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Sunrise Project

Project Execution Plan Modification

Appendix B

Noise Assessment

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Acoustics
Vibration
Structural Dynamics

SUNRISE PROJECT - PROJECT EXECUTION PLAN MODIFICATION

Noise Assessment

30 June 2021

Sunrise Energy Metals Limited

TJ345-12F02 Report (r3).docx

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1 Introduction

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW) (Figure 1).

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001.

The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities.

The Project Execution Plan Modification (the Modification) includes these Project Execution Plan changes to allow for the optimisation of the construction and operation of the Project.

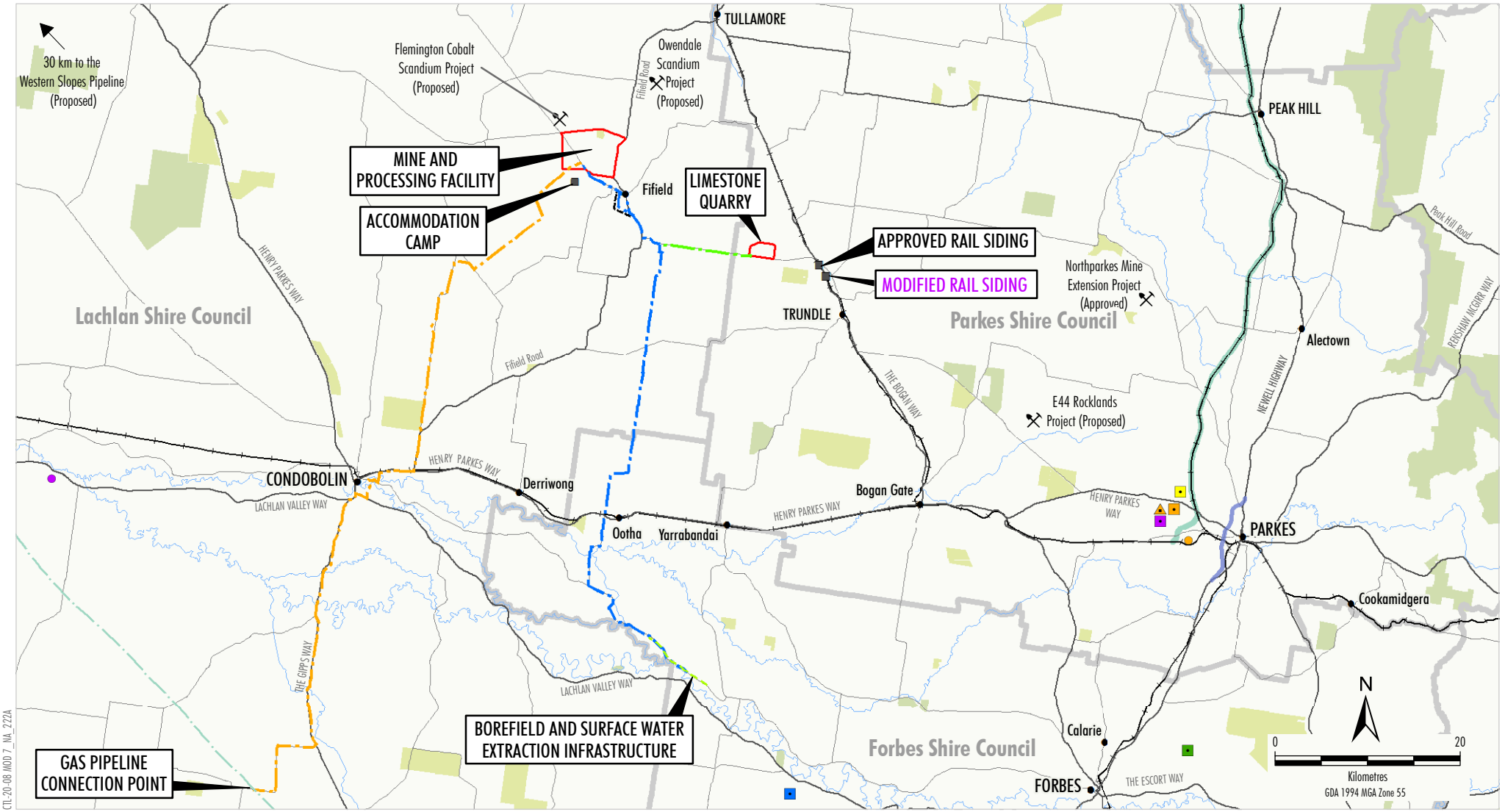
This Noise Assessment has been prepared to support an application by Sunrise Energy Metals Limited (SEM)[1] to modify Development Consent (DA 374-11-00) for the Project, which would be sought under section 4.55(2) of the EP&A Act.

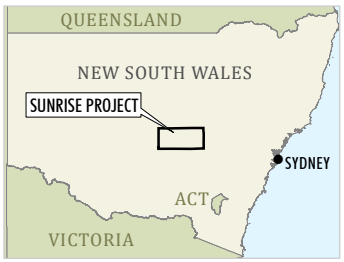
Noise impacts associated with the Modification are assessed in accordance with a number of policies, guidelines and standards, including:

- NSW *Interim Construction Noise Guideline* (ICNG) (Department of the Environment and Climate Change [DECC], 2009);
- NSW *Noise Policy for Industry* (NPfI) (Environment Protection Authority [EPA], 2017);
- *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments* (NSW Government, 2018); and
- NSW *Road Noise Policy* (RNP) (Department of Environment, Climate Change and Water [DECCW], 2011).

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard/New Zealand Standard ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

[1] SEM was previously Clean TeQ Holdings Limited (Clean TeQ).





LEGEND

- National Park/Conservation Area
- State Forest
- Local Government Boundary
- Railway
- Existing Gas Pipeline

Project Components

- Mining Lease Boundary (ML)
- Fifield Bypass
- Gas Pipeline
- Water Pipeline
- Limestone Quarry Water Pipeline
- Borefield Infrastructure Corridor

Other Relevant Projects

- Parkes Bypass (Approved)

Other State Significant Projects

- Mine Site
- Daroobalgie Solar Farm (Proposed)
- Goonumbla Solar Farm (Approved)
- Jemalong Solar Farm (Approved)
- Parkes Solar Farm (Approved)
- Quorn Park Solar Farm (Approved)
- Parkes Peaking Power Plant (Approved)
- Cattle Feedlot and Quarry (Approved)
- Parkes Special Activation Precinct
- Inland Rail (Parkes to Narromine) (Approved)

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)

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SUNRISE PROJECT

Regional Location

Figure 1

2 Project Overview

The Project is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 km west-northwest of Sydney, in NSW (Figure 1).

The Project includes the establishment and operation of the following:

- mine and processing facility;
- limestone quarry;
- rail siding;
- borefield, surface water extraction infrastructure and water pipeline;
- gas pipeline;
- accommodation camp; and
- associated transport activities and transport infrastructure (e.g. the Fifield Bypass, road and intersection upgrades).

Construction of the Project commenced in 2006, which included components of the borefield, however construction of other Project components is yet to commence.

2.1 Overview of the Modification

SEM has continued to review and optimise the Project design, construction and operation as part of preparations for Project execution. The outcomes of this review are outlined in the Project Execution Plan (Clean TeQ, 2020a).

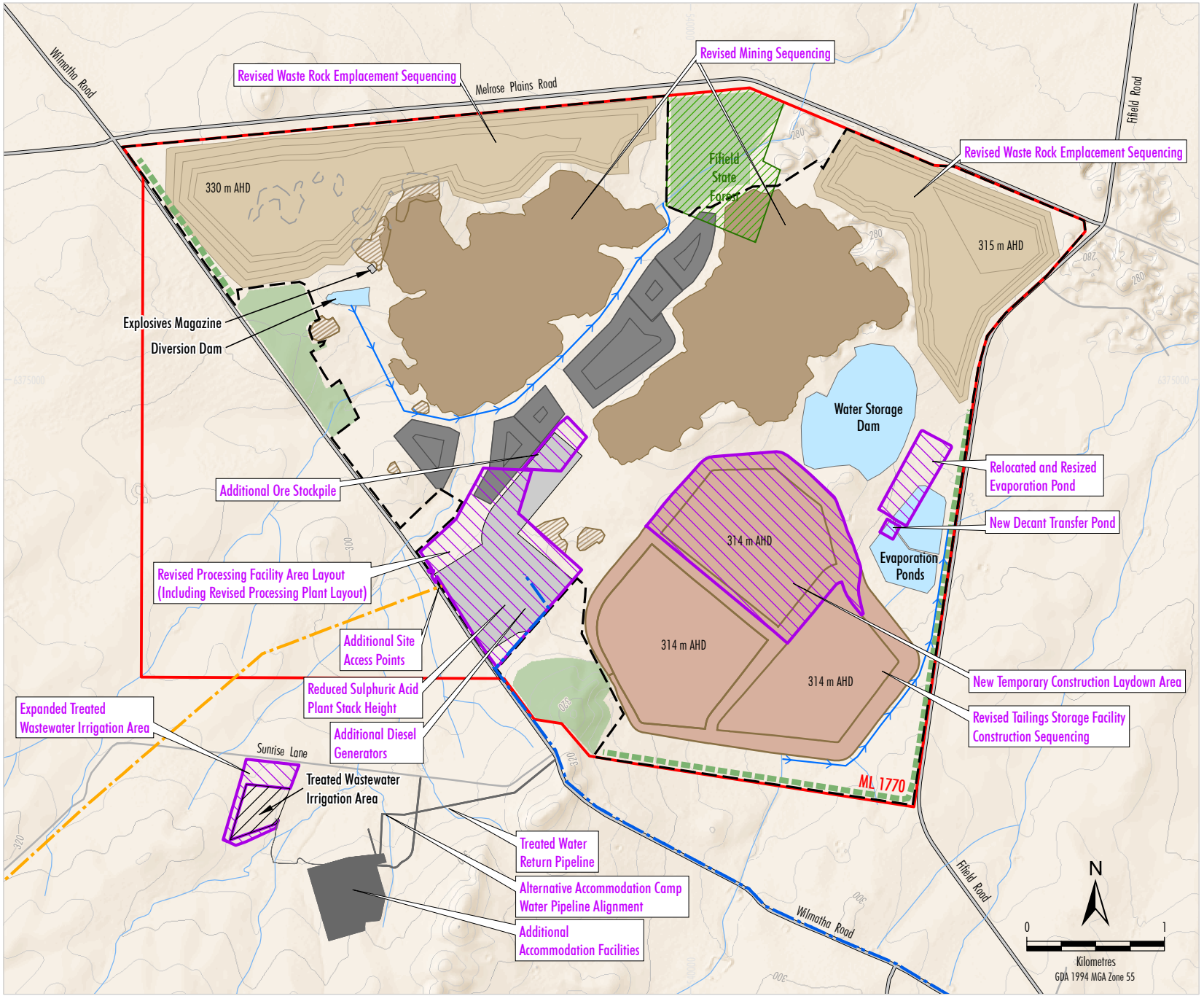
The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities.

The Modification includes these Project Execution Plan changes to allow for the optimisation of the construction and operation of the Project.

The Modification would include the following changes to the approved Project (Figure 2 and Figure 3):

Mine and Processing Facility

- addition of a temporary construction laydown area inside the approved tailings storage facility surface development area;
- optimised production schedule resulting in an increased mining rate during the initial years of mining and associated changes to mining and waste rock emplacement sequencing;



LEGEND

- State Forest

Approved Project

- Mining Lease Boundary (ML)
- Approved Surface Development Area
- Processing Facility
- Tailings Storage Facility
- Open Cut Pit (Scandium Oxide)
- Backfilled Open Cut Pit (Scandium Oxide)
- Open Cut Pit
- Waste Rock Emplacement
- Ore Stockpile
- Accommodation Camp
- Water Storage
- Diversion Structure
- Vegetation Screening
- Existing Open Woodland to be Maintained
- Gas Pipeline
- Water Pipeline

Modified Project

- Modified Layout

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)

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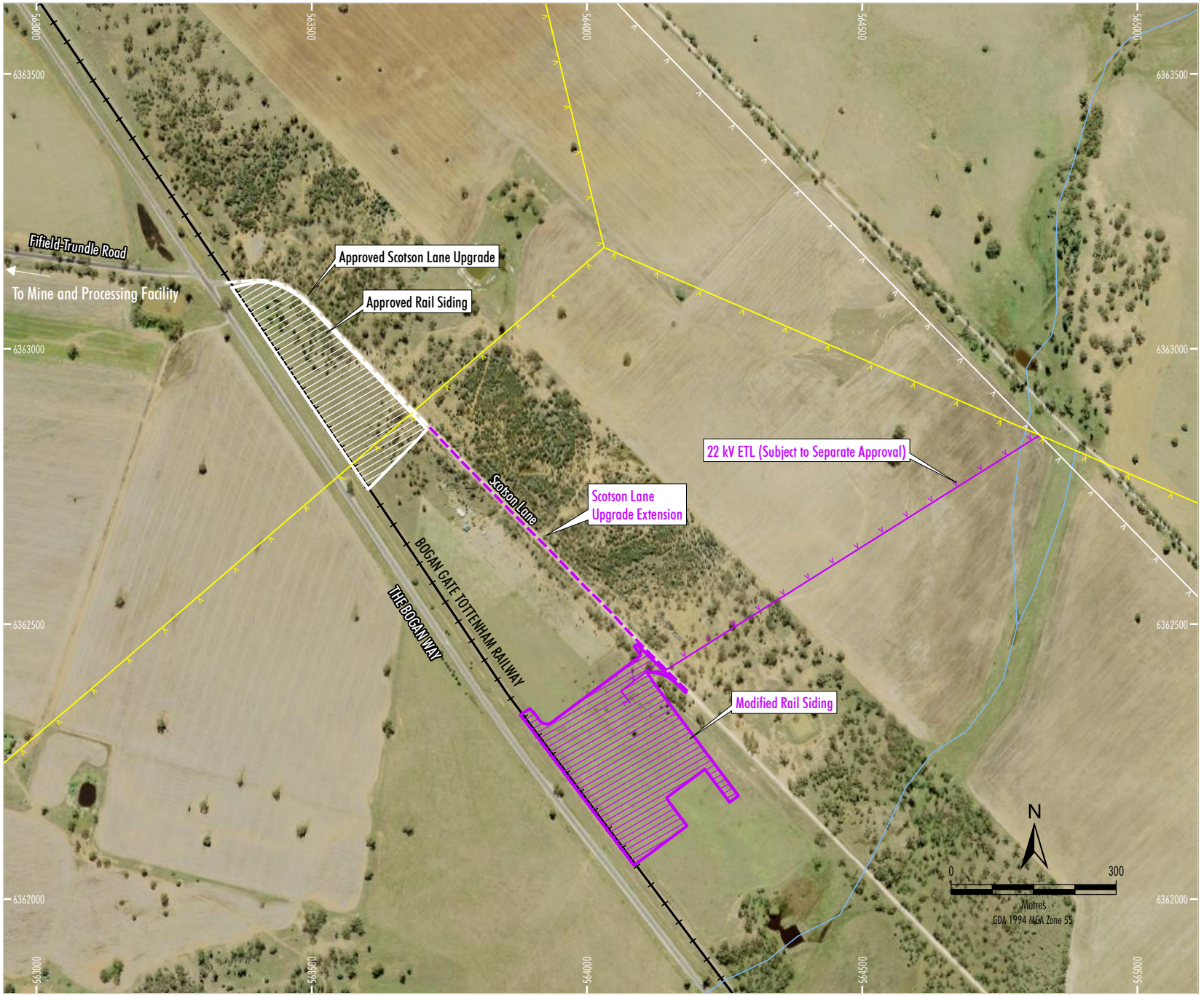
SUNRISE PROJECT

Approved and Modified Mine and Processing Facility Conceptual General Arrangement

Figure 2

CTL-20-08 MOD 7_NA_223A



LEGEND

- Railway
- Existing 11 kV Electricity Transmission Line
- Existing 22 kV Electricity Transmission Line
- Drainage Feature

Approved Project

- Surface Development Area
- Scotson Lane Upgrade

Modified Project

- Surface Development Area
- Scotson Lane Upgrade Extension
- 22 kV Electricity Transmission Line (Subject to Separate Approval)

Source: Black Range Minerals (2000); Clean Teq (2020, 2021); NSW Spatial Services (2020, 2021).

Orthophoto: © NSW Department of Finance, Services & Innovation (2021)

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SUNRISE PROJECT

Approved and Modified Rail Siding

Figure 3

CTL-20-08 MOD 7_NA_224A

- revised processing facility area layout, including a revised processing plant layout and two additional vehicle site access points;
- reduced sulphuric acid plant stack height from 80 m to 40 m;
- revisions to processing plant reagent types, rates and storage volumes;
- revised tailings storage facility cell construction sequence and the addition of a decant transfer pond;
- relocated and resized evaporation pond;
- changes to the water management system to reflect the modified mine and processing facility layout;
- increased number of diesel-powered backup generators (and associated stacks) from one to four;
- addition of exploration activities within the approved surface development area inside Mining Lease (ML) 1770;
- increased duration of the construction phase from two years to three years;
- increased peak construction phase workforce from approximately 1,000 to approximately 1,900 personnel;

Rail Siding

- revised rail siding location and layout;
- addition of an ammonium sulphate storage and distribution facility to the rail siding;
- extension of the Scotson Lane road upgrade;
- addition of a 22 kV electricity transmission line (ETL) (subject to separate approval) to the rail siding power supply;
- increased peak operational phase workforce from approximately five to approximately 10 personnel;

Accommodation Camp

- increased construction phase capacity from 1,300 to 1,900 personnel;
- increased size of the treated wastewater irrigation area;

- option for an alternative alignment of the last section of the accommodation camp water pipeline along the accommodation camp services corridor, rather than along the access road corridor;

- option to transfer treated wastewater to the mine and processing facility for reuse via a water pipeline located inside the approved services corridor;

Road Transport Activities

- changes to construction phase vehicle movements associated with the increased construction phase accommodation camp capacity and changes to heavy vehicle delivery requirements;

- changes to operational phase heavy vehicle movements associated with revisions to processing plant reagent types, rates and storage volumes; and

- changes to operational phase heavy vehicle movements to and from the rail siding associated with the transport of metal sulphate and ammonium sulphate products.

The Modification would not change the following approved components of the Project:

- other mine and processing facility components (e.g. surface development area, mining method, processing method and rate, tailings management and water management concepts);

- other accommodation camp components (e.g. surface development area; operational phase capacity);

- other transport activities and transport infrastructure (e.g. the Fifield Bypass);

- limestone quarry;

- borefield, surface water extraction infrastructure and water pipeline; and/or

- gas pipeline.

