Regulation, this approach assesses the maximum emission standards allowed under the Development Consent (DA 374-11-00) (i.e. represents a maximum case impact).

In addition, the other key emissions from the auxiliary diesel boiler and diesel-powered backup generators (i.e. oxides of nitrogen [$NO_x$], carbon monoxide [CO] and particulate matter [PM]) have been remodelled based on an in-stack concentration equal to the relevant Group 6 in-stack concentrations in Schedule 4 of the PoEO (Clean Air) Regulation. Furthermore, the emissions from the sulphuric acid plant have also been remodelled so that all emissions from the processing facility are considered in the revised modelling.

Table 3 shows the revised modelled emissions from the processing facility.

Table 3 Modelled processing facility emissions

| Source | Sulphuric acid plant stack | Power plant (auxiliary diesel boiler) | Diesel powered backup generator 1 | Diesel powered backup generator 2 | Diesel powered backup generator 3 | Diesel powered backup generator 4 |
|---|---|---|---|---|---|---|
| Easting (m) | 538400 | 538490 | 538482 | 538482 | 538482 | 538482 |
| Northing (m) | 6373390 | 6373410 | 6373451 | 6373451 | 6373451 | 6373451 |
| Height (m) | 40 | 30 | 10 | 10 | 10 | 10 |
| Base elevation (m) | 298 | 299 | 299 | 299 | 299 | 299 |
| Stack tip diameter (m) | 1.80 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 |
| Exhaust temperature (K) | 75 | 453 | 573 | 573 | 573 | 573 |
| Exhaust velocity (m/s) | 26.6 | 22.7 | 18.5 | 18.5 | 18.5 | 18.5 |
| Flow rate ($Nm^3$/s) | 53.1 | 8.7 | 5.6 | 5.6 | 5.6 | 5.6 |
| Mass emission rate (g/s) | | | | | | |
| CO | 0 | 1.1 | 33.0 | 33.0 | 33.0 | 33.0 |
| $NO_x$ | 18.6 | 4.4 | 2.5 | 2.5 | 2.5 | 2.5 |
| PM | 0 | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 |
| VOCs (total) | 0 | 0.3 | 6.4 | 6.4 | 6.4 | 6.4 |
| $SO_2$ | 53.1 | - | - | - | - | - |
| $H_2SO_4$ | 5.3 | - | - | - | - | - |
| Concentrations (mg/$Nm^3$) | | | | | | |
| CO | - | 125* | 5,880 | 5,880 | 5,880 | 5,880 |
| $NO_x$ | 350* | 500* | 450 | 450 | 450 | 450 |
| PM* | - | 50* | 50* | 50* | 50* | 50* |
| VOCs (total) | - | 40* | 1,140 | 1,140 | 1,140 | 1,140 |
| $SO_2$ | 1,000* | - | - | - | - | - |
| $H_2SO_4$ | 100* | - | - | - | - | - |

* In-stack concentration is consistent with the in-stack concentrations adopted in the PEP Modification Air Quality Assessment (Jacobs, 2021a).

Consistent with the PEP Modification Air Quality Assessment (Jacobs, 2021a), although the auxiliary diesel boiler and diesel-powered backup generators would operate irregularly for short periods of time, it has been assumed that emissions would be released continuously 24 hours per day, every day of the year. This approach allows for the proposed emissions to be assessed for all hours over the one-year modelling period and therefore allows for consideration of the maximum case impact.

Results from the revised VOC emission modelling were used to derive benzene, 1,3-butadiene, formaldehyde, acetaldehyde, toluene and xylenes concentrations based on the speciation data below:

- Benzene is 7.9% of total VOCs[2]
- 1,3-butadiene is 7% of total VOCs[2]
- Formaldehyde is 0.10% of total VOCs
- Acetaldehyde is 0.03% of total VOCs
- Toluene is 0.35% of total VOCs
- Xylenes is 0.25% of total VOCs

The modelled ground-level concentrations for the VOCs (benzene, 1,3-butadiene, formaldehyde, acetaldehyde, toluene and xylenes), $NO_x$ (as nitrogen dioxide [$NO_2$]) and CO are provided in Attachment 1.

As relevant PM Group 6 in-stack concentrations in Schedule 4 of the PoEO (Clean Air) Regulation are the same as the PM in-stack concentrations adopted in the PEP Modification Air Quality Assessment (Jacobs, 2021a) and the $SO_2$ and $H_2SO_4$ emissions from the sulphuric acid plant would also be the same as in the PEP Modification Air Quality Assessment (Jacobs, 2021a), the model results for these indicators are not provided in Attachment 1.

Based on the modelled ground-level concentrations from Attachment 1, the following conclusions can be made:

- Benzene concentrations do not exceed the air quality assessment criterion (29 µg/m$^3$) beyond the mine and processing facility boundary for 99.9% of the time (i.e. 99.9$^{th}$ percentile).
- 1-3 butadiene concentrations do not exceed the air quality assessment criterion (40 µg/m$^3$) beyond the mine and processing facility boundary for 99.9% of the time (i.e. 99.9$^{th}$ percentile).
- Formaldehyde concentrations do not exceed the air quality assessment criterion (20 µg/m$^3$) beyond the mine and processing facility boundary for 99.9% of the time (i.e. 99.9$^{th}$ percentile).
- Acetaldehyde concentrations do not exceed the air quality assessment criterion (42 µg/m$^3$) at the nearest sensitive receptors for 99.9% of the time (i.e. 99.9$^{th}$ percentile).
- Toluene concentrations do not exceed the air quality assessment criterion (360 µg/m$^3$) at the nearest sensitive receptors for 99.9% of the time (i.e. 99.9$^{th}$ percentile).
- Xylenes concentrations do not exceed the air quality assessment criterion (190 µg/m$^3$) at the nearest sensitive receptors for 99.9% of the time (i.e. 99.9$^{th}$ percentile).
- Maximum 1-hour average CO concentrations do not exceed the air quality assessment criterion (30 mg/m$^3$) at the nearest sensitive receptors.

[2] The speciation adopted in the PEP Modification Air Quality Assessment (Jacobs, 2021a) based on US EPA (2015) has been adopted over the speciation in Table 1 as it is more conservative.

- Maximum 8-hour average CO concentrations do not exceed the air quality assessment criterion (10 mg/$m^3$) at the nearest sensitive receptors.
- Maximum 1-hour average $NO_2$ concentrations do not exceed the air quality assessment criterion (246 µg/$m^3$) at the nearest sensitive receptors.
- Annual average $NO_2$ concentrations do not exceed the air quality assessment criterion (62 µg/$m^3$) at the nearest sensitive receptors.

Consistent with the conclusions in the PEP Modification Air Quality Assessment (Jacobs, 2021a), PM, $SO_2$ and $H_2SO_4$ emissions would also comply with the relevant air quality assessment criteria.

Given the above, it is considered emissions from the auxiliary diesel boiler and the diesel-powered backup generators have been assessed based on a reasonable maximum case emissions and they comply with the relevant air quality assessment criteria.

*Consideration of Plant Specific In-stack Concentrations*

Plant specific in-stack concentrations for the auxiliary diesel boiler and diesel-powered backup generators would be confirmed prior to the installation of the auxiliary diesel boiler and diesel-powered backup generators. The in-stack concentrations would however comply with the PoEO (Clean Air) Regulation in accordance with Condition 19, Schedule 3 of Development Consent (DA 374-11-00).

It is noted that Sunrise Energy Metals is required to prepare an Air Quality Verification Report that demonstrates the proposed plant specific in-stack concentrations (once confirmed) comply with the PoEO (Clean Air) Regulation and best practice emission concentrations in accordance with Condition 24A, Schedule 3 of Development Consent (DA 374-11-00).

# 3. References

Australian Government Department of Environment, Water, Heritage and the Arts (2008) "National Pollutant Inventory Emission Estimation Technique Manual for Combustion Engines". Version 3.0, June 2008. Published by the Australian Government Department of Environment, Water, Heritage and the Arts.

EPA (2016) "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW". Environment Protection Authority.

Jacobs (2021a) "Sunrise Project – Project Execution Plan Modification – Air Quality Assessment". Report prepared by Jacobs Group (Australia) Pty Ltd for Sunrise Energy Metals Limited. Final, Revision 1, dated 30 June 2021.

Jacobs (2021b) "Sunrise Project – Project Execution Plan Modification – Air Quality Assessment - Response to EPA Comments on Air Quality and Greenhouse Gas Assessment". Letter prepared by Jacobs Group (Australia) Pty Ltd for Sunrise Energy Metals Limited. Final, dated 29 September 2021.

Ramboll Environ (2017) "Syerston Project Modification 4 Air Quality and Greenhouse Gas Assessment".

US EPA (2015) "Speciation Profiles and Toxic Emission Factors for Nonroad Engines". Prepared by the Office of Transportation and Air Quality, U.S. Environmental Protection Agency, March 2015.

