APPENDIX J NOISE IMPACT ASSESSMENT

Denman Battery Energy Storage System

Noise Impact Assessment

PREPARED FOR

Denman BESS Holdings Pty Ltd as a Trustee for the Denman BESS Trust

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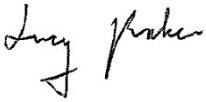
Denman Battery Energy Storage System

Noise Impact Assessment

0717735



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ACRONYMS AND ABBREVIATIONS

Acronyms	Description
BESS	Battery Energy Storage System
CNVMP	Construction Noise and Vibration Management Plan
CON	Reference for modelling scenarios for the construction noise assessment

Acronyms	Description
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).
EPA	Environment Protection Authority
ICNG	Interim Construction Noise Guideline
L_{10}	The noise level exceeded for 10 per cent of the time and is approximately the average of the maximum noise levels.
L_{90}	The noise level exceeded for 90 per cent of the time and is approximately the average of the minimum noise levels. The L_{90} level is often referred to as the "background" noise level and is commonly used as a basis for determining noise criteria for assessment purposes.
L_{eq}	The 'equivalent continuous sound level', L_{eq}, is used to describe the level of a time-varying sound or vibration measurement. L_{eq} is often used as the "average" level for a measurement where the level is fluctuating over time. Mathematically, it is the energy-average level over a period (i.e., the constant sound level that contains the same sound energy as the measured level). When the dB(A) weighting is applied, the level is denoted dB L_{Aeq}. Often the measurement duration is quoted, thus $L_{Aeq,15\ min}$ represents the dB(A) weighted energy-average level of a 15-minute measurement.
L_{max}	The absolute maximum noise level in a noise sample.
NAD	Non-Associated Dwelling
NPI	Noise Policy for Industry (EPA, 2017)
NML	Noise Management Level (as defined in the ICNG (DECC, 2009))
NSW	New South Wales
PNTL	Project Noise Trigger Level (as defined in the NPI (EPA, 2017))
PV	Photovoltaic
RBL	The RBL is the overall single figure background level representing each assessment period (day, evening, and night) over the whole monitoring period (as opposed to over each 24-hour period used for the ABL). This is the level used for assessment purposes. It is the median value of: • All day assessment background levels over the monitoring period for the day; • All evening assessment background levels over the monitoring period for the evening; or All night assessment background levels over the monitoring period for the night.
REZ	Renewable Energy Zone
RMS	Roads and Maritime Services
RNP	Road Noise Policy
SPL	Sound Pressure Level
SWL	Sound Power Level
TfNSW	Transport for NSW

EXECUTIVE SUMMARY

This Noise Impact Assessment (NIA) has been prepared for the Denman Battery Energy Storage System (BESS) (the 'Project') on behalf of the Denman BESS Pty Ltd as a Trustee for the Denman BESS Trust (the 'Applicant'), located at 1711 Denman Road, Denman, NSW, approximately 7.5 km from the Denman town centre.

The Project will involve the construction, operation, and where relevant, decommissioning of a photovoltaic (PV) solar facility with a centralised BESS with a storage capacity of up to 2.4 GW / 4.8 GWh, electrical reticulation and associated and ancillary infrastructure, covering a total area of 38.6 ha. The Project will connect into the existing Transgrid Bayswater – Mt Piper, Bayswater – Wollar transmission line 500 kV
(twin circuit).

The Project is a State Significant Development (SSD) pursuant to Part 2.2, clause 2.6 and Schedule 1 of the *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP). This report supports a Development Application (DA) being prepared under Part 4, Division 4.7 of the *Environmental Planning and Assessment Act 1979*.

As per the project-specific Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning and Environment (DPE) (SSD-76189216, dated 17 October 2024) (now Department of Planning, Housing and Infrastructure
[DPHI]), the Environmental Impact Statement (EIS) must address the key issues relating to noise.

An assessment of the potential construction noise impacts of the development in
This NIA addresses the SEARs for the Project including:

- accordance with NSW Department of Environment and Climate Change (DECC) –*NSW Interim Construction Noise Guideline* (ICNG), July 2009;
- An assessment of operational noise impacts in accordance with the NSW Environment Protection Authority (EPA) – *Noise Policy for Industry* (NPI), October 2017; and
- An assessment of cumulative noise impacts (considering other developments in the area).

The existing environment and noise-sensitive receivers were established, and construction and operational noise management levels and assessment criteria were developed in accordance with the applicable policies, standards and guidelines in NSW, namely the ICNG, NPI and the NSW Department of Environment, Climate Change and Water (DECCW), *NSW Road Noise Policy* (RNP).

Applicable worst-case construction and operational assessment scenarios were developed based on project information provided by the Applicant. Construction and operational noise levels were predicted and compared to the established noise management levels and criteria to evaluate compliance.

For the construction noise impact assessment, the ICNG sets out a 'noise affected' management level and a 'highly noise affected' management level at residences which represents the point above which some or strong community reaction to noise may be expected respectively.

During construction of the Project, worst-case predicted construction noise impacts indicate that the ICNG 'noise affected' management level is likely to be exceeded at times at up to 7 sensitive receivers within 1,500 m of the Project boundary. However, noise impacts are predicted to be below the ICNG 'highly noise affected' management level at all assessed sensitive receivers. The main noise contributors are the drum roller, the padfoot roller, the cranes and the small pile driving rigs. It should be noted that the predicted noise levels represent a worst-case impact based on the shortest separation distance between mobile construction source and sensitive receiver. The duration of exceedances is highly variable due to the intermittent operation of construction equipment and the changing separation distances between noise sources and sensitive receivers. Noise management and control measures are recommended to be implemented to mitigate impacts. The measures entail a combination of informing the community on operating duration of high noise emitting construction machinery, and complaints' handling process. These will be outlined in the Construction Noise and Vibration Management plan (CNVMP) for the Project.

For the operational noise impact assessment, the NPI sets out the Project Noise Trigger Levels (PNTLs) that are used to assess the potential impacts of noise from industry and indicate the noise level at which feasible and reasonable noise management measures should be considered.

During operation of the Project, the predicted noise levels indicate that PNTLs are likely to be exceeded at one sensitive receiver location only (NAD64) under noise enhancing meteorological conditions as defined by the NPI, by 2 dB in both the evening and night-time assessment periods. Compliance with the day-time PNTLs are predicted to be achieved at all noise sensitive receivers.

The Project has investigated the application of all source and pathway feasible and reasonable noise mitigation measures to reduce noise impacts, including quieter equipment, fan duty loads and noise barriers. Pathway noise mitigation measures in the form of noise barriers produced marginal noise benefit and were not economically viable. Therefore, no pathway noise mitigation measures are recommended.

A cumulative noise impact assessment has been conducted for NAD64 taking into consideration noise impacts from this Project and the Upper Hunter South Solar Farm (which is the subject of a separate SSD application). No exceedances of the recommended amenity noise levels are predicted under noise enhancing meteorological conditions.

An analysis of the significance of residual noise impacts at NAD64 indicates that the exceedance of 2 dB would not be discernible by the average listener and therefore does not warrant receiver-based treatments or controls at-receiver.

Should the sound power levels, location or quantity of the selected equipment presented in this report change significantly, this assessment should be reviewed to incorporate the changes in design. It is also recommended to review the cumulative assessment when the predicted operational noise levels for the nearest developments are available.

Construction and operational traffic noise impacts arising from additional traffic associated with the Project have been assessed. Construction and operational road traffic impacts are not expected at all sensitive receivers in accordance with the assessment methodology and criteria outlined in the RNP.

1. INTRODUCTION

This Noise Impact Assessment (NIA) has been prepared for the Denman Battery Energy Storage System (BESS) (the 'Project'), situated in Denman in the Upper Hunter Region of NSW, for Denman BESS Pty Ltd as a Trustee for the Denman BESS Trust (the 'Applicant').

The Project is declared State Significant Development (SSD) under Clause 2.6(1) of the *State Environmental Planning Policy (Planning Systems) 2024* (Planning Systems SEPP). This report supports an Environmental Impact Statement (EIS) for the Project being prepared under Part 4, Division 4.7 of the *Environmental Planning and Assessment Act 1979*.

As per the project-specific Secretary's Environmental Assessment Requirements (SEARs) (SSD-76189216, dated 17 October 2024), the EIS must address the key issues relating to noise.

This NIA addresses the SEARs for the Project including:

- An assessment of the potential construction noise impacts of the development in accordance with NSW Department of Environment and Climate Change (DECC) – *NSW Interim Construction Noise Guideline* (ICNG), July 2009;
- An assessment of operational noise impacts in accordance with the NSW Environment Protection Authority (EPA) – *Noise Policy for Industry* (NPI), October 2017; and
- An assessment of cumulative noise impacts (considering other developments in the area).

The NIA also addresses traffic noise impacts associated with the construction and operation of the Project in accordance with the NSW Road Noise Policy (RNP) (DECCW, 2011).

1.1 PROJECT DESCRIPTION

The Project is located at 1711 Denman Road, Denman, NSW, approximately 7.5 km from the Denman town centre. The Project Area is located within the Muswellbrook Shire Local Government Area (LGA) wholly within a single allotment (Lot 4, DP 6090). The Project Area is located on land predominantly used for small scale cattle grazing farm.

The Project is entirely located within the Upper Hunter Region of New South Wales (NSW). The region is predominantly used for agriculture and mining.

The Project will involve the construction, operation, and where relevant, decommissioning of:

- A centralised BESS with a storage capacity of up to 2.4 GW / 4.8 GWh;
- Electrical reticulation;
- Associated and ancillary infrastructure; and
- Connection to the existing Transgrid Bayswater – Mt Piper, Bayswater – Wollar transmission line 500 kV (twin circuit).

The Project Area is 38.6 ha, with the final layout subject to further design development and refinement. The Project locality is shown in **Figure 1-1**.



WYBONG ROAD
CASTLE ROCK
BENGALLA
MUSWELLBROOK
SYDNEY STREET
ROSEBROOK CREEK
BIG FLAT CREEK
SPRING CREEK
HUNTER RIVER
MUSCLE CREEK
WYBONG CREEK
ANVIL CREEK
QUARRY CREEK
DENMAN ROAD
WHITES CREEK
RAMROD CREEK
PHEENYS CREEK
HOLLYDEEN
MERRIWA ROAD
SANDY CREEK
MANGOOLA
GOULBURN RIVER
EDDERTON
DENMAN
SADDLERS CREEK
YARRAWA
DALSWINTON

Legend
- Project Area
- Existing 500 kV Transmission Line
- Existing 66kV Transmission Line
- Major Road
- Road
- Major Watercourse
- Lots Boundary

Notes:
NSW DTDB, DCDB 2023
ESRI World Street Map
ESRI World Imagery 2023

Coordinate System:
GDA 1994 MGA Zone 56
Date: 09/07/2025
Created By: CS
Drawing Size: A3
0 0.8 1.6 2.4km
1:80,000

1-1 Project Locality

Denman BESS

Denman BESS Pty Ltd

ERM

1.2 OBJECTIVES

The objectives of this report are to provide an assessment of potential noise and vibration impacts associated with the construction and operation of the Project, and to recommend feasible and reasonable noise mitigation and management measures. These mitigation and management measures are designed to ensure that the construction and operation of the Project are carried out in compliance with the noise assessment management levels and criteria established in this report.