The issues addressed in this assessment include noise emissions from:

- modified mine and processing facility and rail siding construction activities;
- modified mine and processing facility and rail siding operational activities; and
- road traffic associated with the modified mine and processing facility and rail siding.

The Modification would not change the approved blasting practices at the Project. Therefore, potential blasting impacts have not been considered further in this assessment.

3 Noise Sensitive Receivers

Land use in the local area in the vicinity of the mine and processing facility is predominately agricultural operations (rural). The majority of properties surrounding the mine and processing facility are privately owned and the remainder are either community properties or mine owned. Fifield (a small community) is located approximately 2 km south-east of the mine and processing facility.

Land use in the local area in the vicinity of the modified rail siding is predominately agriculture operations (rural) The majority of properties surrounding the modified rail siding are privately owned. Trundle is the closest community to the modified rail siding and is located approximately 4 km to the south-southeast.

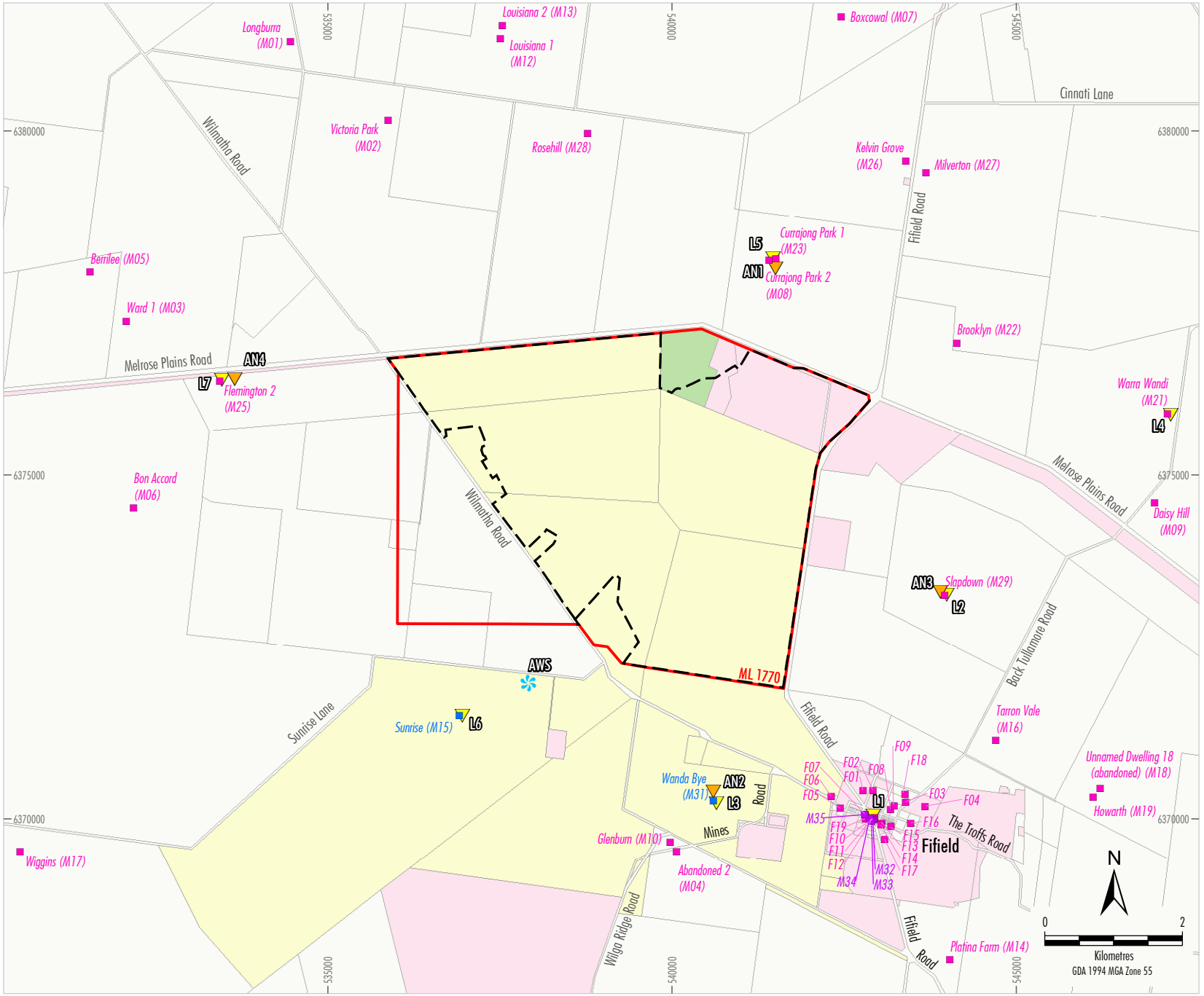
The noise sensitive receiver locations considered in this assessment are listed in Table 3.1 and shown on Figure 4 and Figure 5.

Table 3.1 – Receiver Locations and Ownership Details

ID	Description	Easting	Northing	Ownership
Mine and Processing Facility				
M01	Longburra	534460	6381299	Private
M02	Victoria Park	535880	6380159	Private
M03	Ward 1	532074	6377231	Private
M04	Abandoned 2	540068	6369522	Private
M05	Berrilee	531549	6377952	Private
M06	Bon Accord	532179	6374519	Private
M07	Boxcowal	542455	6381666	Private
M08	Currajong Park 2	541407	6378116	Private
M09	Daisy Hill	547007	6374597	Private
M10	Glenburn	539974	6369660	Private
M12	Louisiana 1	537510	6381346	Private
M13	Louisiana 2	537536	6381538	Private
M14	Platina Farm	544033	6367948	Private
M15	Sunrise	536914	6371503	Mine-owned
M16	Tarron Vale	544700	6371139	Private
M17	Wiggins	530531	6369523	Private
M18	Unnamed Dwelling 18 (abandoned)	546216	6370438	Private
M19	Howarth	546115	6370320	Private
M21	Warra Wandi	547194	6375889	Private
M22	Brooklyn	544134	6376913	Private
M23	Currajong Park 1	541505	6378145	Private
M25	Flemington 2	533432	6376363	Private
M26	Kelvin Grove	543396	6379565	Private

ID	Description	Easting	Northing	Ownership
M27	Milverton	543687	6379393	Private
M28	Rosehill	538772	6379967	Private
M29	Slapdown	543958	6373248	Private
M31	Wanda Bye	540599	6370264	Mine-owned
M32	Fifield Town Hall	542918	6369990	Community
M33	Fifield Fire Station	542895	6369968	Community
M34	Fifield Hotel	542872	6370013	Community
M35	St Dympna's Catholic Church	542799	6370059	Community
F01	Fifield Residences	542770	6370414	Private
F02		542918	6370415	Private
F03		543390	6370245	Private
F04		543672	6370175	Private
F05		542443	6370155	Private
F06		542310	6370326	Private
F07		542800	6370068	Private
F08		543170	6370138	Private
F09		543224	6370187	Private
F10		542932	6370017	Private
F11		542932	6370001	Private
F12		542932	6370001	Private
F13		543045	6369937	Private
F14		543033	6369911	Private
F15		543178	6369894	Private
F16		543463	6369933	Private
F17		543086	6369700	Private
F18		543384	6370362	Private
F19		542808	6369999	Private
Rail Siding				
Q04	Rockleigh (abandoned)	559019	6363455	Private
Q05	Reas Falls	559754	6362715	Private
Q06	Glen Rock	562921	6362293	Private
Q08	Ballenrae West	565349	6362639	Private
Q09	Spring Park	563786	6364360	Private
Q11	The Troffs (abandoned)	559015	6364760	Private
Q17	Boree	563434	6366319	Private
Q18	Boree 2	563816	6366037	Private
Q19	Spring Park 2	563653	6364404	Private
Q20	Ballanrae North	566899	6364681	Private
Q22	Q22	563784.8	6362678	Mine-owned

ID	Description	Easting	Northing	Ownership
Q23	Charlton's	565794	6359093	Private
Q24	Corinya Park	566349	6359048	Private
Q25	Three Trees	560627	6367710	Private
Q26	Rowlands	565465	6359685	Private



Source: Black Range Minerals (2000); Clean TeQ (2017, 2018); NSW Department of Industry (2017); NSW Land & Property Information (2017)

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Sensitive Receiver and Noise Monitoring Locations – Mine and Processing Facility

Figure 4

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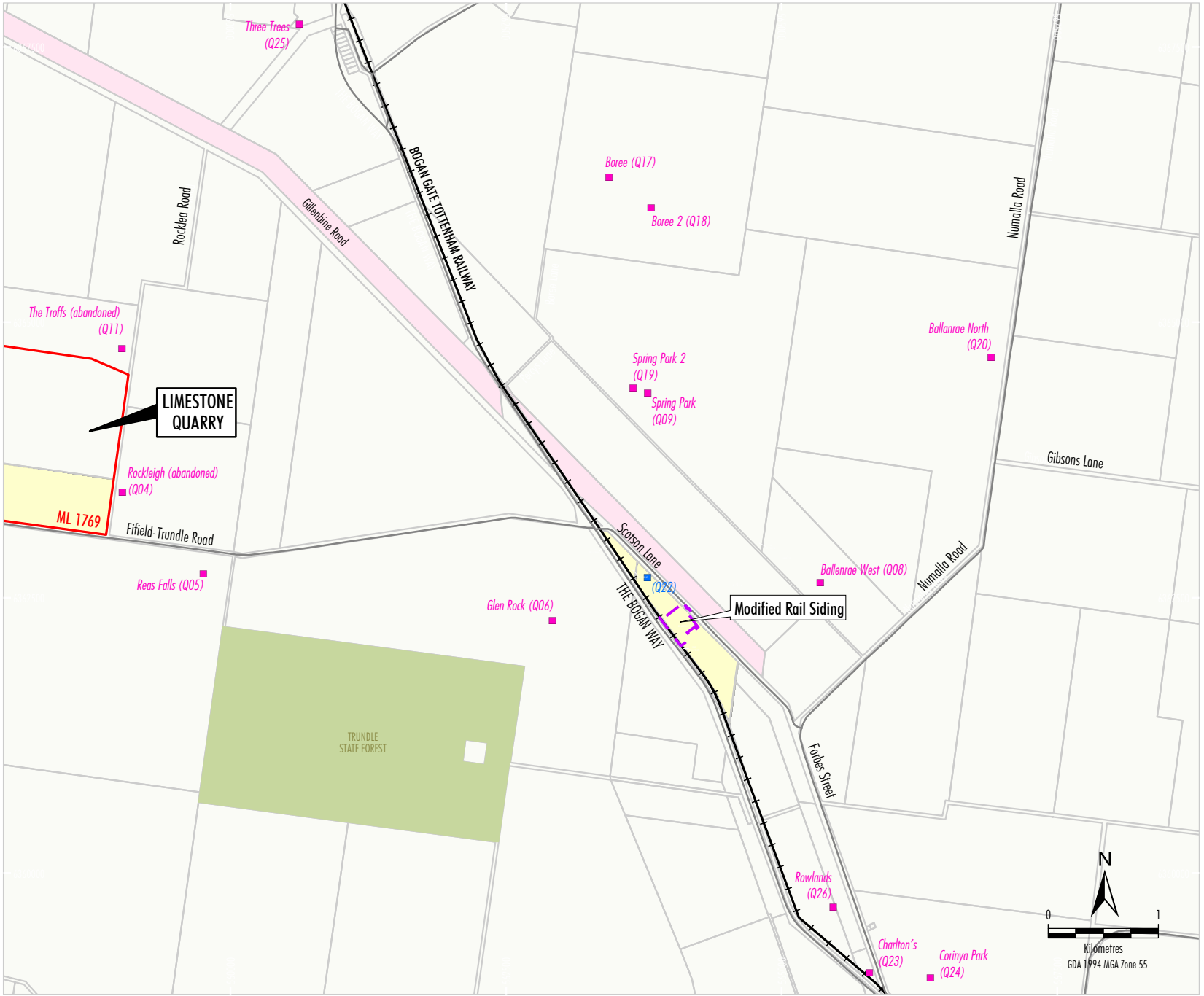

LEGEND

- Railway
- Mining Lease Boundary (ML)
- Sunrise Energy Metals Owned Land
- Crown Land
- Private Landholder
- Mine-owned Dwelling
- Private Dwelling

Modified Project

- Modified Rail Siding Surface Development Area

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020).
Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

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Sensitive Receiver Locations - Rail Siding

Figure 5

CTL-20-08 MOD 7_NA_226A

4 Review of Existing Noise Criteria and Management Measures

A summary of the existing Development Consent (DA 374-11-00) noise criteria and existing management measures are provided below.

4.1 Existing Noise Criteria

4.1.1 Construction

Condition 1, Schedule 3 of Development Consent (DA 374-11-00) outlines the construction hours for the Project. This includes construction hours of 7:00 am to 6:00 pm on Monday to Sunday at the rail siding, and 24 hours per day, seven days per week at the mine and processing facility.

In addition, Condition 2, Schedule 3 of Development Consent (DA 374-11-00) requires SEM to minimise noise generated during construction of the development in accordance with the best practice requirements outlined in the ICNG.

4.1.2 Operational

The existing Development Consent (DA 374-11-00) noise criteria for the mine and processing facility is provided in Table 4.1.

Table 4.1 – Development Consent (DA 374-11-00) Noise Criteria for the Mine and Processing Facility

Location and Receiver ID	Day	Evening	Night	
	$L_{Aeq,15min}$	$L_{Aeq,15min}$	$L_{Aeq,15min}$	$L_{A1,1\ min}$
Currajong Park (M08 and M23)	37	37	37	45
Abandoned 2 (M04)	35	36	36	45
Glenburn (M10)				
Rosehill (M28)				
Slapdown (M29)				
Brooklyn (M22)	36	35	35	45
All other privately-owned residence	35	35	35	45

Notes: Wanda Bye is now mine owned and therefore has been removed from the relevant noise criteria above.

$L_{aeq\ (15\ minute)}$ if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the $L_{Aeq,15min}$ descriptor).

The existing Development Consent (DA 374-11-00) noise criteria for the rail siding is provided in Table 4.2.

Table 4.2 – Development Consent (DA 374-11-00) Noise Criteria for the Rail Siding

Location	Day	Evening	Night	
	$L_{Aeq,15min}$	$L_{Aeq,15min}$	$L_{Aeq,15min}$	$L_{A1,1min}$
Glen Rock Ballanrae Spring Park	37	35	35	45
All other privately-owned residence	35	35	35	45

Development Consent (DA 374-11-00) stipulates noise criteria for the limestone quarry. Given the Modification would not change any Project components at the limestone quarry, the relevant Development Consent (DA 374-11-00) criteria has not been reproduced and noise from the limestone quarry is not considered further.

Condition 7, Schedule 3 of Development Consent (DA 374-11-00) also outlines that the noise criteria outlined in Table 4.1 and Table 4.2 do not apply if a noise agreement with the owner/s or leaseholders of the residence has been reached with SEM.

4.2 Existing Management Measures

The Project operates in accordance with various environmental management plans including the Noise Management Plan (Clean TeQ, 2020b). The Noise Management Plan outlines various noise management measures at the Project including the noise monitoring program, performance indicators, and noise management measures, including:

- temporary cessation of work within an area, or from a particularly noisy piece of equipment, will be considered when adverse conditions are present;
- all plant and machinery used on-site will be maintained regularly to minimise noise generation;
- all plant and machinery used on-site will be operated in a proper and efficient manner (e.g. at correct speed) to minimise noise generation;
- lesser noise generating construction activities (e.g. welding and electrical works) will be conducted during the evening/night-time period;
- regular communication and updates will be provided to local residents on the status and nature of site construction activities; and
- in the event of a complaint from a local resident, SEM will implement the complaints response process.

5 Existing Acoustic Environment

Background noise varies over the course of any 24 hour period, typically from a minimum at 3:00 am in the morning to a maximum during morning and afternoon traffic peak hours. Therefore, the NPfI requires that the level of background and ambient noise be assessed separately for the daytime, evening and night-time periods. The NPfI defines these periods as follows:

- **Day**: 7:00 am to 6:00 pm, Monday to Saturday and 8:00 am to 6:00 pm Sundays and Public Holidays.
- **Evening:** 6:00 pm to 10:00 pm, Monday to Sunday and Public Holidays.
- **Night:** 10:00 pm to 7:00 am, Monday to Saturday and 10:00 pm to 8:00 am Sundays and Public Holidays.

The identified receivers in the vicinity of the mine and processing facility and rail siding are all classified as rural under the NPfI (EPA, 2017). Based on Table 2.1 of the NPfI, for a conservative assessment the minimum assumed Rating Background Levels (RBLs) are adopted for all receiver locations. Therefore, the applicable RBLs used for this assessment are presented in Table 5.1 below.

Table 5.1 – Applicable Rating Background Levels for Mine and Processing Facility and Modified Rail Siding

Time of Day	Minimum RBLs, dB(A)[1]	Applicable RBL, dB(A)
Day	35	**35**
Evening	30	**30**
Night	30	**30**

Notes: 1. In accordance with Table 2.1 of the NPfI (EPA, 2017).

Noise monitoring in the vicinity of the mine and processing facility was conducted as part of the Syerston Project[2] - Modification 4 Noise and Blasting Assessment (Renzo Tonin & Associates, 2017) in 2016 at seven (7) locations. The recorded RBLs for all seven (7) monitoring locations were approximately 30 dB(A) or below (with the exception of one monitoring location which was affected by insect noise) which is consistent with background noise levels expected for the areas (Renzo Tonin & Associates, 2017). These levels are also consistent with the RBLs adopted for this assessment (Table 5.1).

Noise monitoring has not been undertaken in the vicinity of the modified rail siding. Notwithstanding, background noise levels in the vicinity of the modified rail siding are expected to be similar to the levels at the mine and processing facility. This assessment conservatively assumes the minimum RBLs for the modified rail siding (Table 5.1).

[2] In November 2017 the Syerston Project changed name to the Clean TeQ Sunrise Project (now the Sunrise Project).

