Noise Impact and Vibration Assessment

Stoney Creek Battery Energy Storage System

FOR: Enervest Operations Pty Ltd

SLR PROJECT No: 620.031316.00000 Revision: 1.4

12 February 2026

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
1.4	12 Feburary 2026	Benjamin French	Benjamin French	Matt Bryce
1.3	29 October 2025	Benjamin French	Benjamin French	Matt Bryce
1.2	20 October 2025	Benjamin French	Benjamin French	Matt Bryce
1.1	22 August 2025	Benjamin French	Arvind Deivasigamani	Matt Bryce
1.0	7 July 2025	Benjamin French	Matt Bryce	Matt Bryce

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Enervest Operations Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

Executive Summary

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Enervest Operations Pty Ltd (Enervest) to prepare a Noise and Vibration Impact Assessment (NVIA) for a Battery Energy Storage System (BESS) facility in Narrabri, New South Wales.

Based on the analysis and discussion documented in this report, the following is concluded:

- The predicted noise levels at the closest noise sensitive receivers during the construction and operation of the BESS were assessed against the various requirements of the NSW Noise Policy for Industry (NPfI) and the Interim Construction Noise Guideline (ICNG).

The key project impacts in relation to noise is as follows:

- Noise from construction activities: All construction works will be completed during standard construction hours (Monday to Friday 7:00 am to 6:00 pm, Saturday 8:00 am to 1:00 pm, no work on Sunday or public holidays).
- None of the closest receivers are expected to be Noise Affected at any time during the construction of the BESS. Nonetheless, community engagement and best practice noise management controls to minimise residual risk of harm at nearby receivers will be applied to reduce noise impacts as low as reasonably practicable.
- Construction traffic may be noticeable at times during construction at dwellings fronting the proposed heavy vehicle route through Narrabri. Mitigation controls (i.e. scheduling heavy vehicle movements) will be implemented to minimise noise associated with construction traffic.
- Construction vibration is unlikely to be perceptible at the identified nearby receivers.
- Noise from operations: Compliance with the NPfI is expected at all receivers at all times with the inclusion of silencing treatment of the BESS battery containers.
- Cumulative noise emissions from construction and operation of other industry in the region was also considered. Cumulative noise impacts are not expected to exceed the most stringent recommended amenity criterion during the night period.

Mitigation measures have been recommended. Plant/equipment selection and design layout will be reviewed during the detailed design stage to ensure that compliance with the noise criteria is achieved as the acoustic performance of the plant and layout is refined.

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Acronyms and Abbreviations

Term	Meaning
BESS	Battery Energy Storage System
BESS Site	Lot 156 DP 754944 at 41 Stoney Creek Road, Narrabri NSW 2390
CEMP	Construction Environmental Management Plan
CNVG	Construction Noise and Vibration Guideline
CNVMP	Construction Noise and Vibration Management Plan
DA	Development Application
DPE	Department of Planning and Environment, known as DPHI
DPHI	Department of Planning, Housing and Infrastructure
DOP	Department of Planning, known as DPHI
EIS	Environmental Impact Statement
EPA	Environmental Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979 (NSW)*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2021 (NSW)*
Enervest	Enervest Operations Pty Ltd
GIS	Geographical Information Systems
HNA	Highly Noise Affected
ICNG	Interim Construction Noise Guideline
Indicative BESS area	Footprint of BESS and ancillary infrastructure on Lot 156 DP 754944 at 41 Stoney Creek Road, Narrabri NSW 2390
LGA	Local Government Area
NML	Noise Management Level
NPfi	NSW Noise Policy for Industry
NSW	New South Wales
NVIA	Noise and Vibration Impact Assessment
OOH	Out of Hours
OSOM	Oversize and Over Mass
PNTL	Project Noise Trigger Levels
Project Area	Lot 156 DP 754944 at 41 Stoney Creek Road, Narrabri NSW 2390 Road Reserve of Stoney Creek Road, Narrabri NSW 2390 Lot 1 DP 502189 at 70 Stoney Creek Road, Narrabri NSW 2390
RBL	Rated Background Level
RNP	NSW EPA Road Noise Policy
SEAR's	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy (NSW)
Site	Lot 156 DP 754944 at 41 Stoney Creek Road, Narrabri NSW 2390

