Appendix 4

Noise and vibration response to DPHI request for additional information

MEMO

MARSHALL DAY Acoustics

Project:	Valley of the Winds Wind Farm	**Document No.:**	Mm 007 r01		
To:	Ramboll Australia Pty Ltd	**Date:**	4 April 2024		
Attention:	Belinda Sinclair	**Cross Reference:**	Rp 003 r01 20191254 Mm 005 r05 20191254		
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CC:	Claire Butterfield				
Subject:	Response to DPHI Request for Additional Information				

INTRODUCTION

Marshall Day Acoustics Pty Ltd (MDA) has previously conducted an Environmental Impact Statement (EIS) noise assessment for the Valley of the Winds Wind Farm (the Project). This work has been summarised in the EIS Noise Assessment[1] dated 23 February 2022.

Subsequent changes to several aspects of the project have since required that additional updates, clarifications, and additions to the EIS Noise Assessment be carried out. These items have been summarised in MDA document Addendum to EIS Noise Assessment[2], dated 25 September 2023.

In response to the submission of these documents, the NSW Department of Planning, Housing and Infrastructure (DPHI)[3] have issued a Request for Additional Information[4], dated 21 December 2023, requesting:

- Further information / assessment of noise, vibration and blasting impacts associated with quarry activities; and
- Detail on the proposed workforce accommodation facility, with consideration given to noise.

This memo provides further information and assessment regarding the above items.

[1] *Rp 003 r01 20191254 Valley of the Winds wind farm - EIS Noise Assessment*

[2] *Mm 005 r05 20191254 – VoW – Addendum to EIS Noise Assessment*

[3] *Known as the Department of Planning and Environment at the time of the issue of the document*

[4] *Request for Additional Information - 21 December 2023, SSD-10461*

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QUARRY ACTIVITIES

Following submission of the EIS, the Proponent completed a layout refinement to reduce environmental, amenity and social impacts of the Project. This resulted in a reduced indicative construction footprint, including the removal of wind turbines.

The proposed changes mean that less material will be extracted as part of the proposed quarrying activities than previously required. On this basis, Ramboll have requested that MDA review the assessments conducted to date to establish whether updates or additions are required to align with the currently proposed quarry activities.

Construction / operational noise

The three (3) quarry locations proposed for the Project allow construction material for the Project infrastructure (roadways, handstands, building and wind turbine foundations) to be extracted on-site. It is expected that operation of the quarries will be limited to only the Project construction stages. Consequently, operation of the quarries has been treated as a construction work process, with associated noise previously assessed by MDA as part of the EIS Noise Assessment.

While changes to the proposed operation of the quarries have occurred as planning of the Project has developed, the proposed quarry locations have not changed. It is understood that the primary change to operations is related to a reduction in the tonnage of material to be extracted due to project design refinements including a reduction in wind turbine numbers since EIS lodgement.

This means that the equipment, plant items and other quarry related assumptions summarised in the EIS Noise Assessment continue to be valid and the associated predicted noise levels continue to be representative. Given this, no update or additions to the assessment are necessary. The predicted noise levels associated with quarry activities are below the noise management levels at all receivers.

Construction / operational vibration

All receivers identified in the EIS Noise Assessment are more than 2,000 m from any of the three (3) proposed quarry locations. No plant or equipment items are likely to be utilised during quarry activities that will give rise to vibration impacts at this distance.

Blasting

The specific requirement or otherwise for blasting will be determined once a main contractor is appointed and project-specific construction plans and methods are established. At this stage blasting may be required for quarry activities and at wind turbine foundations during the construction phase of the wind farm.

Theoretical modelling of airblast and ground vibration is complex and subject to considerable uncertainty. The blasting process is highly non-linear, and the variability of ground and rock conditions limits the accuracy of predictions.

In the absence of the specific information required in accordance with the ANZEC 1990 Report, as referred to in Section 2.5.3 of the EIS Noise Assessment, it is not possible to provide site specific airblast and ground vibration levels.

Notwithstanding the above, to provide an indication of the effects of blasting, airblast overpressure levels and ground vibration levels have been estimated using the method detailed in AS 2187-2:2006 *Explosives—Storage, transport and use, Part 2: Use of explosives* (AS 2187-2), based on generic assumptions. It is not feasible to establish whether these assumptions are suitable for the project site until such time as a blasting plan is established and necessary site characteristics have been evaluated.