5.1 Potential Cumulative Interactions with Other Projects

Other key proposed or approved projects that may potentially interact with, or have potential cumulative impacts with, the modified Project include (Figure 1):

- Parkes Special Activation Precinct.
- Cattle Feedlot and Quarry.
- Flemington Cobalt Scandium Mine.
- Owendale Scandium Mine.
- Western Slopes Pipeline.
- Northparkes Mine Extension Project.
- Inland Rail Parkes to Narromine.
- Parkes Solar Farm.
- Goonumbla Solar Farm.
- Quorn Park Solar Farm.
- Parkes Peaking Power Plant.
- Parkes Bypass.
- E44 Rocklands Project.
- Jemalong Solar Farm.
- Daroobalgie Solar Farm.

Of these key proposed or approved projects, only the proposed Flemington Cobalt Scandium Mine and Owendale Scandium Mine may potentially interact with, or have potential cumulative noise impacts with, the modified Project as they are located immediately north-west and north-east of the mine and processing facility, respectively. The Environmental Assessment Requirements for these projects were issued in 2018. In accordance with the draft *Assessing Cumulative Impacts Guide Guidance for State Significant Projects* (Department of Planning, Industry and Environment, 2020) guideline, these projects are 'potentially relevant projects', and are therefore not required to be considered. It is expected that any potential cumulative interactions between these projects and the modified Project would be considered in the noise assessments for these projects.

Potential cumulative interactions with other key proposed or approved projects would not be expected as they are located a considerable distance away from approved and modified Project activities (Figure 1).

6 Meteorology

Certain meteorological conditions may increase noise levels by focusing sound-wave propagation paths at a single point. Such refraction of sound waves occur during temperature inversions (atmospheric conditions where temperatures increase with height above ground level) and where there is a wind gradient (that is, wind velocities increasing with height) with wind direction from the source to the receiver.

Temperature inversions occurring within the lowest 50 m to 100 m of atmosphere can affect noise levels measured on the ground. Temperature inversions are most commonly caused by radiative cooling of the ground at night, leading to the cooling of the air in contact with the ground. This is especially prevalent on cloudless nights with little wind. Air that is somewhat removed from contact with the ground will not cool as much, resulting in warmer air aloft than nearer the ground.

Similarly, when significant wind exists, the conditions can significantly affect noise levels at receptor points downwind of a noise source. This would depend, however, on the particular direction and the velocity of the wind at that time. It should also be noted that although wind can increase noise emission levels as perceived from a downstream assessment point, background noise also tends to increase as a result of increased wind activity. This often causes masking of potential increases in intrusive noise.

The NPfI (EPA, 2017) recommends that project noise criteria are to apply under weather conditions characteristic of an area. These conditions may include calm, wind and temperature inversions. In this regard, the increase in noise that results from atmospheric temperature inversions and wind effects may need to be assessed. The noise levels predicted under characteristic meteorological conditions for each receiver are then compared with the criteria to establish whether the meteorological effect will cause a significant impact.

The NPfI (EPA, 2017) permits two approaches for assessing these effects – use of default parameters and use of site-specific parameters:

- When using default parameters, general meteorological values are used to predict noise levels, foregoing detailed analyses of site-specific meteorological data. This approach assumes that meteorological effects are conservative, in that it is likely to predict the upper range of increases in noise levels. Actual noise levels may be less than predicted.
- The use of site-specific parameters is a more detailed approach, which involves analysing site meteorological data to determine whether inversion and/or wind effects are significant features warranting assessment. Where assessment is warranted, default parameters are available for use in predicting noise or, where preferred, measured values may be used instead. The use of site-specific parameters provides a more accurate prediction of noise increases due to meteorological factors.

SEM collects meteorological data in the vicinity of the mine and processing facility in accordance with Condition 25, Schedule 3 of Development Consent (DA 374-11-00) (Figure 4). In accordance with the NPfI, data collected from weather-monitoring stations are considered relevant for a radius of 30 kilometres from the station, provided the surrounding area is in the same topographical basin as the station. Therefore, the meteorological data collected in the vicinity of the mine and processing facility are also relevant for the rail siding.

For this assessment, the more detailed approach using site-specific meteorological parameters was conducted. Weather data was provided by Jacobs Group (Australia) (Jacobs) (2021) taken from the air quality assessment's (Jacobs, 2021) CALMET model for the years 2019 and 2020 which was based on data from the Project's automated weather station located on-site (Figure 4).

6.1 Temperature Inversions

Assessment of impacts from temperature inversions is confined to the winter night-time period, as this is the time likely to have temperature inversions and produce the greatest impact on amenity of nearby residences. As the Project operates at night-time, there is potential for noise impact due to inversions and further consideration of these effects is required.

Following the NPfI procedure, the likelihood of temperature inversion occurrence was determined based on Pasquill-Gifford stability classes for the winter night-time periods in the weather data. A summary of the likelihood of temperature inversions for the night-time is presented in Table 6.1 below.

Table 6.1 – Winter Night-time Temperature Inversion (TI) Likelihood, %

Season	Pasquill-Gifford Stability Class							TI Likelihood (F+G)
	A	B	C	D	E	F	G	
Winter	0.0	0.0	0.0	5.6	17.4	77.0	-	77.0

The results above indicate that the F class temperature inversions are above the 30% occurrence threshold nominated in the NPfI for the night-time period, and therefore, the adverse temperature inversion conditions need to be considered in the assessment for the night-time period.

6.2 Wind Effects

The NPfI specifies a procedure for assessing the significance of wind effects, and a default wind speed to be used in the assessment (3 metres per second [m/s]) where these effects are found to be significant. The procedure requires that wind effects be assessed where wind is a feature of the area. The assessment considers each of the four seasons and assessment periods (day, evening, and night) individually.

Wind is considered to be a feature where source-to-receiver wind speeds (at 10 m height) of 0.5 to 3 m/s occur for 30% of the time or more in any assessment period (day, evening and night) in any season. Winds with velocities less than 0.5 m/s (calm conditions) and greater than 3 m/s (at 10 m height), are not included in the calculations of wind occurrence.

Analysis of the wind data was undertaken using the EPA's Noise Enhancement Wind Analysis program to determine if wind is a 'feature' of the area as defined by the NPfI. The program determines whether there are prevailing source-to-receiver wind conditions. The results of the analysis are presented in Table 6.2 below.

Table 6.2 – Percentage of Wind Records (0.5 to 3 m/s) from the mine and processing facility to Receiver, %

Direction	Summer			Autumn			Winter			Spring		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
N	7.7	12.6	15.4	14.2	7.5	13.9	8.3	5.6	6.0	6.4	5.6	6.7
NNE	8.2	15.7	22.9	16.2	12.1	21.1	8.5	6.3	8.0	6.9	8.0	8.1
NE	7.7	17.1	21.8	14.9	13.9	23.1	11.4	9.0	10.2	9.9	11.0	16.1
ENE	8.5	15.6	23.4	13.5	15.9	25.2	13.2	11.4	14.4	10.8	16.6	22.0
E	6.8	12.3	20.5	11.8	17.1	21.6	11.9	10.9	14.4	10.6	19.4	20.5
ESE	6.8	10.2	13.5	9.4	15.2	16.2	12.3	11.7	13.1	10.5	21.0	20.6
SE	5.3	10.2	13.5	10.5	16.8	14.7	13.1	13.7	15.3	9.1	19.4	18.1
SSE	3.9	7.5	9.6	7.6	12.8	10.5	7.9	8.6	9.3	5.7	11.8	10.1
S	5.3	19.9	15.1	10.4	**30.3**	23.7	14.0	25.8	21.1	7.3	26.0	22.8
SSW	4.7	19.2	15.7	10.1	**30.7**	26.5	15.5	**33.7**	26.8	8.2	26.9	26.6
SW	5.0	21.0	14.7	8.2	28.4	25.1	13.6	**35.9**	26.5	7.9	29.1	24.8
WSW	5.6	15.2	10.8	7.2	23.9	18.5	11.7	**31.8**	24.5	7.2	24.6	20.6
W	5.1	8.0	7.0	7.1	10.9	11.5	11.7	25.1	22.1	6.8	17.6	15.2
WNW	5.2	6.6	4.5	7.6	7.2	6.9	8.6	15.8	15.9	6.2	12.9	9.3
NW	5.6	4.7	5.1	8.6	5.8	6.2	7.3	8.6	10.8	5.5	8.9	8.0
NNW	5.5	7.6	6.8	10.8	5.8	7.3	8.7	7.2	6.9	5.6	5.5	4.9

Notes: **Bold** denotes greater than 30% occurrence of wind scenario.

The results above indicate that there are greater than 30% occurrence of winds between 0.5 m/s and 3 m/s (source-to-receiver component) for certain directions. Therefore, there are prevailing wind (i.e. adverse) conditions in accordance with the NPfI, and south, south-southwest, south-west and west-southwest wind effects during the evening are considered in this assessment.

In accordance with the NPfI, further analyses were undertaken to determine the significance of winds between 0.5 m/s and 2 m/s (source-to-receiver component) during temperature inversion events on winter nights, and no significance was found.

6.3 Summary of Meteorological Assessment Conditions

Based on the findings in Section 6.1 (temperature inversions will need to be considered in the assessment for the night-time period) and Section 6.2 (wind effects are considered in this assessment for the directions south, south-southwest, south-west and west-southwest for the evening period).

Table 6.3 presents a summary of the meteorological conditions considered for the operational noise computer modelling for the mine and processing facility and rail siding. The assessable meteorological conditions have been prepared in accordance with the NPfI.

Table 6.3 – Summary of Meteorological Assessment Conditions

Period	Meteorological Condition Type	Windspeed (Default)	Wind Direction	Inversion
Day	Standard Conditions	0.5 m/s	Source-receiver	-
Evening	Standard Conditions	0.5 m/s	Source-receiver	-
	Adverse Conditions	3 m/s	South	-
		3 m/s	South-southwest	-
		3 m/s	South-west	-
		3 m/s	West-southwest	-
Night	Standard Conditions	0.5 m/s	Source-receiver	-
	Adverse Conditions	-	-	4°C / 100 m

7 Criteria

7.1 Construction Noise

The key components of the ICNG (DECC, 2009) that are incorporated into this assessment include:

- Use of L_{Aeq} as the descriptor for measuring and assessing construction noise.
- Application of reasonable and feasible noise mitigation measures.

NSW noise policies, including the NPfI, RNP and Rail Infrastructure Noise Guideline (RING) (EPA, 2013) have moved to the primary use of L_{Aeq} over any other descriptor. As an energy average, L_{Aeq} provides ease of use when measuring or calculating noise levels since a full statistical analysis is not required as when using, for example, the L_{A10} descriptor.

As stated in the ICNG, a noise mitigation measure is feasible if it is capable of being put into practice and is practical to build given the project constraints. Selecting reasonable mitigation measures from those that are feasible involves making a judgement to determine whether the overall noise benefit outweighs the overall social, economic and environmental effects.

The ICNG provides two methods for the assessment of construction noise, being either a quantitative or a qualitative assessment. A quantitative assessment is recommended for major construction projects of significant duration, and involves the measurement and prediction of noise levels, and assessment against set criteria. A qualitative assessment is recommended for small projects with a duration of less than three weeks and focuses on minimising noise disturbance through the implementation of reasonable and feasible work practices, and community notification.

Given the scale and the (three year) duration of the construction works proposed for the modified Project, a quantitative assessment has been undertaken, consistent with the ICNG.

Table 7.1, reproduced from the ICNG, sets out the Noise Management Levels (NMLs) and how they are to be applied for residential receivers. The Noise Management Levels outline the criteria used in the construction noise assessment (Section 8).

Table 7.1 – Noise Management Levels at Residential Receivers

Time of Day	Management Level $L_{Aeq,15min}$	How to Apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq,15min}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: • times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences • if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB(A)	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 of the ICNG.

Based on the above ICNG requirements, Table 7.2 presents the construction NMLs established for the nearest noise sensitive residential receivers based upon the RBLs nominated in Section 5.

Consistent with Development Consent (DA 374-11-00), construction activities at the modified mine and processing facility would be conducted 24 hours per day, seven days per week and construction activities at the modified rail siding would be conducted between 7:00 am to 6:00 pm, Monday to Sunday.

Table 7.2 – Construction Noise Management Levels at Residential Receivers

Receiver Location	L_{A90} RBL[1,2]			NML $L_{Aeq,15min}$			
				Recommended Standard Hours	Outside Recommended Standard Hours		
	Day	Evening	Night	Day	Day	Evening	Night
All residential receivers	35	30	30	45	40	35	35

Notes: 1. RBLs have adopted the minimum background noise levels nominated in the NPfI as surrounding receivers are rural and previous long term background noise levels were recorded at below the minimum background noise levels (Section 5).

2. the A-weighted sound pressure level that is exceeded for 90% of the 15-minute measurement period.

The construction activities would therefore be conducted both within and outside of the recommended standard construction hours.

The Fifield Hotel (Receiver M34) is assumed to have a permanent caretaker's residence on the property and is considered to be a residential receiver.

Table 7.3 sets out the applicable parts of the ICNG NMLs (measured either internal or external of the premises) for other noise sensitive receiver locations. As identified for residential receivers, a 'highly affected' noise objective of $L_{Aeq,15min}$ 75 dB(A) is also adopted for all noise sensitive receivers, with exceedances addressed as described in Table 7.1.

Table 7.3 – Noise Management Levels at Other Noise Sensitive Land Uses

Land Use	Where Objective Applies	Management Level $L_{Aeq,15min}$
Places of worship	Internal noise level	45 dB(A)
Community centres	Depends on the intended use of the centre.	Refer to the 'maximum' internal levels in AS2107 for specific uses.
Commercial premises	External noise level	70 dB(A)

It is noted that as a general rule, building structures would typically provide a minimum of 10 dB(A) reduction from external noise levels to internal noise levels, with windows opened sufficiently for fresh air ventilation. Therefore, the equivalent external noise management levels for the Fifield Town Hall (Receiver M32) and St Dympna's Catholic Church (Receiver M35) are **55 dB(A)**.

The Fifield Fire Station (Receiver M33) is considered to be a commercial premise.

7.2 Operational Noise

Operational noise from the Project is assessed in accordance with the NPfI. The NPfI is used as a guide by the EPA for setting statutory limits in licences for scheduled noise sources.

The NPfI has two components:

- Controlling intrusive noise impacts in the short term for residences.
- Maintaining noise level amenity for particular land uses for residences and other land uses.

7.2.1 Intrusive Noise Impacts

According to the NPfI, the intrusiveness of a noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the $L_{Aeq,15min}$ descriptor) does not exceed the background noise level measured in the absence of the source by more than 5 dB(A). The intrusiveness criterion is only applicable to residential type receivers and is summarised as follows:

- **$L_{Aeq,15min}$ Intrusiveness noise level = RBL plus 5dB(A)**

Table 7.4 presents the adopted RBLs and the Project intrusiveness noise criteria established for the nearest noise sensitive residential receivers adopting the minimum background noise levels based upon the noise monitoring outlined in Section 5.

Table 7.4 – Project Intrusiveness Criteria

Receiver Location	L_{A90} RBL[1]			$L_{Aeq,15min}$ Intrusiveness Criteria		
	Day	Evening	Night	Day	Evening	Night
All residential receivers	35	30	30	40	35	35

Notes: 1. RBLs have adopted the minimum background noise levels nominated in the NPfI as surrounding receivers are rural and previous long term background noise levels were recorded at below the minimum background noise levels.

7.2.2 Amenity Noise Levels

The amenity noise levels are determined in accordance with Chapter 2.4 of the NPfI. The NPfI recommends base acceptable noise levels for various receivers, including residential, commercial, industrial receivers and sensitive receivers such as schools, hospitals, churches and parks.

To limit continued increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.2 of the NPfI, the applicable parts of which are reproduced in Table 7.5 below.

Table 7.5 – Amenity Noise Levels – Recommended L_{Aeq} Noise Levels from Industrial Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended $L_{Aeq,period}$ Amenity Noise Level
Residence	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	See column 4	See column 4	5 dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
Place of worship – internal	All	When in use	40
Commercial premises	All	When in use	65

Notes: 2. Daytime: 7:00 am - 6:00 pm; Evening: 6:00 pm - 10;00 pm; Night-time: 10:00 pm - 7:00 am.

3. On Sundays and Public Holidays, Daytime: 8:00 am - 6:00 pm; Evening: 6:00 pm - 10:00 pm; Night-time: 10:00 pm - 8:00 am.

4. The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

It is noted that as a general rule, building structures would typically provide a minimum of 10 dB(A) reduction from external noise levels to internal noise levels, with windows opened sufficiently for fresh air ventilation. Therefore, the equivalent external management levels for the town hall and place of worship are **45 dB(A)** and **50 dB(A)**, respectively.

The recommended amenity noise levels represent the objective for total industrial noise at a receiver location, whereas the Project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows:

- **Project amenity noise level for industrial developments = recommended amenity noise level (Table 7.5) minus 5 dB(A)**

The relevant recommended amenity noise levels as well as Project amenity noise levels are summarised below in Table 7.6.

Table 7.6 – Recommended and Project Amenity Noise Levels, dB(A)

Type of receiver	Land Use	Recommended $L_{Aeq,period}$ Amenity Noise Level			Project $L_{Aeq,period}$ Amenity Noise Level		
		Day	Evening	Night	Day	Evening	Night
Residence	Rural residential	50	45	40	45	40	35
Hotel	Caretakers' quarters (rural)	55	50	45	50	45	40
Any	Place of worship	External 50 dB(A) when in use			External 45 dB(A) when in use		
Any	Commercial premises	65 dB(A) when in use			60 dB(A) when in use		

7.2.3 Project Noise Trigger Levels

In accordance with the NPfI, noise impact should be assessed in terms of both intrusiveness and amenity. The NPfI describes the 'Project noise trigger levels' (PNTL) (also referred to as Project Specific Noise Level [PSNL]) as being the lower (i.e. more stringent) of the Project intrusiveness noise level and Project amenity noise levels. The NPfI also stipulates that Project trigger noise levels should be expressed as $L_{Aeq,15min}$ levels as follows:

- **$L_{Aeq,15min}$ = $L_{Aeq,period}$ plus 3 dB**

Based on the background and ambient noise monitoring carried out at the nearest affected receiver locations, the PNTL are outlined in Table 7.7 below.