The noise and vibration assessment was undertaken based on the design information, site and layout plans, equipment lists and manufacturers' specifications, and operating modes outlined in this report.

1.3 SCOPE OF WORKS

The scope of the assessment includes:

- Evaluation of the existing noise environment and identification of noise sensitive receivers;
- Establishment of project-specific noise criteria in accordance with the ICNG, NPI and RNP at noise sensitive receivers for compliance assessment;
- Determining the extent of construction noise and vibration impacts (if any) associated with the construction of the proposed BESS in accordance with the ICNG;
- Determining the extent of operational noise impacts (if any) associated with the operation of the proposed BESS in accordance with the NPI;
- Determining the extent of traffic noise impacts (if any) associated with the construction and operation of the proposed BESS in accordance with the RNP;
- Recommendation of mitigation measures to be implemented on site to ensure compliance with the operational and construction project-specific noise criteria; and
- Preparation of a draft construction noise and vibration management plan (CNVMP).

2. NOISE POLICIES, GUIDELINES AND STANDARDS

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

- NSW Department of Environment and Climate Change (DECC) – *NSW Interim Construction Noise Guideline* (ICNG), July 2009;
- NSW Environment Protection Authority (EPA) – *Noise Policy for Industry* (NPI), October 2017; and
- NSW Department of Environment, Climate Change and Water (DECCW) – *NSW Road Noise Policy* (RNP), March 2011.

Further information regarding the application of the key policy and guidelines is provided below.

2.1 NSW INTERIM CONSTRUCTION NOISE GUIDELINE

The ICNG (DECC, 2009), presents an accepted method to assess construction noise impacts for a range of receiver types. It provides a set of recommended standard hours of construction, specifically:

- Monday to Friday: 7am to 6pm;
- Saturday: 8am to 1pm; and
- No work on Sundays or public holidays.

Construction outside these hours might be undertaken in accordance with the ICNG for the following categories of work:

- The delivery of oversized plant or structures that police or other authorities determine require special arrangements to transport along public roads;
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm; and
- Works where a proponent demonstrates and justifies a need to operate outside the recommended standard hours.

The ICNG encourages works to occur within the recommended standard hours of construction unless justification is provided. It focuses on minimising noise by managing construction noise impacts, rather than only on achieving numeric noise levels, and recognises that some noise from construction sites is inevitable.

The ICNG encourages organisations involved with construction, maintenance or upgrading works (e.g., large scale contractors or Government agencies) to develop best-practice techniques for managing construction noise and vibration and implementing feasible and reasonable mitigation measures.

The ICNG is suitable to quantitatively assess potential noise emissions and impacts associated with Project construction. The ICNG assessment methodology has been adopted to develop project-specific construction noise management levels, assess potential impacts, and recommend any necessary mitigation, management measures.

Table 2-1 details the ICNG construction noise management levels guidance for residential receivers.

TABLE 2-1 CONSTRUCTION NOISE MANAGEMENT LEVELS FOR RESIDENTIAL RECEIVERS

Time of day	Management Level, $L_{eq\ (15min)}$, dB(A)	How to apply
Recommended standard hours (SH): • Monday to Friday: 7am to 6pm • Saturday: 8am to 1pm • No work on Sundays or public holidays	Noise affected Rating Background Level (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 $L_{eq,\ 15\ minute}$ 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 a 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, considering: • Times identified by the community when they are less sensitive to noise (e.g., before and after school for works near schools); • 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 (OOH): • All other times including Public Holidays	Noise affected Rating Background Level (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 dBA 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.

2.2 NSW NOISE POLICY FOR INDUSTRY

Responsibility for the control of noise emissions in NSW is typically vested in Local Government and the NSW Environment Protection Authority (EPA). The NPI (EPA, 2017) provides a framework and methodology for deriving criteria for project consent and environment protection licence conditions.

2.3 NSW ROAD NOISE POLICY

The RNP (DECCW, 2011) outlines the range of measures needed to minimise road traffic noise and its impacts. It is intended for use by acoustics specialists as well as:

- Road project proponents;
- Determining authorities and regulators involved in the approval and construction of road projects and land use developments that generate additional traffic on existing roads; and
- City and transport planners and policymakers dealing with issues such as route corridors, heavy vehicle transport and building codes.

The RNP aims to identify the strategies that address the issue of road traffic noise from existing roads, new road projects, road redevelopment projects and new traffic-generating developments.

The RNP provides guidance, criteria, and procedures for assessing noise impacts from existing, new, and redeveloped roads and traffic generating developments. The assessment of road traffic noise impacts on residences near public roads is assessed under the RNP. In this case, the RNP is considered the suitable document to qualitatively assess potential noise emissions and impacts associated with construction and operational road traffic.

The RNP details noise assessment criteria for various road categories and land uses. Road access to the Project will be via Denman Road, which is classified as a State road.

3. EXISTING NOISE ENVIRONMENT

Noise sensitive receivers within 2 km of the Project boundary have been identified, as shown in **Figure 6-1** and tabulated in **Appendix A**.

The noise environment in the vicinity of the Project and at noise sensitive receivers is best described as rural residential. Rural residential is described in the NPI (EPA, 2017) as an area with an acoustical environment that is dominated by natural sounds (such as foliage noise, birdsong and insect noise) having little or no road traffic noise (from Denman Road) and is generally characterised by low background noise levels. Settlement patterns (rural residential) would be typically sparse.

The background noise levels at the noise sensitive receivers within 2 km of the Project are expected to be similar to the minimum assumed rating background levels (RBLs) specified in *Table 2.1* of the NPI.

The use of minimum assumed RBLs is reasonable in rural environments where there are no prominent noise sources associated with roads, rail and industrial plant influencing the noise environment at the receivers. It also allows for the strictest NPI Project Noise Trigger Levels (PNTLs) to be developed. The PTNLs applicable to the noise sensitive receivers are further discussed in **Section 4**.

4. PROJECT SPECIFIC MANAGEMENT LEVELS AND CRITERIA

4.1 CONSTRUCTION NOISE MANAGEMENT LEVELS

Construction works are expected to occur only during the recommended standard daytime hours as defined in **Section 2.1**. The project-specific construction noise management levels (NMLs), for works within the recommended standard hours for construction, are presented in **Table 4-1** below.

These NMLs have been established with due regard to the requirements of the ICNG for all identified residential and other sensitive non-residential receivers.

For this assessment, noise monitoring was not conducted and instead the minimum RBLs as stated in the NPI policy summarised in **Table 4-2** were applied. This provides a conservative construction noise assessment for the Project.

TABLE 4-1 CONSTRUCTION NOISE MANAGEMENT LEVELS

Receiver Type and Time of Day	Daytime Rating Background Level (RBL), dB(A)	Noise Affected Management Level, $L_{eq(15\ min)}$, dB(A)	Highly Noise Affected Management Level, $L_{eq(15\ min)}$, dB(A)
Residence - Recommended Standard Hours	35	45	75

4.2 OPERATIONAL NOISE CRITERIA

The term project noise trigger levels (PNTLs) are defined in *Section 2.1* of the NPI and considers the lowest of the intrusive or amenity residential receiver criterion so that the most stringent threshold is set concerning existing industrial noise in the area. PNTLs have been established with due regard to the requirements of the NPI for all identified residential receivers. PNTLs for all associated assessment periods are provided as noise sources expected to be present during all these periods.

4.2.1 PROJECT INTRUSIVENESS NOISE LEVEL

The NPI states:

> *"The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the background noise level by more than 5 dB when beyond a minimum threshold. This intrusiveness noise level seeks to limit the degree of change a new noise source introduces to an existing environment."*

The intrusiveness noise level is determined as follows:

$L_{Aeq,\ 15min}$ ≤ Rating Background Noise *Level* + *5 dB*

4.2.1.1 RATING BACKGROUND NOISE LEVEL AND PROJECT INTRUSIVE NOISE LEVEL

The Rating Background Level (RBL) is the single-figure background L_{90} level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24-hour period used for the assessment background level).

For this assessment, noise monitoring was not conducted, instead the minimum RBL as per the NPI were applied. As such, the minimum intrusiveness noise levels were adopted, providing a conservative assessment of operational noise of the Project. The project intrusiveness noise levels are summarised in **Table 4-2**.

TABLE 4-2 MINIMUM ASSUMED RBLS AND PROJECT INTRUSIVENESS NOISE LEVELS

Time of day	Minimum assumed RBL, in dB(A)	Minimum project intrusiveness noise levels, in $L_{Aeq,15min}$ dB(A)
Day	35	40
Evening	30	35
Night	30	35

4.2.2 AMENITY NOISE LEVELS AND PROJECT AMENITY NOISE LEVELS

To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels specified in Table 2.2 of the NPI, where feasible and reasonable. The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and sleep disturbance. The receivers are all classified as rural residential and their corresponding noise amenity levels are given in **Table 4-3**.

TABLE 4-3 AMENITY NOISE LEVELS

Receiver/ Noise Amenity Area	Assessment Period	Recommended Amenity Noise Level, L_{eq} dB(A)
Residential Rural	Day	50
	Evening	45
	Night	40

Note:
- Day-time period is from 7am to 6pm (Monday to Saturday) and 8am to 6pm (Sundays and Public Holidays)
- Evening period is from 6pm to 10pm
- Night-time period is from 10pm to 7am (Monday to Saturday) and 10pm to 8am (Sundays and Public Holidays)

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 minus 5 dB(A)

4.2.3 MAXIMUM NOISE LEVEL EVENT ASSESSMENT – SLEEP DISTURBANCE

The potential for sleep disturbance from maximum noise level events from the development during the night-time period needs to be considered. Sleep disturbance relates to both awakenings and disturbance to sleep stages.

A detailed maximum noise level event assessment should be undertaken where the subject development night-time noise levels at a residential location exceed:

- $L_{Aeq,15min}$ 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.

The night-time noise levels subject to a detailed maximum noise level event assessment are therefore $L_{Aeq,15min}$ 40 dB(A) and/or L_{AFmax} 52 dB(A).

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

Other factors that may be important in assessing the extent of impacts on sleep include:

- How often high noise events will occur;
- The distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the subject development;
- Whether there are times of day when there is a clear change in the noise environment (such as during early-morning shoulder periods); and
- Current scientific literature available at the time of the assessment regarding the impact of maximum noise level events at night.

4.2.4 PROJECT NOISE TRIGGER LEVELS

PNTLs have been determined in **Table 4-4** and are the more stringent level between the project intrusiveness noise level and the project amenity noise criteria for all assessment periods.

