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PREPARED FOR

MMG Dugald River Pty Ltd

Noise Impact Assessment Report

Dugald River Wind Farm Project

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Noise Impact Assessment Report

Dugald River Wind Farm Project

0755929

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ACRONYMS AND ABBREVIATIONS

Acronym	Description
Acoustic environment	The part of the environment of an area or place characterised by the total amount of noise that may be experienced there.
AQO	Acoustic Quality Objectives, defined in EPP Noise 2019 as the maximum level of noise that should be experienced in the acoustic environment of the sensitive receptor.
BESS	Battery Energy Storage System
dB(A)	dB(A) denotes a single number sound pressure level that includes a frequency weighting ("A-weighting") to reflect the subjective loudness of the sound level. The frequency of a sound affects its perceived loudness. Human hearing is less sensitive at low and very high frequencies, and so the A-weighting is used to account for this effect. An A-weighted decibel level is written as dB(A)
DRM	Dugald River Mine
EPP Noise 2019	Environmental Protection Policy (Noise) 2019
ERM	Environmental Resources Management Australia Pty Ltd
Hz	Hertz - the measure of frequency of sound wave oscillations per second. 1 oscillation per second equals 1 hertz
L_{Aeq}	Time averaged A-weighted equivalent continuous sound pressure level
L_{A90}	A-weighted sound pressure level which is exceeded for 90% of the measurement period. Often referred to as the Background noise level
$L_{A1,adj,1hr}$	A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 1% of a 1-hour period when measured using a fast standardised response time.
$L_{A10,adj,1hr}$	A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 10% of a 1-hour period when measured using a fast standardised response time.
$L_{Aeq,adj,1hr}$	A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within a 1-hour period has the same mean square sound pressure of a sound that varies with time.
Met Mast	Meteorological Mast
MMG	MMG Dugald River Pty Ltd
NIA	Noise Impact Assessment
SPL	Sound Pressure Level - the level of sound pressure; as measured at a distance by a standard sound level meter with a microphone. This differs from LW in that this is the received sound as opposed to the sound 'intensity' at the source
SWL	Sound Power Level - this is a measure of the total power radiated by a source. The Sound Power of a source is a fundamental property of the source and is independent of the surrounding environment
WTG	Wind Turbine Generator

EXECUTIVE SUMMARY

Environmental Resources Management Australia Pty Ltd (ERM) has been engaged by MMG Dugald River Pty Ltd (MMG) to prepare a Noise Impact Assessment for the Dugald River Wind Farm Project (the Project). The Project comprises the construction, operation and decommissioning of up to 24 Wind Turbine Generators (WTGs) and a Battery Energy Storage System (BESS) as well as ancillary features including two permanent Meteorological Masts (Met Masts) and associated infrastructure.

The Project is located on the Knapdale Range, approximately 63 km north, northeast of the Cloncurry Township in Queensland and adjacent to the Dugald River Mine (DRM). Three noise sensitive receptors were identified, namely a dwelling house (the McMillan residence), the DRM Accommodation Camp and the DRM Fly Camp. All receptors are considered Host Lots as per *State Code 23: Wind Farm Development* (DILGP, 2025a) (State Code 23).

This Report is required to support a Material Change of Use Application for the Project to be lodged with the State Assessment and Referral Agency as the assessment manager for Wind Farm developments in Queensland. Based on the findings of this report, the Project is unlikely to generate significant noise impacts to the existing and future community.

Proposed Wind Farm

This assessment has been undertaken in accordance with State Code 23 contained in the State Development Assessment Provisions version 3.2, dated 3 February 2025, and the associated Planning Guideline (DILGP, 2025b).

Noise from up to 24 WTGs has been modelled by referencing the noise emission data from the Goldwind GW165-6.0MW turbine, the nominated WTG for the Project. The Goldwind GW165-6.0MW turbine has been modelled at a hub height of 130 m and at a Sound Power Level (SWL) of 112.2 dB(A).

The worst-case predicted noise levels at the nearest sensitive receptors were assessed against the acoustic criteria defined in State Code 23, and compliance is predicted at the three nearest sensitive receptors. The risk of noise impacts at the nearest receptors as a result of the proposed wind farm is low.

Proposed BESS

The applicable BESS operational assessment scenario was also developed based on the Project Layout and BESS information as outlined in this Report.

The BESS noise assessment indicates that at the three noise sensitive receptors, compliance is predicted to be achieved against Performance Outcome PO20 of the Planning guideline - State Code 27 and the AQO from EPP Noise 2019. No specific noise mitigation measures are required for the BESS. The risk of noise impacts at the nearest receptors as a result of the proposed BESS is low.

1. INTRODUCTION

MMG Dugald River Pty Ltd (MMG) proposes to develop the Dugald River Wind Farm Project (the Project) which comprises the construction, operation and decommissioning of up to 24 Wind Turbine Generators (WTGs) and a Battery Energy Storage System (BESS).

Ancillary features of the Project include two permanent Meteorological Masts (Met Masts) and associated infrastructure including access tracks, foundations, hardstand areas, underground cabling, overhead powerlines, material laydown areas, construction areas and a centralised operations area.

1.1 OBJECTIVES AND SCOPE

This Noise Impact Assessment (NIA) has been prepared to assess noise impacts associated with the Project in accordance with State Code 23: Wind Farm Development and State Code 27: Battery Storage Facility Development. The NIA is required to support a Material Change of Use Application for the Project.

This NIA contains the project description, identification of all potentially affected sensitive receptors within the area of influence (defined to be 3 km from any WTG location), the assessment methodology, WTG and Battery Energy Storage System (BESS) noise operational criteria and findings based on the predicted noise levels associated with the WTGs and BESS through noise modelling at sensitive receptors.

Wind farm

This NIA considers noise impacts from WTGs at noise sensitive receptors via noise modelling in accordance with the methodology set in the State Code 23 (DILGP, 2025a) and the associated Planning Guideline (DILGP, 2025b).

State Code 23 ensures clear and consistent noise impact assessment of Wind Farms in Queensland, by presenting a guideline for best practice noise criteria and assessment methodology. The Planning Guideline contains a methodology in *Appendix 3* for assessment of WTG noise during the development assessment process.