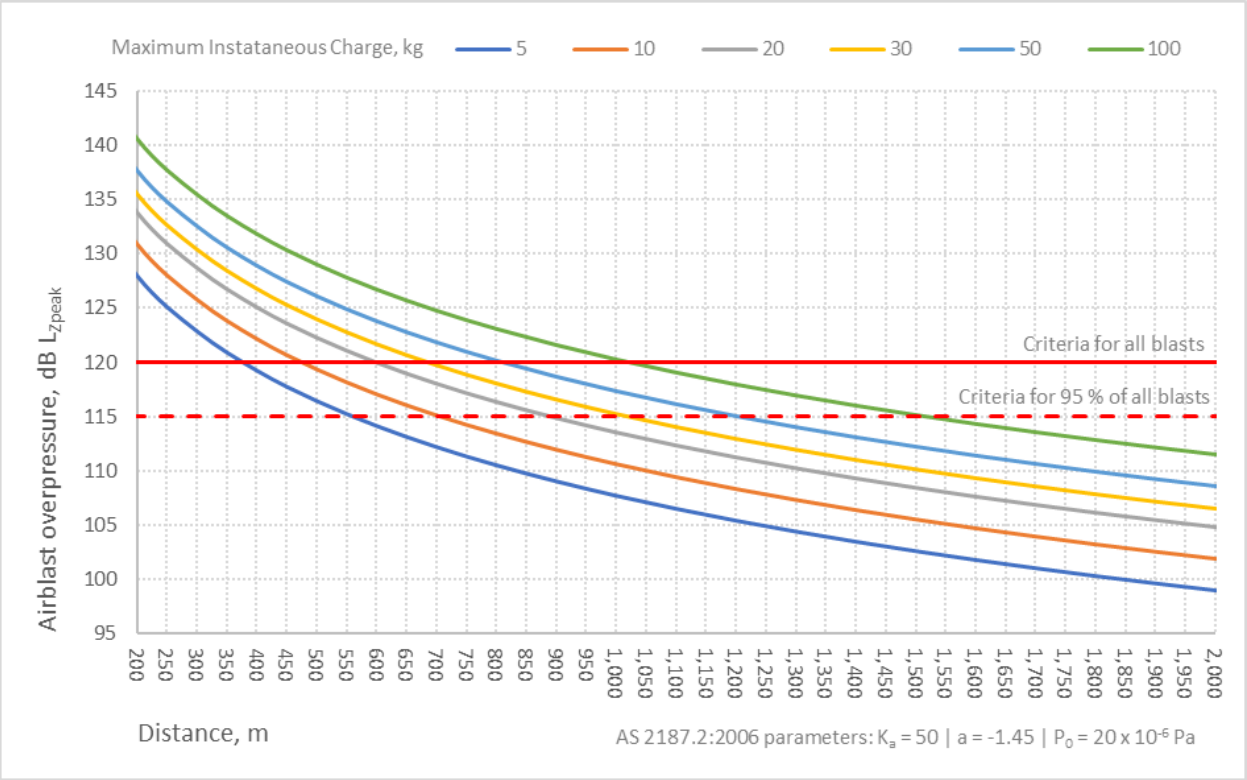
The method accounts for the separating distance, the mass of the charge detonated in any given instant (referred to as the maximum instantaneous charge), the configuration of the charge (unconfined versus confined blastholes), and site characteristics that can be evaluated from measurements of test shots.

Airblast overpressure

Estimated airblast overpressure levels are presented in Figure 1 for a range of separating distances and maximum instantaneous charge weights. The estimated levels are based on confined blasthole charges and assumed site characteristics[5].

The criteria specified in the ANZEC 1990 Report, set out in Section 2.5.3 of the EIS Noise Assessment, are also shown in Figure 1.