TABLE 4-4 NSW NPI CRITERIA

Receiver	Assessment period[a]	Project Intrusiveness Noise Level[b] $L_{Aeq,15min}$ dB(A)	NPI Amenity Noise Level $L_{Aeq,period}$ dB(A)	Project Amenity Noise Level $L_{Aeq,15min}$ dB(A)[c,d]	Project Noise Trigger Level $L_{Aeq,15min}$ dB(A)	Sleep Disturbance $L_{Aeq,15min}$ / L_{Amax} dB(A)
Residential	Day	40	50	48	**40**	**-**
	Evening	35	45	43	**35**	**-**
	Night	35	40	38	**35**	**40 / 52**

Notes:

[a] Day-time period is from 7am to 6pm (Monday to Saturday) and 8am to 6pm (Sundays and Public Holidays; Evening period is from 6pm to 10pm and Night-time period is from 10pm to 7am (Monday to Saturday) and 10pm to 8am (Sundays and Public Holidays).

[b] Based on RBL as noted in **Table 4-2**.

[c] These levels have been converted to $L_{Aeq, 15\ minute}$ using the following: $L_{Aeq, 15\ minute} = L_{Aeq, period} + 3$ dB (Reference: *Section 2.2* of the NPI).

[d] To account for the existing industrial noise sources, '-5 dB' was applied to the Project Amenity Noise Level (Reference: *Section 2.4* of the NPI).

Table 4-4 shows that the PNTLs are dictated by the project intrusiveness noise levels for all assessment periods and is applicable to the operational noise assessment.

By meeting the PNTLs at the identified sensitive receivers, the noise levels at all other receivers located further away from the Project are expected to comply with the noise criteria of the NPI.

By meeting the night-time PNTL of $L_{Aeq,15min}$ 35 dB(A) at the identified receivers, a detailed maximum noise level event assessment is not required.

4.3 ROAD TRAFFIC NOISE CRITERIA

The RNP criteria applicable to the nearest residences affected by additional road traffic due to the Project are presented in **Table 4-5**.

TABLE 4-5 RNP RESIDENTIAL ROAD TRAFFIC NOISE CRITERIA

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

Note: The assessment criteria for external noise levels apply at 1 metre from the façade of any affected residential receiver.

It should be noted that the RNP criteria is applicable to a permanent road traffic scenario. The usage of the RNP criteria for an assessment of construction traffic noise, which is temporary, is considered conservative.

5. CONSTRUCTION NOISE ASSESSMENT

5.1 NOISE MODELLING METHODOLOGY

Conservative predictions of construction noise have been established through the calculation of the geometrical dispersion of noise with the assumption of flat topography, no acoustic shielding and no ground absorption effects.

The noise predictions consider the sound power level of the equipment operating continuously for a 15-minute period. It should be noted that the construction noise levels at any receiver depend on the type and duration of construction activity being undertaken and are expected to be variable over the total construction program.

Under a worst-case noise scenario, the construction noise sources are assumed to be at the boundary of the site fronting the nearest sensitive receivers, representing the shortest separation distance between noise source and receiver.

5.2 CONSTRUCTION NOISE SOURCES

The following typical construction noise sources and their sound power levels are anticipated for the project and are listed in **Table 5-1.**

TABLE 5-1 CONSTRUCTION NOISE SOURCES

Equipment	Sound Power Level per unit, dB(A)*
Small Pile Driving Rig	114
Crane	110
Drum Roller	109
Padfoot Roller	109
Wheeled Loader	109
Dump Truck	108
Excavator	107
Bulldozer	108
Scraper	116
Grader	107
Chain Trencher	104
Water Truck	104
Telehandler	98
Forklift	90
Tub Grinder/ Mulcher 40-50 hp	116

*Note: *The sound power levels provided in the above table are based on AS 2436:2010 (Standards Australia, 2010) and the Transport for New South Wales Construction Noise and Vibration Guideline (TfNSW, 2016).*

The following worst-case construction noise scenarios were assessed:

1. **CON 1** - Site preparation and establishment - A drum roller and a padfoot roller at the site's boundary fronting a sensitive receiver and operating continuously for 15 minutes;
2. **CON 2** - Delivery of infrastructure – Two cranes at the site's boundary fronting a sensitive receiver and operating continuously for 15 minutes; and
3. **CON 3** - General construction of infrastructure – Two small pile driving rigs at the site's boundary fronting a sensitive receiver and operating continuously for 15 minutes.

5.3 PREDICTED CONSTRUCTION NOISE LEVELS

Predicted worst-case and unmitigated $L_{Aeq,15min}$ noise levels for all individual construction machinery/equipment and above-mentioned construction scenarios at the nearest sensitive receivers (within 2 km of the site's boundary where construction noise impacts may be present) have been presented in **Table 5-2**.

The following findings have been summarised from the results:

- The ICNG 'noise affected' management level is exceeded at:
  - 3 Sensitive Receivers for construction scenario CON 1;
  - 4 Sensitive Receivers for construction scenario CON 2; and
  - 7 Sensitive Receivers for construction scenario CON 3;
- No exceedance of the ICNG 'highly affected' management level at any of the sensitive receivers is expected for all construction scenarios; and
- The main noise contributors are the drum roller, the padfoot roller, the cranes and the small pile driving rigs, as defined in the worst-case construction noise scenarios.

It should be noted that the predicted noise levels and the duration of any exceedances are variable due to the intermittent operation of construction equipment and the changing separation distances between mobile construction noise sources and sensitive receivers. A construction noise and vibration management plan (CNVMP) is required as per standard practice for construction in NSW and in-principal noise and vibration mitigation measures are discussed in **Section 8.1**. As per the SEARs for this Project, a draft CNVMP is provided in **Appendix B**.

TABLE 5-2 PREDICTED CONSTRUCTION NOISE LEVELS

Sensitive Receiver ID	Equipment [a]															Scenario [b]		
	Small pile driving rig	Crane	Drum roller	Padfoot roller	Wheeled loader	Dump truck	Excavator	Bulldozer	Scraper	Grader	Chain trencher	Water truck	Telehandler	Forklift	Tub Grinder/ Mulcher	CON 1	CON 2	CON 3
NAD13	**49**	45	44	44	44	43	42	43	**51**	42	39	39	33	25	**51**	**47**	**48**	**52**
NAD15	**48**	44	43	43	43	42	41	42	**50**	41	38	38	32	24	**50**	**46**	**47**	**51**
NAD14	**48**	44	43	43	43	42	41	42	**50**	41	38	38	32	24	**50**	**46**	**47**	**51**
NAD64	**47**	43	42	42	42	41	40	41	**49**	40	37	37	31	23	**49**	45	**46**	**50**
NAD59	**46**	42	41	41	41	40	39	40	**48**	39	36	36	30	22	**48**	44	45	**49**
NAD51	**45**	41	40	40	40	39	38	39	**47**	38	35	35	29	21	**47**	43	44	**48**
NAD16	44	40	39	39	39	38	37	38	**46**	37	34	34	28	20	**46**	42	43	**47**
NAD12	42	38	37	37	37	36	35	36	44	35	32	32	26	18	44	40	41	45
NAD21	42	38	37	37	37	36	35	36	44	35	32	32	26	18	44	40	41	45
NAD24	41	37	36	36	36	35	34	35	43	34	31	31	25	17	43	39	40	44
NAD20	41	37	36	36	36	35	34	35	43	34	31	31	25	17	43	39	40	44
NAD50	41	37	36	36	36	35	34	35	43	34	31	31	25	17	43	39	40	44
NAD49	41	37	36	36	36	35	34	35	43	34	31	31	25	17	43	39	40	44
NAD58	41	37	36	36	36	35	34	35	43	34	31	31	25	17	43	39	40	44
NAD25	40	36	35	35	35	34	33	34	42	33	30	30	24	16	42	38	39	43
NAD26	40	36	35	35	35	34	33	34	42	33	30	30	24	16	42	38	39	43

Notes:
The Noise Affected Management Level is $L_{Aeq(15\ min)}$ 45 dB(A), and the Highly Noise Affected Management Level is $L_{Aeq(15\ min)}$ 75 dB(A)
*Noise Affected Management Level exceedances are shown in **bold** font. Important to note that these exceedances are only when the specific machinery is operating, or stated construction scenario is occurring.*
[a] Predicted noise levels for equipment are for the operation of a single equipment item at the BESS boundary fronting each assessed Sensitive Receiver
*[b] Construction scenarios CON 1, CON 2 and CON 3 are defined in **Section 5.2**.*

5.4 CONSTRUCTION VIBRATION – SAFE WORKING DISTANCES

Safe working distances for vibration causing plant, which may be used during the construction activities, have been taken from the Transport for New South Wales Construction Noise Strategy (TfNSW, 2016) and are summarised in **Table 5-3**.

TABLE 5-3 RECOMMENDED SAFE WORKING DISTANCES

Plant Item	Rating/Description	Safe Working Distance, in metres	
		Cosmetic Damage (BS 7385[1])	Human Response (AS 2670)
Vibratory Roller	<50kN (1-2t)	5	15 to 20
Vibratory Roller	<100kN (2-4t)	6	20
Vibratory Roller	<200kN (4-6t)	12	40
Vibratory Roller	<300kN (7-13t)	15	100
Small Hydraulic Hammer	300kg – 5 to 12t excavator	2	7
Medium Hydraulic Hammer	900kg – 12 to 18t excavator	7	23

The safe working distances for typical vibration causing plant in construction range from 7 to 100 metres to trigger a human response. There is no vibration sensitive receiver within this range and therefore vibration impacts are not expected from the project.

[1] BS 7385 -2: 1993 Guide to damage levels from ground borne vibration

6. OPERATIONAL NOISE ASSESSMENT

6.1 METHODOLOGY

Noise modelling has been undertaken using the CONCAWE algorithm (Manning, 1981), as implemented within the environmental noise modelling software package, SoundPLAN 9.1. 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 main noise modelling parameters are summarised in **Table 6-1**.

TABLE 6-1 NOISE MODELLING PARAMETERS

Modelling Aspect	Parameter
Software	SoundPLAN 9.1
Outdoor Noise Propagation Algorithm	CONCAWE incorporating the ISO 171534-3 (improved method selected)
Ground Absorption Factor	0.5 (50% acoustically hard ground and 50% acoustically soft ground)
Topographical contours	5 m intervals
Receiver height	1.5 m
CONCAWE Meteorological Inputs	• Daytime/Evening: Stability category D with wind speed of 3m/s • Night-time: Stability category F with wind speed of 2m/s

6.2 OPERATIONAL NOISE SOURCES

Table 6-2 summarises the noise sources and modelling assumptions for this assessment. The locations of all modelled noise sources are displayed in **Figure 6-1**.