ATTACHMENT 1 Modelled ground-level concentrations

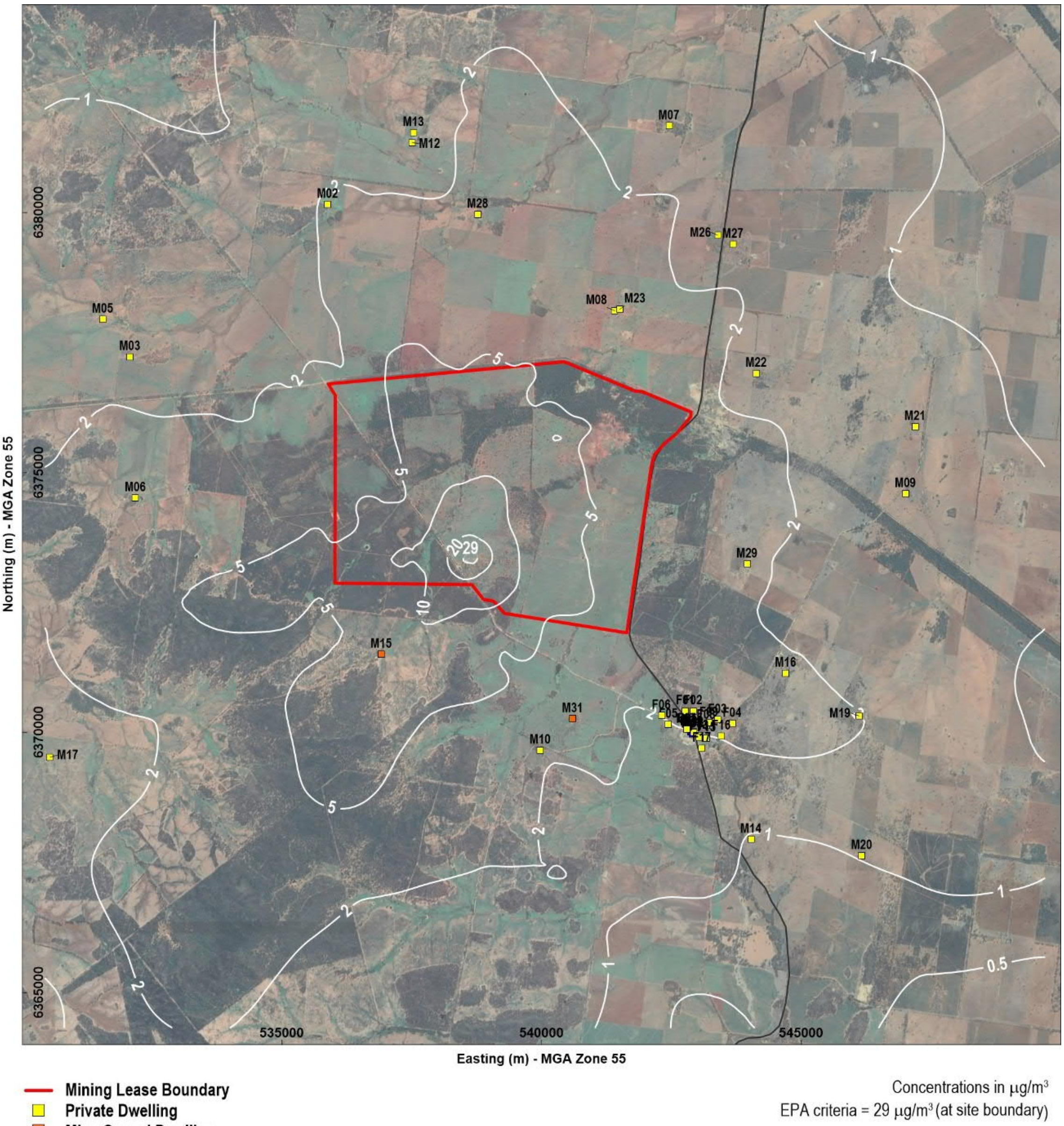


Figure 1 Modelled 99.9th percentile benzene concentrations due to the processing facility