Figure 1: Estimated airblast overpressure levels for K_a = 50 and a = -1.45



Ground vibration

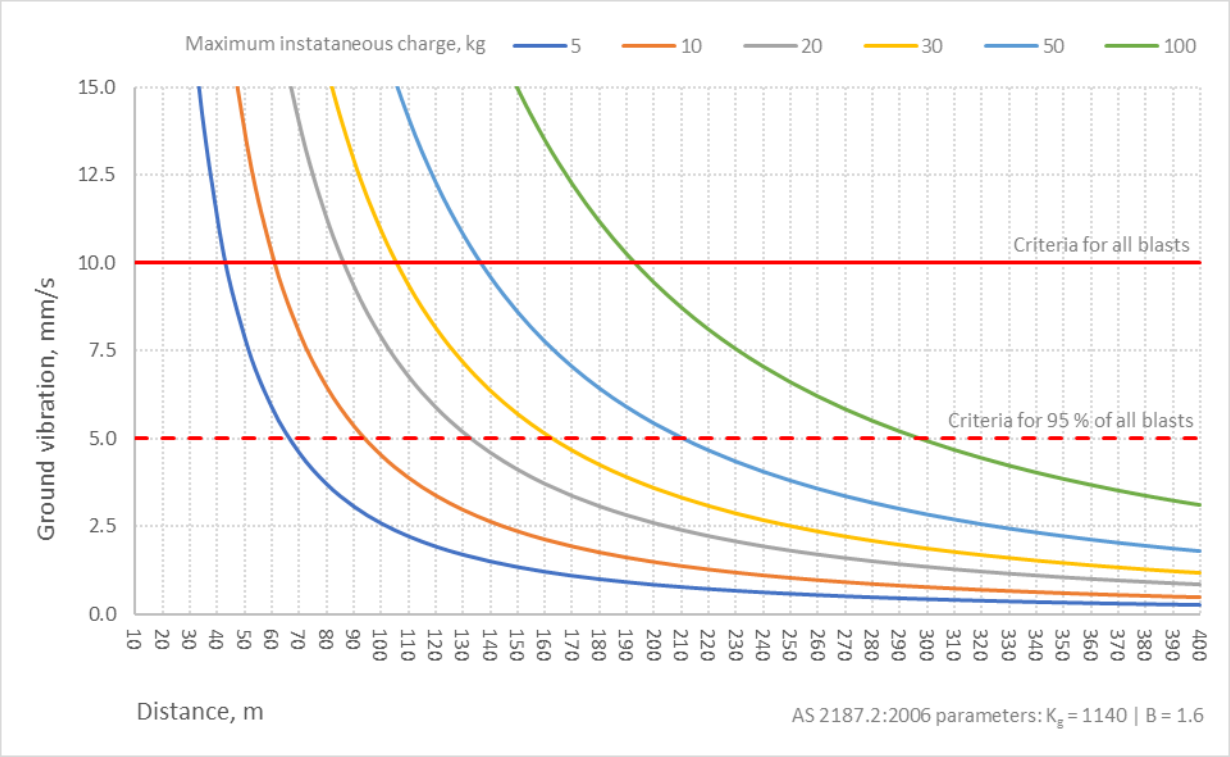
Estimated ground vibration levels are presented in Figure 2 for a range of separating distances and maximum instantaneous charge weights. The estimated levels are based on assumed site characteristics[6].

The criteria specified in the ANZEC 1990 Report, set out in Section 2.5.3 of the EIS Noise Assessment, are also shown in Figure 2.

[5] Site-specific characteristics are defined in terms of a site exponent and site constant. AS 2187-2 refers to a site exponent of -1.45 for estimating overpressure, with corresponding site constants commonly ranging from 10 to 100. In lieu of site-specific data, a site exponent of -1.45 and a mid-value site constant of 50 has been assumed for estimating overpressure.

[6] In lieu of site-specific data, a site exponent of 1.6 and a site constant of 1140 as provided in the example calculation in AS 2187-2 has been assumed for estimating ground vibration.

Figure 2: Estimated ground vibration levels for K_g = 1140 and B = 1.6



The minimum distances between receivers and potential blasting locations i.e. quarries or wind turbine foundations are summarised in Table 1, based on information provided by the client and detailed in the EIS Noise Assessment. Only the closest receiver to each blasting location is detailed.