Table 7.7 – Project Noise Trigger Levels

Locality	Land Use	Intrusiveness, $L_{Aeq,15min}$, dB(A)			Amenity, $L_{Aeq,15min}$, dB(A)		
		Day	Evening	Night	Day	Evening	Night
Privately Owned Land	Rural residential	**40**	**35**	**35**	48	43	38
Hotel	Caretakers' quarters (rural)	N/A	N/A	N/A	**53**	**48**	**43**
Any	Fifield Town Hall	N/A	N/A	N/A	**External 43 dB(A) when in use**		
Any	St Dympna's Catholic Church	N/A	N/A	N/A	**External 48 dB(A) when in use**		
Any	Fifield Fire Station	N/A	N/A	N/A	**63 dB(A) when in use**		

Notes: **Bold** text denotes the lower of the Project intrusiveness noise levels and Project amenity noise levels (i.e. Project Specific Trigger Levels).

It is noted the PNTLs are consistent with the noise criteria presented in Development Consent (DA 374-11-00), with the exception of Currajong Park, Abandoned 2, Glenburn, Rosehill, Slapdown and Brooklyn residences (Section 4).

7.2.4 Voluntary Land Acquisition and Mitigation Policy

The NSW Government's *Voluntary Land Acquisition and Mitigation Policy: For State Significant Mining, Petroleum and Extractive Industry Developments* (NSW Government, 2018) (VLAMP) refers to the criteria in the NPfI.

The NPfI considers the assessment of intrusiveness and amenity noise levels and states that the intrusiveness and amenity noise levels have been selected to protect at least 90% of the population living in the vicinity of industrial noise sources from the adverse effects of noise for at least 90% of the time. Provided the intrusiveness and amenity noise levels in the policies are achieved, then it is unlikely that most people would consider the resultant noise levels excessive.

In the cases where the PNTL or cannot be achieved, then it does not automatically follow that those people affected by the noise would find the noise unacceptable. In subjective terms, exceedances of the PNTLs are described in the VLAMP and reproduced in Table 7.8 below.

Table 7.8 – Characterisation of Noise Impacts & Potential Treatments

If the Predicted Noise Level minus the PNTL[1] is:	And the Total Cumulative Industrial Noise Level is:	Characterisation of Impacts:	Potential Treatment:
All time periods 0-2 dB(A)	Not applicable	Impacts are considered to be **negligible**	The exceedances would not be discernible by the average listener and therefore would not warrant receiver based treatments or controls
All time periods 3-5 dB(A)	• ← recommended amenity noise level in Table 2.2 of the NPfI; or • > recommended amenity noise level in Table 2.2 of the NPfI, but the increase in total cumulative industrial noise level resulting from the development is ← 1 dB	Impacts are considered to be **marginal**	Provide mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity.
All time periods 3-5 dB(A)	> recommended amenity noise level in Table 2.2 of the NPfI, and the increase in total cumulative industrial noise level resulting from the development is > 1dB	Impacts are considered to be **moderate**	As for marginal impacts but also upgraded façade elements such as windows, doors or roof insulation, to further increase the ability of the building façade to noise levels.
Day and evening >5 dB(A)	← recommended amenity noise levels in Table 2.2 of the NPfI	Impacts are considered to be **moderate**	As for marginal impacts but also upgraded façade elements such as windows, doors or roof insulation, to further increase the ability of the building façade to noise levels.
Day and evening >5 dB(A)	> recommended amenity noise levels in Table 2.2 of the NPfI	Impacts are considered to be **significant**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions below.
Night >5 dB(A)	Not applicable	Impacts are considered to be **significant**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions below.

Notes: 1. also referred to as the PSNL.

Furthermore, the policy also presents information regarding the requirements for voluntary mitigation and voluntary acquisition. A consent authority can apply voluntary mitigation and voluntary land acquisition rights to reduce:

- *operational noise impacts of a development on privately owned land; and*
- *rail noise impacts of a development on privately owned land near a non-network rail line (private rail line), on or exclusively servicing an industrial site (see Appendix 3 of the RING);*

But not:

- *construction noise impacts, as these impacts are shorter term and can be controlled;*
- *noise impacts on the public road or rail network; or*

- *modifications of existing developments with legacy noise issues, where the modification would have beneficial or negligible noise impacts*[3].

Voluntary Mitigation Rights

A consent authority should only apply voluntary mitigation rights where, even with the implementation of best practice management at the mine and processing facility:

- *the noise generated by the development would meet the requirements in Table 1 (see following page)* (sic)*, such that the impacts would be characterised as marginal, moderate or significant, at any residence on privately owned land; or*
- *the development would increase the total industrial noise level at any residence on privately owned land by more than 1 dB(A) and noise levels at the residence are already above the recommended amenity noise levels in Table 2.2 of the Noise Policy for Industry; or*
- *the development includes a private rail line and the use of that private rail line would cause exceedances of the recommended acceptable levels in Table 6 of Appendix 3 of the RING by greater than or equal to 3 dB(A) at any residence on privately owned land*

All noise levels must be calculated in accordance with the NPfI or RING (as applicable).

The selection of mitigation measures in cases when the PNTLs are not, or cannot be, achieved, should be guided by the potential treatments identified in Table 7.8.

Voluntary Land Acquisition Rights

A consent authority should only apply voluntary land acquisition rights where, even with the implementation of best practice management:

- *the noise generated by the development would be characterised as significant, according to Table 1 (see following page)* (sic)*, at any residence on privately owned land; or*
- *the noise generated by the development would contribute to exceedances of the acceptable noise levels plus 5 dB in Table 2.2 of the NPfI on more than 25% of any privately owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls*[4]*; or*
- *the development includes a private rail line and the use of that private rail line would cause exceedances of the recommended maximum criteria in Table 6 of Appendix 3 of the RING at any residence on privately owned land.*

[3] Noise issues for existing premises may be addressed through site-specific pollution reduction programs under the *Protection of the Environment Operations Act 1997*.

[4] Voluntary land acquisition rights should not be applied to address noise levels on vacant land other than land specifically meeting these criteria.

All noise levels must be calculated in accordance with the NPfI or RING (as applicable).

7.2.5 Cumulative Noise Levels

For cumulative noise levels, the NPfI amenity criteria is applicable as it is intended to control the total noise level at a receiver location from all industrial or mining developments (Table 3.1). Cumulative noise levels are therefore assessed against the recommended amenity level nominated in Table 7.5.

It is noted there are no other industrial noise sources in the vicinity of the mine and processing facility and modified rail siding that would contribute to cumulative noise levels.

7.2.6 Sleep Disturbance

The potential for sleep disturbance from maximum noise level events from the modified Project during the night time period needs to be considered. Section 2.5 of the NPfI provides sleep disturbance trigger levels and the relevant trigger levels are summarised below:

- *$L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
- *L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater*

For the RBLs in Table 7.4, the relevant trigger levels for the Project are summarised in Table 7.9 below.

Table 7.9 – Sleep Disturbance Trigger Levels

Receiver	Sleep Disturbance Trigger Levels, 10:00 pm - 7:00 am	
	$L_{Aeq,15min}$	L_{AFmax}
All residential	40 dB(A)	52 dB(A)

7.3 Road Traffic Noise

Noise impact from the potential changes in traffic on the surrounding road network due to construction and operational activities is assessed against the RNP (DECCW, 2011). The RNP sets out criteria to be applied to particular types of road and land uses. These noise criteria are to be applied when assessing noise impact and determining mitigation measures for sensitive receivers that are potentially affected by road traffic noise associated with the construction and operation of the modified Project, with the aim of preserving the amenity appropriate to the land use.

Table 7.10 sets out the assessment criteria for residences, to be applied to particular types of projects, road category and land use. These criteria are for assessment against façade corrected noise levels when measured in front of a building façade. The surrounding road network potentially impacted by the modified Project traffic consists of roads classified as sub-arterial roads.

In Table 7.10 below and in accordance with the RNP, freeways, arterial roads and sub-arterial roads are grouped together and attract the same criteria.

Table 7.10 – Road Traffic Noise Assessment Criteria for Residential Land Uses

Road Category	Type of Project/Land Use	Assessment Criteria, dB(A)	
		Day 7:00 am – 10:00 pm	Night 10:00 pm – 7:00 am
Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,15hour}$ 60 (external)	$L_{Aeq,9hour}$ 55 (external)

Where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria.

As described in the RNP, in assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.

The traffic noise impact from the 'land use development with potential to generate additional traffic on existing road' would need to also comply with the 'Relative Increase Criteria' as discussed in Section 2.4 of the RNP. The relative increase criteria are to be applied to the external areas of existing residential and sensitive land uses impacted upon by traffic noise.

The relative increase criteria as set out in the RNP applicable to the modified Project are reproduced in Table 7.11 below.

Table 7.11 – Relative Increase Criteria

Type of Development	Total Traffic Noise Level Increase, dB(A)
Land use development with the potential to generate additional traffic on existing road	Existing traffic $L_{Aeq,period}$ + 12 dB (external)

8 Construction Noise Assessment

8.1 Construction Noise Modelling Scenario

The construction noise modelling scenario for the mine and processing facility is based on the peak construction phase which is expected to occur in Construction Year 2 of the modified Project. The construction noise modelling scenario for the rail siding is considered indicative of the 7 month rail siding construction phase.

Consistent with Development Consent (DA 374-11-00), construction activities at the mine and processing facility would be conducted 24 hours per day, seven days per week and the construction activities at the rail siding would be conducted between 7:00 am to 6:00 pm, Monday to Sunday (Section 7.1).

8.2 Construction Noise Sources

The Sound Power Levels (SWLs) of plant likely to be used during the construction activities have been determined based on manufacturer's specifications, or other available information including Renzo Tonin & Associates' database of noise levels and previous studies.

Modifying factor adjustments, as per Fact Sheet C of the NPfI, has been considered for all proposed plant and equipment. Based on Renzo Tonin & Associates' experience, noise from all proposed plant and equipment, individually and in combination were determined not to exhibit tonal, low-frequency, impulsive, and/or intermittent characteristics. Therefore, no modifying factors corrections are required.

A summary of plant and equipment included in the noise modelling for the construction scenarios and relevant SWLs is provided in Table 8.1.

Table 8.1 – Indicative Construction Plant, Equipment Fleet List and SWLs – Mine and Processing Facility and Rail Siding

Plant Item	Specification	SWLs, dB(A) re. 1pW (per Item)	Number of Items
Mine and Processing Facility			
Excavator	EX1200	115	2
FEL	966	112	3
Franna Crane	-	110	1
Haul Truck	740	110	12
Scraper	-	110	3
Dozer	D10	109	1
Grader	16M	108	2
Roller	825H	107	2
Service Truck	-	105	1
Water Cart	777F	105	2

Plant Item	Specification	SWLs, dB(A) re. 1pW (per Item)	Number of Items
Light Vehicle	-	88	20
Rail Siding			
FEL	998	115	1
Scraper	-	110	1
Dozer	-	109	1
Excavator	-	107	1
Roller	-	107	1
Concrete Truck	-	106	1
Grader	-	106	1
Truck	-	105	2
Light Vehicle	-	88	2

8.3 Noise Modelling Methodology

Noise emissions from the various plant and equipment listed in Table 8.1 were calculated to the nearest and potentially most affected residential receiver locations identified in Table 3.1. The noise modelling methodology has been undertaken in accordance with the ICNG. Noise emissions were determined by modelling the noise sources, receiver locations, topographical features of the intervening area and recommended noise control treatments, using the Environmental Noise Model (ENM) computer program. ENM is an industry accepted noise modelling program which calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site. ENM is endorsed by the EPA and its environmental noise predictions have been verified on many occasions using noise monitoring measurements in the field.

Noise levels were calculated at the nearest affected residential locations considering the maximum case scenario of all plant operating simultaneously.

8.4 Predicted Construction Noise Levels

Table 8.2 below presents predicted construction noise levels at the nearest potentially affected receivers to the mine and processing facility and modified rail siding. Construction noise contours are presented in Appendix B. With regard to noise contours, the calculation involves numerical interpolation from a series of calculations to specific points within a regular spaced grid, 1.5 m above ground level. The noise contours are estimates of the predicted noise levels, and the contour values may differ slightly from equivalent calculations at individual residences.

Table 8.2 – Predicted Construction Noise Levels at Nearest Potentially Affected Receivers ($L_{Aeq,15min}$)

ID	Description	Construction Noise Management Level, dB(A)				Predicted Construction Noise Levels for Year 2, dB(A)		
		Recommended Standard Hours	Outside Recommended Standard Hours			Day	Evening	Night
		Day	Day	Evening	Night			
Mine and Processing Facility								
Privately-owned Receivers								
M01	Longburra	45	40	35	35	<20	<20	<20
M02	Victoria Park	45	40	35	35	<20	<20	<20
M03	Ward 1	45	40	35	35	<20	<20	<20
M04	Abandoned 2	45	40	35	35	20	21	22
M05	Berrilee	45	40	35	35	<20	<20	<20
M06	Bon Accord	45	40	35	35	<20	<20	<20
M07	Boxcowal	45	40	35	35	<20	<20	<20
M08	Currajong Park 2	45	40	35	35	23	23	24
M09	Daisy Hill	45	40	35	35	<20	<20	<20
M10	Q22	45	40	35	35	20	21	22
M12	Louisiana 1	45	40	35	35	<20	<20	<20
M13	Louisiana 2	45	40	35	35	<20	<20	<20
M14	Platina Farm	45	40	35	35	<20	<20	<20
M16	Tarron Vale	45	40	35	35	<20	<20	<20
M17	Wiggins	45	40	35	35	<20	<20	<20
M18	Unnamed Dwelling 18 (abandoned)	45	40	35	35	<20	<20	<20
M19	Howarth	45	40	35	35	<20	<20	<20
M21	Warra Wandi	45	40	35	35	<20	<20	<20
M22	Brooklyn	45	40	35	35	20	20	21
M23	Currajong Park 1	45	40	35	35	22	23	23
M25	Flemington 2	45	40	35	35	<20	<20	<20
M26	Kelvin Grove	45	40	35	35	<20	<20	<20
M27	Milverton	45	40	35	35	<20	<20	<20
M28	Rosehill	45	40	35	35	<20	<20	<20
M29	Slapdown	45	40	35	35	22	23	24
M34	Fifield Hotel	45	40	35	35	<20	<20	<20
F01	Fifield Residences	45	40	35	35	<20	<20	<20
F02		45	40	35	35	<20	<20	<20
F03		45	40	35	35	<20	<20	<20
F04		45	40	35	35	<20	<20	<20
F05		45	40	35	35	<20	<20	<20
F06		45	40	35	35	<20	<20	<20
F07		45	40	35	35	<20	<20	<20
F08		45	40	35	35	<20	<20	<20
F09		45	40	35	35	<20	<20	<20
F10		45	40	35	35	<20	<20	<20

ID	Description	Construction Noise Management Level, dB(A)				Predicted Construction Noise Levels for Year 2, dB(A)		
		Recommended Standard Hours	Outside Recommended Standard Hours			Day	Evening	Night
		Day	Day	Evening	Night			
F11		45	40	35	35	<20	<20	<20
F11		45	40	35	35	<20	<20	<20
F13		45	40	35	35	<20	<20	<20
F14		45	40	35	35	<20	<20	<20
F15		45	40	35	35	<20	<20	<20
F16		45	40	35	35	<20	<20	<20
F17		45	40	35	35	<20	<20	<20
F18		45	40	35	35	<20	<20	<20
F19		45	40	35	35	<20	<20	<20
Community Building								
M32	Fifield Town Hall			55[1]		<20	<20	<20
M33	Fifield Fire Station			70[1]		<20	<20	<20
M35	St Dympna's Catholic Church			55[1]		<20	<20	<20
Mine-owned Receivers								
M15	Sunrise	45	40	35	35	<20	<20	<20
M31	Wanda Bye	45	40	35	35	<20	<20	<20
Rail Siding								
Privately-owned Receivers								
Q04	Rockleigh (abandoned)	45	40	35	35	<20	-	-
Q05	Reas Falls	45	40	35	35	<20	-	-
Q06	Glen Rock	45	40	35	35	31	-	-
Q08	Ballenrae West	45	40	35	35	37	-	-
Q09	Spring Park	45	40	35	35	24	-	-
Q11	The Troffs (abandoned)	45	40	35	35	<20	-	-
Q17	Boree	45	40	35	35	<20	-	-
Q18	Boree 2	45	40	35	35	<20	-	-
Q19	Spring Park 2	45	40	35	35	24	-	-
Q20	Ballanrae North	45	40	35	35	<20	-	-
Q23	Charlton's	45	40	35	35	<20	-	-
Q24	Corinya Park	45	40	35	35	<20	-	-
Q25	Three Trees	45	40	35	35	<20	-	-
Q26	Rowlands	45	40	35	35	24	-	-
Mine-owned Receivers								
Q22	Q22	45	40	35	35	52	-	-

Notes 1. When in use

The predicted construction noise levels at all privately-owned receivers and community buildings were found to comply with the construction NMLs for all relevant time periods (Table 8.2). This outcome is consistent with the approved Project (Renzo Tonin & Associates, 2017).

9 Operational Noise Assessment

9.1 Operational Noise Modelling Scenarios

The scenarios selected for mine and processing facility operational noise modelling for the Modification were:

- Year 1 – the year of commencement of maximum operational fleet.
- Year 10 – reduced operational fleet with the north-western waste emplacement at an indicative height of approximately 323 m Australian Height Datum (AHD) and the north-eastern waste emplacement at an indicative height of approximately 298 m AHD.
- Year 17 – reduced operational fleet with the north-western waste emplacement at maximum height of approximately 330 m AHD and the north-eastern waste emplacement at maximum height of approximately 315 m AHD.

An indicative modified rail siding operational scenario has also been prepared.

Consistent with Development Consent (DA 374-11-00) operations at the mine and processing facility and rail siding would be undertaken 24 hours per day, seven days per week.

9.2 Operational Noise Sources

The SWLs of plant likely to be used during the operation of the modified Project have been determined based on manufacturer's specifications, or other available information including Renzo Tonin & Associates' database of noise levels and previous studies.

Modifying factor adjustments, as per Fact Sheet C of the NPfI, have been considered for all proposed plant and equipment. Based on Renzo Tonin & Associates' experience, noise from all proposed plant and equipment, individually and in combination were determined not to exhibit tonal, low-frequency, impulsive, and/or intermittent characteristics. Therefore, no modifying factors corrections are required.

A summary of plant and equipment included in the noise modelling for the operational scenarios and relevant SWLs is provided in Table 9.1. SEM would have a daytime and evening/night-time fleet with reduced ore and waste haul trucks required during the evening and night (Table 9.1).

9.3 Noise Modelling Methodology

Noise emissions from the various plant and equipment listed in Table 9.1 were calculated to the nearest and potentially most affected residential receiver locations. Noise emissions were determined by modelling the noise sources, receiver locations, topographical features of the intervening area and recommended noise control treatments, using the ENM program.