TABLE 6-2 MODELLED NOISE SOURCES AND ASSUMPTIONS

Modelled Location – Refer to Figure 6-1	Plant Item	Sound Power Level per Plant Item, $L_{Aeq(15\ min)}$ dB(A)	Sound Power Level Reference	Quantity	Assumptions
Yellow Areas	Inverters (with silencer kit)	85.0	Manufacturer's data reference – SMA Solar Tech SCS 4600 UP-S	583	• Reference data – Sound Power Level of 85dB(A) with silencer. • Source modelled at a height of 2.3m.
Not modelled – For reference only	Medium Voltage Transformer	68.9	Manufacturer's data reference – SMA Solar Tech - Test Report Noise Level Test 4600kVA (4140kVA) Transformer MVPS-K2 (Actual Model: SMA MVPS 4200-S2)	583	• Reference data – Sound Power Level of 63.9dB(A). • A tonal penalty of 5 dB(A) has been added. • MV transformers are not modelled due to their SWL being significantly lower than SWL of inverters and battery units.
Pink Areas	Battery Units (with noise reduction kits)	78.8	Manufacturer's data reference – Acoustic Emission Report for SunTera 5.015MWh IEC BESS (Jinko JKE-5015-2H-LAA)	1166	• Acoustic Emission Report refers to an estimated Sound Power Level (SWL) of 78.8 dB(A) with noise reduction kit (Fan speed is 4x1600rpm). • Dimensions are specified at 6.1m (W) x 2.4m (H) x 2.9m (D).
Blue Area within Main Substation Area	High Voltage Transformer	93	Manufacturer's data reference – HV 220kV/33kV transformer with 210 MVA rated power	1	• Reference data – Sound Power Level of 93 dB(A). • Source modelled as a point source in the middle of the main substation area at a height of 2.9m. • No penalty added.

NAD22
NAD20
NAD21
NAD24
NAD15
NAD14
NAD59
NAD13
NAD51
DENMAN ROAD
NAD49
NAD50
NAD16
NAD64

Legend

- Assessment Receivers (Non-associated dwellings [NAD])
- Major Road
- Project Area
- Disturbance Footprint
- Construction Line
- Access Road
- Access Road (subject to separate application)
- Switchgear

Operational Noise Sources

- Battery Units
- HV Transformer
- Inverters

Notes:
NSW DTDB, DCDB 2023
Nearmap Imagery Feb 2023

Coordinate System:
GDA 1994 MGA Zone 56
Date: 09/07/2025
Created By: CS
Drawing Size: A3
0 150 300 450m
1:15,000

6-1 Locations of Modelled Operational Noise Sources

Denman BESS

Denman BESS Pty Ltd

ERM

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6.3 MODELLING RESULTS

The predicted operational noise levels at the noise sensitive receivers have been compared with the applicable Project Noise Trigger Levels (PTNLs) (derived in **Section 4.2**).

Predicted operational noise levels at the nearest sensitive receivers within 2 km of the Project boundary for the day, evening and night-time noise enhancing meteorological conditions as required by the NPI are shown in **Table 6-3.**

The noise contours indicating the predicted noise levels at identified sensitive receivers for noise-enhancing meteorological conditions are provided in **Appendix C**.

The operational noise levels have been predicted based on the modelled noise sources' assumptions presented in **Table 6-2**.

The predicted noise levels indicate that the PNTLs are likely to be exceeded at one sensitive receiver location only (NAD64) under noise enhancing meteorological conditions as defined by the NPI, by 2 dB in both the evening and night-time assessment periods. Compliance with the day-time PNTLs are predicted to be achieved at all noise sensitive receivers.

The Project has considered the application of all source and pathway feasible and reasonable noise mitigation measures to reduce noise impacts, as follows:

1. Quieter equipment including inverters fitted with silencer kits have been selected to minimise the sound emission at source.
2. Appropriate fan duty loads for the battery units have been implemented for the day, evening and night-time assessment periods.
3. The use of noise barriers to mitigate noise along the sound transmission path has been investigated, however, modelling results indicate that noise barriers will only provide minimal noise reduction at receiver locations where PTNL exceedances are predicted. The marginal noise benefit of applying noise barriers for the Project is not economically viable. Following consultation and discussion with the Applicant, no sound transmission pathway noise mitigation measures in the form of noise barriers are recommended.

The need for receiver-based noise mitigation treatments will be evaluated in the subsequent residual noise impact assessment in **Section 6.5**.

TABLE 6-3 PREDICTED OPERATIONAL NOISE LEVELS

Sensitive Receiver ID	Distance to Project Boundary, in metres	Assessment Criteria, PNTLs in $L_{Aeq,15\ min}$, dB(A) Day / Evening / Night-time	Predicted Operational Noise Level for Noise Enhancing Meteorological Conditions* in, $L_{Aeq,15\ min}$, dB(A)		
			Day	Evening	Night-time
NAD13	741	40 / 35 / 35	32	32	32
NAD15	790	40 / 35 / 35	32	32	32
NAD14	840	40 / 35 / 35	35	35	35
NAD64	847	40 / 35 / 35	37	**37**	**37**
NAD59	949	40 / 35 / 35	30	30	30
NAD51	1095	40 / 35 / 35	31	31	31
NAD16	1267	40 / 35 / 35	34	34	34
NAD12	1569	40 / 35 / 35	34	34	34
NAD21	1624	40 / 35 / 35	28	28	28
NAD24	1684	40 / 35 / 35	27	27	27
NAD20	1723	40 / 35 / 35	27	27	27
NAD50	1759	40 / 35 / 35	28	28	28
NAD49	1784	40 / 35 / 35	27	27	27
NAD58	1797	40 / 35 / 35	28	28	28
NAD25	1926	40 / 35 / 35	25	25	25
NAD57	2041	40 / 35 / 35	27	27	27
NAD56	2379	40 / 35 / 35	28	28	28

*Note: PNTL exceedances are shown in **bold** font.*
** Day/Evening: stability categories A–D with light winds up to 3 m/s at 10 m AGL.*
** Night: stability categories A–D with light winds up to 3 m/s at 10 m AGL and/or stability category F with winds up to 2 m/s at 10 m AGL.*

6.4 CUMULATIVE IMPACTS

The Project is located within the Hunter-Central Coast Renewable Energy Zone (REZ), which is proposed to facilitate the coordinated development of renewable energy generation projects, energy storage and transmission. This means that the region is planned to have a significant number of renewable energy developments, as well as other SSD and DA projects, that may lead to cumulative noise impacts at sensitive receivers.

The nearest developments with the potential to contribute to the noise levels generated by the Project at the identified sensitive receivers are listed in **Table 6-4**.

TABLE 6-4 NEAREST NOISE-GENERATING DEVELOPMENTS

Development	Brief Description	Distance from the Project	Status as of April 2025
Upper Hunter South Solar farm (SSD-65996959)	Development of a 90 MW solar farm.	Adjacent	SEARs issued. EIS/NIA under preparation.
Denman Solar Park (DA 49/2020)	Development of a 22 MW solar farm.	1.2 km	DA approved
Edderton Solar Project (SSD-69965958)	Development of a 350 MW solar farm.	1.3 km	SEARs issued. EIS under preparation.

Noise impact assessments for the nearest developments are noted to be under preparation as of April 2025. In line with similar projects and development consent approvals, it is expected that the noise impacts from the nearest developments will be assessed in accordance with and comply with the NPI (EPA, 2017).

The Upper Hunter South Solar Farm development is located within the same parcel of land as the Project and is expected to have the highest contribution to the cumulative noise at the most impacted noise sensitive receivers to this Project. The predicted noise levels in the NIA for Upper Hunter South Solar Farm, currently being prepared by ERM, have been adopted for use in this cumulative noise impact assessment.

While Denman Solar Park and Edderton Solar Project are located further away, they also have the potential to contribute to cumulative noise at the closest noise sensitive receivers to the Project.

The Denman Solar Park is indicatively located north of the Project and its associated noise emissions may affect this Project's northern sensitive receivers.

The Edderton Solar Project has one photovoltaic site indicatively located south of this Project, where its associated noise emissions might affect the Project's southern noise sensitive receivers.

For this cumulative assessment, we note that the project amenity noise level is specifically used for addressing cumulative noise impacts and this has already been considered in the development of the PNTLs for this Project. Where the predicted noise levels for the Project indicate compliance with the PNTLs, this also demonstrates that cumulative impacts are unlikely. It is also expected that the nearest noise-generating projects, summarised in **Table 6-4**, will comply with the NPI project amenity noise levels to address cumulative noise impacts. In summary, this means that cumulative impacts are unlikely at all the sensitive receivers assessed in this report, except for NAD64.

For the cumulative impact assessment at NAD64, at the time of preparing this report, no noise impact predictions at NAD64 associated with the Denman Solar Park and Edderton Solar Project were available through publicly available noise impact assessments. It is assumed for approval purposes, that both the Denman Solar Park and Edderton Solar Project will comply with the NPI and do not contribute towards cumulative impacts at NAD64.

This cumulative noise impact assessment has been conducted for NAD64 only, where PNTLs are predicted to be exceeded. The predicted cumulative noise levels are compared against NPI's recommended amenity noise levels which is specifically used for addressing cumulative noise impacts. **Table 6-5** shows the predicted cumulative noise impacts at NAD64**.**

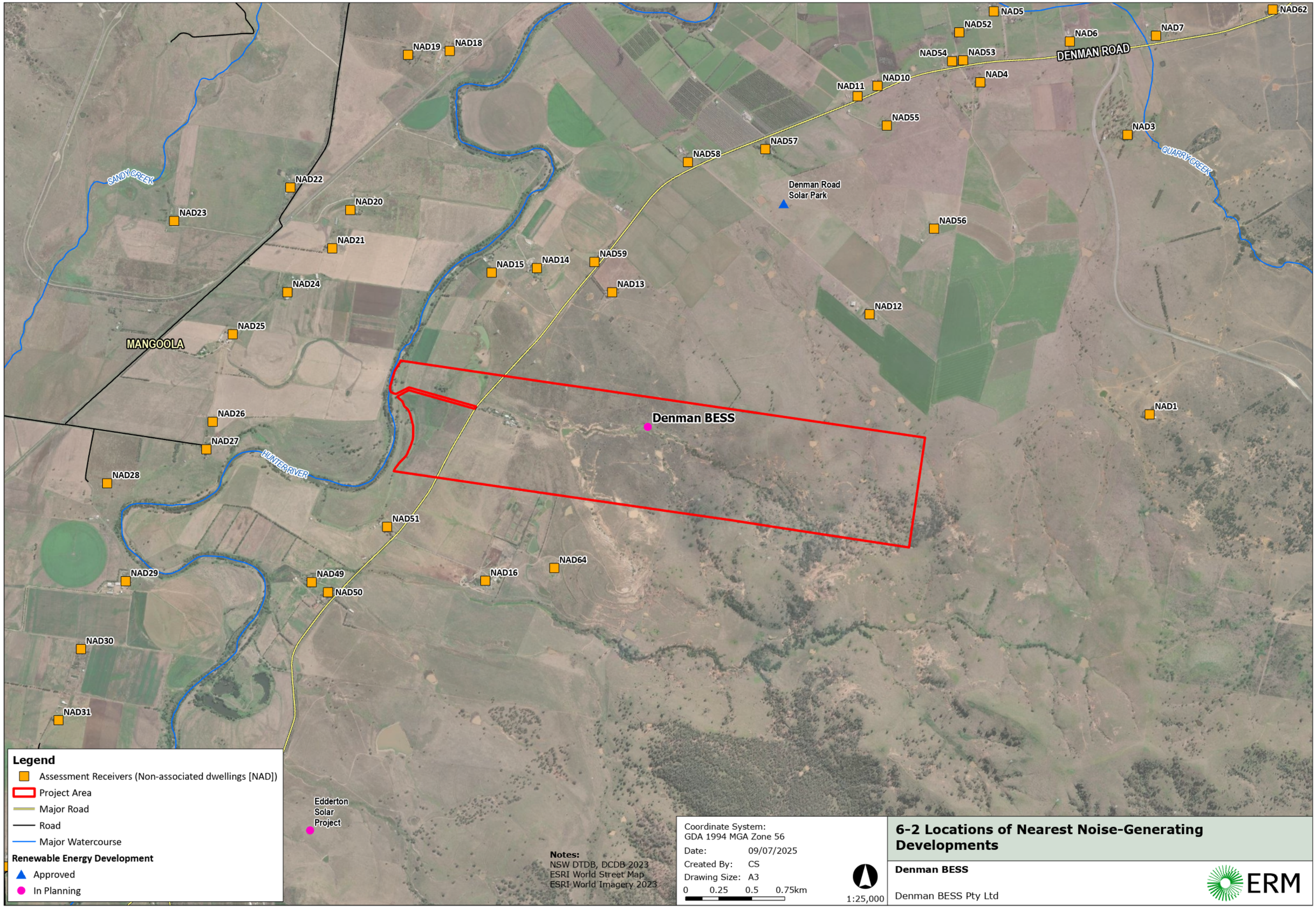
TABLE 6-5 ASSSESSMENT OF CUMULATIVE NOISE IMPACTS