This NIA has been prepared in accordance with *Appendix 3* of the Planning Guideline and includes:

- Review of the Project Layout and proposed WTG locations;
- Establishment of noise assessment requirements in accordance with the State Code 23;
- Identification of the closest and potentially most affected noise sensitive receptors situated within the area of influence of the Project;
- Establishment of acoustic criteria for WTGs in accordance with the State Code 23;
- Development of a noise model to predict WTG noise impact levels;
- Assessment of the predicted noise levels against the acoustic criteria and identification of any levels that exceed criteria stipulated in State Code 23;
- Evaluation of the magnitude and extent of potential impacts associated with noise from the Project's WTGs; and
- Provision of noise mitigation measures, if required.

BESS

The NIA provides an assessment of potential noise impacts associated with operation of the BESS, and to recommend reasonable and relevant mitigation and management measures, where required, with the aim of achieving compliance with the established noise assessment criteria.

The NIA was undertaken based on the BESS design information, layout plans, proposed equipment quantities and equipment manufacturers' specifications, and operating modes as outlined in this Report.

This BESS assessment has been conducted in accordance with the following policies and guidelines:

- Department of State Development, Infrastructure and Planning, State Code 27: Battery storage facility development (Queensland Government, 2025);
- Environmental Protection (Noise) Policy 2019 [EPP Noise 2019] (Queensland Government, 2019; Queensland Government, 2019b);

And includes:

- Evaluation of the existing noise environment and identification of noise sensitive receptors;
- Establishment of operational assessment criteria;
- Determining the extent of operational noise impacts (if any) associated with the operation of the BESS, and cumulative noise impacts (in consideration of other developments in the area, if any); and
- Recommendation of noise mitigation measures to be implemented on site to enable compliance with the operational assessment criteria.

1.2 PROJECT DESCRIPTION

The Project will be located on the Knapdale Range, adjacent to the Dugald River Mine, owned and operated by MMG. The Project is situated on State Land, 63 km north-east of the Township of Cloncurry and immediately west of Dugald River Mine.

The Knapdale Range is situated within the Mount Isa subregion, which is characterised by tilted metamorphic hills and ranges, low open woodlands with *Eucalyptus spp., Corymbia spp* and Spinifex dominant grasslands with *Acacia spp.* dominant shrub layers throughout. Soil types range from rocky, skeletal soil types to shallow-moderate sandy loam towards the eastern base of the range.

The Project is proposed to be constructed in two stages. The first stage is proposed to comprise the construction and operation of a Met Mast and up to eight WTGs, with an associated substation and BESS. Following the construction and operation of the first stage of the Project, the second stage is proposed to consist of an additional Met Mast, up to 16 WTGS and an expanded BESS.

Once both stages of construction are completed, the Project will consist of the following:

- Up to 24 X 6 MW WTGs;
- A staged BESS facility comprising a maximum of 66 battery units and 33 Medium Voltage Power Stations;

- Two permanent Met Masts;
- Access tracks, Hardstand and Material laydown areas;
- Supporting infrastructure (including a collection substation, switchyard and underground and overhead powerlines);
- An Operations And Maintenance Facility.

The Project comprises a total disturbance footprint of 136.74 ha as detailed in Table 1-1 and as shown in Figure 1-1

TABLE 1-1 PROJECT SPECIFICATIONS

Feature	Details	Area (ha)
Stage One		
WTG Construction Areas	8 X WTGs	21.67
Central Operations and Switchyard Area	• 18 X Battery Units • 9 X MVPS • Substation and Switching Infrastructure • Operations Facility	2.29
Access Tracks	Access Tracks	30.09
Met Mast 1	Stage 1 Met Mast	0.28
33 kV Powerline	Stage 1 Overhead Powerline which links each WTG to the Central Switchyard Area. This area includes the underground power corridors between each WTG and the closest power pole	11.34
220 kV Powerline	Overhead Powerline linking the Central Operations and Switchyard Area to the DRM	4.69
Laydowns	2 X Laydown areas for storage and construction purposes	2.42
Taglines	Temporary Taglines used during construction of each WTG	1.26
	Stage One Disturbance Area	*74.04*
Stage Two		
WTG Construction Areas	Up to 16 X WTGs	31.5
Central Operations and Switchyard Area	• 48 X Battery Units • 24 X MVPS	Nil additional disturbance
Access Tracks	Access Tracks	30.64
Met Mast 2	Stage 2 Met Mast	0.28
Stage 1 and 2 Link	Easement between Stages 1 and 2	0.27
	Stage Two Disturbance Area	*62.69*
	Total Disturbance Footprint	136.74

KAJABBI NORMANTON ROAD

Dugald River

BURKE DEVELOPMENTAL ROAD

GRANADA ROAD

MMG DUGALD RIVER MINE ACCESS ROAD

Cabbage Tree Creek

N3
N4
N1
N2A
N5
N8
N6
N7
S1
S2
WTG01
MET MAST 2
Dugald River Mine
WTG02
WTG03
S4
S5
S6
WTG04
S7
WTG05
WTG06
MET MAST 1
WTG07
WTG08
S9
S8

Legend

- Met Mast
- Turbine Location
- 220kV Powerline
- 33kV Powerline
- Highway
- Main Road
- Local Road
- Major Watercourse
- Project Area
- Micrositing Corridor
- Substation
- Disturbance Footprint

Source:
Base Data - QSpatial
Imagery - ESRI World Imagery

Coordinate System:
GDA2020 MGA Zone 54
Date: 02/04/2026
Created By: CB
Drawing Size: A3
0 1 2Km
1:100,000

F1-1 Project Layout

MMG Dugald River Renewables
Noise Assessment
Client: MMG

ERM

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2. SITE LAYOUT AND AREA OF INFLUENCE