Term	Meaning
SLR	SLR Consulting Australia Pty Ltd
SSD	State Significant Development
TfNSW	Transport for New South Wales
TIA	Traffic Impact Assessment

1.0 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Enervest Operations Pty Ltd (Enervest) to prepare a Noise and Vibration Impact Assessment (NVIA) for a Battery Energy Storage System (BESS) facility in Narrabri, New South Wales.

The proposal involves the installation of a BESS facility located at 41 Stoney Creek Road, Narrabri NSW 2390, adjacent to an existing substation facility, hereafter referred to as 'the Project'.

The structure of this NVIA report is shown in Table 1.

Table 1 NVIA Report Structure

Section	Title	Description
1.0	Introduction	Identifies the context of the project.
2.0	Policy Context	Summarises the relevant legislation and policy requirements that apply to the assessment.
0	Project Description	Describes the project, including location, site design, and access arrangements.
4.0	Assessment	Outlines the technical analysis to assess the noise impacts on sensitive receivers.
5.0	Mitigation Measures	Outlines the recommended actions for the applicant following the lodgement of the SSD application.
6.0	Conclusion	Summarises the findings of the assessment and recommends approval conditions.

2.0 Policy Context

2.1 Secretary's Environmental Assessment Requirements (SEARS)

The proposal is a State Significant Development, and the Department of Planning, Housing and Infrastructure (DPHI) has issued Secretary's Environmental Assessment Requirements (SEARs)[1]. SEARs relevant to this study and where they are addressed are listed in Table 2 below. The Agency comments received in conjunction with the SEARs are listed in Table 3.

[1] Application number: SSD – 75680468, 14 October 2024

Table 2 SEARs Requirements – DPHI

Key Issue	SEARs Requirements		Section where addressed
Noise	Including an assessment of the construction noise impacts (including impacts from proposed road upgrades) of the development in accordance with the Interim Construction Noise Guideline (ICNG), operational noise impacts in accordance with the NSW Noise Policy for Industry (2017) and cumulative noise impacts (considering other developments in the area), including (where appropriate):	Identification of impacts associated with construction, site emission and traffic generation at noise affected sensitive receivers, including the provision of operational noise contours; Details of noise monitoring survey, background noise levels and amenity noise levels at the most-affected residential receivers;	Section 4.0 Section 5.0 Figure 4
		Details of the likely charging/discharging load profile, manufacturer specifications for plant and equipment and noise source inventory (including intensity, quantity, location, directivity and frequency information);	Section 4.2.3.1 Appendix B
		An assessment of 'worst case' noise emission scenarios during periods of discharging and charging;	Section 4.3.2
		Consideration of annoying characteristics of noise and prevailing meteorological conditions in the study area; and	Section 4.2 Section 4.1.3.3 Section 4.3.2.1
		Details and analysis of the effectiveness of proposed management and mitigation measures to adequately manage identified impacts, including a clear identification of residual noise and vibration impacts following application of these mitigation measures and details of any proposed compliance monitoring programs.	Section 5.0

Table 3 Agency SEARs Comments – Narrabri Shire Council

Agency SEARs Comments	Section where addressed
5. Noise and Vibration Operation of machinery during construction, including clearing and excavation, would generate noise with the potential to affect sensitive receivers such as rural residences. An assessment should be undertaken to further understand these noise impacts and to identify and implement mitigation measures to manage the impacts.	Section 4.2.2

3.0 Project Description

3.1 Site Location

The Project Area is located on land in the northeast periphery of the township of Narrabri, within the Narrabri Shire Council Local Government Area (LGA). It is located approximately 180 km west of Armidale and 135 km northwest of Tamworth.

Narrabri Shire is strategically positioned at the crossroads of two major highways, the Newell and Kamilaroi Highways, midway between Sydney and Brisbane. It is also considered the main freight hub in the Northern Inland Region of NSW.