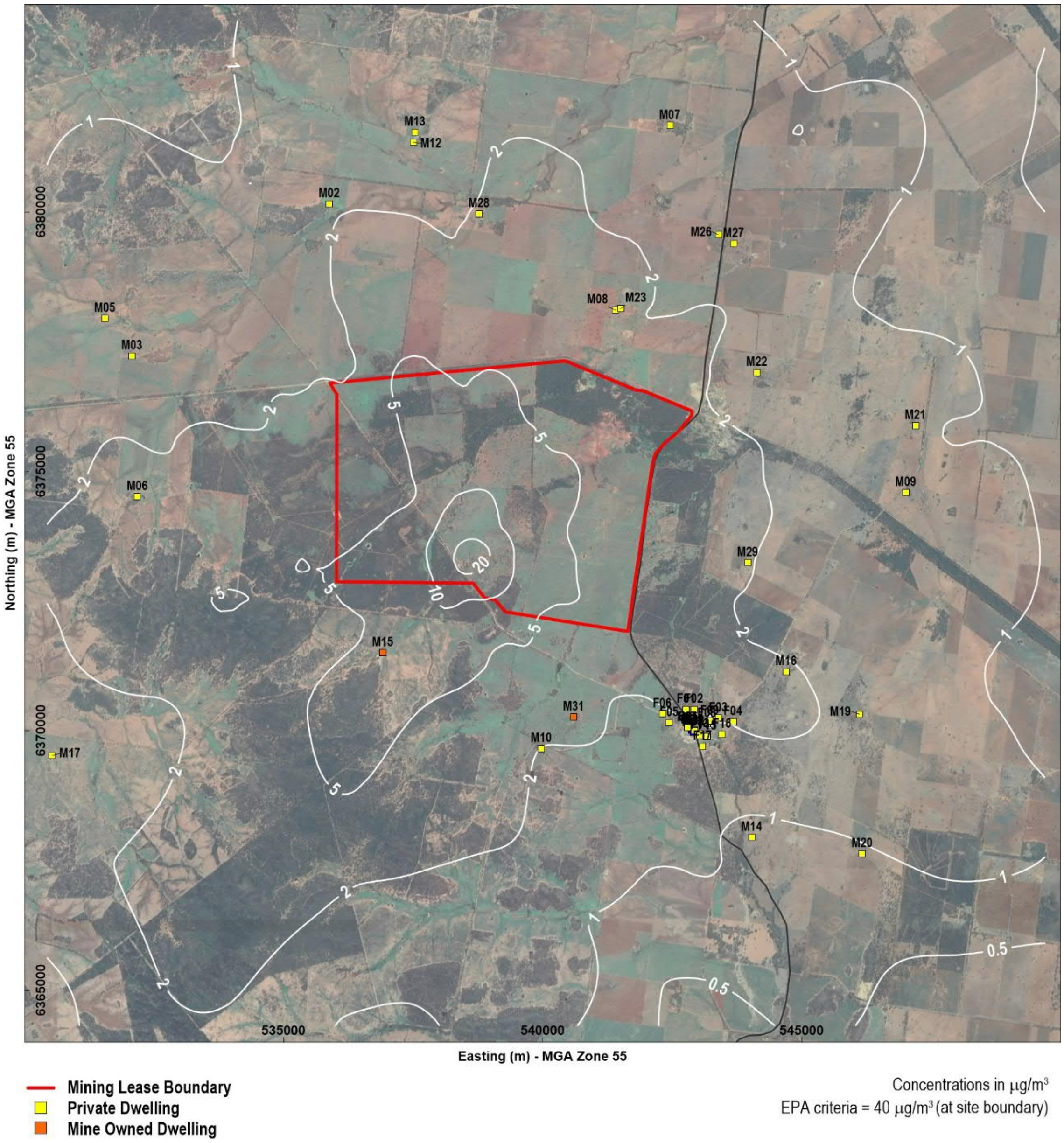


Figure 2 Modelled 99.9th percentile 1,3 butadiene due to the processing facility

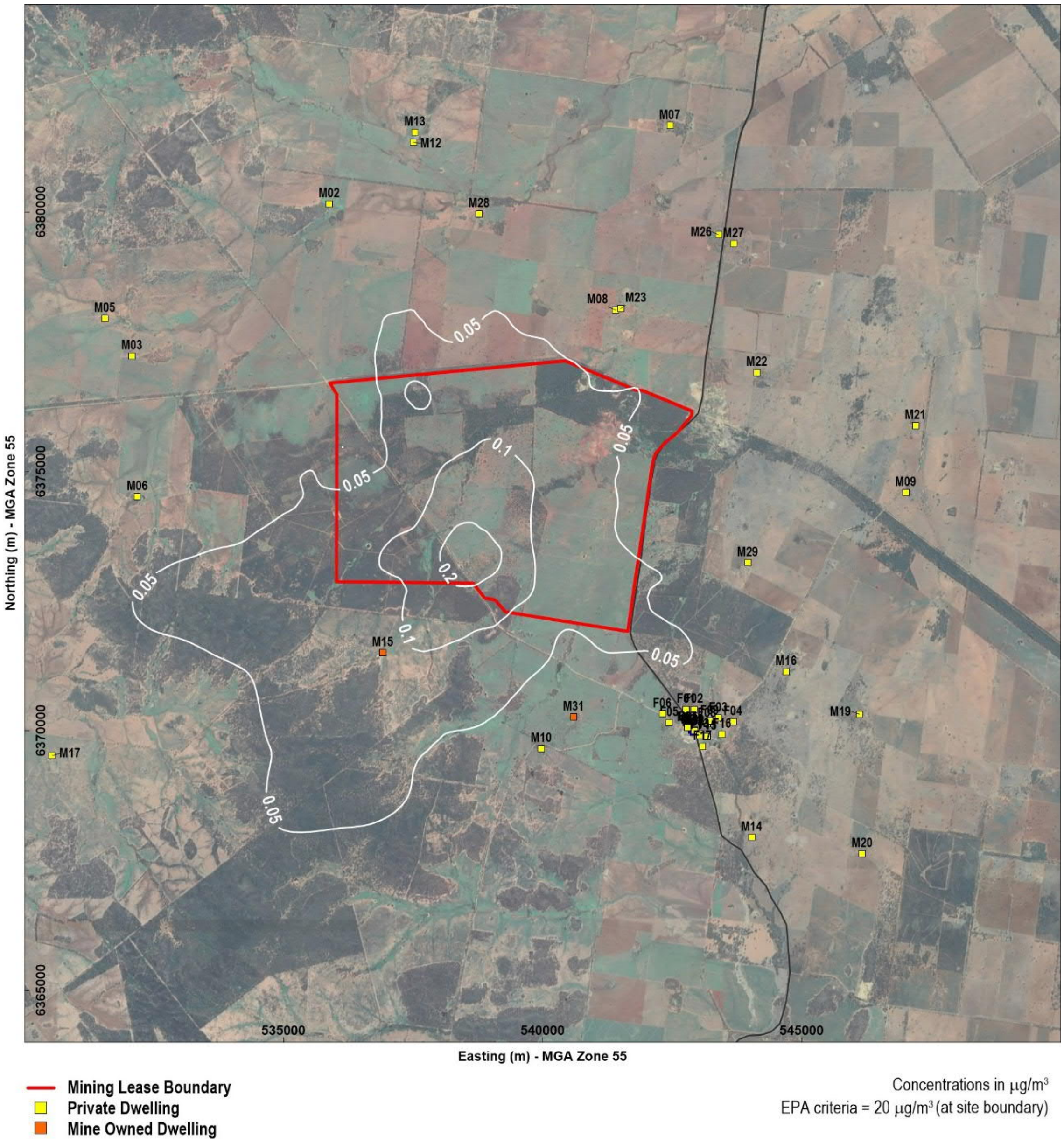


Figure 3 Modelled 99.9th percentile formaldehyde due to the processing facility

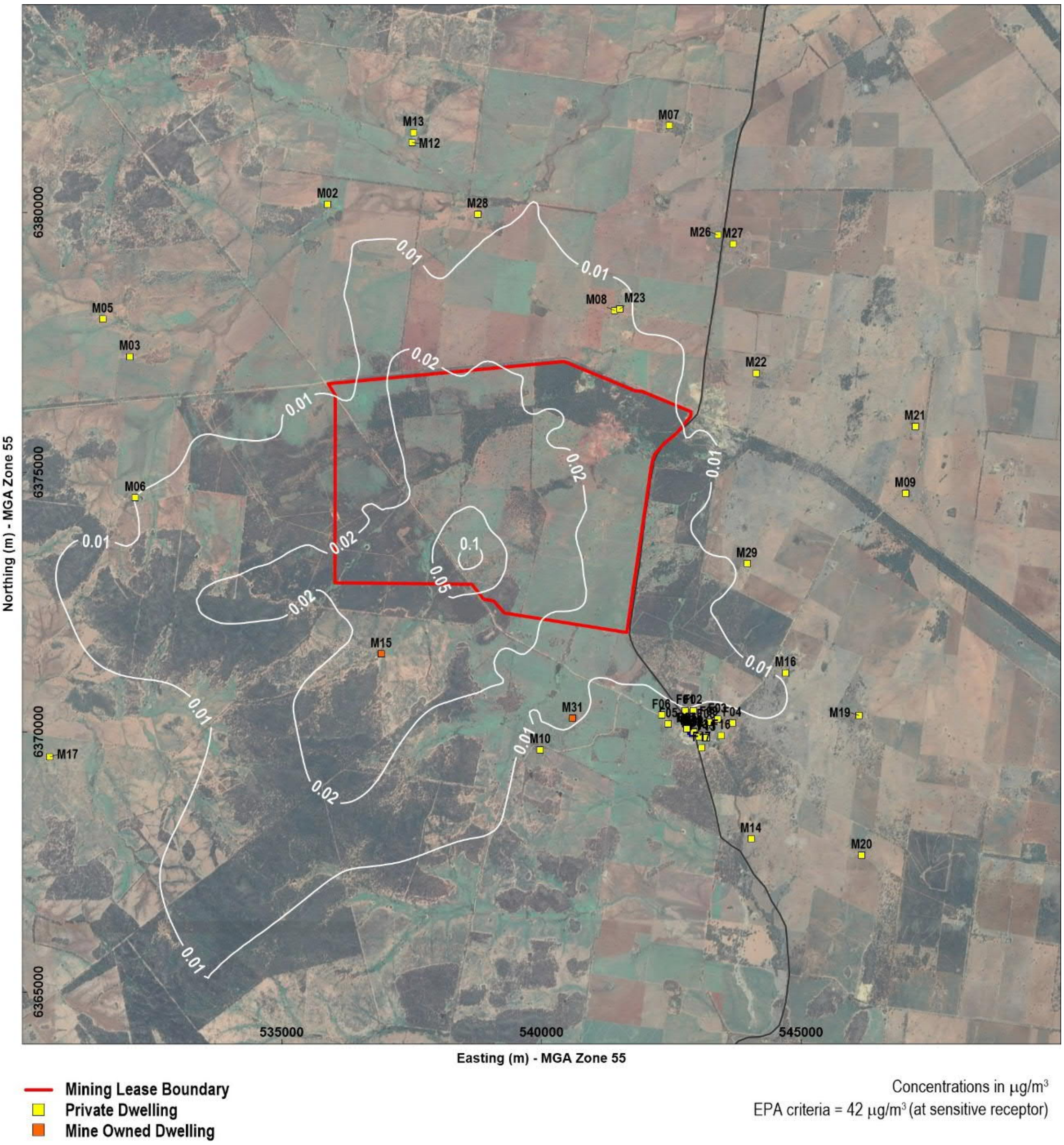


Figure 4 Modelled 99.9th percentile acetaldehyde due to the processing facility

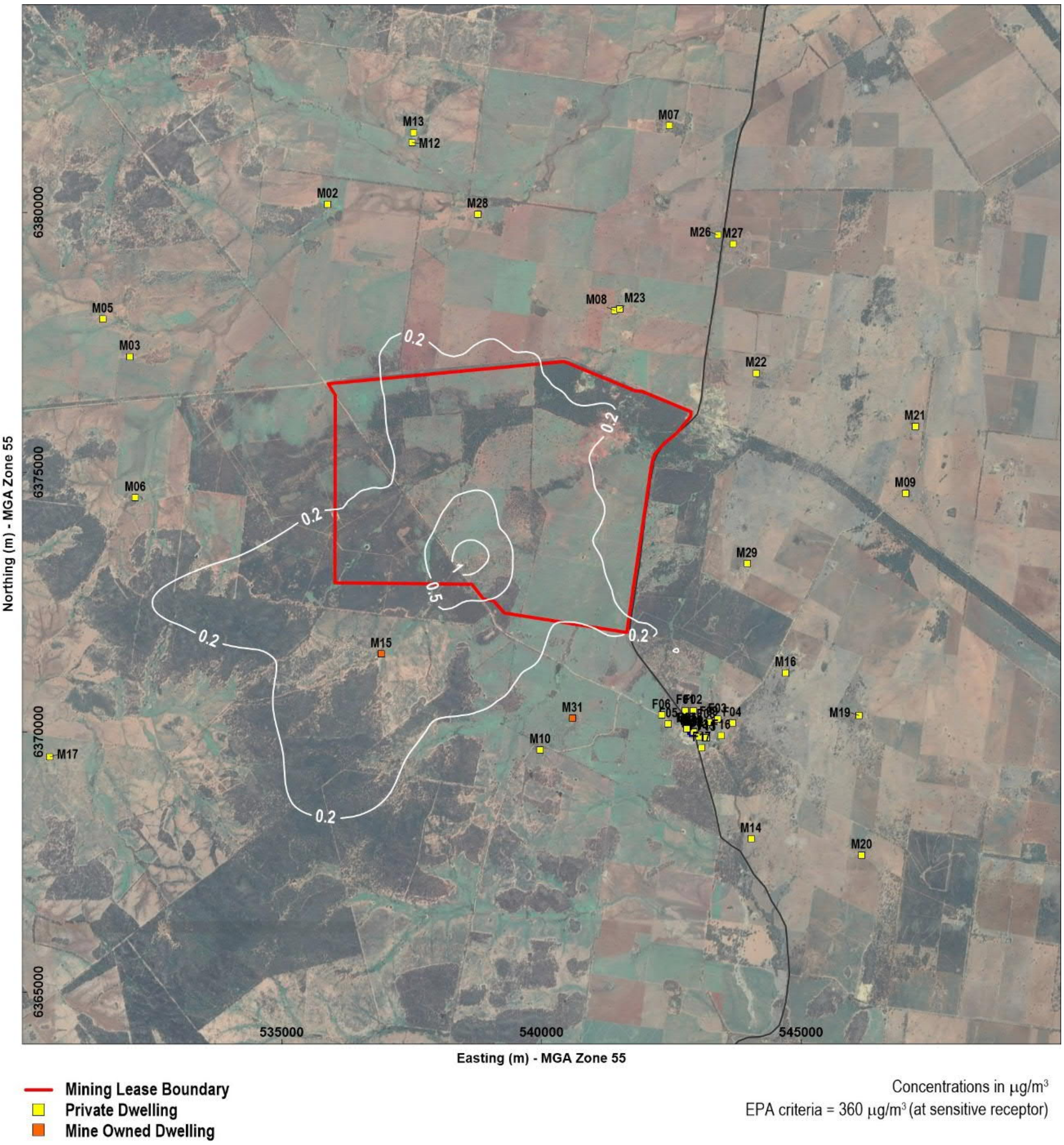


Figure 5 Modelled 99.9th percentile toluene due to the processing facility

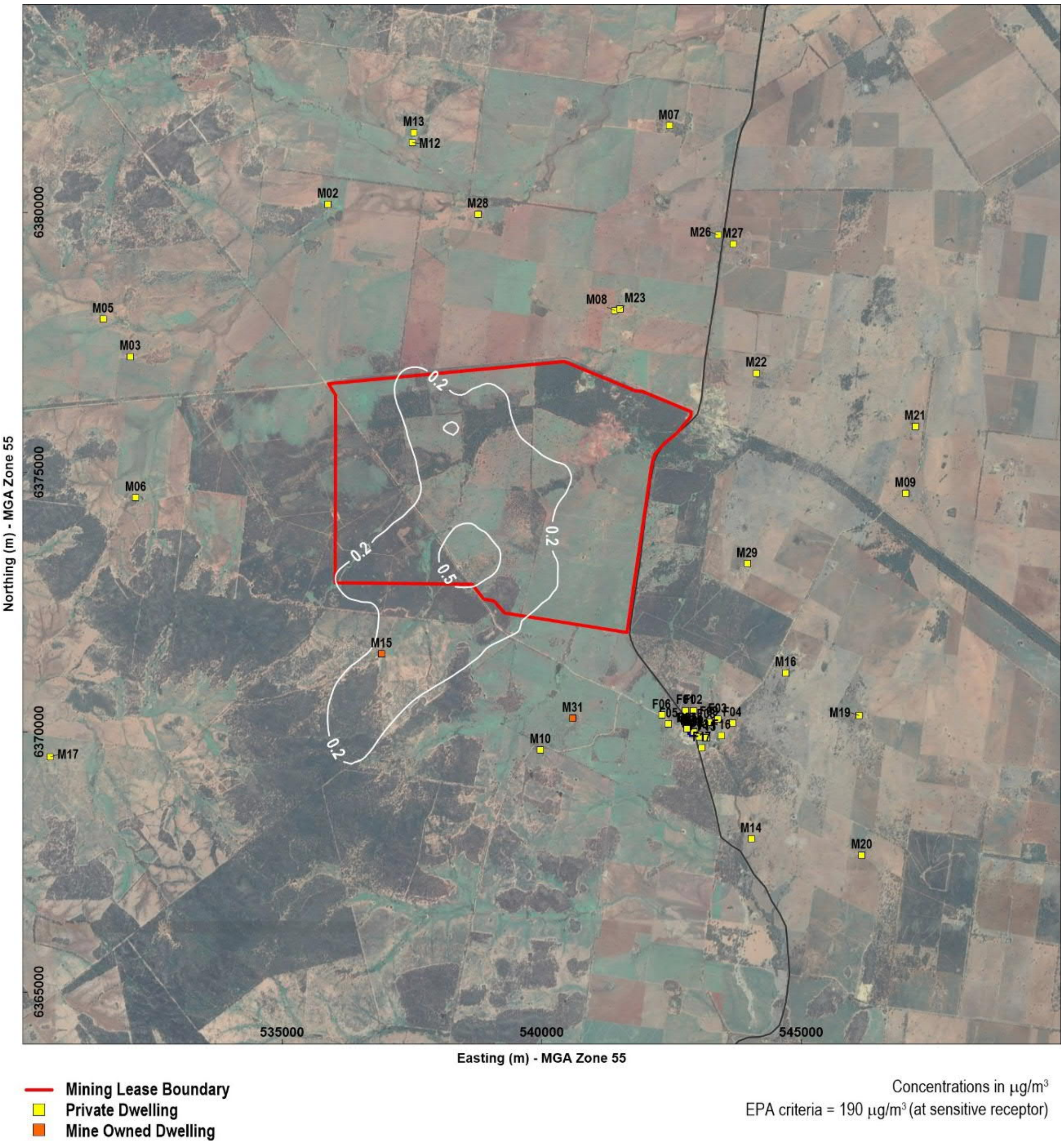


Figure 6 Modelled 99.9th percentile xylenes due to the processing facility