Sensitive Receiver ID	Assessment Period	Predicted Operational Noise Level for Noise Enhancing Meteorological Conditions, $L_{Aeq,15\ min}$, dB(A)			Assessment Criteria, Recommended Amenity Noise Level*, $L_{Aeq,15min}$ dB(A)
		Upper Hunter South Solar Farm	Denman Battery Energy Storage System (The Project)	Predicted Cumulative Noise Levels	
NAD64	Day	34	37	39	53
	Evening	34	37	39	48
	Night	31	37	38	43

Note:
** As per the NPI, a +3 dB(A) correction has been applied to convert the recommended amenity noise levels from period levels to 15-minute levels to allow for comparison with the predicted $L_{Aeq,15min}$ cumulative noise levels.*

The predicted cumulative noise levels, as shown in Table 6-5 indicate that no exceedances of the recommended amenity noise levels are expected under noise enhancing meteorological conditions at NAD 64. The assessment of residual noise impacts for NAD64 is presented in Section 6.5.

It is recommended to update this cumulative assessment when the predicted operational noise levels provided in noise impact assessment reports for the Denman Solar Park and Edderton Solar Project become available.



6-2 Locations of Nearest Noise-Generating Developments

Denman BESS

Denman BESS Pty Ltd

ERM

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6.5 RESIDUAL NOISE IMPACTS

6.5.1 ACCEPTABILITY OF RESIDUAL NOISE IMPACTS

A residual noise impact may exist where the best-achievable noise level from a development, when assessed at a sensitive receiver location, remains above the PNTLs. Where noise levels above the PNTLs are predicted at any sensitive receiver locations, noise mitigation measures are to be considered for the Project to reduce noise levels towards the PNTLs, before any residual impacts are determined and addressed. Residual noise impacts are identified after the application of all source and pathway feasible and reasonable noise mitigation measures.

Planning decisions for proposed developments take into account social, economic and environmental factors. Noise impact is one factor taken into account and decisions can be made that result in residual noise impacts (that is, noise levels above the PNTL). In these cases, a consent may include an obligation on proponents to undertake noise mitigation at receiver locations. The significance of residual noise impacts, if any, should be determined, and the need to assess receiver-based treatment options should be considered accordingly. The significance of residual noise impacts as outlined in the NPI (EPA, 2017) is summarised in **Table 6-6**.

TABLE 6-6 SIGNIFICANCE OF RESIDUAL NOISE IMPACTS

If the Predicted Noise Level minus the Project Noise Trigger Level is:	And the Total Cumulative Industrial Noise Level is:	Then the Significance of Residual Noise Level is:
≤ 2 dB(A)	Not applicable	Negligible
≥ 3 but ≤ 5 dB(A)	< recommended amenity noise level or > recommended amenity noise level, but the increase in total cumulative industrial noise level resulting from the development is less than or equal to 1dB	Marginal
≥ 3 but ≤ 5 dB(A)	> recommended amenity noise level and the increase in total cumulative industrial noise level resulting from the development is more than 1 dB	Moderate
> 5 dB(A)	≤ recommended amenity noise level	Moderate
> 5 dB(A)	> recommended amenity noise level	Significant

Examples of receiver-based treatment options for different significance levels of residual noise impacts as outlined in the NPI (EPA, 2017) are shown in **Table 6-7**.

TABLE 6-7 EXAMPLES OF RECEIVER-BASED TREATMENT TO MITIGATE RESIDUAL NOISE IMPACTS

Significance of Residual Noise Level	Example of Potential Treatment
Negligible	The exceedances would not be discernible by the average listener and therefore would not warrant receiver-based treatments or controls
Marginal	Provide mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity.
Moderate	As for 'marginal', but also upgraded façade elements, such as windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels.
Significant	May include suitable commercial agreements where considered feasible and reasonable.

6.5.2 ASSESSMENT OF RESIDUAL NOISE IMPACTS

The operational noise levels have been predicted based on the modelled noise sources' assumptions presented in **Table 6-2**. The predicted noise levels indicate that the PNTLs are likely to be exceeded at NAD64 only by 2 dB for both the evening and night-time assessment periods under noise enhancing meteorological conditions. Compliance with the day-time PNTLs are predicted to be achieved at all noise sensitive receivers.

A cumulative noise impact assessment has also been conducted for NAD64 as the PTNLs are predicted to be exceeded, taking into consideration noise impacts from this Project and the Upper Hunter South Solar Farm. The predicted cumulative noise levels indicate that no exceedances of the recommended amenity noise levels are expected under noise enhancing meteorological conditions at NAD 64.

The significance of residual noise impacts at NAD64 associated with the Project have been determined based on the aforementioned noise assessment results according to the definition outlined in the NPI, as presented in **Table 6-8**.

TABLE 6-8 ASSESSMENT OF RESIDUAL NOISE IMPACTS

Sensitive Receiver ID	Assessment Period	Exceedance of PNTLs – Refer to Table 6-3	Exceedance of Predicted Cumulative Noise Level – Refer to Error! Not a valid result for table.	Significance of Residual Noise Impact – Refer to Table 6-6
NAD64	Day	-	-	-
	Evening	2	-	Negligible
	Night	2	-	Negligible

Note:
'-' indicates compliance, that is, the predicted Project / cumulative noise levels are below the corresponding criteria. Residual noise impacts are considered insignificant if the predicted project noise levels are below the corresponding PNTLs.

The results of the residual noise impacts conclude that the impacts at NAD64 associated with the exceedances of the PNTLs are considered negligible. No receiver-based treatments or controls are recommended.

7. TRAFFIC NOISE ASSESSMENT

This section assesses noise impacts from noise generated by additional traffic associated with Project construction and operation.

7.1 EXISTING ROAD TRAFFIC

Existing road traffic data, relevant to this assessment, for Denman Road near the proposed site access was obtained from the Traffic Impact Assessment (Appendix N of the EIS), and are as follows:

TABLE 7-1 EXISTING ROAD TRAFFIC DATA

Parameter	Value
Posted speed limit	100 km/hr
Heavy vehicle traffic percentage	13%
Weekday traffic - 24hr	2,643 vehicles
Weekday traffic - Day (7am to 10pm)	~1,982 vehicles
Weekday traffic - Night (10pm to 7am)	~661 vehicles

Source: *Section 2.3* of the Traffic Impact Assessment (Appendix N of the EIS).

Overall, the data indicates Denman Road currently accommodates a moderate level of traffic for its road classification and is able to accommodate an increase in vehicle traffic.

7.2 CONSTRUCTION TRAFFIC NOISE

As stated in the Traffic Impact Assessment (Appendix N of the EIS), the peak hour for construction traffic will occur at the start and end of the day when workers are transported to/from the Project area. Most workers will typically arrive on-site between 6am and 7am and depart between 5pm and 7pm. Workers generally have staggered finish times which results in the evening peak hour being less pronounced.

The predicted daily peak construction traffic volume provided in the Traffic Impact Assessment (Appendix N of the EIS) are 200 light vehicles and 112 heavy vehicles. The predicted peak construction traffic volume during peak hour are 100 light vehicles and 28 heavy vehicles.

For this road traffic noise assessment, it is assumed that during the night-time assessment period, all vehicle movements will occur between 6am to 7am corresponding to the peak hour traffic predicted data. During the day assessment period, it is assumed that the remaining vehicles will arrive and depart throughout the day from 7am to 7pm.

Noise sensitive receiver NAD59 (identified in **0**) along the road section on Denman Road, is approximately 40m west of the road, north of the site, and is selected to be the assessment location. Among all the noise sensitive receivers, NAD59 is the most sensitive and has the highest potential to be affected by construction traffic noise.

The predicted construction traffic noise levels at NAD59 are shown in **Table 7-2.**

TABLE 7-2 PREDICTED CONSTRUCTION TRAFFIC NOISE LEVELS AT NAD59

Assessment Period	Existing Traffic			Project Traffic Volume		Existing + Project Traffic			RNP Criteria, dB(A)
	Traffic Volume		Predicted Traffic Noise Level, dB(A)			Traffic Volume		Predicted Traffic Noise Level, dB(A)	
	LV	HV		LV	HV	LV	HV		
Day (7am to 10pm)	1,724	258	$L_{Aeq,15\ hour}$ 54.7	100	84	1,824	342	$L_{Aeq,15\ hour}$ 55.5	$L_{Aeq,15\ hour}$ 60
Night (10pm to 7am)	575	86	$L_{Aeq,9\ hour}$ 54.1	100	28	675	114	$L_{Aeq,9\ hour}$ 54.8	$L_{Aeq,9\ hour}$ 55

Note:
A façade refection of 2.5 dB has been applied to all calculated results as per the RNP (DECCW, 2011).
LV = Light Vehicles
HV = Heavy Vehicles

The predicted road traffic noise levels at Sensitive Receiver NAD59 indicate compliance with the day and night-time RNP criteria during the peak construction traffic period. The peak construction period is expected to last 6-9 months.