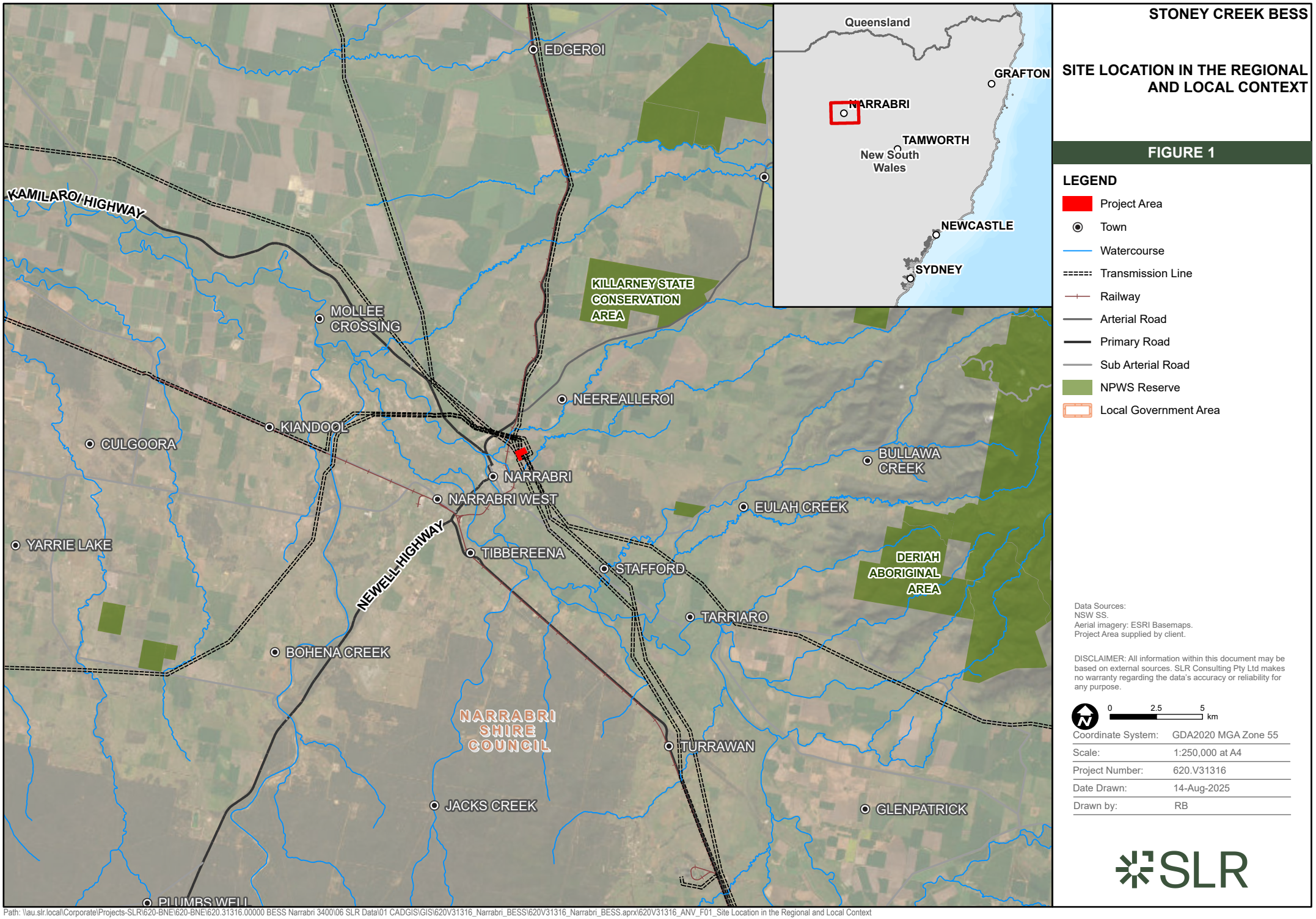
There are two other large towns within the LGA, being Boggabri and Wee Waa. A number of other villages are found throughout the LGA. Narrabri provides essential retail, commercial and community services to a range of local communities with a strong and growing economy centred on agricultural production, agribusiness and mineral resources production and includes several research institutions.