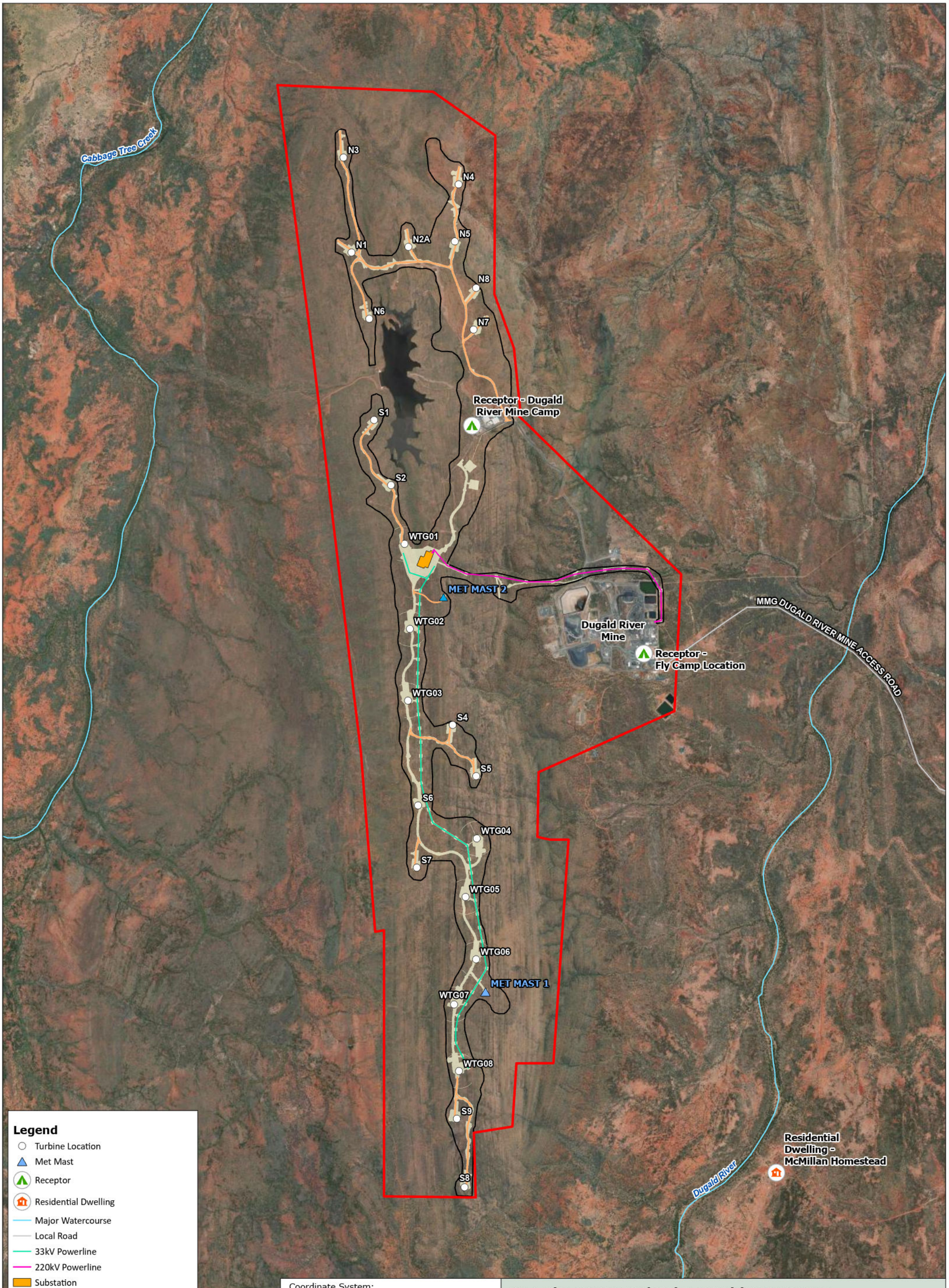
As required by State Code 23 (DILGP, 2025a), the area of influence for this NIA is defined as a 3 km buffer zone from the nearest potential WTG location in the area surrounding the Project.

The Area Of Influence comprised three noise sensitive receptors. The noise sensitive receptors are as follows and are shown in Figure 2-1 with coordinates provided in Appendix A.

1. A dwelling house (the McMillan residence) - Located approximately 3.6 km east from the nearest WTG. This property is considered a host lot[1] as defined by State Code 23.
2. The DRM Accommodation Camp (assessed at the point of the closest building to the closest WTG) - Located approximately 1 km east of the nearest WTG, providing accommodation for workers employed at the DRM. The DRM Accommodation Camp is considered a host lot[1] as defined by State Code 23.
3. DRM Fly Camp – The DRM operations' area is located approximately 2.5 km from the DRM Accommodation Camp, and approximately 2 km from the Project. It is treated as a host lot[1] as defined by State Code 23 for the purposes of this assessment.

The DRM Accommodation Camp and DRM Fly Camp are key facilities supporting operations at the DRM by providing essential housing and amenities for the mine workforce. Owned and operated by MMG, the DRM Accommodation Camp and DRM Fly Camp are approved as components of the DRM Environmental Authority which is permitted by the *Environmental Protection Act 1994* and *Mineral Resources Act 1989*.

[1] A host lot (also commonly referred to as "host property" or an "associated dwelling") is defined in State Code 23 as a "*means a parcel of land (lot(s)) that accommodates any part of a wind farm development*".



0755929_DRWF_MMG_NoiseAssessment_R02.aprx

3. WIND FARM ASSESSMENT

3.1 ASSESSMENT REQUIREMENTS - STATE CODE 23

The State Code 23 (DILGP, 2025a), along with the Planning Guideline (DILGP, 2025b), provide guidance to assist applicants in preparing Development Applications for new or expanding Wind Farms in Queensland. The documents assist in responding to the Performance Outcomes (acoustic criteria) and Acceptable Outcomes specified within the State Code 23 (DILGP, 2025a). The Planning Guideline (DILGP, 2025b) also includes details of the required methodology for noise impact assessment and noise monitoring.

Performance Outcomes - Acoustic Criteria

State Code 23 (DILGP, 2025a) requires wind farm developments to achieve the following performance outcomes (POs) for acoustic amenity:

- PO12: The predicted acoustic level at all noise affected existing or approved sensitive land uses on host lots does not exceed the criteria stated in *Table 23.2*; and
- PO13: The predicted acoustic level at all noise affected existing or approved sensitive land uses on nonhost lots does not exceed the criteria stated in *Table 23.3*.

"*Sensitive land uses*" are defined by *Schedule 24* of the Queensland Government Legislation, Planning Regulation 2017 (QLD Gov, 2025) and relevantly include all forms of dwellings, as well as a range of other sensitive uses including non-resident workforce accommodation.

The three noise sensitive receptors identified for the Project are classified as "host lots". State Code 23 (DILGP, 2025a) sets the acoustic criteria for sensitive land uses on host lots as reproduced in Table 3-1. There are no noise sensitive receptors classified as "non-host lots" for the Project.

Section 4.6 of the Planning Guideline (DILGP, 2025b) clarifies that host lots are land which is either owned or lawfully occupied by the Project proponent or are subject to a formal agreement between the landowner and the Project proponent to host the Wind Farm on the land.

No daytime (6am to 8pm) noise criterion applies for this assessment, however night-time (8pm to 6am) noise criterion is still considered to ensure protection of sleep in line with World Health Organisation (WHO) guidance on environmental noise (WHO, 2022).