Although construction traffic noise impacts are predicted to be insignificant, general best practice noise control measures are provided in **Section 8.1.1**, to ensure noise impacts to residents and other noise sensitive receivers surrounding the site are minimised.

7.3 OPERATIONAL TRAFFIC NOISE

The Traffic Impact Assessment (Appendix N of the EIS) notes the following on operational traffic:

> *During operation, the BESS is expected to generate a minimal level of traffic associated with maintenance and operation services. The BESS is expected to be operated by up to 4 maintenance personnel resulting in a traffic generation of up to 8 vehicle trips per day which would result in a negligible change to the traffic environment. There would also be occasional light commercial vehicles delivering parts to the site but only as required for maintenance.*

Based on the above, traffic noise impacts at sensitive receivers during the operational stage of the Project are expected to be negligible.

8. RECOMMENDATIONS

This section presents recommended construction and operational noise mitigation and management measures. All recommendations are based on the predicted noise levels and evaluation of the magnitude and extent of potential impacts identified in **Section 5.3** (for construction) and **Section 6.3** (for operation) of this report.

They are designed to ensure that, where feasible, reasonable, and practical to implement, construction and operational noise emissions are maintained within acceptable levels at all receivers. These recommendations also provide a general reassurance that suitable safeguards and provisions for monitoring are documented in this report to manage construction and operational noise.

8.1 CONSTRUCTION

Based on the findings presented in **Section 5.3**, the ICNG 'noise affected' management level is exceeded at 3 sensitive receivers for construction scenario CON 1, 4 sensitive receivers for construction scenario CON 2, and 7 sensitive receivers for construction scenario CON 3. The results were based on worst-case assumptions of construction activities at the Project boundary fronting sensitive receivers in the absence of any noise mitigation measures.

Although construction noise may be audible and there is likely to be some degree of adverse impact during sensitive periods (socialising or relaxing), as is typical with construction projects near residential receivers, by incorporating the noise control measures provided in this section, the noise impact to residents and other noise sensitive receivers surrounding the site can be managed.

The highest construction noise impact will be experienced for a short duration when activities are closest to the receivers. As the activities move further away from the receivers, the noise levels are expected to be lower to the predicted noise levels in **Table 5-2**.

The following construction noise control measures are recommended to enable compliance with the 'noise affected' management levels:

- Noise generating work and activities should be (as proposed) limited (where possible) to the ICNG recommended standard hours (i.e., 7am to 6pm Monday to Friday and 8am to 1pm Saturdays and no work on Sundays or public holidays);
- Where an equipment item (drum roller, the padfoot roller, the cranes, the small pile driving rigs, scraper and tub grinder/mulcher) operates close to the Project Boundary and these works are anticipated to generate high levels of noise e.g., > 45 dB(A) at a sensitive receiver as per **Table 5-2**, potential respite periods, e.g., three hours of work, followed by one hour of respite should be applied. Respite should be implemented if it is the preference of the affected receivers and if they are feasible and reasonable, and practical, to implement during the works. In some circumstances respite may extend the duration of works and inadvertently increase noise impacts; hence due care should be taken when considering this management measure;
- Appropriate plant, equipment and/or machinery for each task should be selected and efficient work practices to minimise the total construction period and the number of noise sources on the site should be adopted;

- Unnecessary noise due to idling engines should be avoided. High engine speeds should be avoided when equipment can be powered down and lower engine speeds are feasible;
- All plant, equipment and/or machinery used on the site should be in suitable condition, with particular emphasis on exhaust silencers, covers on engines and inspection of squeaking or rattling components. Excessive noise-generating machines should be repaired or removed from the site;
- Reversal alarms shall be replaced with broadband "squash duck" motion alarms, where feasible;
- If any validated noise complaints are received, operator attended noise validation and compliance measurements should be undertaken to measure and compare the site noise level contributions to the NMLs presented in this report. All site noise levels should be measured and quantified in the absence of any influential noise sources not associated with the Project. If the measured site noise levels are above the NMLs presented in this report, further mitigation and/or management measures should be considered;
- Unattended noise monitoring systems shall be established at selected worst-affected sensitive receivers depending on the different activities and stages of construction when such details are finalised. The results shall be used to improve the noise mitigation and management measures for the Project so that best practice noise control is continually implemented; and
- As per standard practice for any construction activities in NSW, a Construction Noise Management and Vibration Plan (CNVMP) containing noise mitigation and management measures shall be created for the construction phase of this Project. A Draft CNVMP is provided in **Appendix B**.

8.1.1 CONSTRUCTION ROAD TRAFFIC

Construction traffic noise management should be included in the CNVMP for the Project.

It is anticipated that this may include site awareness training and environmental inductions for construction and operation staff, highlighting driving practices to minimise traffic noise impacts on the sensitive receivers.

The following noise strategies to manage construction related traffic should also be considered:

- Consultation and notification:
  - Provide, reasonably ahead of time, information such as duration, what is being done to minimise noise and when respite periods will occur;
  - Provide information to neighbours before and during construction through media such as letterbox drops, meetings or individual contact. In some areas, the proponent will need to provide notification in languages other than English. A website could also be established for the project to provide information;
  - Use a site information board at the front of the site with the name of the organisation responsible for the site and their contact details, hours of operation and regular information updates. This signage should be clearly visible from the outside and include afterhours emergency contact details;
  - Maintain good communication between the community and project staff;
  - Appoint a community liaison officer where required;

- Provide a toll-free contact phone number for enquiries during the works;
- Facilitate contact with people to ensure that everyone can see that the site manager understands potential issues, that a planned approach is in place and that there is an ongoing commitment to minimise noise;

- Complaints handling:
  - Provide a readily accessible contact point, for example, through a 24-hour toll-free information and complaints line;
  - Give complaints a fair hearing;
  - Have a documented complaints process, including an escalation procedure so that if a complainant is not satisfied there is a clear path to follow;
  - Call back as soon as possible to keep people informed of action to be taken to address noise problems;
  - Provide a quick response to complaints, with complaint handling staff having both a good knowledge of the project and ready access to information;
  - Implement all feasible and reasonable measures to address the source of complaint;
  - Keep a register of any complaints, including details of the complaint such as date, time, person receiving complaint, complainant's contact number, person referred to, description of the complaint, work area (for larger projects), time of verbal response and timeframe for written response where appropriate;
- Work scheduling:
  - Provide respite periods: Consult with affected residents to ensure that noise-generating construction works are acceptable at those times;
  - Organise work to be undertaken during the recommended standard hours where possible;
  - Schedule work when neighbours are not present;
  - Schedule noisy activities around times of high background noise (local road traffic or when other local noise sources are active) where possible to provide masking or to reduce the amount that the construction noise intrudes above the background;
  - Consult with affected neighbours about scheduling activities to minimise noise impacts; and

    Where night work near residences cannot be feasibly or reasonably avoided, restrict the number of nights per week and/or the number of nights per calendar month that the works are undertaken, in consultation with residents who will be most affected.

8.2 OPERATION

Based on the assessment presented in **Section 6**, the recommended receiver-based noise treatments listed in Error! Reference source not found. should be considered to mitigate the residual noise impacts at NAD64, NAD14, NAD16, NAD12, NAD15 and NAD13.

Opportunities for 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.

Equipment selection and quantity are to adhere to the sound power level (SWL) per plant item and quantity specified in **Table 6-2**. Should the SWL, location or quantity of the selected equipment change significantly, this assessment should be reviewed to incorporate the changes in design.

9. CONCLUSION

This NIA assessed potential construction and operational noise impacts associated with the Denman BESS development.

The existing environment at identified noise sensitive receivers was established, and construction and operational noise management levels and assessment criteria were developed in accordance with the relevant NSW standards and guidelines, namely the NPI, ICNG and the RNP.

Applicable worst-case construction and operational assessment scenarios were developed based on project information outlined in this report. Construction and operational noise levels were predicted and compared to the established noise management levels and criteria to evaluate compliance.

The ICNG 'noise affected' management level is exceeded at 3 sensitive receivers for construction scenario CON 1, 4 sensitive receivers for construction scenario CON 2, and 7 sensitive receivers for construction scenario CON 3. The results were based on worst-case assumptions of construction activities at the Project boundary fronting sensitive receivers in the absence of any noise mitigation measures. However, no exceedance of the ICNG 'highly noise affected' management level at any of the sensitive receivers is expected during construction. Noise management and mitigation measures will be required to be implemented in the Construction Noise and Vibration Management plan (CNVMP) for the Project.

During operation of the Project, the predicted noise levels indicate that PNTLs are likely to be exceeded at one sensitive receiver location only (NAD64) under noise enhancing meteorological conditions as defined by the NPI, by 2 dB in both the evening and night-time assessment periods. Compliance with the day-time PNTLs are predicted to be achieved at all noise sensitive receivers.

The Project has investigated the application of all source and pathway feasible and reasonable noise mitigation measures to reduce noise impacts, including quieter equipment, fan duty loads and noise barriers. Pathway noise mitigation measures in the form of noise barriers produced marginal noise benefit and were not economically viable. Therefore, no pathway noise mitigation measures are recommended.

A cumulative noise impact assessment has been conducted for NAD64 taking into consideration noise impacts from this Project and the Upper Hunter South Solar Farm. No exceedances of the recommended amenity noise levels are predicted under noise enhancing meteorological conditions.

An analysis of the significance of residual noise impacts at NAD64 indicates that that the exceedance of 2 dB of the PNTL would not be discernible by the average listener and therefore does not warrant receiver-based treatments or controls at-receiver.

Should the assumed sound power levels, location or quantity of the selected equipment presented in this report change significantly, this assessment should be reviewed to incorporate the changes in design. It is also recommended to review the cumulative assessment when the predicted operational noise levels for the nearest developments are available.

Construction and operational traffic noise impacts arising from additional traffic associated with the Project have been assessed. Construction and operational road traffic impacts are not expected at all sensitive receivers in accordance with the assessment methodology and criteria outlined in the RNP.

10. REFERENCES

DECC. (2009). *NSW Department of Environment & Climate Change (DECC), Interim Construction Noise Guideline (ICNG).*

DECCW. (2011). *NSW Department of Environment, Climate Change and Water (DECCW), Road Noise Policy (RNP).*

EPA. (2017). *NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI).*

Manning, C. J. (1981). *The Propagation of Noise from Petroleum and Petrochemical Complexes to Neighbouring Communities, CONCAWE Report No. 4/81.*

Standards Australia. (2010). *AS 2436 Guide to noise and vibration control on construction, demolition and maintenance sites.*

TfNSW. (2016). *Construction Noise and Vibration Guideline .*

TfNSW. (2016). *Construction Noise Strategy 7TP-ST-157/3.0.*

APPENDIX A NOISE SENSITIVE RECEIVERS

Sensitive Receiver ID	Type of Property	GPS Co-ordinates (UTM Zone 56S, in metres)		Distance to Project Boundary, in metres
		Easting	Northing	
NAD13	Residential	288864	6419985	741
NAD15	Residential	287953	6420134	790
NAD14	Residential	288295	6420168	840
NAD64	Residential	288520	6417887	847
NAD59	Residential	288730	6420215	949
NAD51	Residential	287163	6418214	1095
NAD16	Residential	287905	6417807	1267
NAD12	Residential	290809	6419819	1569
NAD21	Residential	286749	6420317	1624
NAD24	Residential	286410	6419986	1684
NAD20	Residential	286885	6420607	1723
NAD50	Residential	286716	6417720	1759
NAD49	Residential	286593	6417796	1784
NAD58	Residential	289436	6420969	1797
NAD25	Residential	285997	6419669	1926
NAD26	Residential	285845	6419007	1987
NAD57	Residential	290021	6421067	2041
NAD56	Residential	291296	6420466	2379

APPENDIX B DRAFT CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN

B1. INTRODUCTION

As per the project-specific Secretary's Environmental Assessment Requirements (SEARs) issued by the Department of Planning and Environment (DPE) (SSD-76189216, dated 17 October 2024), a Draft Construction Noise and Vibration Management Plan (CNVMP) has been prepared in advance of the detailed design, to demonstrate the framework for noise management during construction of the Project.