Table 9.1 – Indicative Operational Plant and Equipment List and SWLs

Plant Item	Specification	$L_{Aeq,15min}$ SWL dB(A) re. 1 pico Watt (pW) (per Item)	Number of Equipment			Period of Use
			Year 1	Year 10	Year 17	
Mine Site						
Process Plant	-	124	1	1	1	Day, Evening, Night
Excavator (Ore)	EX1200	115	3	2	2	Day, Evening, Night
Excavator (Waste)	EX2500	115	1	1	1	Day, Evening, Night
FEL	992K	115	1	1	1	Day, Evening, Night
Haul Truck (Waste)	777D	115	14 (7)	9 (6)	6 (3)	Day (Evening, Night)
Drill Rig	M6290	111	2	2	1	Day, Evening, Night
Compactor	CP64	110	1	1	1	Day, Evening, Night
Franna Crane	-	110	1	1	1	Day, Evening, Night
Haul Truck (Ore) / Moxy	740	110	7 (5)	6 (3)	6 (6)	Day (Evening, Night)
Integrated Tool Carrier	980H	110	1	1	1	Day, Evening, Night
Dozer	D10	109	4	3	2	Day, Evening, Night
Grader	16M	108	4	2	2	Day, Evening, Night
Roller	825H	107	1	1	1	Day, Evening, Night
Heavy Vehicle	-	105	2	2	2	Day, Evening, Night
Service Truck	-	105	4	2	2	Day, Evening, Night
Water Cart	777F	105	4	2	2	Day, Evening, Night
Forklift	MHT-X	103	1	1	1	Day, Evening, Night
Elevated Work Platform	-	98	1	1	1	Day, Evening, Night
Light Vehicle	-	88	14	8	6	Day, Evening, Night
Rail Siding						
FEL	998	115	1	1	1	Day, Evening, Night
Locomotive	-	110	2	2	2	Day, Evening, Night
Reach Stacker	-	106	4 (2)	4 (2)	4 (2)	Day (Evening, Night)
Truck	-	105	4	4	4	Day, Evening, Night
Forklift	-	103	1	1	1	Day, Evening, Night
Light Vehicle	-	88	3	3	3	Day, Evening, Night

Noise levels were calculated at the nearest affected residential locations considering the maximum case scenario of all plant operating simultaneously. As a further exercise, the noise levels resulting from adverse meteorological conditions, potentially increasing noise emissions at the nearest residences, were computed using the ENM program. These occurrences are expected to be infrequent based on typical weather patterns for the study area and present extreme cases.

Where feasible and reasonable, mitigation measures have been introduced into the proposal to reduce potential noise emissions from the modified Project. The iterative steps undertaken are described below:

1. Preliminary noise modelling of scenarios representative of the maximum noise emissions from the modified Project to identify the potential for noise exceedances (Section 9.4).

2. Evaluation of various combinations of noise management and mitigation measures to assess their relative effectiveness.

3. Review of the effectiveness of these measures and assessment of their feasibility by SEM.

4. Adoption of management and mitigation measures to appreciably reduce noise emissions associated with the modified Project (Section 9.5).

9.4 Preliminary Noise Modelling, Evaluation and Review of Management and Mitigation Measures

As described in Section 9.3, preliminary noise modelling of the modified Project was undertaken which indicated that, in the absence of additional noise mitigation measures, intrusive noise levels at privately-owned dwellings could, with adverse meteorological conditions (i.e. Category F temperature inversion conditions at night, or predominate winds in the evening), range up to 7 dB(A) above the PNTLs.

Five privately-owned receivers (M08 [Currajong Park 2], M22 [Brooklyn], M23 [Currajong Park 1], M28 [Rosehill] and M29 [Slapdown]) were predicted to experience moderate and significant exceedances of the PNTLs (i.e. greater than 3 dB[A] above the PNTLs).

Modelling and evaluation of a range of potential noise mitigation benefits, capital and operating costs of mitigation and impacts on related modified Project metrics was undertaken. From this it was identified by SEM that an appreciable noise reduction of up to 2 dB(A) could be reasonably achieved albeit at significant operating cost to SEM, by modifying mining operations during the evening period during various wind enhancing conditions. The following reasonable and feasible mitigation measures were identified and adopted in the noise modelling for the Modification (Section 9.5):

<u>Year 10</u>

- Ceased operations on the north-eastern waste emplacement and ceased operation of an excavator in the eastern pit during south-southwest, south-west and west-southwest wind conditions in the evening period.
- Ceased haulage on the north-western waste emplacement during south wind condition in the evening period.

Year 17

- Ceased haulage on the north-eastern waste emplacement during south-southwest and south-west wind conditions in the evening period.

The resulting achievable maximum intrusive noise levels of up to 40 dB(A) would result in a "moderate" exceedance of the PNTL of 35 dB(A) at two receivers. In accordance with the VLAMP (NSW Government, 2018) these receivers would be afforded noise mitigation measures upon request rights.

Given the considerable operating costs associated with significantly modifying mining operations during adverse meteorological conditions, SEM will seek to enter into negotiated agreements with the owners of the two receivers with predicted moderate exceedances in accordance with the VLAMP (NSW Government, 2018).

In accordance with Condition 7, Schedule 3 of Development Consent (DA 374-11-00) (Section 4.1.2), if negotiated agreements were to be put in place with the owners of the five receivers, or these receivers were to become mine-owned, significant modifications to mining operations would not be considered reasonable, and modifications to mining operations would be less significant, with a noise reduction of less than 2 dB(A) (e.g. ceasing operation of a small number of noisy equipment such as drills, moving such equipment to more sheltered areas, or avoiding the use of intermittently operating auxiliary equipment).

However, if negotiated agreements with the owners of the five receivers are not achieved or are only achieved for a subset of the five receivers, SEM would significantly modify mining operations during the predominant south, south-southwest, south-west and west-southwest wind conditions in the evening period as required to reduce noise levels by up to 2 dB(A).

9.5 Predicted Operational Noise Levels

Table 9.2, Table 9.3 and Table 9.4 below present predicted operational noise levels for Year 1, Year 10 and Year 17, at the nearest potentially affected receivers, respectively.

The results presented in Table 9.2, Table 9.3 and Table 9.4 assume that the reasonable and feasible mitigation measures described in Section 9.4 are implemented and negotiated agreements are not achieved with the owners of the receivers that are exceeded.

Table 9.2 – Year 1 Predicted Operational Noise Levels at Nearest Potentially Affected Receivers ($L_{Aeq,15min}$)

ID	Description	PNTL, dB(A)			Predicted Operational Noise Levels, dB(A)							
					Day	Evening					Night	
		Day	Evening	Night	Standard Conditions	Standard Conditions	S Wind	SSW Wind	SW Wind	WSW Wind	Standard Conditions	F Class Inversion
Mine and Processing Facility												
Privately-owned Receivers												
M01	Longburra	*40*	*35*	*35*	25	24	27	26	23	<20	25	27
M02	Victoria Park	*40*	*35*	*35*	27	26	32	31	29	22	28	32
M03	Ward 1	*40*	*35*	*35*	23	23	24	<20	<20	<20	24	28
M04	Abandoned 2	*40*	*35*	*35*	33	32	19	20	21	23	34	**36**
M05	Berrilee	*40*	*35*	*35*	22	21	22	<20	<20	<20	22	25
M06	Bon Accord	*40*	*35*	*35*	22	21	18	<20	<20	<20	22	24
M07	Boxcowal	*40*	*35*	*35*	24	22	25	26	26	25	23	25
M08	Currajong Park 2	*40*	*35*	*35*	**37**	34	**39**	**40**	**39**	**38**	35	**38**
M09	Daisy Hill	*40*	*35*	*35*	27	25	22	26	27	28	26	28
M10	Glenburn	*40*	*35*	*35*	33	33	20	20	21	23	35	**37**
M12	Louisiana 1	*40*	*35*	*35*	27	25	31	30	29	26	27	29
M13	Louisiana 2	*40*	*35*	*35*	28	25	31	30	29	26	26	29
M14	Platina Farm	*40*	*35*	*35*	21	20	<20	<20	<20	22	21	25
M16	Tarron Vale	*40*	*35*	*35*	27	25	<20	20	25	27	26	27
M17	Wiggins	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	16	18
M18	Unnamed Dwelling 18 (abandoned)	*40*	*35*	*35*	21	20	<20	<20	20	21	20	22
M19	Howarth	*40*	*35*	*35*	22	20	<20	<20	20	21	21	22
M21	Warra Wandi	*40*	*35*	*35*	25	23	22	24	25	26	24	25
M22	Brooklyn	*40*	*35*	*35*	35	32	34	**36**	**37**	**37**	33	35
M23	Currajong Park 1	*40*	*35*	*35*	**36**	32	**37**	**38**	**38**	**37**	33	**37**
M25	Flemington 2	*40*	*35*	*35*	25	24	25	20	<20	<20	25	27
M26	Kelvin Grove	*40*	*35*	*35*	27	25	28	29	29	29	26	29
M27	Milverton	*40*	*35*	*35*	27	24	27	27	28	27	25	27
M28	Rosehill	*40*	*35*	*35*	28	26	33	32	31	28	28	30
M29	Slapdown	*40*	*35*	*35*	35	33	28	33	35	**37**	34	**36**
M34	Fifield Hotel	*40*	*35*	*35*	26	24	<20	<20	21	26	25	29
F01	Fifield Residences	*40*	*35*	*35*	28	26	<20	<20	23	27	27	29
F02		*40*	*35*	*35*	28	26	<20	<20	23	27	27	30

ID	Description	PNTL, dB(A)			Predicted Operational Noise Levels, dB(A)							
					Day	Evening					Night	
		Day	Evening	Night	Standard Conditions	Standard Conditions	S Wind	SSW Wind	SW Wind	WSW Wind	Standard Conditions	F Class Inversion
F03		*40*	*35*	*35*	24	22	<20	<20	19	22	23	25
F04		*40*	*35*	*35*	26	24	<20	<20	23	25	25	28
F05		*40*	*35*	*35*	30	29	<20	20	27	31	31	33
F06		*40*	*35*	*35*	30	30	20	21	28	31	32	34
F07		*40*	*35*	*35*	26	24	<20	<20	21	25	25	28
F08		*40*	*35*	*35*	26	24	<20	<20	21	25	25	28
F09		*40*	*35*	*35*	24	21	<20	<20	<20	22	22	26
F10		*40*	*35*	*35*	27	26	<20	<20	23	27	27	29
F11		*40*	*35*	*35*	27	25	<20	<20	23	26	27	29
F11		*40*	*35*	*35*	27	25	<20	<20	23	26	27	29
F13		*40*	*35*	*35*	26	25	<20	<20	23	26	26	28
F14		*40*	*35*	*35*	26	25	<20	<20	22	25	26	28
F15		*40*	*35*	*35*	23	20	<20	<20	<20	21	22	25
F16		*40*	*35*	*35*	23	20	<20	<20	<20	21	21	24
F17		*40*	*35*	*35*	25	23	<20	<20	20	26	24	29
F18		*40*	*35*	*35*	26	24	<20	<20	22	26	25	28
F19		*40*	*35*	*35*	26	24	<20	<20	<20	25	25	28
Community Building												
M32	Fifield Town Hall	*43 when in use*			26	25	<20	<20	23	26	26	29
M33	Fifield Fire Station	*63 when in use*			25	23	<20	<20	20	25	25	29
M35	St Dympna's Catholic Church	*48 when in use*			26	24	<20	<20	20	25	25	28
Mine-owned Receivers												
M15	Sunrise	*40*	*35*	*35*	32	31	25	24	24	25	32	35
M31	Wanda Bye	*40*	*35*	*35*	36	36	23	24	25	35	37	39
Rail Siding												
Privately-owned Receivers												
Q04	Rockleigh (abandoned)	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q05	Reas Falls	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q06	Glen Rock	*40*	*35*	*35*	27	28	25	21	20	<20	28	33
Q08	Ballenrae West	*40*	*35*	*35*	30	31	32	33	35	35	32	33
Q09	Spring Park	*40*	*35*	*35*	<20	<20	28	28	26	22	20	26
Q11	The Troffs (abandoned)	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20

ID	Description	PNTL, dB(A)			Predicted Operational Noise Levels, dB(A)							
					Day	Evening					Night	
		Day	Evening	Night	Standard Conditions	Standard Conditions	S Wind	SSW Wind	SW Wind	WSW Wind	Standard Conditions	F Class Inversion
Q17	Boree	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q18	Boree 2	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q19	Spring Park 2	*40*	*35*	*35*	25	25	34	34	32	28	26	32
Q20	Ballanrae North	*40*	*35*	*35*	<20	<20	<20	20	20	20	<20	<20
Q23	Charlton's	*40*	*35*	*35*	<20	20	<20	<20	<20	<20	21	25
Q24	Corinya Park	*40*	*35*	*35*	<20	<20	<20	<20	<20	23	<20	26
Q25	Three Trees	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q26	Rowlands	*40*	*35*	*35*	23	25	<20	<20	<20	24	26	28
Mine-owned Receivers												
Q22	Q22	*40*	*35*	*35*	45	45	49	48	46	42	45	48

Notes: 1. Green denotes a **negligible** exceedance of 0-2 dB(A) above the PNTL.
2. Blue denotes a **moderate** exceedance of 3-5 dB(A) above the PNTL.
3. Red denotes a **significant** exceedance of >5 dB(A) above the PNTL.

Table 9.3 – Year 10 Predicted Operational Noise Levels at Nearest Potentially Affected Receivers ($L_{Aeq,15min}$)

ID	Description	PNTL, dB(A)			Predicted Operational Noise Levels, dB(A)							
					Day	Evening					Night	
		Day	Evening	Night	Standard Conditions	Standard Conditions	S Wind	SSW Wind	SW Wind	WSW Wind	Standard Conditions	F Class Inversion
Mine and Processing Facility												
Privately-owned Receivers												
M01	Longburra	*40*	*35*	*35*	28	27	29	29	26	<20	27	30
M02	Victoria Park	*40*	*35*	*35*	31	30	33	33	31	25	31	33
M03	Ward 1	*40*	*35*	*35*	26	25	24	20	<20	<20	26	29
M04	Abandoned 2	*40*	*35*	*35*	31	32	20	20	21	22	33	35
M05	Berrilee	*40*	*35*	*35*	25	24	25	<20	<20	<20	25	28
M06	Bon Accord	*40*	*35*	*35*	23	22	<20	<20	<20	<20	24	26
M07	Boxcowal	*40*	*35*	*35*	25	23	28	26	26	25	24	28
M08	Currajong Park 2	*40*	*35*	*35*	35	33	**40**	**37**	**37**	**36**	34	**38**
M09	Daisy Hill	*40*	*35*	*35*	25	22	<20	23	25	26	23	29
M10	Glenburn	*40*	*35*	*35*	32	33	20	20	21	22	34	**36**
M12	Louisiana 1	*40*	*35*	*35*	30	29	33	33	32	29	30	32
M13	Louisiana 2	*40*	*35*	*35*	30	28	32	32	31	28	29	32

ID	Description	PNTL, dB(A)			Predicted Operational Noise Levels, dB(A)							
					Day	Evening					Night	
		Day	Evening	Night	Standard Conditions	Standard Conditions	S Wind	SSW Wind	SW Wind	WSW Wind	Standard Conditions	F Class Inversion
M14	Platina Farm	*40*	*35*	*35*	<20	<20	<20	<20	<20	21	<20	24
M16	Tarron Vale	*40*	*35*	*35*	25	25	<20	<20	23	26	25	29
M17	Wiggins	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
M18	Unnamed Dwelling 18 (abandoned)	*40*	*35*	*35*	20	<20	<20	<20	<20	<20	20	23
M19	Howarth	*40*	*35*	*35*	21	21	<20	<20	<20	21	21	24
M21	Warra Wandi	*40*	*35*	*35*	25	23	21	25	26	26	24	29
M22	Brooklyn	*40*	*35*	*35*	33	32	34	35	**36**	**37**	33	**37**
M23	Currajong Park 1	*40*	*35*	*35*	35	33	**39**	**37**	**37**	**36**	34	**37**
M25	Flemington 2	*40*	*35*	*35*	28	28	22	21	<20	<20	29	32
M26	Kelvin Grove	*40*	*35*	*35*	29	26	34	29	29	29	27	31
M27	Milverton	*40*	*35*	*35*	29	27	34	30	30	29	28	31
M28	Rosehill	*40*	*35*	*35*	35	33	**37**	**36**	35	32	34	**36**
M29	Slapdown	*40*	*35*	*35*	29	29	21	26	30	32	30	35
M34	Fifield Hotel	*40*	*35*	*35*	25	25	<20	<20	21	27	27	31
F01	Fifield Residences	*40*	*35*	*35*	27	27	<20	<20	22	27	28	31
F02		*40*	*35*	*35*	27	26	<20	<20	21	26	28	30
F03		*40*	*35*	*35*	24	24	<20	<20	<20	24	25	28
F04		*40*	*35*	*35*	27	28	<20	20	26	29	29	31
F05		*40*	*35*	*35*	30	31	<20	20	28	31	32	34
F06		*40*	*35*	*35*	31	31	20	21	29	32	33	35
F07		*40*	*35*	*35*	26	26	<20	<20	22	27	27	31
F08		*40*	*35*	*35*	26	26	<20	<20	20	25	27	29
F09		*40*	*35*	*35*	25	25	<20	<20	<20	24	26	28
F10		*40*	*35*	*35*	27	27	<20	<20	25	28	29	31
F11		*40*	*35*	*35*	26	26	<20	<20	22	26	27	30
F11		*40*	*35*	*35*	26	26	<20	<20	22	26	27	30
F13		*40*	*35*	*35*	26	26	<20	<20	23	27	28	30
F14		*40*	*35*	*35*	25	25	<20	<20	21	25	27	29
F15		*40*	*35*	*35*	23	23	<20	<20	<20	24	24	27
F16		*40*	*35*	*35*	24	24	<20	<20	<20	23	25	27
F17		*40*	*35*	*35*	23	23	<20	<20	20	27	25	30
F18		*40*	*35*	*35*	25	25	<20	<20	21	25	26	29

ID	Description	PNTL, dB(A)			Predicted Operational Noise Levels, dB(A)							
					Day	Evening					Night	
		Day	Evening	Night	Standard Conditions	Standard Conditions	S Wind	SSW Wind	SW Wind	WSW Wind	Standard Conditions	F Class Inversion
F19		*40*	*35*	*35*	25	25	<20	<20	21	25	26	29
Community Building												
M32	Fifield Town Hall	*43 when in use*			25	26	<20	<20	23	26	27	30
M33	Fifield Fire Station	*63 when in use*			25	25	<20	<20	20	26	26	30
M35	St Dympna's Catholic Church	*48 when in use*			25	26	<20	<20	21	26	27	30
Mine-owned Receivers												
M15	Sunrise	*40*	*35*	*35*	32	32	25	25	25	25	33	35
M31	Wanda Bye	*40*	*35*	*35*	34	35	22	22	23	34	36	39
Rail Siding												
Privately-owned Receivers												
Q04	Rockleigh (abandoned)	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q05	Reas Falls	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q06	Glen Rock	*40*	*35*	*35*	27	28	25	21	20	<20	28	33
Q08	Ballenrae West	*40*	*35*	*35*	30	31	32	33	35	35	32	33
Q09	Spring Park	*40*	*35*	*35*	<20	<20	28	28	26	22	20	26
Q11	The Troffs (abandoned)	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q17	Boree	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q18	Boree 2	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q19	Spring Park 2	*40*	*35*	*35*	25	25	34	34	32	28	26	32
Q20	Ballanrae North	*40*	*35*	*35*	<20	<20	<20	20	20	20	<20	<20
Q23	Charlton's	*40*	*35*	*35*	<20	20	<20	<20	<20	<20	21	25
Q24	Corinya Park	*40*	*35*	*35*	<20	<20	<20	<20	<20	23	<20	26
Q25	Three Trees	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q26	Rowlands	*40*	*35*	*35*	23	25	<20	<20	<20	24	26	28
Mine-owned Receivers												
Q22	Q22	*40*	*35*	*35*	45	45	49	48	46	42	45	48

Notes:
1. Green denotes a **negligible** exceedance of 0-2 dB(A) above the PNTL.
2. Blue denotes a **moderate** exceedance of 3-5 dB(A) above the PNTL.
3. Red denotes a **significant** exceedance of >5 dB(A) above the PNTL.