Table 1: Closest receivers to potential blasting locations

Potential blasting location	Receiver	Distance, m
Non-associated receivers		
Quarry (Leadville cluster)	182	2,578
Quarry (Mount Hope cluster)	86	3,101
Quarry (Girragulang Road cluster)	278	3,838
Wind turbine (LV03)	190	2,083
Associated receiver		
Quarry (Leadville cluster)	303	2,057
Quarry (Mount Hope cluster)	281	2,234
Quarry (Girragulang Road cluster)	258	4,105
Wind turbine (MH49)	250	882

Based on these distances, and the estimated airblast overpressure and ground vibration levels, the following can be established:

- Estimated airblast overpressure levels at all non-associated receivers are below the criteria set for all blasts; and
- Estimated airblast overpressure levels at associated receiver 250, and any other associated receiver within 1,100 m of a blasting location (297, 258, 303 and 310) may be above the criteria for all blasts for some maximum instantaneous charge weights; and
- Estimated ground vibration levels at all non-associated and associated receivers are below the criteria set for all blasts.

Accordingly, if blasting is required, the activities would need to be controlled using blast management procedures documented in an approved construction management plan. The procedures would need to identify the locations where blasting could be conducted, and describe the testing, management and monitoring measures which would be implemented to achieve the ANZEC 1990 Report criteria. This is expected to involve conducting test shots to evaluate site-specific characteristics, in turn enabling the selection of suitable maximum instantaneous charge weights that are appropriate for the site.

WORKFORCE ACCOMODATION FACILITY

The workforce accommodation facility forms an assortment of temporary infrastructure required only during the construction stages of the wind farm. Generally, the workforce accommodation facility is more than 1,500 m from associated receivers and more than 2,000 m from non-associated receivers, however, two (2) receivers are located within 100 m of the proposed facility boundaries:

- 502 – classed as a non-associated receiver and comprising an uninhabited burnt down dwelling; and
- 307 – classed as an associated receiver.

Operational noise

At this stage of the Project, information with respect to the workforce accommodation facility is minimal and limited to proposed site boundaries. No information is available with respect to site design, locations of structures, routing of internal roads, mechanical services equipment, operational noise sources or other factors that would influence noise emissions from such a facility. It is expected that these will be developed and defined once a main contractor is appointed.

Noise sources associated with the workforce accommodation facility are likely to include vehicle movements within the facility site, mechanical services, and general habitation noise. Due to the nature of the operation of the facility it is expected that noise emissions would need to comply with the NSW EPA *Noise Policy for Industry* 2017 (NPfI) including applicable project noise trigger levels, similar to other ancillary infrastructure considered as part of the EIS Noise Assessment.

Due to the variation in site design that could occur, assumptions with respect to operational noise are not practical or feasible, however widespread noise control of typical noise sources can be achieved through simple site design considerations and management controls.

On this basis, it is expected that the workforce accommodation facility can be operated in such a manner that compliance with the NPfI is achievable, provided appropriate site design and noise control measures are included in the formalised facility design.

Specific noise control requirements, and the potential extent of these requirements should be defined based on a qualitative or quantitative assessment of compliance with the applicable noise limits once a main contractor is appointed and the design of the facility is formalised.

As a matter of course the following should be considered:

- Locating workforce accommodation facility infrastructure as far from the dwellings as feasible;
- Positioning of building infrastructure to provide shielding to other noise sources;
- Mandating appropriate noise limiting management controls;
- Selection and design of mechanical services equipment considering noise emissions; and
- Provision of physical noise control measures such as barriers.

Construction noise

As a main contractor has not been appointed, and the specific design of the workforce accommodation facility is not known, information related to Project specific construction staging and proposed equipment and plant items is not available.

The erection of structures, construction of internal roadways and installation of demountables typical for the construction of a workforce accommodation facility is expected to be similar from project to project. As a consequence, it is possible to make appropriate assumptions with respect to representative construction processes and equipment.

To enable an assessment of construction noise to be carried out, the Proponent has provided a list of equipment that may be used for the construction of the workforce accommodation facility. This is summarised in Table 2.

Example construction staging and equipment items associated with each stage is summarised in Table 3.