TABLE 3-1 ACOUSTIC CRITERIA FOR HOST LOTS

Noise description	Acoustic level does not exceed
The outdoor (free-field) night-time (8pm to 6am) A-weighted equivalent acoustic level (L_{Aeq}), assessed at all noise affected existing or approved sensitive land uses.	• 45 dB(A); or • The background noise (L_{A90}) by more than 5 dB(A); whichever is the greater, for wind speed from cut-in to rated power of the wind turbine and each integer wind speed in between referenced to hub height.

For this assessment, the base criteria of 45 dB(A) L_{Aeq} is used for each integer wind speed from cut-in to rated power of the wind turbine.

3.2 WIND FARM NOISE MODELLING

The noise prediction modelling standard used for this assessment is based on International Standard ISO 9613-2:2024 *Acoustics - Attenuation of sound during propagation outdoors, Part 2: Engineering method for the prediction of sound pressure levels outdoors* (International Standard, 2024) (latest revision), as recommended in the Planning Guideline (DILGP, 2025b), used to predict indicative worst-case noise levels at the identified sensitive receptors.

The model predicts noise levels through geometrical divergence and applies adjustments for attenuation from acoustic shielding from intervening ground topography, ground effects, meteorological effects and atmospheric absorption.

ISO 9613-2 specifies a method for predicting L_{Aeq} noise levels at a distance from a source under meteorological conditions favourable to noise propagation, namely downwind propagation (<5 m/s), or equivalently propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs at night. The method is conservative because it assumes that the favourable propagation conditions occur simultaneously in all directions. Where sensitive receptors are located upwind of the dominant wind directions then the noise levels are expected to be less than that predicted using this method.

The L_{Aeq} noise parameter is predicted based on the sound power levels determined in accordance with the testing procedures outlined in the International Electrotechnical Commission (IEC)-61400-11:2012 *Wind Turbine Generator Systems – Part 11: Acoustic Noise Measurement Techniques* (IEC, 2012).

3.2.1 FEATURES, INPUTS AND ASSUMPTIONS

Key features, inputs and assumptions informing the noise modelling and assessment are outlined in Table 3-2 below.

TABLE 3-2 MODELLING FEATURES, INPUTS AND ASSUMPTIONS

Feature	Description
General Acoustics	All sound pressure levels presented in this report (e.g. noise levels predicted at a receptor) are in decibels (dB) referenced to 2 x 10-5 Pa, with A-weighting applied. All sound power levels presented in this report (e.g. wind turbine sound power levels) are decibels (dB) referenced to 10-12 W, with A-weighting applied.
Software	SoundPLAN v9.1 noise modelling software package was utilised to calculate noise levels using ISO 9613-2:2024 (International Standard, 2024)
Parameters	Model parameters include: • Barrier attenuation of no more than 2dB • 4 metres receptor height
Meteorology	Project environmental conditions: • 59% Humidity • 23°C Temperature Wind conditions - Noise level at each receptor is predicted based on being simultaneously downwind of every wind turbine at the site.
Topography	10-metre contour interval terrain data, extracted from Queensland Spatial Catalogue (QSpatial) Note that 10-meter contour interval terrain data were judged to be adequate for this assessment based on the absence of undulating terrain.

Feature	Description
Assumptions	Ground absorption factor: 0.5 (50% acoustically hard ground and 50% acoustically soft ground)

3.2.2 WIND TURBINE SPECIFICATIONS

Noise from Stage 1 and Stage 2 has been modelled by referencing the noise emission data from the Goldwind GW165-6.0MW turbine, the nominated WTG for the Project. The WTG specifications as modelled in this assessment are summarised in Table 3-3.

TABLE 3-3 WIND TURBINE SPECIFICATIONS

Parameter	Specification
Hub Height	130 m
Rotor Diameter	165 m
Cut-In Wind Speed	3 m/s
Cut-Out Wind Speed	24 m/s
Standard Power Operation Mode Maximum Sound Power Level (SWL)	112.2 dB(A), including a +1.7 dB uncertainty as specified by the manufacturer

3.2.2.1 NOISE EMISSION LEVELS

The Sound Power Levels (SWLs) for the Goldwind GW165-6.0MW turbine, for wind speeds from 3 m/s to 14 m/s, have been provided by the manufacturer. The SWLs, as referenced in the noise model, are presented in Table 3-4.

The SWLs are adjusted to account for the uncertainty of +1.7 dB as noted by the manufacturer resulting into maximum SWL of 112.2 dB(A). As SWLs are unchanged above 12 m/s, results for higher hub height wind speeds are expected and assumed to be equal to that modelled for the 12 m/s hub height wind speed scenario.

TABLE 3-4 WIND TURBINE SOUND POWER LEVEL PER HUB-HEIGHT WIND SPEED

Wind Speed at Hub Height (m/s)	Sound Power Level (SWL), L_{Aeq}, in dB(A)
3	98.4
4	98.4
5	100.0
6	103.9
7	107.3
8	109.7
9	111.2
10	112.0
11	112.0
>12	112.2

3.2.2.2 NOISE EMISSION SPECTRUM

A reference SWL spectrum at 1/3 octave band centre frequencies is presented in Table 3-5. This 1/3 octave band spectrum is considered representative for the Goldwind GW165-6.0MW turbine, adjusted to the maximum SWL of 112.1 dB(A).

TABLE 3-5 WIND TURBINE SOUND POWER LEVEL SPECTRUM

1/3 Octave Band Centre Frequency	Sound Power Level (SWL), L_{Aeq}, in dB(A)
20 Hz	66.3
25 Hz	70.5
31.5 Hz	74.4
40 Hz	79.8
50 Hz	84.9
63 Hz	87.9
80 Hz	91.9
100 Hz	94.2
125 Hz	96.8
160 Hz	99.9
200 Hz	101.2
250 Hz	102.3
315 Hz	103.5
400 Hz	103.3
500 Hz	102.7
630 Hz	102.0
800 Hz	101.1
1000 Hz	100.5
1250 Hz	99.0
1600 Hz	95.7
2000 Hz	91.3
2500 Hz	87.0
3150 Hz	82.3
4000 Hz	75.6
5000 Hz	67.9
6300 Hz	65.6

1/3 Octave Band Centre Frequency	Sound Power Level (SWL), L_{Aeq}, in dB(A)
8000 Hz	65.0
10000 Hz	64.0
Overall A-weighted value	**112.2**

3.3 PREDICTED WIND TURBINE NOISE

The predicted noise levels for Stage 1 and Stage 2 at the three noise sensitive receptors, located on host lots, are presented in Table 3-6.