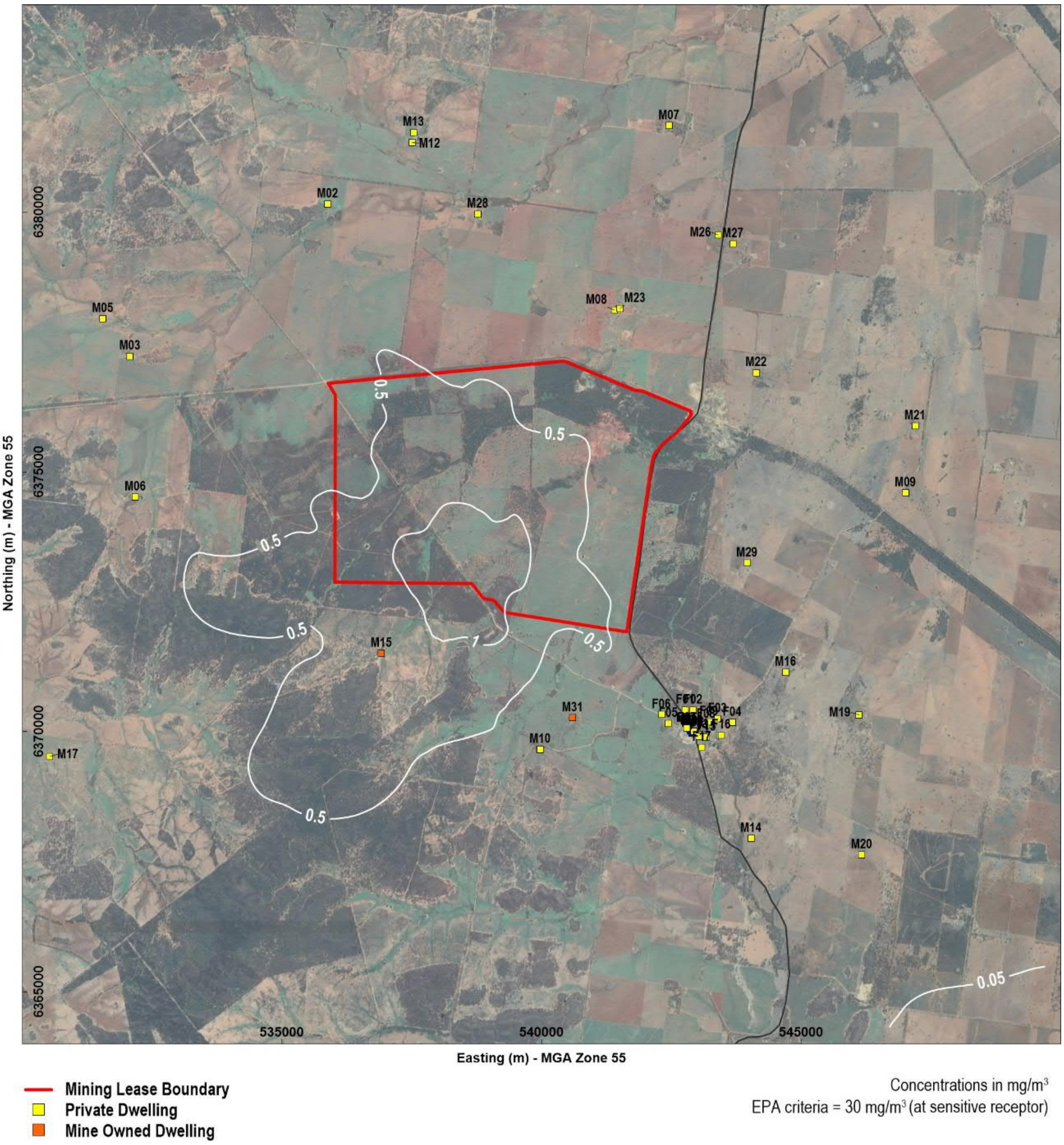


Figure 7 Modelled maximum 1-hour average CO due to the processing facility

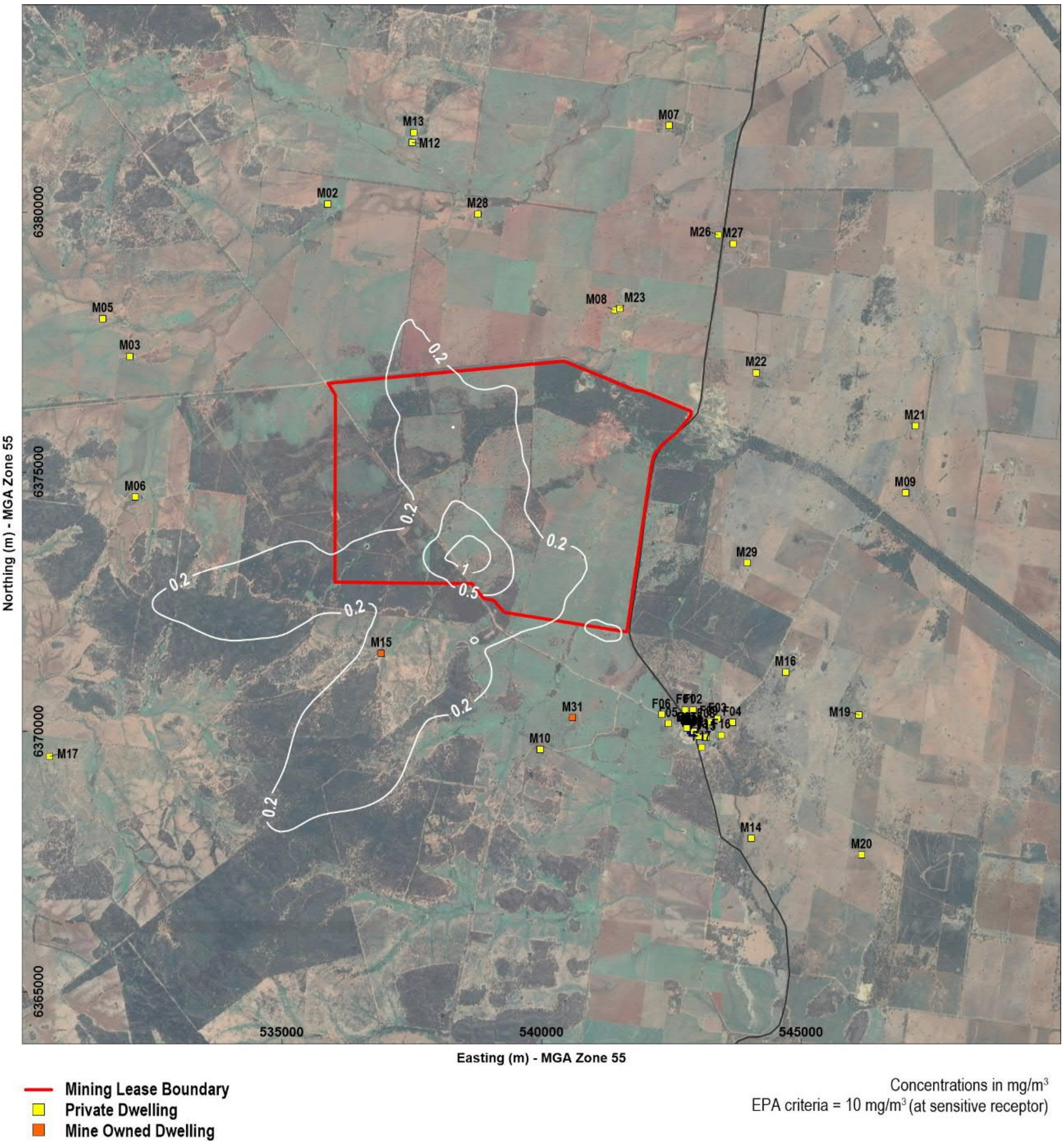


Figure 8 Modelled maximum 8-hour average CO due to the processing facility

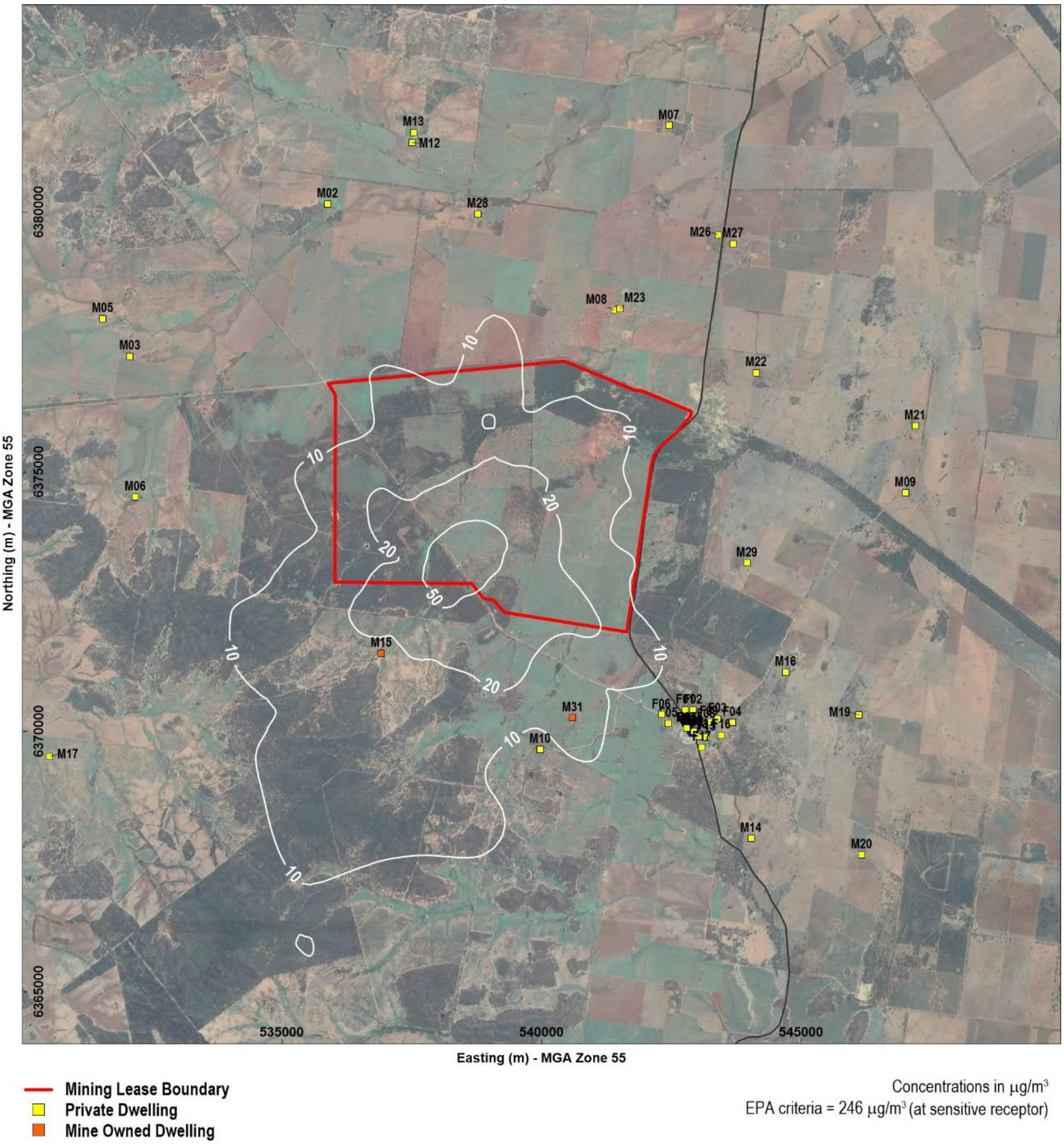


Figure 9 Modelled maximum 1-hour average $NO_2$ due to the processing facility

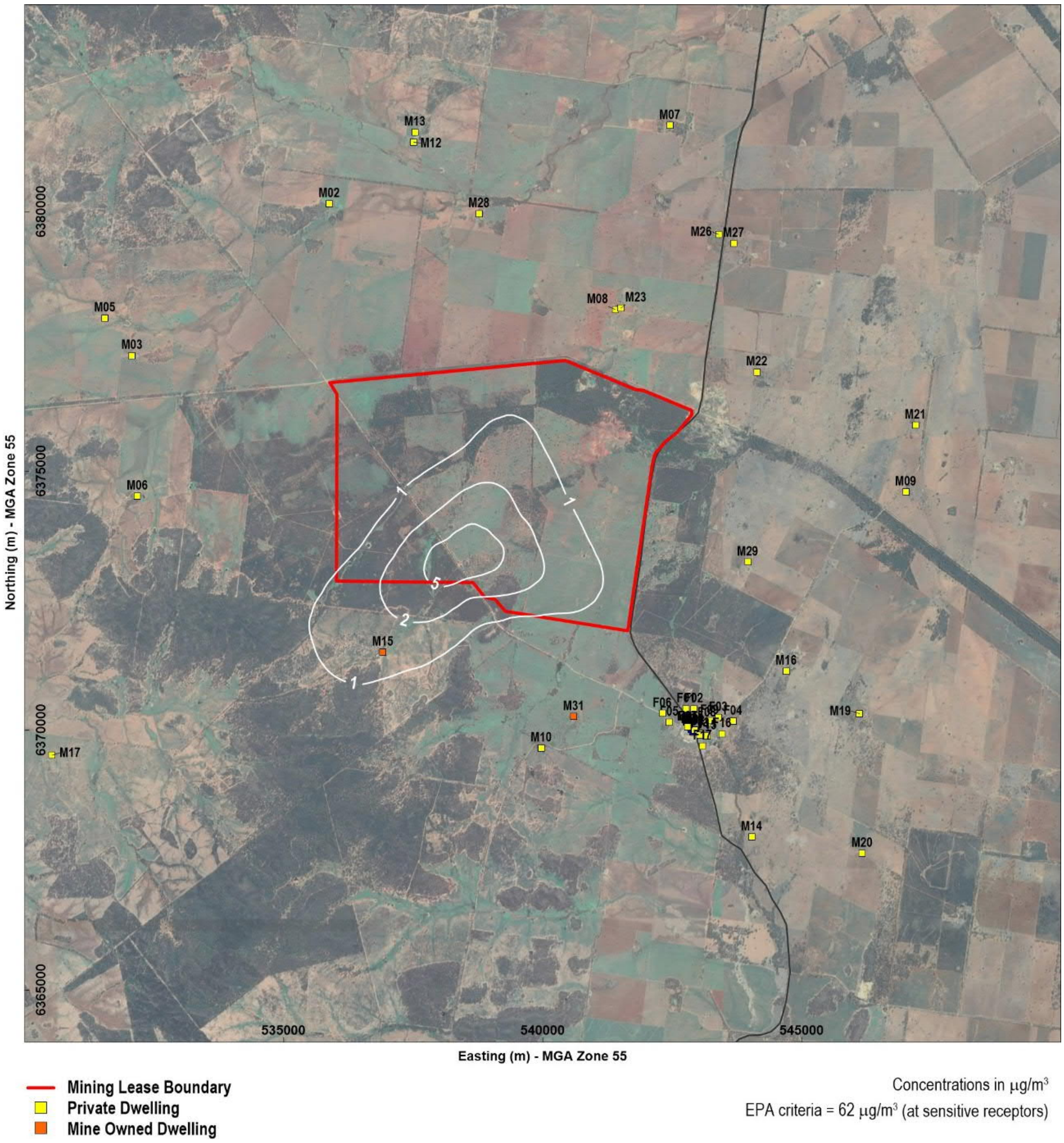


Figure 10 Modelled annual average $NO_2$ due to the processing facility

ATTACHMENT 2

RESPONSES TO NOISE MATTERS

12 November 2021
TJ345-15F02 EPA Advice on RTS (r2).docx

Sunrise Energy Metals Limited
Ms Bronwyn Flynn
Environment, Approvals and Community Lead

From: William Chan [William.Chan@renzotonin.com.au]

# Sunrise Project - Project Execution Plan Modification - Response to Noise-related Matters in the EPA Advice on the Submissions Report

## 1 Introduction

The Modification Report for the Sunrise Project – Project Execution Plan Modification (the PEP Modification) was placed on public exhibition by the Department of Planning, Industry and Environment (DPIE) from 27 July 2021 to 9 August 2021.