The Draft CNVMP will be updated prior to implementation and summarises the noise mitigation measures that can provide feasible and reasonable controls to reduce noise impacts at Sensitive Receivers.

The content of this Draft CNVMP has been duplicated from the sections relevant to construction noise from the main report.

B2. EXISTING NOISE ENVIRONMENT AND SENSITIVE RECEIVERS

The noise environment in the vicinity of the Project and at noise sensitive receivers is best described as rural residential. Rural residential is described in the NSW Environment Protection Authority (EPA), *Noise Policy for Industry* (NPI), as an area with an acoustical environment that is dominated by natural sounds (such as foliage noise, birdsong and insect noise) having little or no road traffic noise (from Denman Road) and is generally characterised by low background noise levels. Settlement patterns (rural residential) would be typically sparse.

The background noise levels at the nearest Sensitive Receivers to the Project are expected to be similar to the minimum assumed Rating Background Levels (RBLs) specified in Table 2.1 of NPI. The use of minimum assumed RBLs is reasonable in rural environments where there are no prominent noise sources associated with roads, rail and industrial plant influencing the noise environment at the receivers.

The nearest sensitive receivers within 2 km of the Project boundary have previously been identified above in **Appendix A**.

B3. NSW INTERIM CONSTRUCTION NOISE GUIDELINE

The Interim Construction Noise Guideline (ICNG) presents an accepted method to assess construction noise impacts for a range of receiver types. It provides a set of recommended standard hours of construction, specifically:

- Monday to Friday: 7am to 6pm;
- Saturday: 8am to 1pm; and
- No work on Sundays or public holidays.

Construction outside these hours might be undertaken in accordance with the ICNG for the following categories of work:

- The delivery of oversized plant or structures that police or other authorities determine require special arrangements to transport along public roads;

- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm; and
- Works where a proponent demonstrates and justifies a need to operate outside the recommended standard hours.

The ICNG encourages works to occur within the recommended standard hours of construction unless justification is provided. It focuses on minimising noise by managing construction noise impacts, rather than only on achieving numeric noise levels, and recognises that some noise from construction sites is inevitable.

The ICNG encourages organisations involved with construction, maintenance or upgrading works (e.g., large scale contractors or Government agencies) to develop best-practice techniques for managing construction noise and vibration and implementing feasible and reasonable mitigation measures.

The ICNG is suitable to quantitatively assess potential noise emissions and impacts associated with Project construction. The ICNG assessment methodology has been adopted to develop project-specific construction noise management levels, assess potential impacts, and recommend any necessary mitigation, management measures.

Table B3-1 details the ICNG construction noise management levels guidance for residential receivers.

TABLE B3-1 CONSTRUCTION NOISE MANAGEMENT LEVELS FOR RESIDENTIAL RECEIVERS

Time of day	Management Level, $L_{eq\ (15min)}$, dB(A)	How to apply
Recommended standard hours (SH): • Monday to Friday: 7am to 6pm • Saturday: 8am to 1pm • No work on Sundays or public holidays	Noise affected Rating Background Level (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 $L_{eq,\ 15\ minute}$ 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 a 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, considering: • Times identified by the community when they are less sensitive to noise (e.g., before and after school for works near schools); • 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 (OOH): • All other times including Public Holidays	Noise affected Rating Background Level (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 dBA 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.

B4. CONSTRUCTION NOISE MANAGEMENT LEVELS

Construction works are expected to occur only the recommended standard daytime hours. The project-specific construction noise management levels (NMLs), for works within the recommended standard hours for construction, are presented in **Table B4-1** below.

These NMLs have been established with due regard to the requirements of the ICNG for all identified residential and other sensitive non-residential receivers.

For this assessment, noise monitoring was not conducted and instead the minimum RBLs as stated in the NPI were applied. This provides a conservative construction noise assessment for the Project.

TABLE B4-1 CONSTRUCTION NOISE MANAGEMENT LEVELS

Receiver Type and Time of Day	Daytime Rating Background Level (RBL)), dB(A)	Noise Affected Management Level, $L_{eq(15\ min)}$, dB(A)	Highly Noise Affected Management Level, $L_{eq(15\ min)}$, dB(A)
Residence - Recommended Standard Hours	35	45	75

B5. CONSTRUCTION NOISE ASSESSMENT

B5.1 MODELLING METHODOLOGY

Conservative predictions of construction noise have been established through the calculation of the geometrical dispersion of noise with the assumption of flat topography, no acoustic shielding and no ground absorption effects.

The noise predictions consider the sound power level of the equipment operating continuously for a 15-minute period. It should be noted that the construction noise levels at any receiver depend on the type and duration of construction activity being undertaken and are expected to be variable over the total construction program.

Under a worst-case noise scenario, the construction noise sources are assumed to be at the boundary of the site fronting the nearest sensitive receivers, representing the shortest separation distance between noise source and receiver.

B5.2 CONSTRUCTION NOISE SOURCES

The following typical construction noise sources and their sound power levels are anticipated for the project and are listed in **Table B5-1.**

TABLE B5-1 CONSTRUCTION NOISE SOURCES

Equipment	Sound Power Level per unit, dB(A)*
Small Pile Driving Rig	114
Crane	110
Drum Roller	109
Padfoot Roller	109
Wheeled Loader	109
Dump Truck	108
Excavator	107
Bulldozer	108
Scraper	116
Grader	107
Chain Trencher	104
Water Truck	104
Telehandler	98
Forklift	90
Tub Grinder/ Mulcher 40-50 hp	116

*Note: *The sound power levels provided in the above table are based on AS 2436:2010 (Standards Australia, 2010) and the Transport for New South Wales Construction Noise and Vibration Guideline (TfNSW, 2016).*

The following worst-case construction noise scenarios were assessed:

1. **CON 1** - Site preparation and establishment - A drum roller and a padfoot roller at the site's boundary fronting a sensitive receiver and operating continuously for 15 minutes;
2. **CON 2** - Delivery of infrastructure – Two cranes at the site's boundary fronting a sensitive receiver and operating continuously for 15 minutes; and
3. **CON 3** - General construction of infrastructure – Two small pile driving rigs at the site's boundary fronting a sensitive receiver and operating continuously for 15 minutes.

B5.3 PREDICTED CONSTRUCTION NOISE LEVELS

Predicted worst-case and unmitigated $L_{Aeq,15min}$ noise levels for all individual construction machinery/equipment and above-mentioned construction scenarios at the nearest sensitive receivers (within 2 km of the site's boundary where construction noise impacts may be present) have been presented in **Table B5-2**.

The following findings have been summarised from the results:

- The ICNG 'noise affected' management level is exceeded at:
  - 3 Sensitive Receivers for construction scenario CON 1;
  - 4 Sensitive Receivers for construction scenario CON 2; and
  - 7 Sensitive Receivers for construction scenario CON 3;
- No exceedance of the ICNG 'highly affected' management level at any of the sensitive receivers is expected for all construction scenarios; and
- The main noise contributors are the drum roller, the padfoot roller, the cranes and the small pile driving rigs, as defined in the worst-case construction noise scenarios.

It should be noted that the predicted noise levels and the duration of any exceedances are variable due to the intermittent operation of construction equipment and the changing separation distances between mobile construction noise sources and sensitive receivers.

TABLE B5-2 PREDICTED CONSTRUCTION NOISE LEVELS

Sensitive Receiver ID	Equipment [a]															Scenario [b]		
	Small pile driving rig	Crane	Drum roller	Padfoot roller	Wheeled loader	Dump truck	Excavator	Bulldozer	Scraper	Grader	Chain trencher	Water truck	Telehandler	Forklift	Tub Grinder/ Mulcher	CON 1	CON 2	CON 3
NAD13	**49**	45	44	44	44	43	42	43	**51**	42	39	39	33	25	**51**	**47**	**48**	**52**
NAD15	**48**	44	43	43	43	42	41	42	**50**	41	38	38	32	24	**50**	**46**	**47**	**51**
NAD14	**48**	44	43	43	43	42	41	42	**50**	41	38	38	32	24	**50**	**46**	**47**	**51**
NAD64	**47**	43	42	42	42	41	40	41	**49**	40	37	37	31	23	**49**	45	**46**	**50**
NAD59	**46**	42	41	41	41	40	39	40	**48**	39	36	36	30	22	**48**	44	45	**49**
NAD51	**45**	41	40	40	40	39	38	39	**47**	38	35	35	29	21	**47**	43	44	**48**
NAD16	44	40	39	39	39	38	37	38	**46**	37	34	34	28	20	**46**	42	43	**47**
NAD12	42	38	37	37	37	36	35	36	44	35	32	32	26	18	44	40	41	45
NAD21	42	38	37	37	37	36	35	36	44	35	32	32	26	18	44	40	41	45
NAD24	41	37	36	36	36	35	34	35	43	34	31	31	25	17	43	39	40	44
NAD20	41	37	36	36	36	35	34	35	43	34	31	31	25	17	43	39	40	44
NAD50	41	37	36	36	36	35	34	35	43	34	31	31	25	17	43	39	40	44
NAD49	41	37	36	36	36	35	34	35	43	34	31	31	25	17	43	39	40	44
NAD58	41	37	36	36	36	35	34	35	43	34	31	31	25	17	43	39	40	44
NAD25	40	36	35	35	35	34	33	34	42	33	30	30	24	16	42	38	39	43
NAD26	40	36	35	35	35	34	33	34	42	33	30	30	24	16	42	38	39	43

Notes:
The Noise Affected Management Level is $L_{Aeq(15\ min)}$ 45 dB(A), and the Highly Noise Affected Management Level is $L_{Aeq(15\ min)}$ 75 dB(A)
*Noise Affected Management Level exceedances are shown in **bold** font. Important to note that these exceedances are only when the specific machinery is operating, or stated construction scenario is occurring.*
[a] Predicted noise levels for equipment are for the operation of a single equipment item at the BESS boundary fronting each assessed Sensitive Receiver
[b] Construction scenarios CON 1, CON 2 and CON 3 are defined above.