TABLE 3-6 PREDICTED NOISE LEVELS AT NOISE SENSITIVE RECEPTORS

Receptor ID	Status	Nearest WTG (Stage 1 and 2 combined)	Distance to Nearest WTG	Base Noise Limit, L_{Aeq} in dB(A)	Predicted Noise Levels, L_{Aeq} in dB(A)		
					Stage 1	Stage 2	Cumulative – Stage 1 & Stage 2
DRM Accommodation Camp	Host	N7	1112 m	45	36	45	45
DRM Fly Camp	Host	S4	2359 m	45	34	35	38
McMillan residence	Host	S8	3610 m	45	28	27	31

The predicted noise levels indicate compliance at the three noise sensitive receptors. Whilst there are no criteria exceedances, general recommendations are discussed in Section 5.

A noise contour map for all WTGs (Stage 1 and Stage 2) operating at the maximum sound power level under the Project's environmental conditions at 59% Humidity and 23^{o}C Temperature is presented in Figure 3-1.

N3
N4
N1
N2A
N5
N8
N6
N7
S1
Receptor - Dugald River Mine Camp
S2
WTG01
Dugald River Mine
MET MAST 2
WTG02
MMG DUGALD RIVER MINE ACCESS ROAD
Receptor - Fly Camp Location
WTG03
S4
S5
S6
Cabbage Tree Creek
WTG04
S7
WTG05
WTG06
MET MAST 1
WTG07
WTG08
S9
S8
Residential Dwelling - McMillan Homestead

Legend

- Turbine Location
- Met Mast
- Receptor
- Residential Dwelling
- Major Watercourse
- Local Road
- 33kV Powerline
- 220kV Powerline
- Substation
- Project Area
- Disturbance Footprint
- Micrositing Corridor

Predicted Noise Level, LAeq dB(A)

- 30
- 35
- 40
- 45
- 50
- 55
- 60

Source:
Base Data - QSpatial
Imagery - ESRI World Imagery

Coordinate System:
GDA2020 MGA Zone 54
Date: 02/04/2026
Created By: CB
Drawing Size: A3
0 0.75 1.5Km
1:50,000

F3-1 Predicted Noise Contours for WTGs under the Project's Environmental Conditions

MMG Dugald River Renewables
Noise Assessment
Client: MMG

ERM

0755929_DRWF_MMG_NoiseAssessment_R02.aprx

3.4 WIND TURBINE NOISE CHARACTERISTICS

The acoustic criteria for WTGs as per State Code 23 considers the fundamental characteristics of Wind Farm noise, including aerodynamic noise from the rotating blades, amplitude modulation, the mechanical noise of the gearbox and other hub and nacelle components, as well as other less frequent and short-term noises that may occur, such as braking or start-up procedures.

The considerations of these noise characteristics in the assessment and WTG design are summarised in Table 3-7.

TABLE 3-7 WTG NOISE CHARACTERISTICS

Noise Characteristic	Discussion
Amplitude modulation	Expected characteristic of WTG noise (commonly described as a 'swish'). Accounted for by assessment under the State Code 23 criteria.
Low frequency noise	Refers to sound with frequencies between 20Hz and 200 Hz. Modern turbines produce broadband noise across the frequency spectrum. With large separation distances, higher frequency noise is attenuated at a greater rate, resulting in a higher concentration of lower frequency noise at residences. It is noted that the normal acoustic environment contains many other sources of low frequency sound which are commonly experienced, such as the sound of diesel engines, aircraft flyovers, blasting, mechanical plant (including pumps, compressors, air-conditioners and gas turbines), surf waves breaking on a beach, waterfalls, thunder, wind blowing the foliage of trees and shrubs, etc. Accounted for by assessment under the State Code 23 criteria.
Tonality	A normal operating WTG without mechanical faults may still exhibit sound with tonal characteristics. The WTG manufacturer shall provide a guarantee that the supplied WTGs will not exhibit tonal characteristics at residences as per recommendation in Planning Guideline.
Impulsivity	Not a normal characteristic of wind turbine noise but which may occur infrequently as a result of mechanical or aerodynamic problems with the WTG. Impulsive sound is best addressed during the operational phase by maintenance, if and when they occur.
Infrasound	State Code 23 references a study conducted by Resonate Acoustics for the South Australian Government Environmental Protection Authority (EPA) entitled 'Infrasound Levels Near Windfarms and in Other Environments', (SA EPA & Resonate Acoustics, 2013). The study analysed measured G-weighted infrasound levels from wind turbines at 4 rural locations for a period of 1 week. Localised wind conditions appeared to be the primary source of infrasound in rural locations. The study concludes that the level of infrasound at houses near the wind turbines assessed is no greater than that experienced in other urban and rural environments, and is also significantly below the human perception threshold.

3.5 CUMULATIVE WIND FARM NOISE IMPACTS

There are no new or proposed Wind Farm Project's that are likely to contribute additional noise to any of the assessed noise sensitive receptors identified within a 5 km buffer from the Project. As such the further assessment for cumulative noise impacts is not required.

4. BESS ASSESSMENT

4.1 ASSESSMENT REQUIREMENTS

This BESS assessment has been conducted in accordance with the following policies and guidelines:

- Department of State Development, Infrastructure and Planning, State Code 27: Battery storage facility development (Queensland Government, 2025); and
- Environmental Protection (Noise) Policy 2019 [EPP Noise 2019] (Queensland Government, 2019; Queensland Government, 2019b).

4.1.1 STATE CODE 27

The planning guideline for State Code 27 (Queensland Government, 2025) provides details on the information that is required to assess compliance with its Acoustic Amenity and Vibration performance outcomes (PO20 and PO21).

The planning guideline states that the development must be designed, constructed, and operated to ensure noise and vibration emissions do not adversely impact sensitive receptors.

Section 4.9 of the Planning Guideline is relevant to this assessment and states that if any sensitive receptors could possibly be affected by noise, then a Noise Impact and Vibration Assessment (NIVA) report should be prepared to demonstrate compliance with the relevant levels in the EPP Noise 2019. However, as vibration impacts are not expected at the identified sensitive receptors due to the significant separation distances involved, this report is termed as a NIA.