The Environment Protection Authority (EPA) provided a submission on the Modification Report via a letter on 19 August 2021 which requested additional information regarding the Noise Assessment prepared by Renzo Tonin & Associates (2021a) (the PEP Modification Noise Assessment). Renzo Tonin & Associates (2021b) subsequently provided a response to the EPA's submission as part of the Submissions Report for the PEP Modification.

The EPA provided advice on the Submissions Report on 21 October 2021 that requested additional information in regard to the PEP Modification Noise Assessment. This letter provides further responses to the matters in the EPA's advice on the Submission Report related to the acoustic bunds, as follows:

> *Sunrise Energy have identified that a noise bund to shield Currajong Park from potential noise emissions from the premises is not considered necessary. Sunrise Energy allege that the noise sources would be located too far away from the bund to create a significant reduction in noise. Sunrise Energy also consider that a noise bund would result in limited noise mitigation when inversion conditions are present at the premises.*
>
> *The EPA notes that no quantitative evidence has been provided to support these conclusions. The EPA does not consider inversion conditions to be adequate justification as they typically occur during night time and only for a limited part of the year. Furthermore, the response discounts the potential benefits a noise bund would provide when inversions are not present, which is likely to be most of the time operations occur.*


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*In that regard, the EPA does not consider that appropriate justification has been provided for not constructing a noise bund. The EPA reiterates that a noise bund may be a reasonable and feasible noise mitigation measure for the project.*

***EPA recommends*** *that DPIE notes the assessment of noise bunds and satisfies itself that all reasonable and feasible mitigation measures have been adopted to manage noise impacts. The EPA recommends that DPIE considers appropriate consent conditions if the application is approved.*

# 2 Proposed Reasonable and Feasible Noise Mitigation Measures

Renzo Tonin & Associates (2021a) conducted an assessment of reasonable and feasible noise mitigation measures for the mine and processing facility as part of the PEP Modification Noise Assessment.

Based on this assessment, a range of additional reasonable and feasible mitigation measures would be adopted at the modified mine and processing facility during relevant adverse meteorological conditions in the evening period including (Section 9.4 of the PEP Modification Noise Assessment):

- Cease operations on the north-eastern waste rock emplacement and cease operation of an excavator in the eastern open cut pit during predominant south-southwest, south-west and west-southwest wind conditions in Year 10.
- Cease haulage on the north-western waste rock emplacement during predominant southerly wind conditions in Year 10.
- Cease haulage on the north-eastern waste rock emplacement during south-southwest and south-west wind conditions in Year 17.

Furthermore, the proposed production schedule includes the operation of a reduced ore and waste rock haul truck fleet during the evening and night in the scheduled mine plan (Section 9.2 of the PEP Modification Noise Assessment) to reduce operations during the evening and night-time which appreciably reduced the predicted noise levels during these periods.

SEM considered additional opportunities to further reduce the predicted noise levels at Currajong Park 1 and 2 (e.g. acoustic bunds); however no further mitigation measures (in addition to the significant mitigation measures already committed to [listed above]) were considered reasonable or feasible.

# 3 Further Consideration of the Effectiveness of Acoustic Bunds

## 3.1 Additional Noise Modelling

To address the EPA's request for further (quantitative) justification for the effectiveness of the acoustic bunds at the Currajong Park 1 and Currajong Park 2 receivers, additional operational noise modelling incorporating the acoustic bunds has been conducted.

The following operational noise modelling scenarios have been considered:

- Year 1 – 10 m high acoustic bunds located on the north and eastern sides of the eastern open cut pits and the northern side of the north-eastern waste rock emplacement (Figure 1).

- Year 10 – 10 m high acoustic bunds located on the northern side of the north-eastern waste rock emplacement (Figure 2).

- Year 17 – 10 m high acoustic bunds located on the northern side of the north-eastern waste rock emplacement (Figure 3).

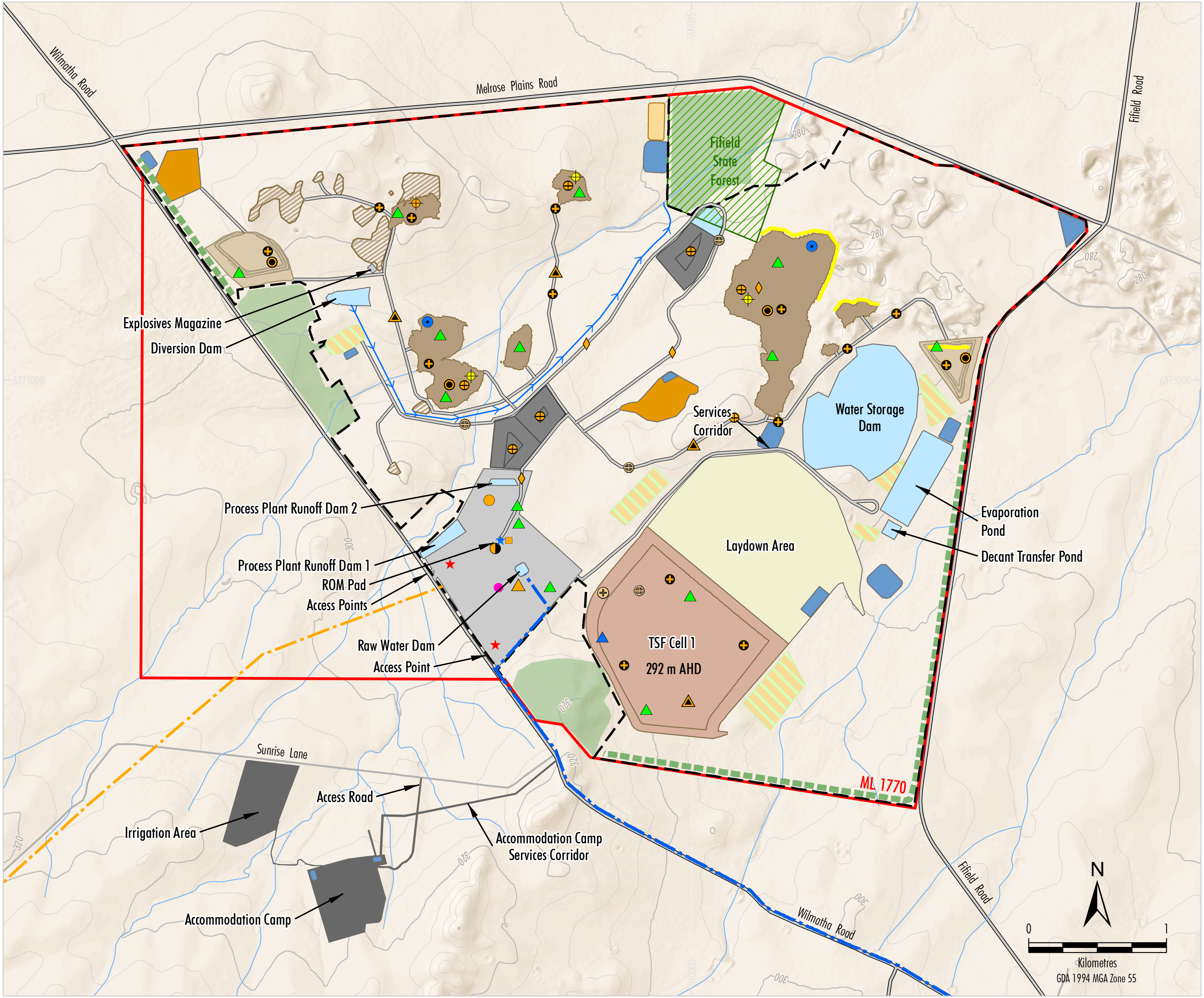
The additional noise modelling considered the following assessable meteorological conditions that were predicted to result in exceedances of the relevant Development Consent (374-11-00) noise criteria at Currajong Park 1 and/or Currajong Park 2:

- Temperature inversions; and

- Noise-enhancing winds (winds from the south, south-southwest, south-west, west-southwest).

Acoustic bunds were modelled at 10 m height for all scenarios. The predicted noise levels at Currajong Park 1 and 2 for the three operational noise modelling scenarios and the relevant assessable meteorological conditions are summarised in Table 1.

The noise modelling shows that the acoustic bunds could possibly reduce predicted noise levels at Currajong Park 1 and 2 by up to 1 dB under certain meteorological conditions (although there would be no reduction for the majority of scenarios and meteorological conditions considered) as shown in Table 1. The noise modelling did however show that the acoustic bunds would reduce the predicted noise level associated with certain individual fleet items that are practicably able to work close to the acoustic bunds, however, the overall noise levels at Currajong Park 1 and 2 would still only reduce by up to 1 dB. This shows that although the acoustic bunds may be effective at reducing noise for some individual fleet items that are able to work close to the acoustic bunds, the acoustic bunds do not result in an appreciable reduction in overall noise levels from the mine and processing facility at Currajong Park 1 and 2 (as it is not practicable for all fleet items to work near the acoustic bunds).