Table 2: Example plant / equipment relevant to workforce accommodation facility construction, including sound power levels, dB L_{WA}

Plant / Equipment	Sound power level
Excavator (100 to 200 kW)	107
Crane (200 t)	105
Delivery Trucks	107
Concrete trucks	108
Grader	110
Bulldozer	108
Roller (vibratory)	108
Loader (wheeled)	105
Front end loader	113
Machine mounted hydraulic drill	113
Vehicle (light commercial e.g. 4WD)	106
Forklift	106
Hand tools (electric)	102

Table 3: Example construction stages, associated plant / equipment, and overall sound power levels, dB L_{WA}

Construction stage	Plant / Equipment	Approximate overall sound power level
Stage 1	2 x Excavator (100 to 200 kW), 2 x Delivery Trucks, 2 x Concrete trucks, 1 x Grader, 2 x Bulldozer, 1 x Roller (vibratory), 2 x Loader (wheeled), 1 x Front end loader, 1 x Machine mounted hydraulic drill, 4 x Vehicle (light commercial e.g. 4WD)	120
Stage 2	2 x Crane (200t), 2 x Delivery Trucks, 4 x Vehicle (light commercial e.g. 4WD), 2 x Forklift, 2 x Hand tools (electric)	115

Construction noise has been calculated based on the method detailed in the EIS Noise Assessment, specifically considering NSW DECC[7] publication *Interim Construction Noise Guideline*, dated 2009 (ICNG) and Australian Standard 2436:2010 *Guide to noise and vibration control on construction, demolition and maintenance sites (AS 2436).*

Sound power levels for plant / equipment items have been determined from guidance and data sources including AS 2436 and noise level data from previous projects of a similar nature. Sound power levels for individual items and total aggregated sound power levels for both construction stages are summarised in Table 2 and Table 3 respectively.

Noise levels associated with each of the two construction stages for the workforce accommodation facility have been predicted at receiver 502 and receiver 307 and are shown in Table 4.

It should be noted that the assessment is not intended to be an indication of absolute, Project specific noise levels but a generalised assessment of potential risks associated with construction noise for the workforce accommodation facility. Once specific construction stages and associated project specific plant / equipment are known, more robust, Project specific evaluation of noise impacts will be feasible.

Table 4: Indicative range of construction noise predictions, dB L_{Aeq}

Construction stage	Predicted level range	Noise affected management level	Exceedance	Highly noise affected management level	Exceedance
Non-associated receiver - 502					
Stage 1	70-75	45	25-30	75	-
Stage 2	65-70	45	20-25	75	-
Associated receiver - 307					
Stage 1	75-80	45	30-35	75	0-5
Stage 2	70-75	45	25-30	75	-

Construction noise levels predicted at associated receiver 307 are typical for construction works occurring at separating distances less than 100 m. Additionally, given typically low background noise levels in rural locations, and the indicated exceedance of the highly noise affected management level, adverse noise impacts are at an increased likelihood of occurring.

The predicted noise levels represent a likely worst case, with all plant / equipment nominated for the construction stage generally assumed to be concurrently operating at 100 %, in the same work area, at the closest possible position to the subject receiver. In practice this situation is likely to occur rarely, if at all, and

[7] The former Department of Environment and Climate Change, now the DPIE

for very brief periods. For a majority of the remainder time, noise levels will be below that predicted, in most cases significantly below.

The information provided in this risk assessment should be used by the Proponent and main contractor in assisting the development of the construction staging and plant / equipment items for the workforce accommodation facility. Effort should be made to reduce noise levels and potential noise impacts when compared to the assumptions indicated in this document.

Specific noise control measures will be developed at a later time once detailed assessment of construction noise is conducted; however, example controls capable of reducing construction noise may include:

- Dividing the proposed two (2) stages of construction into smaller stages comprising less plant / equipment (this may extend the duration of the construction period);
- Reducing the number of equipment items operating concurrently within specific stages through scheduling (this may extend the duration of the construction period);
- Providing respite periods;
- Limiting construction works to daytime periods when receivers are typically less sensitive to noise (noting that construction works are expected to occur during standard construction hours as a matter of course); and
- Utilising quieter work methods, plant, or equipment.

With appropriately designed Project specific construction methods, construction noise levels can be significantly reduced compared to that outlined in Table 4.

Adverse construction noise impacts at associated receiver, 502, are likely to be nil, as the dwelling is abandoned, uninhabitable and unlikely to be rebuilt during the proposed Project timeframes.