B6. CONSTRUCTION VIBRATION – SAFE WORKING DISTANCES

Safe working distances for vibration causing plant, which may be used during the construction activities, have been taken from the Transport for New South Wales Construction Noise Strategy (TfNSW, 2016) and are summarised in **Table B6-1**.

TABLE B6-1 RECOMMENDED SAFE WORKING DISTANCES

Plant Item	Rating/Description	Safe Working Distance, in metres	
		Cosmetic Damage (BS 7385[1])	Human Response (AS 2670)
Vibratory Roller	<50kN (1-2t)	5	15 to 20
Vibratory Roller	<100kN (2-4t)	6	20
Vibratory Roller	<200kN (4-6t)	12	40
Vibratory Roller	<300kN (7-13t)	15	100
Small Hydraulic Hammer	300kg – 5 to 12t excavator	2	7
Medium Hydraulic Hammer	900kg – 12 to 18t excavator	7	23

The safe working distances for typical vibration causing plant in construction range from 7 to 100 metres to trigger a human response. There is no vibration sensitive receiver within this range and therefore vibration impacts are not expected from the project.

[1] BS 7385 -2: 1993 Guide to damage levels from ground borne vibration

B7. CONSTRUCTION TRAFFIC NOISE

As stated in the Project's Traffic Impact Assessment, the peak hour for construction traffic will occur at the start and end of the day when workers are transported to/from the Project area. Most workers will typically arrive on-site between 6am and 7am and depart between 5pm and 7pm. Workers generally have staggered finish times which results in the evening peak hour being less pronounced.

The predicted daily peak construction traffic volume provided in the Project's Traffic Impact Assessment are 200 light vehicles and 112 heavy vehicles. The predicted peak construction traffic volume during peak hour are 100 light vehicles and 28 heavy vehicles.

For this road traffic noise assessment, it is assumed that during the night-time assessment period, all vehicle movements will occur between 6am to 7am corresponding to the peak hour traffic predicted data. During the day assessment period, it is assumed that the remaining vehicles will arrive and depart throughout the day from 7am to 7pm.

Noise sensitive receiver NAD59 along the road section on Denman Road, is approximately 40m west of the road, north of the site, and is selected to be the assessment location. Among all the noise sensitive receivers, NAD59 is the most sensitive and has the highest potential to be affected by construction traffic noise.

The predicted construction traffic noise levels at NAD59 are shown in **Table B7-1**.

TABLE B7-1 PREDICTED CONSTRUCTION TRAFFIC NOISE LEVELS AT NAD59

Assessment Period	Existing Traffic			Project Traffic Volume		Existing + Project Traffic			RNP Criteria, dB(A)
	Traffic Volume		Predicted Traffic Noise Level, dB(A)			Traffic Volume		Predicted Traffic Noise Level, dB(A)	
	LV	HV		LV	HV	LV	HV		
Day (7am to 10pm)	1,724	258	$L_{Aeq,15\ hour}$ 54.7	100	84	1,824	342	$L_{Aeq,15\ hour}$ 55.5	$L_{Aeq,15\ hour}$ 60
Night (10pm to 7am)	575	86	$L_{Aeq,9\ hour}$ 54.1	100	28	675	114	$L_{Aeq,9\ hour}$ 54.8	$L_{Aeq,9\ hour}$ 55

Note:
A façade refection of 2.5 dB has been applied to all calculated results as per the RNP (DECCW, 2011).
LV = Light Vehicles
HV = Heavy Vehicles

The predicted road traffic noise levels at Sensitive Receiver NAD59 indicate compliance with the day and night-time RNP criteria during the peak construction traffic period. The peak construction period is expected to last 6-9 months.

Although construction traffic noise impacts are predicted to be insignificant, general best practice noise control measures are provided below, to ensure noise impacts to residents and other noise sensitive receivers surrounding the site are minimised.

B8. NOISE MITIGATION MEASURES

Based on the findings presented in this report, the ICNG 'noise affected' management level is exceeded at 3 sensitive receivers for construction scenario CON 1, 4 sensitive receivers for construction scenario CON 2, and 7 sensitive receivers for construction scenario CON 3. The results were based on worst-case assumptions of construction activities at the Project boundary fronting sensitive receivers in the absence of any noise mitigation measures.

Although construction noise may be audible and there is likely to be some degree of adverse impact during sensitive periods (socialising or relaxing), as is typical with construction projects near residential receivers, by incorporating the noise control measures provided in this section, the noise impact to residents and other noise sensitive receivers surrounding the site can be managed.

A CNVMP would generally follow the approach in the Interim Construction Noise Guideline (ICNG), including the strategies to manage noise provided in *'Appendix C Audible alarms on mobile plant' of the ICNG*.

Table B8-1 summarises the mitigation measures to be implemented during the construction of the Project.

TABLE B8-1 NOISE MITIGATION MEASURES

Subject	Measures Summary
Scheduling	Works should be undertaken during standard working hours only, as specified in the ICNG (DECC, 2009): • Monday to Friday: 7am to 6pm; • Saturday: 8am to 1pm; and • No work on Sundays or public holidays.
	Construction outside these hours might be undertaken as follows: • In accordance with the ICNG; • For activities that are inaudible at Non-associated dwellings (dwellings without an agreement with The Applicant with respect to the management of noise for the Project); and • With agreement by DPHI.
	Where an equipment item operates close to the Project Boundary, or where noise level exceedances cannot be avoided (generate high levels of noise e.g., > 45 dB(A) at a Sensitive Receiver), then consideration may be given to implementing time restrictions and/or providing periods of respite for affected receivers, where feasible and reasonable. In some circumstances respite may extend the duration of works and inadvertently increase noise impacts; hence due care should be taken when considering this management measure.
Equipment	• Selection of the quietest plant, equipment and/or machinery for each construction activity, where practicable; • Efficient work practices to minimise the total construction period and the number of noise sources onsite should be adopted; • Unnecessary noise due to idling engines should be avoided; • High engine speeds should be avoided when equipment can be powered down and lower engine speeds are feasible; • All plant, equipment and/or machinery used onsite should be in suitable condition, with particular emphasis on exhaust silencers, covers on engines and inspection of squeaking or rattling components. Excessive noise-generating machines should be repaired or removed from the site;

Subject	Measures Summary
	• Reversal alarms shall be replaced with broadband "squash duck" motion alarms, where feasible; • Any equipment not in use for extended periods during construction should be turned off; • Vehicles and equipment should be regularly serviced according to manufacturers' instructions and maintained in proper working order; • Simultaneous operation of noisy equipment should be avoided where practical; and • Where practical, noisy equipment should be positioned behind structures that act as barriers to sensitive receivers, or at the greatest distance from sensitive receivers, or oriented to directed noise emissions away from sensitive receivers.
Training	All construction workforce should receive inductions prior to commencing on site. Inductions may occur via toolbox meetings, training and/or education, and should inform staff of: • Procedures to operate plant and equipment in a quiet and efficient manner; • Location of nearest sensitive receivers; • Standard construction hours; • Relevant approval conditions; and • Incidents and complaints handling procedures.
Sensitive receivers consultation	Affected sensitive receivers should be consulted with prior to the commencement of works that are expected to exceed noise criteria. Consultation activities should discuss: • The details of proposed works; • The anticipated noise impacts; • The time periods over which these woks would occur; and • To identify any management measures required to minimise impact at affected sensitive receivers.

B9. COMPLIANCE MANAGEMENT

B9.1 COMPLAINTS

Any complaints received from the community regarding noise should be addressed in accordance with the complaints handling procedures (to be developed at a later stage) to be provided for the Project.

If any validated noise complaints are received from the community, attended noise compliance measurements should be undertaken to measure and compare the site noise level contributions to the NMLs presented in this report.

All site noise levels should be measured and quantified in the absence of any influential noise sources not associated with the Project. If the measured site noise levels are above the NMLs presented in this report, further mitigation and/or management measures should be considered.

B9.2 MONITORING AND REPORTING

Unattended noise monitoring systems should be established at selected worst-affected sensitive receivers depending on the different activities and stages of construction when such details are finalised. The results should be used to improve the noise mitigation and management measures for the Project so that best practice noise control is continually implemented.

APPENDIX C OPERATIONAL NOISE CONTOURS

NAD21
NAD15
NAD14
NAD59
NAD13
NAD12
NAD56
NAD64
NAD16

Legend

- Non-Associated Dwellings (Noise Sensitive Receivers)
- Major Road
- Path/Track
- Project Area
- Construction Line
- Access Road

Operational Noise Sources

- Battery Units
- Main Substation Area
- Inverters
- Switchgear
- HV Transformer

Noise Contours, $L_{Aeq,15min}$ in dB(A)

- 30
- 35
- 40
- 45
- 50
- 55
- 60
- 65
- 70

Notes:
NSW DTDB, DCDB 2023
Nearmap Imagery Feb 2023

Coordinate System:
GDA 1994 MGA Zone 56
Date: 09/07/2025
Created By: CS/RT
Drawing Size: A3
0 125 250 375m
1:12,500

C-1 Operational Noise Contours - Day and Evening

Denman BESS

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ERM

0717735_DBESS_Noise_R0.aprx

NAD21
NAD15
NAD14
NAD59
NAD13
NAD12
NAD56
NAD64
NAD16

Legend

- Non-Associated Dwellings (Noise Sensitive Receivers)
- Major Road
- Path/Track
- Project Area
- Construction Line
- Access Road

Operational Noise Sources

- Battery Units
- Main Substation Area
- Inverters
- Switchgear
- HV Transformer

Noise Contours, $L_{Aeq,15min}$ in dB(A)

- 30
- 35
- 40
- 45
- 50
- 55
- 60
- 65
- 70
- 75

Notes:
NSW DTDB, DCDB 2023
Nearmap Imagery Feb 2023

Coordinate System:
GDA 1994 MGA Zone 56
Date: 09/07/2025
Created By: CS/RT
Drawing Size: A3
0 125 250 375m
1:12,500

C-2 Operational Noise Contours - Night

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NAD21
NAD15
NAD14
NAD59
NAD13
NAD12
NAD56
NAD64
NAD16

Legend

- Non-Associated Dwellings (Noise Sensitive Receivers)
- Project Area
- Battery Units
- Main Substation Area
- Inverters
- Switchgear
- Access Road
- Construction Line
- Major Road
- Road
- Path/Track

Noise Contours, $L_{Aeq,15min}$ in dB(A)

- 30
- 35
- 40
- 45
- 50
- 55
- 60
- 65
- 70
- 75

Notes:
NSW DTDB, DCDB 2023
Nearmap Imagery Feb 2023

Coordinate System:
GDA 1994 MGA Zone 56
Date: 09/07/2025
Created By: CS
Drawing Size: A3
0 125 250 375m

1:12,500

C-3 Operational Noise Contours - Night (50% Battery Unit Load Fan Duty)

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