LEGEND

State Forest
Mining Lease Boundary (ML)
Approved Mine Site and Processing Facility Surface Development Area
Processing Facility
Tailings Storage Facility
Open Cut Pit (Scandium Oxide)
Open Cut Pit
Waste Rock Emplacement
Ore Stockpile
Topsoil Stockpile
Accommodation Camp
Water Storage
Sediment Dam
Laydown Area
Borrow Pit
Initial Rehabilitation
Diversion Structure
Vegetation Screening
Existing Open Woodland to be Maintained
Gas Pipeline
Water Pipeline
Acoustic Bund

Fleet Item

16M Grader
740 Haul Truck (Ore)
777D Haul Truck (Waste)
777F Water Cart
825H Roller
980H IT
CP64 Compactor
Cat 980 FEL (ROM)
D10 Dozer
EWP
EX1200 Excavator (Ore)
EX2500-6 Excavator (Waste)
Franna Crane
Light Vehicle
M6290 Drill Rig
MHT-X Forklift
Processing Facility
Service Truck
Heavy Vehicle

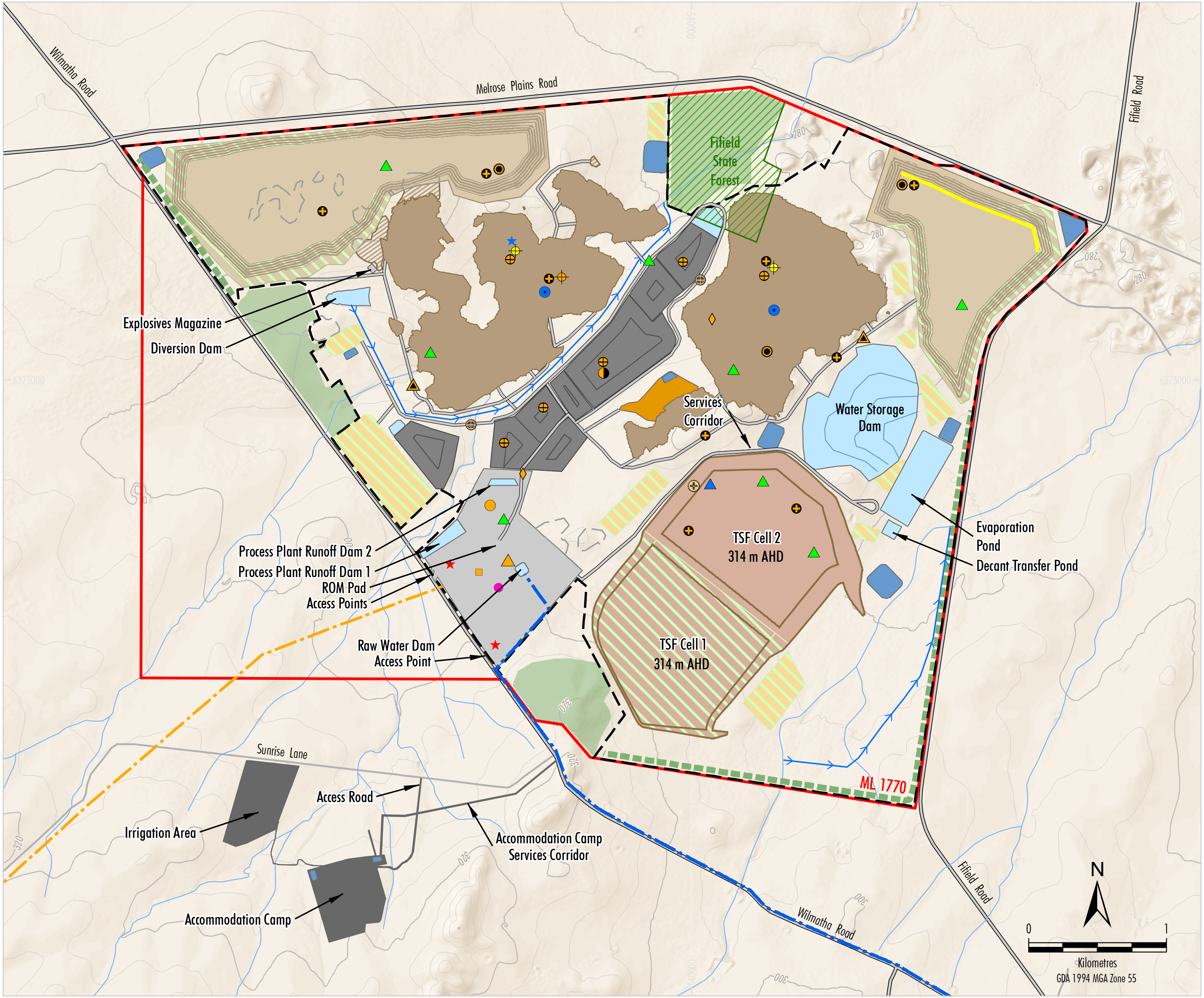
sunrise energy metals

S U N R I S E P R O J E C T

## Modified Mine and Processing Facility Conceptual General Arrangement Operational Year 1

**Figure 1**

CTL-20-08 MOD 7_SR_207A



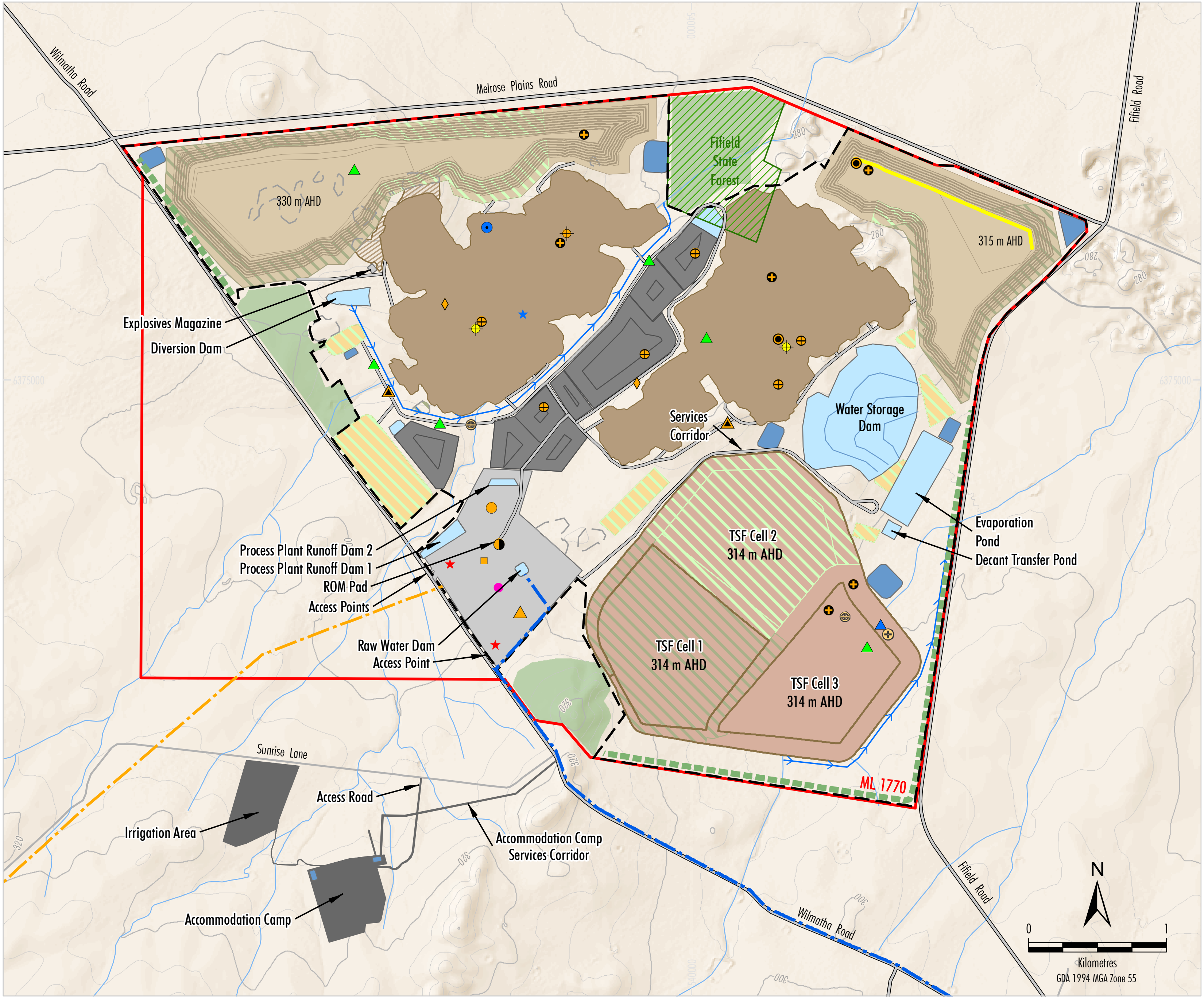

sunrise energy metals

S U N R I S E P R O J E C T

**Modified Mine and Processing Facility Conceptual General Arrangement Operational Year 10**

**Figure 2**

CTL-20-08 MOD 7_SR_208A




sunrise energy metals

S U N R I S E P R O J E C T

**Modified Mine and Processing Facility Conceptual General Arrangement Operational Year 17**

**Figure 3**

CTL-20-08 MOD 7_SR_209A

**Table 1: Comparison of Predicted Operational Noise Levels at Currajong Park Receivers ($L_{Aeq,15min}$, dB[A])**

| Operational Scenario and Assessable Meteorological Condition | Currajong Park 1 | | | Currajong Park 2 | | |
|---|---|---|---|---|---|---|
| | No Acoustic Bunds[1] | Acoustic Bunds | Further Reduction with Acoustic Bund | No Acoustic Bunds[1] | Acoustic Bunds | Further Reduction with Acoustic Bund |
| **Year 1** | | | | | | |
| Temperature Inversion | 37 | 37 | - | 38 | 38 | - |
| Noise-enhancing Wind (South) | 37 | 37 | - | 39 | 39 | - |
| Noise-enhancing Wind (South-southwest) | 38 | 38 | - | 40 | 40 | - |
| Noise-enhancing Wind (South-west) | 38 | 38 | - | 39 | 39 | - |
| Noise-enhancing Wind (West-southwest) | 37 | 37 | - | 38 | 38 | - |
| **Year 10** | | | | | | |
| Temperature Inversion | 37 | 37 | - | 38 | 37 | 1 |
| Noise-enhancing Wind (South) | 39 | 38 | 1 | 40 | 39 | 1 |
| Noise-enhancing Wind (South-southwest) | 37 | 36 | 1 | 37 | 36 | 1 |
| Noise-enhancing Wind (South-west) | 37 | 36 | 1 | 37 | 36 | 1 |
| Noise-enhancing Wind (West-southwest) | 36 | 35 | 1 | 36 | 35 | 1 |
| **Year 17** | | | | | | |
| Temperature Inversion | 39 | 39 | - | 40 | 39 | 1 |
| Noise-enhancing Wind (South) | 40 | 39 | 1 | 40 | 40 | - |
| Noise-enhancing Wind (South-southwest) | 40 | 40 | - | 40 | 40 | - |
| Noise-enhancing Wind (South-west) | 40 | 40 | - | 40 | 40 | - |
| Noise-enhancing Wind (West-southwest) | 40 | 40 | - | 40 | 40 | - |

Notes: 1. As per the PEP Modification Noise Assessment (Renzo Tonin & Associates, 2021a).

The maximum predicted operational noise level at Currajong Park 1 and 2 would remain the same at 40 dB(A). Furthermore, the predicted noise levels at Currajong Park 1 and 2 in all three operational scenarios would continue to:

- represent moderate exceedances (i.e. 3 to 5 dBA above the Project Noise Trigger Levels) as defined in the Voluntary Land Acquisition and Mitigation Policy (NSW Government, 2018) during night-time and evening periods; and
- exceed the night-time and evening Development Consent (DA 374-11-00) noise criteria.

Given the above, the acoustic bunds are not expected to result in an appreciable reduction in noise levels at Currajong Park 1 and 2 and are not considered to be a feasible noise mitigation option.

## 3.2 Reasonable and Feasible Noise Mitigation Measures

A review of the effectiveness of the acoustic bunds to reduce potential noise emissions at Currajong Park 1 and 2 to below the relevant Development Consent (374-11-00) criteria (i.e. 37 dB[A] in the day, evening and night-time periods) has been undertaken. In particular, the use of acoustic bunds to maximise shielding of key noise generating fleet items, most notably in the early years of operation of the eastern open cut pits (Figure 1) and for the north-eastern waste rock emplacement (Figures 1 to 3) was considered and it was concluded:

North-Eastern Waste Rock Emplacement

- An acoustic bund would be ineffective (refer to noise modelling results in Table 1) as the relevant fleet items would not be able to continually operate in close proximity to the acoustic bund in order for the acoustic bund to be effective[1] as fleet items would have to approach from the opposite side of the acoustic bund.
- Restricting fleet items to operate in close proximity to the acoustic bund to maximise the potential effectiveness of the acoustic bund is not considered practicable and would result in significant operational constraints.
- The acoustic bund would need to be reconstructed a number of times over the Project life as the north-eastern waste rock emplacement area is progressively constructed to the north and north-west and the acoustic bund would need to be approximately 10 m high and up to approximately 1,500 m long to be potentially effective for fleet items that are practicably able to work close to the acoustic bunds.
- Approximately 500,000 tonnes of waste rock would be required to construct the final acoustic bund at an estimated cost of approximately $2 million (Note: this does not include the waste rock quantities and cost associated with the progressive construction of the acoustic bunds that would be required earlier in the Project life).
- The progressive construction of the acoustic bunds would require the movement of significant quantities of waste rock resulting in additional noise, air quality and greenhouse gas emissions.
- Given that the acoustic bund would be impracticable and ineffective, the significant costs associated with constructing such large acoustic bunds and the restrictions to the operation of the key noise generating fleet items, the acoustic bund is not considered to be reasonable and feasible.

[1] Acoustic bunds are typically effective when the fleet is operating in close proximity to them (i.e. within 50 to 100 m).

Eastern Open Cut Pit