As noted in State Code 27, the EPP Noise 2019 sets out the Acoustic Quality Objectives (AQO) for nearby sensitive receptors. In addition to the AQOs in the EPP Noise 2019, the development must demonstrate background ambient noise on nearby sensitive receptors is not impacted by complying with 30 to 35 dB(A) at the outdoor façade or, if background noise is 'very low' (e.g. rural areas) - background noise + 5 dB(A).

While background noise at the NSRs is low, ERM does not deem the level to be 'very low' based on a qualitative review of the area. Hence, 35 dB(A) is set as the 'Additional State Code 27 Criterion' for all periods, in addition to the EPP Noise 2019 AQOs.

Although State Code 27 prescribes a range of criteria (30 to 35 dB(A)), the criterion of 35 dB(A) instead of 30 dB(A) is justifiable. This is because the lowest estimated background noise level is estimated to be 30 dB(A) during the night and intrusiveness to a residential receptor is typically experienced at 5 dB(A) above the background noise level.

4.1.2 ACOUSTIC QUALITY OBJECTIVES (EPP NOISE 2019)

In Queensland, noise is regulated under the *Environmental Protection Act 1994* (Queensland Government, 1994) and subordinate regulation and policy including the Environmental Protection 2019 Regulation (Queensland Government, 2019a), and the EPP Noise 2019 (Queensland Government, 2019b).

Schedule 1 of the EPP Noise lists the acoustic quality objectives (AQO) for residential sensitive receptors and are provided in Table 4-1**.**

TABLE 4-1 ACOUSTIC QUALITY OBJECTIVES

Sensitive Receptor	Time of Day	Acoustic Quality Objectives (measured at the receptor) dB(A)			Environmental Value
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,1hr}$	$L_{A1,adj,1hr}$	
Residence (for outdoors)	daytime and evening	50	55	65	health and wellbeing
Residence (for indoors)	daytime and evening	35	40	45	health and wellbeing
	night-time	30	35	40	health and wellbeing, in relation to the ability to sleep
Residence (for indoors) – Converted to outdoors*	daytime and evening	42	-	-	-
	night-time	37	-	-	-

Notes:
$L_{A1,adj,1hr}$ means the A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 1% of a 1-hour period when measured using a fast standardised response time.
$L_{A10,adj,1hr}$ means the A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 10% of a 1-hour period when measured using a fast standardised response time.
$L_{Aeq,adj,1hr}$ means an A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within a 1-hour period has the same mean square sound pressure of a sound that varies with time.
The adjustment, 'adj' for tonal character, impulsiveness.

*Referring to the Noise and Vibration – EIS Information Guideline (Queensland Government DES, 2022), for typical Queensland buildings with open windows, an outdoor to indoor noise attenuation value of 7 dB is to be used.

For this assessment, noise emissions from the BESS are assumed to be continuous under a worst-case scenario during any 1-hour period, and therefore the $L_{Aeq,adj,1hr}$ parameter is the most appropriate AQO for this assessment.

Both the residence (for outdoors) and residence (for indoors) AQO in Table 4-1 must be met as per EPP Noise 2019. When the residence (for indoors) AQO is converted to outdoor levels, it is the more stringent AQO and will therefore be used to determine the assessment criteria.

4.2 BESS ASSESSMENT CRITERIA

BESS assessment criteria have been determined in Table 4-2 and are the more stringent level between the State Code 27 additional criteria (Refer to Section 4.1.1) and the EPP Noise 2019 acoustic quality objectives (AQOs) (Refer to Section 4.1.2) for all assessment periods.

TABLE 4-2 BESS ASSESSMENT CRITERIA

Receptor Ref.	Assessment period (T)[1]	Estimated Average Background Noise Level	Additional State Code 27 Criterion	EPP Noise 2019 AQO	Project Assessment Criteria
		$L_{A90,T}$[2] dB(A)	$L_{Aeq,adj,T}$ dB(A)		
All Sensitive Rceptors	Day	40	35	42	**35**
	Evening	35	35	37	**35**
	Night	30	35	37	**35**

Note:
1. *Day - 7am to 6pm; Evening - 6pm to 10pm; Night - 10pm to 7am.*
2. *Estimated average background noise levels based Rural land use and Negligible Transportation data provided in Appendix A of the Australian Standard AS 1055.3—1997: Acoustics—Description and measurement of environmental noise, Part 3: Acquisition of data pertinent to land use* (Standards Australia, 1997).

Table 4-2 reflects that the BESS assessment criteria are dictated by the additional criterion of 35 dB(A) from State Code 27 for all assessment periods. By meeting this criterion, it should be noted that the EPP Noise 2019 AQOs are also met.

4.3 BESS NOISE MODELLING

Noise modelling has been undertaken using SoundPLAN version 9.1, which is a software package utilised for the calculation, presentation, assessment, and prediction of environmental noise. The noise prediction algorithms implemented in the noise model for this NIA, as selected in the software package, are from ISO 9613-2:2024 *Acoustics – Attenuation of sound during propagation outdoors* (Standards Australia, 2024).

The noise modelling takes into consideration the sound power levels of the proposed site equipment, and applies adjustments for attenuation from geometrical dispersion, acoustic shielding from intervening ground topography, ground effects, meteorological effects, and atmospheric absorption.

The noise modelling parameters are summarised in Table 4-3.

TABLE 4-3 NOISE MODELLING PARAMETERS

Modelling Aspect	Parameter
Software	SoundPLAN v9.1
Outdoor Noise Propagation Algorithm	ISO 9613-2:2024 *Acoustics – Attenuation of sound during propagation outdoors* (Standards Australia, 2024)
Ground Absorption Factor	0.5 (50% acoustically hard ground and 50% acoustically soft ground)

Modelling Aspect	Parameter
Project environmental conditions	59% Humidity & 23°C Temperature Note: Higher temperatures and humidity generally lead to increased air absorption, meaning sound will be attenuated (reduced) more significantly over distance, especially at higher frequencies.
Topographical contours	10-metre contour interval terrain data, extracted from Queensland Spatial Catalogue (QSpatial)
Receptor height	1.5 m

4.3.1 OPERATIONAL NOISE SOURCES

The modelled noise sources, references and assumptions for the assessed operational scenario of the BESS is summarised in Table 4-4. The location of the BESS substation is shown in Figure 4-1.

Representative assumptions for the sound power levels of the components have been made in consultation with the client. The BESS components will be finalised during the detailed design stage.