Table 9.4 – Year 17 Predicted Operational Noise Levels at Nearest Potentially Affected Receivers ($L_{Aeq,15min}$)

ID	Description	PNTL, dB(A)			Predicted Operational Noise Levels, dB(A)							
					Day	Evening					Night	
		Day	Evening	Night	Standard Conditions	Standard Conditions	S Wind	SSW Wind	SW Wind	WSW Wind	Standard Conditions	F Class Inversion
Mine and Processing Facility												
Privately-owned Receivers												
M01	Longburra	*40*	*35*	*35*	26	26	29	28	25	<20	26	29
M02	Victoria Park	*40*	*35*	*35*	29	29	33	32	29	20	29	32
M03	Ward 1	*40*	*35*	*35*	23	23	24	<20	<20	<20	24	28
M04	Abandoned 2	*40*	*35*	*35*	30	31	<20	<20	<20	21	32	35
M05	Berrilee	*40*	*35*	*35*	22	21	24	<20	<20	<20	22	26
M06	Bon Accord	*40*	*35*	*35*	20	20	<20	<20	<20	<20	21	23
M07	Boxcowal	*40*	*35*	*35*	28	27	30	30	30	30	28	30
M08	Currajong Park 2	*40*	*35*	*35*	38	**36**	**40**	**40**	**40**	**40**	**37**	**40**
M09	Daisy Hill	*40*	*35*	*35*	26	24	22	25	28	29	25	28
M10	Glenburn	*40*	*35*	*35*	31	32	<20	<20	<20	20	33	**36**
M12	Louisiana 1	*40*	*35*	*35*	29	28	33	32	31	28	29	32
M13	Louisiana 2	*40*	*35*	*35*	28	28	32	32	31	27	28	32
M14	Platina Farm	*40*	*35*	*35*	<20	<20	<20	<20	<20	21	20	24
M16	Tarron Vale	*40*	*35*	*35*	28	27	<20	20	26	29	28	30
M17	Wiggins	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
M18	Unnamed Dwelling 18 (abandoned)	*40*	*35*	*35*	23	22	<20	<20	22	23	22	24
M19	Howarth	*40*	*35*	*35*	22	20	<20	<20	20	22	20	23
M21	Warra Wandi	*40*	*35*	*35*	25	24	23	27	28	29	25	28
M22	Brooklyn	*40*	*35*	*35*	35	32	33	**36**	**37**	**37**	32	**36**
M23	Currajong Park 1	*40*	*35*	*35*	38	**36**	**40**	**40**	**40**	**40**	**37**	**39**
M25	Flemington 2	*40*	*35*	*35*	23	23	23	<20	<20	<20	24	29
M26	Kelvin Grove	*40*	*35*	*35*	30	28	32	32	32	32	28	31
M27	Milverton	*40*	*35*	*35*	31	29	32	33	33	33	29	32
M28	Rosehill	*40*	*35*	*35*	32	33	**37**	**37**	**36**	34	33	**36**
M29	Slapdown	*40*	*35*	*35*	33	31	23	31	33	34	32	34
M34	Fifield Hotel	*40*	*35*	*35*	24	24	<20	<20	<20	26	25	29
F01	Fifield Residences	*40*	*35*	*35*	30	30	20	21	28	32	32	34
F02		*40*	*35*	*35*	29	29	20	20	28	31	31	33

ID	Description	PNTL, dB(A)			Predicted Operational Noise Levels, dB(A)							
					Day	Evening					Night	
		Day	Evening	Night	Standard Conditions	Standard Conditions	S Wind	SSW Wind	SW Wind	WSW Wind	Standard Conditions	F Class Inversion
F03		*40*	*35*	*35*	26	24	<20	<20	<20	26	25	28
F04		*40*	*35*	*35*	28	27	<20	<20	26	29	28	31
F05		*40*	*35*	*35*	28	29	<20	<20	26	29	30	33
F06		*40*	*35*	*35*	29	29	<20	20	26	29	31	33
F07		*40*	*35*	*35*	24	25	<20	<20	20	25	26	30
F08		*40*	*35*	*35*	28	28	<20	<20	26	29	29	32
F09		*40*	*35*	*35*	25	24	<20	<20	20	25	25	30
F10		*40*	*35*	*35*	26	26	<20	<20	23	27	28	30
F11		*40*	*35*	*35*	26	26	<20	<20	23	27	27	30
F11		*40*	*35*	*35*	26	26	<20	<20	23	27	27	30
F13		*40*	*35*	*35*	26	26	<20	<20	23	27	27	30
F14		*40*	*35*	*35*	26	26	<20	<20	24	27	28	31
F15		*40*	*35*	*35*	23	23	<20	<20	20	24	24	26
F16		*40*	*35*	*35*	23	21	<20	<20	<20	24	22	26
F17		*40*	*35*	*35*	22	22	<20	<20	<20	25	23	28
F18		*40*	*35*	*35*	26	25	<20	<20	20	27	26	29
F19		*40*	*35*	*35*	24	24	<20	<20	<20	25	25	29
Community Building												
M32	Fifield Town Hall	*43 when in use*			26	26	<20	<20	23	27	27	30
M33	Fifield Fire Station	*63 when in use*			24	24	<20	<20	<20	25	25	29
M35	St Dympna's Catholic Church	*48 when in use*			24	25	<20	<20	20	25	26	29
Mine-owned Receivers												
M15	Sunrise	*40*	*35*	*35*	30	31	25	25	24	25	32	35
M31	Wanda Bye	*40*	*35*	*35*	34	35	21	21	22	34	36	38
Rail Siding												
Privately-owned Receivers												
Q04	Rockleigh (abandoned)	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q05	Reas Falls	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q06	Glen Rock	*40*	*35*	*35*	27	28	25	21	20	<20	28	33
Q08	Ballenrae West	*40*	*35*	*35*	30	31	32	33	35	35	32	33
Q09	Spring Park	*40*	*35*	*35*	<20	<20	28	28	26	22	20	26
Q11	The Troffs (abandoned)	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20

ID	Description	PNTL, dB(A)			Predicted Operational Noise Levels, dB(A)							
					Day	Evening					Night	
		Day	Evening	Night	Standard Conditions	Standard Conditions	S Wind	SSW Wind	SW Wind	WSW Wind	Standard Conditions	F Class Inversion
Q17	Boree	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q18	Boree 2	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q19	Spring Park 2	*40*	*35*	*35*	25	25	34	34	32	28	26	32
Q20	Ballanrae North	*40*	*35*	*35*	<20	<20	<20	20	20	20	<20	<20
Q23	Charlton's	*40*	*35*	*35*	<20	20	<20	<20	<20	<20	21	25
Q24	Corinya Park	*40*	*35*	*35*	<20	<20	<20	<20	<20	23	<20	26
Q25	Three Trees	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q26	Rowlands	*40*	*35*	*35*	23	25	<20	<20	<20	24	26	28
Mine-owned Receivers												
Q22	Q22	*40*	*35*	*35*	45	45	49	48	46	42	45	48

Notes:
1. **Green** denotes a **negligible** exceedance of 0-2 dB(A) above the PNTL.
2. **Blue** denotes a **moderate** exceedance of 3-5 dB(A) above the PNTL.
3. **Red** denotes a **significant** exceedance of >5 dB(A) above the PNTL.

A number of residential receivers were found to exceed the PNTL with the assumed mitigation measures in place, as shown in Table 9.2, Table 9.3 and Table 9.4. All community / commercial receivers were found to comply with the PNTL. A summary of the privately-owned receivers with PNTL exceedances during the operational phase are presented in Table 9.5.

Table 9.5 – Summary of Privately-owned Dwellings with PNTL Exceedances

Zone[1]	Exceedance Level	Maximum Predicted Noise Level		
		Year 1	Year 10	Year 17
Noise Management Zone	Negligible 0-2 dB(A) above PNTL	M04 [Abandoned 2], M10 [Glenburn], M22 [Brooklyn], M29 [Slapdown]	M10 [Glenburn], M22 [Brooklyn], M28 [Rosehill]	M10 [Glenburn], M22 [Brooklyn], M28 [Rosehill]
	Moderate 3-5 dB(A) above PNTL	M08 [Currajong Park 2], M23 [Currajong Park 1]	M08 [Currajong Park 2], M23 [Currajong Park 1]	M08 [Currajong Park 2], M23 [Currajong Park 1]
Noise Affectation Zone	Significant >5 dB(A) above PNTL	-	-	-

Notes: 1. Source: After VLAMP.

With the implementation of the assumed mitigation measures, receivers M04 [Abandoned 2], M10 [Glenburn], M22 [Brooklyn], M28 [Rosehill] and M29 [Slapdown] are predicted to experience negligible exceedances above the PNTL. As described in the NPfI and VLAMP, "negligible" exceedances would not be discernible to the average listener. Receivers M08 [Currajong Park 2] and M23 [Currajong Park 1] are predicted to experience moderate exceedances above the PNTL with the assumed mitigated measures implemented. In accordance with the VLAMP, potential treatment to receivers M08 and M23 include providing mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity, also upgraded façade elements such as windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels, if requested by the landholder.

With the exception of Currajong Park 1 and 2 (which is now in the moderate exceedance level), all other receivers would remain within the predicted exceedance levels of the approved Project (i.e. negligible exceedance) (Renzo Tonin & Associates, 2017). A comparison of the maximum modified Project's operational noise levels and the Development Consent (DA 374-11-00) is provided in Table 9.6.

Table 9.6 – Comparison of modified Project Operational Noise Levels and Development Consent (DA 374-11-00) Criteria ($L_{Aeq,15min}$)

Location and Receiver ID	Development Consent (DA 374-11-00) Criteria, dB(A)			Modified Project Maximum Predicted Operational Noise Levels, dB(A)		
	Day	Evening	Night	Day	Evening	Night
Mine and Processing Facility						
Currajong Park 2 (M08)	37	37	37	38	40	40
Currajong Park 1 (M23)	37	37	37	38	40	39
Abandoned 2 (M04)	35	36	36	33	32	36
Glenburn (M10)				33	33	37
Rosehill (M28)				35	37	36
Slapdown (M29)				35	37	36
Brooklyn (M22)	36	35	35	35	37	37
All other privately-owned residence	35	35	35	N/A	N/A	N/A
Rail Siding						
Glen Rock (Q06)	37	35	35	27	28	33
Ballanrae (Q08)				30	35	33
Spring Park (Q09)				<20	28	26
All other privately-owned residence	35	35	35	N/A	N/A	N/A

In addition, with the exception of Currajong Park 1 and 2, all other receivers would comply with the amenity noise criteria (Section 7.2.3), which would exceed the relevant criteria by up to 2 dBA in the night.

Mitigated operational noise contours, which incorporate the mitigation measures described above, are presented in Appendix B.

With regards to noise contours, the calculation involves numerical interpolation from a series of calculations to specific points within a regular spaced grid, 1.5 m above ground level. It is noted that the noise contours are estimates of the predicted noise levels, and the contour values may differ slightly from equivalent calculations at individual residences.

As per the VLAMP, review of the operational noise contours in Appendix B found no property experiences exceedance of the acceptable noise levels plus 5 dB in Table 2.2 of the NPfI (i.e. Night = 40 + 5 = 45 dB[A] for rural residential receivers) on more than 25% of the property's land (i.e. any land where there is an existing dwelling or where a dwelling could be built under existing planning controls).

9.6 Sleep Disturbance

The potential for sleep disturbance from the modified Project's night-time operations has been based on the noise modelling methodology described in Sections 9.3 and 9.4. From Section 9.5, no privately-owned receiver location was predicted to experience noise levels greater than $L_{Aeq,15min}$ 40 dB(A) and therefore comply with the $L_{Aeq,15min}$ sleep disturbance trigger level. The $L_{Aeq,15min}$ sleep disturbance trigger level is not considered further from herein.

The proposed operational plant and equipment and their corresponding typical L_{Amax} SWLs used for the prediction of L_{Amax} sleep disturbance are presented in Table 9.7.

Table 9.7 – Sleep Disturbance Sound Power Levels (L_{Amax})

Plant Item	Specification	L_{Amax} SWL dB(A) re. 1pW (per Item)	Number of Equipment		
			Year 1	Year 10	Year 17
Mine and Processing Facility					
Process Plant	-	124	1	1	1
Excavator (Ore)	EX1200	119	3	2	2
Excavator (Waste)	EX2500	119	1	1	1
FEL	992K	120	1	1	1
Haul Truck (Waste)	777D	120	7	6	3
Drill Rig	M6290	114	2	2	1
Compactor	CP64	110	1	1	1
Franna Crane	-	110	1	1	1
Haul Truck (Ore) / Moxy	740	117	5	3	6
Integrated Tool Carrier	980H	116	1	1	1
Dozer	D10	116	4	3	2
Grader	16M	115	4	2	2
Roller	825H	110	1	1	1
Heavy Vehicle	-	116	2	2	2
Service Truck	-	116	4	2	2
Water Cart	777F	116	4	2	2
Rail Siding					
FEL	998	115	1	1	1
Locomotive	-	120	2	2	2
Reach Stacker	-	116	2	2	2
Truck	-	116	4	4	4

Based on the SWLs presented above, Table 9.8 presents the predicted night time L_{Amax} noise levels at the nearest affected residential receivers. The maximum noise level predictions take into account the meteorological assessment conditions nominated in Section 6 for the night time period and presented values are the highest L_{Amax} noise levels predicted over all meteorological conditions.

Table 9.8 – Predicted Sleep Disturbance Noise Levels at Nearest Affected Residential Receivers (L_{Amax})

ID	Description	L_{Amax}, Sleep Disturbance Trigger Level (10:00 pm - 7:00 am)	Predicted Sleep Disturbance Level L_{Amax}		
			Year 1	Year 10	Year 17
Mine and Processing Facility					
Privately-owned Receivers					
M01	Longburra	*52*	32	35	34
M02	Victoria Park	*52*	37	38	37
M03	Ward 1	*52*	32	34	33
M04	Abandoned 2	*52*	39	39	38
M05	Berrilee	*52*	30	33	31
M06	Bon Accord	*52*	29	31	28
M07	Boxcowal	*52*	31	32	35
M08	Currajong Park 2	*52*	44	43	45
M09	Daisy Hill	*52*	33	35	33
M10	Glenburn	*52*	40	39	39
M12	Louisiana 1	*52*	34	37	37
M13	Louisiana 2	*52*	34	37	36
M14	Platina Farm	*52*	29	27	28
M16	Tarron Vale	*52*	33	34	34
M17	Wiggins	*52*	23	24	22
M18	Unnamed Dwelling 18 (abandoned)	*52*	27	28	29
M19	Howarth	*52*	28	29	29
M21	Warra Wandi	*52*	31	35	33
M22	Brooklyn	*52*	41	42	41
M23	Currajong Park 1	*52*	42	43	45
M25	Flemington 2	*52*	32	37	33
M26	Kelvin Grove	*52*	34	36	37
M27	Milverton	*52*	33	37	38
M28	Rosehill	*52*	35	41	41
M29	Slapdown	*52*	41	40	39
F01	Fifield Residences	*52*	35	36	38
F02		*52*	35	35	37
F03		*52*	31	33	33
F04		*52*	33	34	35
F05		*52*	37	37	37
F06		*52*	37	38	37
F07		*52*	33	34	34
F08		*52*	33	34	36
F09		*52*	32	33	35
F10		*52*	34	35	34
F11		*52*	33	34	34
F11		*52*	33	34	34

ID	Description	L_{Amax}, Sleep Disturbance Trigger Level (10:00 pm - 7:00 am)	Predicted Sleep Disturbance Level L_{Amax}		
			Year 1	Year 10	Year 17
F13		*52*	33	34	35
F14		*52*	32	33	35
F15		*52*	30	31	30
F16		*52*	30	32	31
F17		*52*	32	33	32
F18		*52*	33	33	34
F19		*52*	33	33	33
Mine-owned Receivers					
M15	Sunrise	*52*	40	39	40
M31	Wanda Bye	*52*	42	41	41
Rail Siding					
Privately-owned Receivers					
Q04	Rockleigh (abandoned)	*52*	26	26	26
Q05	Reas Falls	*52*	27	27	27
Q06	Glen Rock	*52*	46	46	46
Q08	Ballenrae West	*52*	47	47	47
Q09	Spring Park	*52*	39	39	39
Q11	The Troffs (abandoned)	*52*	24	24	24
Q17	Boree	*52*	29	29	29
Q18	Boree 2	*52*	29	29	29
Q19	Spring Park 2	*52*	43	43	43
Q20	Ballanrae North	*52*	31	31	31
Q23	Charlton's	*52*	37	37	37
Q24	Corinya Park	*52*	38	38	38
Q25	Three Trees	*52*	22	22	22
Q26	Rowlands	*52*	40	40	40
Mine-owned Receivers					
Q22	Q22	*52*	61	61	61

From Table 9.8, predicted sleep disturbance noise levels for all privately owned receivers were found to comply with the sleep disturbance trigger level for all operational years.