- An acoustic bund would be ineffective (refer to noise modelling results in Table 1) as the relevant fleet items would not be able to continually operate in close proximity to the acoustic bund in order for the acoustic bund to be effective.
- Restricting fleet items (e.g. the EX1200 excavator) to operate in close proximity to the acoustic bunds to maximise the potential effectiveness of the acoustic bunds is not considered practicable and would result in significant operational constraints.
- The acoustic bunds would need to be approximately 10 m high and approximately 1,400 m long to be potentially effective for fleet items that are practicably able to work close to the acoustic bunds.
- The acoustic bunds would require the movement of significant quantities of waste rock (approximately 480,000 tonnes) at significant cost (approximately $2 million).
- As the acoustic bund would be constructed within the open cut pit extent to maximise its effectiveness, the acoustic bund would need to be removed (and reconstructed) to allow for the progressive development of the open cut pit, resulting in further costs (approximately $2 million).
- The construction and removal of the acoustic bund would require the movement of significant quantities of waste rock resulting in additional noise, air quality and greenhouse gas emissions.
- Given that the acoustic bund would be impracticable and ineffective, the significant costs associated with constructing such a large acoustic bund and the restrictions to the operation of the key noise generating fleet items, the acoustic bunds are not considered to be reasonable and feasible.

In addition to the above, it is noted that noise levels are predicted to exceed the relevant Development Consent (374-11-00) criteria at Currajong Park 1 and/or Currajong Park 2 under inversion conditions for all of the operational scenarios and inversion conditions are expected to occur during 77% of nights in winter (Section 6.1 of the PEP Modification Noise Assessment). The acoustic bund would result in limited noise reductions when inversion conditions are present at the mine and processing facility due to the refraction of sound waves during the inversion conditions which would further limit the effectiveness of the acoustic bunds (refer to modelling results in Table 1).

# 4 Conclusion

The implementation of the acoustic bunds is not considered to be a reasonable and feasible mitigation measure given the following:

- The acoustic bunds would be impracticable and require significant restrictions on operations.
- There would be no appreciable reduction in noise levels at Currajong Park 1 and 2 due to the acoustic bunds.
- The maximum predicted operational noise level would remain the same at 40 dB(A).
- The predicted noise levels in all three operational scenarios would continue to:
  - represent moderate exceedances (i.e. 3 to 5 dBA above the Project Noise Trigger Levels) as defined in the Voluntary Land Acquisition and Mitigation Policy (NSW Government, 2018) during the night-time and evening periods; and
  - exceed the night-time and evening Development Consent (DA 374-11-00) noise criteria.
- The acoustic bunds would require the movement of significant quantities of waste rock at significant cost (greater than $5 million).
- The construction and removal of the acoustic bund would require the movement of significant quantities of waste rock resulting in additional noise, air quality and greenhouse gas emissions.

# Document control

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# APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

| | |
|---|---|
| Adverse weather | Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter). |
| Ambient noise | The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far. |
| Assessment period | The period in a day over which assessments are made. |
| Assessment point | A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated. |
| Background noise | Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below). |
| Decibel [dB] | The units that sound is measured in. The following are examples of the decibel readings of every day sounds:<br>0dB The faintest sound we can hear<br>30dB A quiet library or in a quiet location in the country<br>45dB Typical office space. Ambience in the city at night<br>60dB CBD mall at lunch time<br>70dB The sound of a car passing on the street<br>80dB Loud music played at home<br>90dB The sound of a truck passing on the street<br>100dB The sound of a rock band<br>115dB Limit of sound permitted in industry<br>120dB Deafening |
| dB(A) | A-weighted decibels. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter. |
| dB(C) | C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies. |
| Frequency | Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz. |
| Impulsive noise | Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise. |
| Intermittent noise | The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more. |
| $L_{Max}$ | The maximum sound pressure level measured over a given period. |
| $L_{Min}$ | The minimum sound pressure level measured over a given period. |

| | |
|---|---|
| $L_1$ | The sound pressure level that is exceeded for 1% of the time for which the given sound is measured. |
| $L_{10}$ | The sound pressure level that is exceeded for 10% of the time for which the given sound is measured. |
| $L_{90}$ | The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A). |
| $L_{eq}$ | The "equivalent noise level" is the summation of noise events and integrated over a selected period of time. |
| Reflection | Sound wave changed in direction of propagation due to a solid object obscuring its path. |
| SEL | Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations. |
| Sound | A fluctuation of air pressure which is propagated as a wave through air. |
| Sound absorption | The ability of a material to absorb sound energy through its conversion into thermal energy. |
| Sound level meter | An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels. |
| Sound pressure level | The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone. |
| Sound power level | Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power. |
| Tonal noise | Containing a prominent frequency and characterised by a definite pitch. |