TABLE 4-4 MODELLED NOISE SOURCES AND ASSUMPTIONS

Location	Plant Item	Sound Power Level per Plant Item, $L_{Aeq,adj}$	Sound Power Level Reference	Quantity	Assumptions
BESS Substation	Battery Units	87 dB(A)	Manufacturer's data ref.: • BYD - MC Cube MC10C-B5010-U-R2M01, MC Cube 10+1 Test Report (Ref. D2508038410, dated 29 August 2025)	Stage 1: 18 Stage 2: 48 Total: 66	• Reference data – Sound Power Level of 87 dB(A) at 45°C. • Dimensions are specified at 6.1 m (W) x 2.9 m (H) x 2.4 m (L). • Source modelled as an area source for total number of battery containers.
	Medium Voltage Power Station	91 dB(A)	Manufacturer's data ref.: • Medium Voltage Power Station 4600-S2 (SCS 4600 UP-S), Sunny Central Storage UP-S Technical Datasheet	Stage 1: 9 Stage 2: 24 Total: 33	• Reference data – Sound Power Level of 91 dB(A) with no silencer kit. • Dimensions are specified at 1.8 m (W) x 2.3 m (H) x 1.6 m (L). • Source modelled as an area source for total number of Medium Voltage Power Station.

The assessment has conservatively assumed that all plant items are operating at the stated modelled sound power levels for all assessment periods (i.e. day, evening, and night).

4.4 PREDICTED BESS OPERATIONAL NOISE

The predicted modelling operational noise levels at the noise sensitive receptors are summarised in Table 4-5 and assessed against the BESS assessment criteria.

TABLE 4-5 PREDICTED OPERATIONAL NOISE LEVELS

Receptor ID	Approx. Distance to BESS Substation	BESS Assessment Criteria for all Periods	Predicted Operational Noise Level in $L_{Aeq,adj,T}$ dB(A) – Stage 1 & Stage 2
DRM Accommodation Camp	1.5 km	35	28
DRM Fly Camp	2.7 km	35	20
McMillan residence	>5 km	35	<15

The predicted noise levels indicate compliance with the BESS assessment criteria based on the modelled noise sources and assumptions as discussed above.

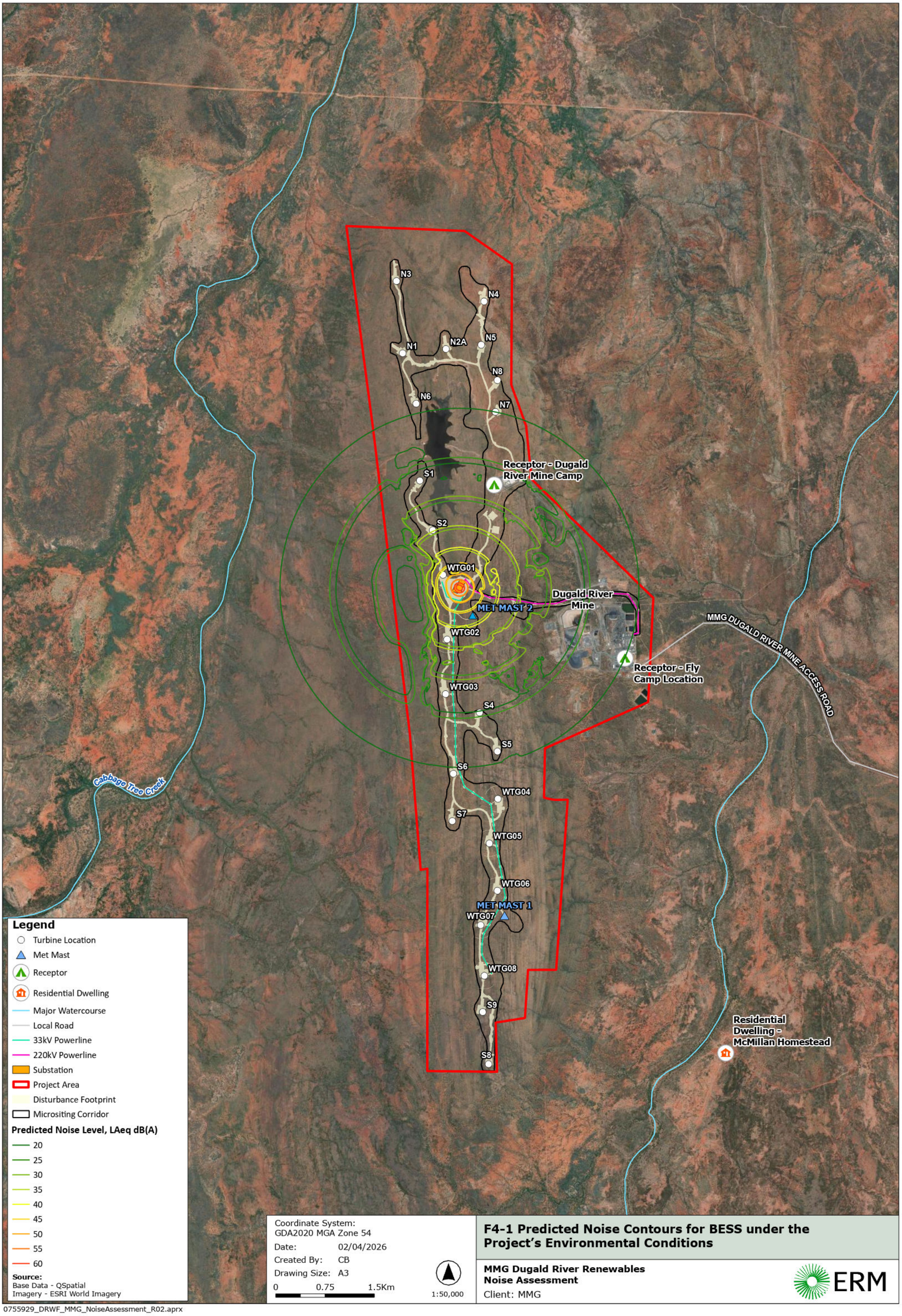
A noise contour map for the BESS operational noise impacts under the project environmental conditions at 59% Humidity and 23°C Temperature is presented in Figure 4-1.

4.5 CUMULATIVE INDUSTRIAL NOISE IMPACTS

The EPP Noise 2019 AQO are also cumulative noise criteria which consider noise emissions from all other nearby existing and future developments.

There is no other existing development or future development within 5 km of the Project which may contribute to noise emissions at the noise sensitive receptors. Therefore, the predicted BESS operational noise levels, as presented in Table 4-5, are also considered as the predicted cumulative noise levels.