10 Road Traffic Noise Assessment

A Road Transport Assessment for the Modification was prepared by The Transport Planning Partnership (TTPP) (2021). The modified Project operational traffic would be consistent through the life of the modified Project and the year 2033 was selected as a future assessment scenario by TTPP (2021).

The Road Transport Assessment (TTPP, 2021) identified six road locations for forecasting future traffic volumes to determine the impact on the traffic volumes carried by the surrounding road network for the year 2033. Table 10.1 presents the future day (7:00 am to 10:00 pm) and night (10:00 pm to 7:00 am) total traffic for the modified Project compared to the approved Project on the six surrounding roads, including a breakdown of light and heavy vehicles.

Table 10.1 – Traffic Volumes

Road	Total traffic (vehicles per day)					
	Day (7:00 am – 10:00 pm)			Night (10:00 pm - 7:00 am)		
	Light	Heavy	Total	Light	Heavy	Total
Year 2033 with Modification						
1. The Bogan Way north of Trundle	552	139	691	61	20	81
2. Fifield Road north of Platina Road	356	394	750	48	95	143
3. Fifield-Trundle Road west of The Bogan Way	147	108	255	39	41	80
4. Platina Road east of Fifield Road	139	140	279	31	45	76
5. Wilmatha Road west of Slee Street	73	147	220	37	50	87
6. Slee Street in Fifield	356	394	750	48	95	143
Year 2033 with Approved Project						
1. The Bogan Way north of Trundle	541	140	681	50	17	67
2. Fifield Road north of Platina Road	366	397	763	58	92	150
3. Fifield-Trundle Road west of The Bogan Way	138	104	242	30	35	65
4. Platina Road east of Fifield Road	138	140	278	30	39	69
5. Wilmatha Road west of Slee Street	90	150	240	54	47	101
6. Slee Street in Fifield	366	397	763	58	92	150

Based on the traffic volumes in Table 10.1, and the nearest distance from each of the six roads to residential receivers, the traffic noise levels at the worst affected receiver locations are predicted for the year 2033 and compared in Table 10.2. If the predicted traffic noise levels at the closest residential receiver meets the proposed criteria then the criteria would be met at all other residential receivers along the same road.

Table 10.2 – Predicted Day ($L_{Aeq,15hour}$) and Night ($L_{Aeq,9hour}$) Traffic Noise Levels

Road	Distance to nearest receiver (m)	Day $L_{Aeq,15hour}$ (dB[A]) (7:00 am – 10:00 pm)			Night $L_{Aeq,9hour}$ (dB[A]) (10:00 pm - 7:00 am)		
		Modific-ation Traffic	Approved Traffic	Differ-ence	Modific-ation Traffic	Approved Traffic	Differ-ence
1. The Bogan Way north of Trundle	22	56	56	-0.1	49	49	0.8
2. Fifield Road north of Platina Road	35	56	56	0.0	52	52	0.1
3. Fifield-Trundle Road west of The Bogan Way	200	41	41	0.2	39	38	0.7
4. Platina Road east of Fifield Road	52	51	51	0.0	48	48	0.6
5. Wilmatha Road west of Slee Street	16	53	53	-0.1	51	51	0.1
6. Slee Street in Fifield	11	59	59	0.0	55	55	0.1

From Table 10.2, the daytime $L_{Aeq,15hour}$ traffic noise levels predicted for receivers along all six roads are within the RNP $L_{Aeq,15hour}$ noise criterion of 60 dB(A) for year 2033. Furthermore, the receivers along all six roads would not experience an increase of more than 2 dB(A) compared to existing traffic noise levels, without the Project.

The night time $L_{Aeq,9hour}$ traffic noise levels predicted for receivers along all six roads are within the RNP $L_{Aeq,9hour}$ noise criterion of 55 dB(A) for year 2033. Furthermore, the receivers along all six roads would not experience an increase of more than 2 dB(A) compared to existing traffic noise levels, without the modified Project.

From Table 10.2, the noise level change between the approved Project and the Modification scenarios are less than 2 dB at receivers close to the roads and it would be expected that receivers well removed from the roads would also experience a less than 2 dB increase. The Modification therefore complies with the relative increase criteria.

11 Conclusion

11.1 General

- SEM has undertaken a Project Execution Plan to identify opportunities to improve the overall efficiency of the of the Project and the Modification involves the implementation of these opportunities.
- For day, evening and night periods the minimum RBLs as nominated in the NPfI have been adopted to allow for a conservative assessment.
- An analysis of noise enhancement from adverse meteorological conditions has been conducted in accordance with the NPfI based upon the CALMET model outputs provided by the air quality consultant (Jacobs). Based on site-specific meteorological data, both wind enhancement and temperature inversions were found to be a feature of the area and were included in the operational noise modelling. Noise modelling for the operational phase was undertaken under a varied set of adverse meteorological conditions.

11.2 Project Construction Noise

- Project construction activities at the mine and processing facility would occur 24 hours per day, seven days per week.
- Construction activities at the rail siding would occur 7:00 am to 6:00 pm, Monday to Sunday.
- The mine and processing facility construction scenario was assessed for the peak construction phase which is expected to occur in Construction Year 2 of the Project.
- The modified rail siding construction scenario is considered indicative of the 7 month rail siding construction phase.
- All surrounding receivers were found to comply with the ICNG noise management levels.

11.3 Project Operational Noise

- Operational scenarios were considered for Year 1, Year 10 and Year 17 at the mine and processing facility coinciding with the commencement of utilisation of the maximum operational fleet and subsequent significant stages of development of the north-eastern and north-western emplacements.
- An operation scenario was also developed for the modified rail siding.
- Following the implementation of feasible and reasonable mitigation measures, five (5) privately owned receivers are predicted to experience negligible (i.e. 1 to 2 dB[A]) exceedances of the PNTL and two (2) privately owned receivers are predicted to experience moderate (i.e. 3 to 5 dB[A]) exceedances of the PNTL.

- All privately-owned receivers are predicted to experience operational noise levels below the PNTL at the modified rail siding.
- In accordance with the NSW Government's *Voluntary Land Acquisition and Mitigation Policy – SSD Mining* (NSW Government, 2018), negligible exceedances would not be discernible by the average listener and would not warrant receiver based treatments or controls. The potential treatment for moderate exceedances would be to provide mechanical ventilation / comfort condition systems to enable windows to be close without comprising internal air quality / amenity and also upgraded façade elements such as windows, doors or roof insulation, to further increase the ability of the building façade to noise levels, if requested by the landholder.
- All privately-owned receivers are predicted to experience night-time L_{Amax} noise levels below the sleep disturbance trigger level.

11.4 Project Road Traffic Noise

- Road traffic noise was assessed for the year 2033 for six major roads of the surrounding road network, as determined by the Road Transport Assessment for the modified Project (TTPP, 2021).
- Predicted road traffic noise at sensitive receiver locations for all day and night periods were found to comply with the relevant RNP criteria and requirements.

References

1. Clean TeQ (2020a) *Project Execution Plan*.
2. Clean TeQ (2020b) *Clean TeQ Sunrise Project Noise Management Plan.*
3. Department of Environment and Climate Change (2009) *NSW Interim Construction Noise Guideline.*
4. Department of Environment, Climate Change and Water (2011) *NSW Road Noise Policy.*
5. Department of Planning, Industry and Environment (2020) *Assessing Cumulative Impacts Guide - Guidance for State Significant Projects.*
6. Environment Protection Authority (2013) *Rail Infrastructure Noise Guideline*.
7. Environment Protection Authority (2017) *NSW Noise Policy for Industry*.
8. Jacobs Group (Australia) (2021) *Sunrise Project - Project Execution Plan Modification Air Quality and Greenhouse Gas Assessment*
9. New South Wales Government (2018) *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments.*
10. Renzo Tonin & Associates (2017) *Syerston Project – Modification 4 Noise and Blasting Assessment.*
11. The Transport Planning Partnership (2021) *Sunrise Project Project Execution Plan Road Transport Assessment.*

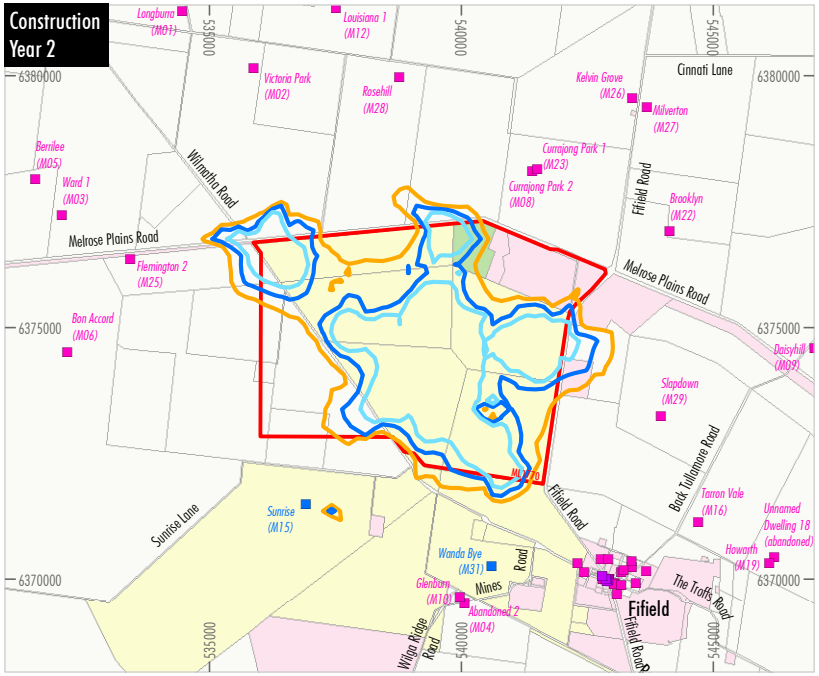
APPENDIX A Glossary of Terminology

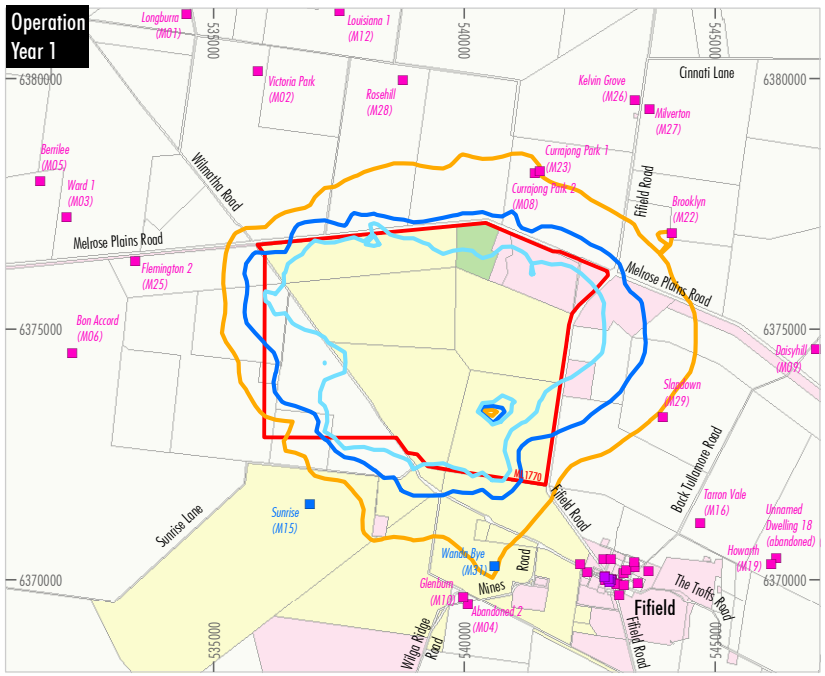
The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

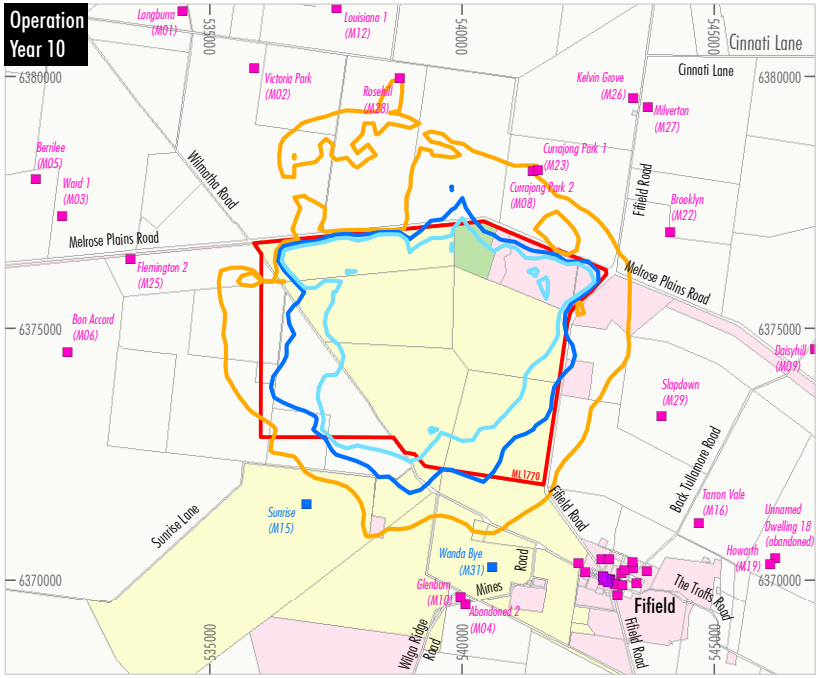
Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights 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 L_{90} 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: 0 dB The faintest sound we can hear 30 dB A quiet library or in a quiet location in the country 45 dB Typical office space. Ambience in the city at night 60 dB CBD mall at lunch time 70 dB The sound of a car passing on the street 80 dB Loud music played at home 90 dB The sound of a truck passing on the street 100 dB The sound of a rock band 110 dB Operating a chainsaw or jackhammer 120 dB 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.
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.
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.

APPENDIX B Construction and Operational Noise Contours







LEGEND

- Mining Lease Boundary (ML)
- Sunrise Energy Metals Owned Land
- Crown Land
- Fifield State Forest
- Private Landholder
- Mine-owned Dwelling
- Private Dwelling
- Community Receiver
- 35 dB(A) Noise Contour
- 40 dB(A) Noise Contour
- 45 dB(A) Noise Contour

Note: Fifield receiver labels are shown on Figure 4.

Criteria:
Construction (during recommended standard hours): 45 dB(A)
Construction (outside recommended standard hours): 40 dB(A)
Operation: 40 dB(A)

N

0 4

Kilometres
GDA 1994 MGA Zone 55

Source: Black Range Minerals (2000); CleanTeQ (2017, 2019); Renzo Tonin (2021); NSW Department of Industry (2017); NSW Land & Property Information (2017)

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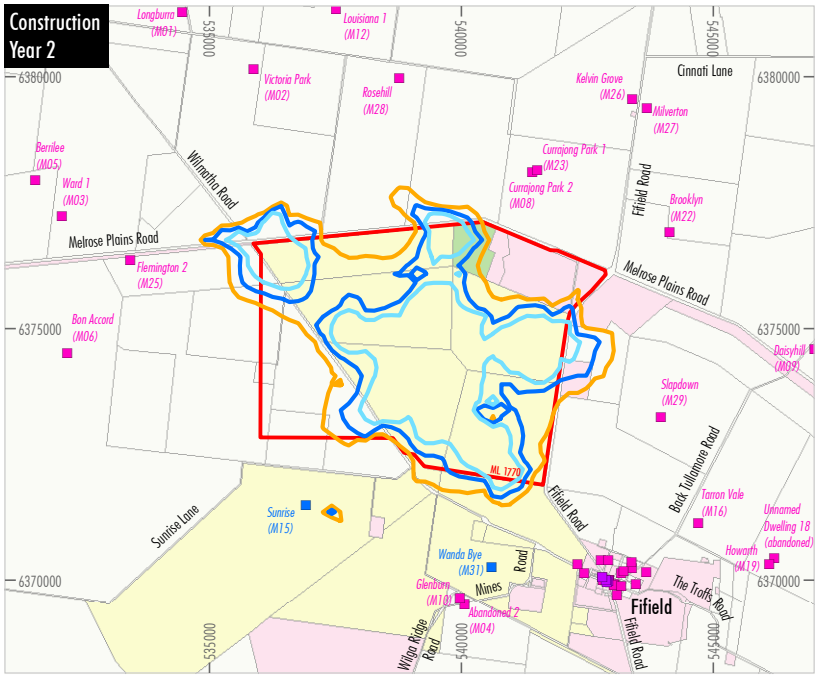
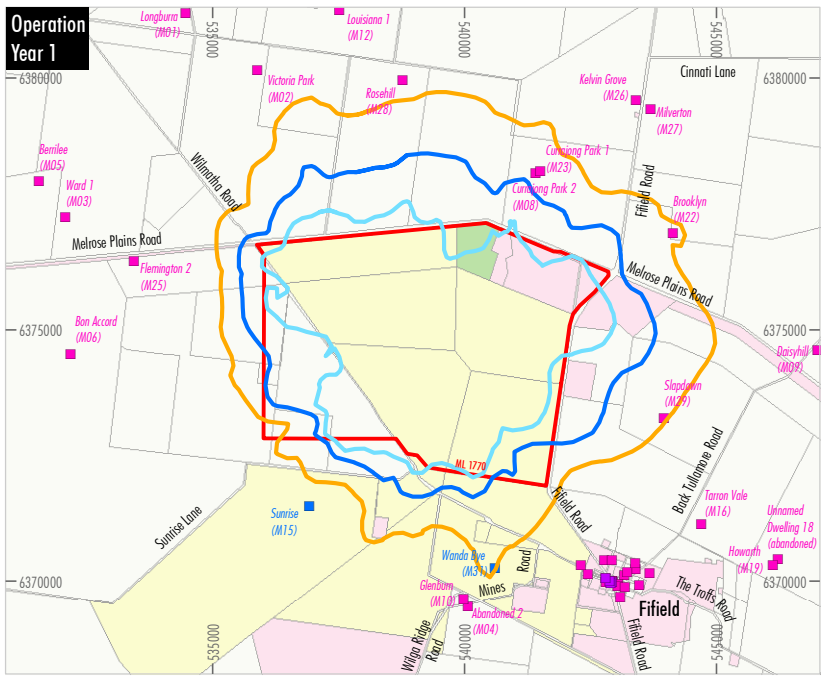
SUNRISE PROJECT

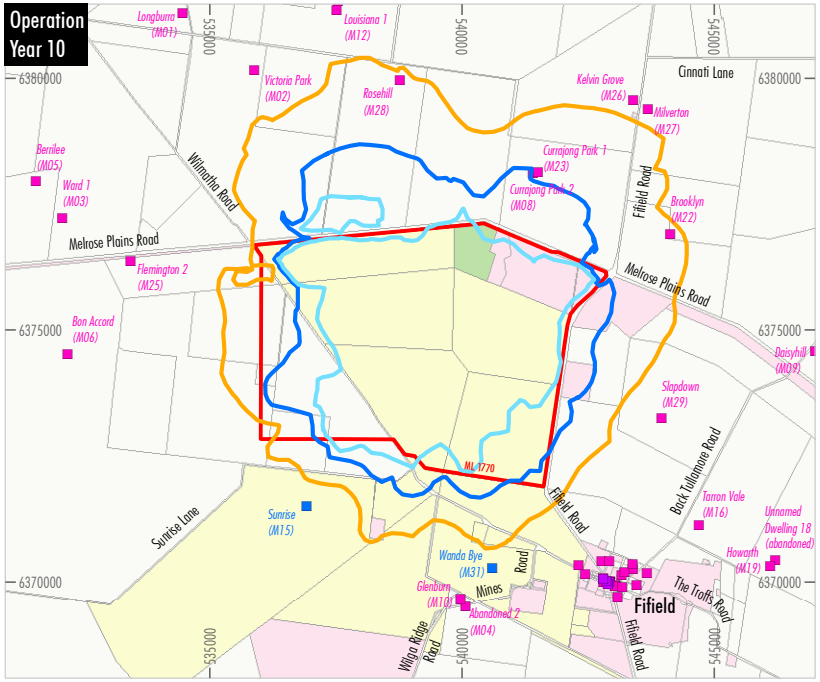
Maximum Day Construction and Operation Noise Contours $L_{Aeq\ (15\ minute)}$ dB(A) – Mine and Processing Facility

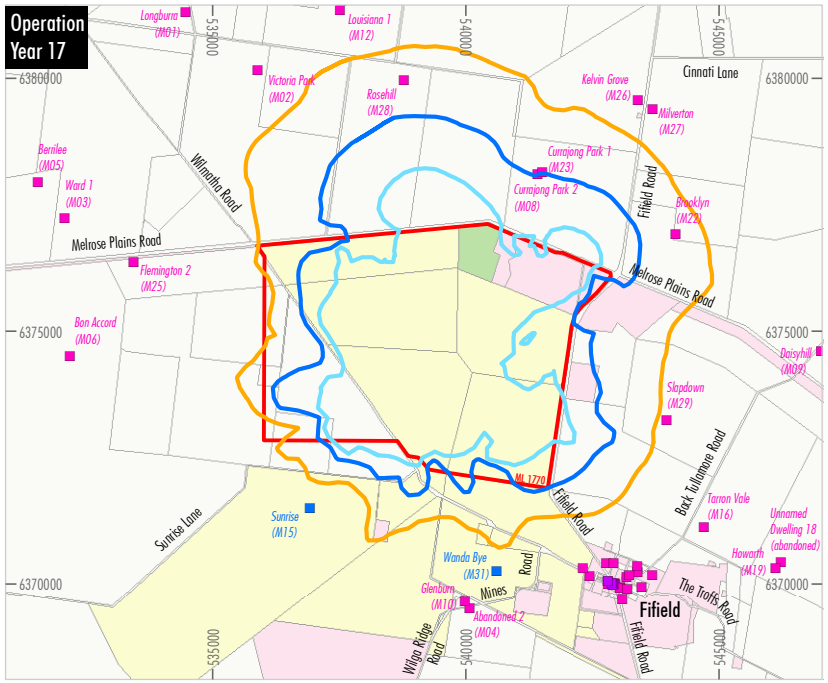
Figure B-1

CTL-20-08 MOD 7_NA_228A









LEGEND

- Mining Lease Boundary (ML)
- Sunrise Energy Metals Owned Land
- Crown Land
- Fifield State Forest
- Private Landholder
- Mine-owned Dwelling
- Private Dwelling
- Community Receiver
- 35 dB(A) Noise Contour*
- 40 dB(A) Noise Contour*
- 45 dB(A) Noise Contour*

*Note: * Contours shown are the maximum case for all modelled standard meteorological conditions and relevant noise enhancing winds (e.g. S, SW, SSW, WSW).*

Note: Fifield receiver labels are shown on Figure 4.

Criteria = 35 dB(A)

N

0 4

Kilometres

GDA 1994 MGA Zone 55

Source: Black Range Minerals (2000); Clean TeQ (2017, 2019); Renzo Tonin (2021); NSW Department of Industry (2017); NSW Land & Property Information (2017)

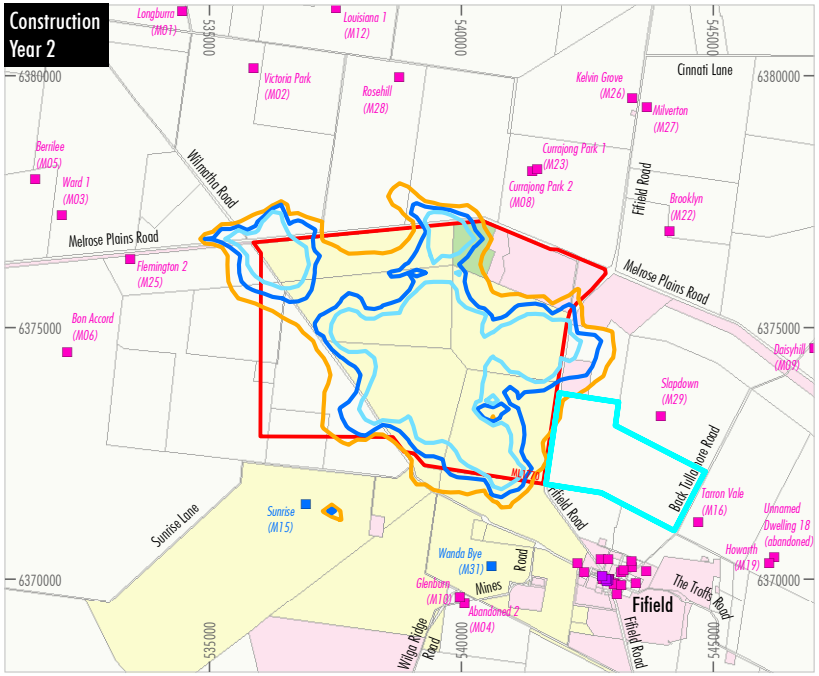
sunrise energy metals

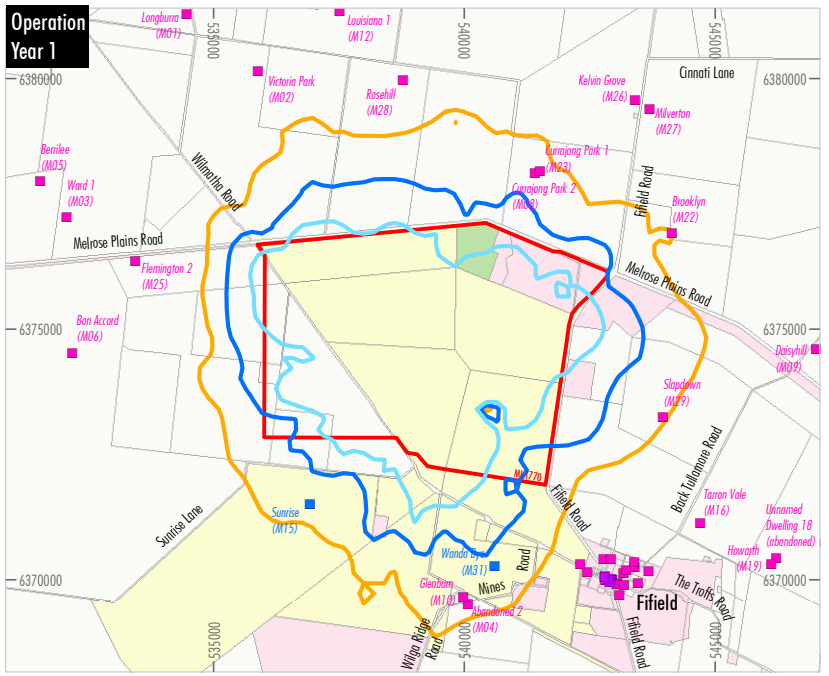
SUNRISE PROJECT

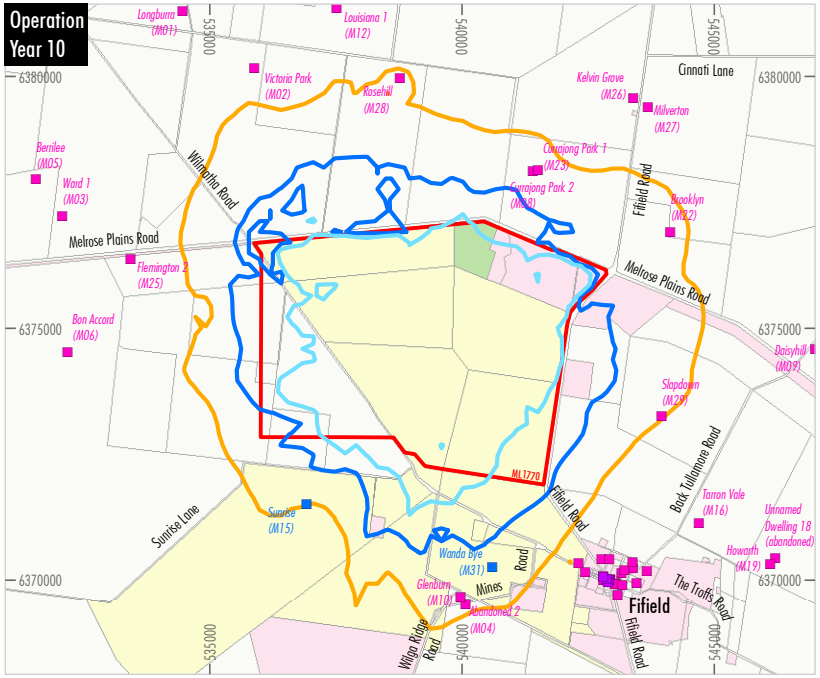
Maximum Evening Construction and Operation Noise Contours $L_{Aeq\ (15\ minute)}$ dB(A) – Mine and Processing Facility

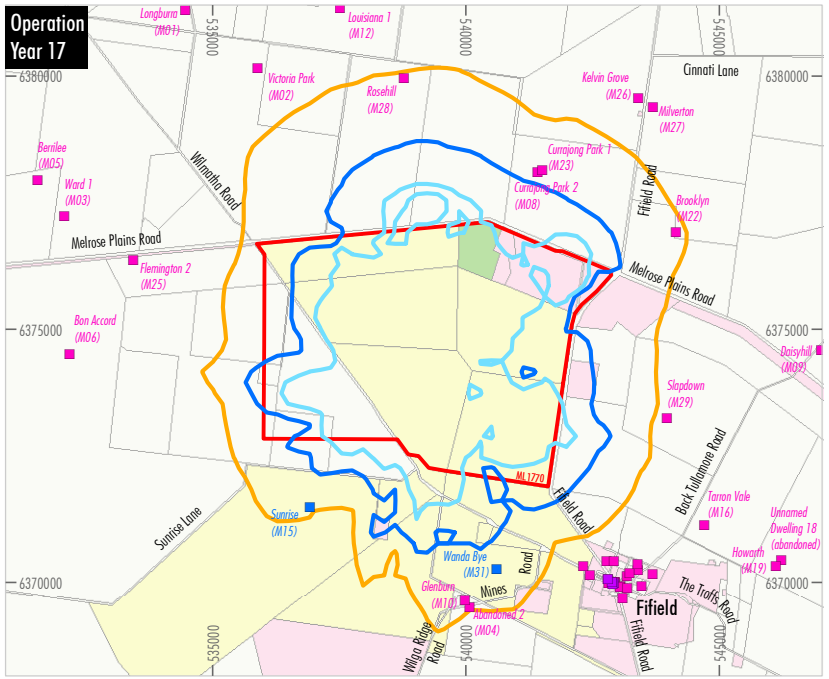
Figure B-2

CTL-20-08 MOD 7_NA_227A









LEGEND

- Mining Lease Boundary (ML)
- Sunrise Energy Metals Owned Land
- Crown Land
- Fifield State Forest
- Private Landholder
- Mine-owned Dwelling
- Private Dwelling
- Community Receiver
- 35 dB(A) Noise Contour
- 40 dB(A) Noise Contour
- 45 dB(A) Noise Contour

Note: Fifield receiver labels are shown on Figure 4.

Criteria = 35 dB(A)

N

0 4

Kilometres

GDA 1994 MGA Zone 55

Source: Black Range Minerals (2000); CleanTeQ (2017, 2019); Renzo Tonin (2021); NSW Department of Industry (2017); NSW Land & Property Information (2017)

sunrise energy metals

SUNRISE PROJECT

Maximum Night Construction and Operation Noise Contours $L_{Aeq\ (15\ minute)}$ dB(A) – Mine and Processing Facility

Figure B-3

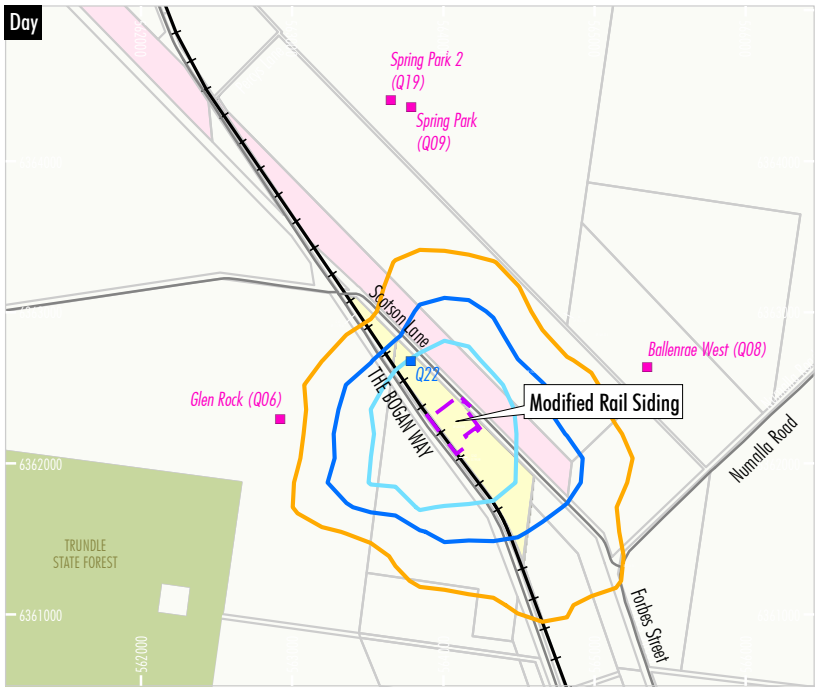
CTL-20-08 MOD 7_NA_229A

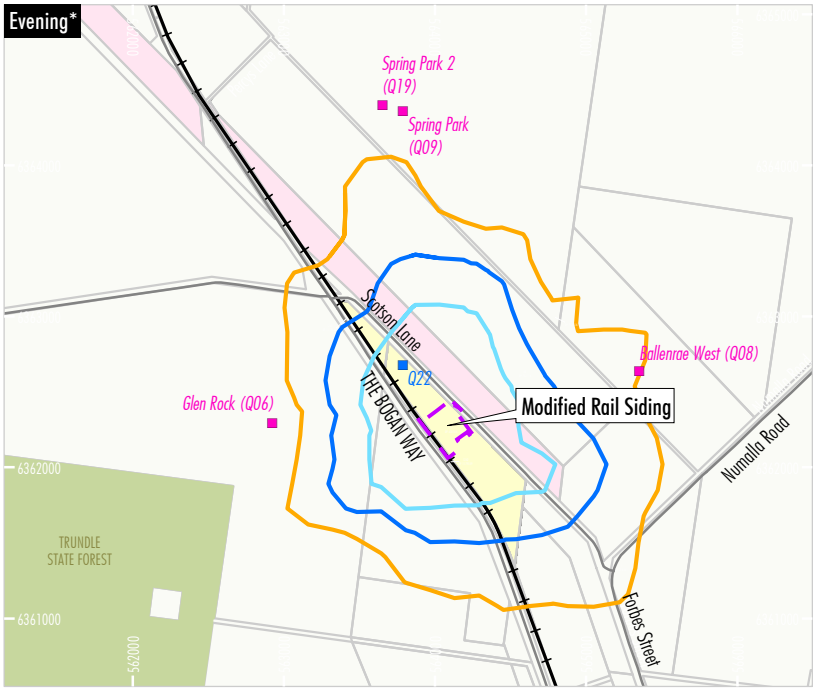
SUNRISE PROJECT

Maximum Construction Noise Contours $L_{Aeq\ (15\ minute)}$ dB(A) – Rail Siding

Figure B-4

CTL-20-08 MOD 7_NA_231A





LEGEND

- Railway
- Sunrise Energy Metals Owned Land
- Crown Land
- Private Landholder
- Mine-owned Dwelling
- Private Dwelling
- 35 dB(A) Noise Contour
- 40 dB(A) Noise Contour
- 45 dB(A) Noise Contour

Modified Project

- Modified Rail Siding Surface Development Area

*Note: * Contours shown are the maximum case for all modelled standard meteorological conditions and relevant noise enhancing winds (e.g. S, SW, SSW, WSW).*

Criteria:
Day = 40 dB(A)
Evening = 35 dB(A)
Night = 35 dB(A)

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020); Renzo Tonin (2021).

N

0 1

Kilometres

GDA 1994 MGA Zone 55

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SUNRISE PROJECT

Maximum Operation Noise Contours $L_{Aeq\ (15\ minute)}$ dB(A) – Rail Siding

Figure B-5

CTL-20-08 MOD 7_NA_230A

sunrise
energy metals

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