No specific noise mitigation measures are recommended for the BESS due to cumulative noise impacts.



0755929_DRWF_MMG_NoiseAssessment_R02.aprx

5. RECOMMENDATIONS

5.1 WIND FARM

No specific noise mitigation measures are required for the Wind Farm. Notwithstanding, The following recommendations are provided as safeguards to minimise or reduce noise impacts from the Project.

Background noise monitoring

Due to the low margin of criteria compliance at the DRM Accommodation Camp once Stage 2 is complete, the criterion at this location is advised to be refined by conducting background noise monitoring in accordance with State Code 23 prior to Stage 1 construction. This is to ensure background noise levels are measured without the influence of wind turbine noise and other industrial noise sources. Monitoring will allow for background noise levels ($L_{A90, 10min}$) to be correlated for a range of hub height wind speeds. The results of the correlated data will allow for the acoustic criteria to be derived for a range of hub height wind speeds to reassess WTG noise levels at this location.

Noise monitoring Plan

During operation, a noise monitoring plan shall be prepared for the Project as required by the Planning Guideline (DILGP, 2025b). This may include details of:

- The position of proposed residential monitoring locations (subject to access being agreed with each landholder);
- The proposed number of noise monitoring periods and the duration of each noise monitoring period;
- The proposed make and model of equipment and wind shields used for noise monitoring;
- The proposed method for determining wind speed and rainfall at microphone height;
- Details of any additional noise measurements to assist in the determination of the contribution of noise from the Project;
- The measured background noise levels at the proposed residential monitoring locations; and
- The proposed method of determining wind speed at hub height (by direct measurement or measurement and correction) and demonstration that the wind speed is equivalent to the wind speed used for background noise monitoring.

5.2 BESS

No specific noise mitigation measures are required for the BESS.

Opportunities for other mitigation strategies through technology selection, localised equipment noise control among other options with equivalent or improved noise impact mitigation performance may be considered in the detailed design phase, however, are not required to achieve compliance with the applicable noise limits.

Equipment selection and quantity are to adhere to the Sound Power Level per plant item and quantity specified in the assessment. Should the Sound Power Level, location or quantity of the selected equipment change significantly, this assessment should be revised to incorporate the changes in design.

6. CONCLUSION

This NIA has evaluated the noise impacts associated with Stage 1 and Stage 2 of the Project in accordance with State Code 23 (DILGP, 2025a) and the associated Planning Guideline (DILGP, 2025b) as well as State Code 27 (Queensland Government, 2025) and the EPP Noise 2019 (Queensland Government, 2019b).

Three noise sensitive receptors were identified, namely, a dwelling (the McMillan residence), the DRM Accommodation Camp and the DRM Fly Camp. All receptors are considered Host Lots as defined by State Code 23 for the purposes of this assessment.

Proposed Wind Farm

Noise output from WTGs proposed as part of the Stage 1 and Stage 2 were modelled by referencing the noise emission data from the Goldwind GW165-6.0MW turbine, the nominated for the Project. The Goldwind GW165-6.0MW turbine was modelled at a hub height of 130 m and a sound power level of 112.2 dB(A).

The worst-case predicted noise levels at the sensitive receptors were assessed against the base acoustic criteria defined in State Code 23, and compliance is predicted at the three identified sensitive receptors.

Should the Project Layout or WTG model deviate from this assessment, an updated noise model and impact assessment is required to verify compliance with the acoustic criteria with the revised Project data, with the revised results informing the selection of noise mitigation measures, if necessary.

Proposed BESS

The applicable BESS operational assessment scenario was also developed based on project information outlined in this report.

The BESS noise assessment indicates that at the three noise sensitive receptors, compliance is predicted to be achieved against Performance Outcome PO20 of the Planning guideline - State Code 27 and the AQO from EPP Noise 2019. No specific noise mitigation measures are required for the BESS.

Opportunities for other mitigation strategies through BESS technology selection, localised equipment noise control among other options with equivalent or improved noise impact mitigation performance may be considered in the detailed design phase, however, are not required to achieve compliance with the applicable noise limits.

Equipment selection and quantity are to adhere to the Sound Power Level per plant item and quantity specified in the assessment. Should the Sound Power Level, location or quantity of the selected equipment change significantly, this assessment should be revised to incorporate the changes in design.

Based on the findings of this report, the Project is unlikely to generate noise impacts the nearest sensitive receptors to the Project site.

7. STATEMENT OF LIMITATIONS

- The findings of this Report are solely based on, and the information provided in this Report is strictly limited to that required by, the Scope of Work. Except to the extent stated otherwise, in preparing this Report ERM has not considered any question, nor provides any information beyond that required by the Scope of Work.
- This Report was prepared between March 2026 and April 2026 and is based information available at the time of preparation. The Report does not, and cannot, consider changes in law, factual circumstances, applicable regulatory instruments or any other future matter. ERM does not, and will not, provide any on-going advice on the impact of any future matters unless it has agreed with MMG to amend the Scope of Work or has entered into a new engagement to provide a further report.
- Should the Project Layout or BESS / Turbine model selection deviate from this assessment (with any potential for a noise level increase at the noise sensitive receptors), an updated noise assessment is required to verify compliance with the acoustic criteria.
- This Report must be read in full, and no excerpts are to be taken as representative of the whole Report. To ensure its contextual integrity, the Report is not to be copied, distributed or referred to in part only. No responsibility or liability is accepted by ERM for use of any part of this Report in any other context.
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APPENDIX A WIND TURBINE COORDINATES

Wind Turbine ID	Coordinates (GDA2020 Zone 54)	
	X	Y
Stage 1		
WTG 01	409308	7761571
WTG 02	409372	7760589
WTG 03	409350	7759760
WTG 04	410145	7758164
WTG 05	410015	7757487
WTG 06	410137	7756766
WTG 07	409883	7756243
WTG 08	409940	7755473
Stage 2		
N1	408698	7764948
N2A	409356	7765013
N3	408605	7766047
N4	409937	7765737
N5	409893	7765077
N6	408903	7764181
N7	410109	7764056
N8	410139	7764538
S1	408959	7763010
S2	409155	7762256
S4	409868	7759481
S5	410140	7758889
S6	409468	7758550
S7	409453	7757830

Wind Turbine ID	Coordinates (GDA2020 Zone 54)	
	X	Y
S8	410005	7754131
S9	409916	7754924

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