The BESS site is identified as 41 Stoney Creek Road, Narrabri NSW 2390, being Lot 156 in DP 754944. The Project Area also includes the existing Narrabri 132/66 kV substation that the BESS would be connected to via a new underground cable and above ground transmission line. The substation is located on Lot 1 in DP 502189, 70 Stoney Creek Road, Narrabri NSW 2390, approximately 40m southwest of the site. he substation is to the western corner adjacent to Lot 6 in DP 224780, 80 Stoney Creek Road, Narrabri NSW 2390. The BESS site is generally regular in shape and is zoned RU1 Primary Production in accordance with the *Narrabri Local Environment Plan 2012* (Narrabri LEP). The Project Area is relatively flat and approximately 9.55 ha in size. The total disturbance footprint area is 8.24ha. The neighbouring lots are predominantly large rural lots and generally cleared land.

Access to the BESS Site is provided via Stoney Creek Road, which runs along the southern extent of the BESS Site, with an existing substation located on the opposite side of this road.

The neighbouring lots are predominantly large rural lots and generally cleared land. The closest residence is approximately 600 metres from the proposed BESS facility to the south.

Figure 1 shows the site location in the regional and local contexts.



STONEY CREEK BESS

SITE LOCATION IN THE REGIONAL AND LOCAL CONTEXT

FIGURE 1

LEGEND

- Project Area
- Town
- Watercourse
- Transmission Line
- Railway
- Arterial Road
- Primary Road
- Sub Arterial Road
- NPWS Reserve
- Local Government Area

Data Sources:
NSW SS.
Aerial imagery: ESRI Basemaps.
Project Area supplied by client.

0 2.5 5 km

Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:250,000 at A4
Project Number:	620.V31316
Date Drawn:	14-Aug-2025
Drawn by:	RB

SLR

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.31316.00000 BESS Narrabri 3400\06 SLR Data\01 CADGIS\GIS\620V31316_Narrabri_BESS\620V31316_Narrabri_BESS.aprx\620V31316_ANV_F01_Site Location in the Regional and Local Context

3.2 Sensitive Receivers

Noise sensitive receivers identified near to the Project are listed in Table 4 in relation to the BESS location. Table 5 shows the closest three identified non noise sensitive receivers.

Table 4 Noise Sensitive Receivers

Receiver ID	Address	Easting (GDA2020 – MGA55)	Northing (GDA2020 – MGA55)	Distance to Site Centroid
R1	80 Stoney Creek Road	769265.831	6642343.229	630m
R2	12 Bailey Street	768459.712	6642610.736	790m
R3	10 Bailey Street	768470.635	6642593.000	800m
R4	8 Bailey Street	768484.604	6642573.133	810m
R5	6 Bailey Street	768484.149	6642554.648	820m
R6	4 Bailey Street	768500.307	6642539.866	830m
R7	2 Bailey Street	768506.095	6642523.283	840m
R8	74 Goldman Street	769063.030	6642075.951	960m
R9	19 Stoltenbergs Road	770159.957	6643921.068	1100m

Table 5 Non-Residential Receivers

Receiver ID	Address	Easting (GDA2020 – MGA55)	Northing (GDA2020 – MGA55)	Distance to Site Centroid
NR1	26 Namoi Street (Narrabri Saleyards)	768215.440	6643097.106	900m
NR2	44 Old Cemetery Road (Narrabri Cemetery)	768688.576	6642878.182	450m
NR3	2 Hunt Street (Narrabri Jockey Club)	768891.017	6642044.507	1000m

STONEY CREEK BESS

NEAREST NOISE SENSITIVE RECEIVERS

FIGURE 2

LEGEND

- Receiver
- Road
- Watercourse
- Cadastre
- Disturbance Footprint
- Project Area
- Title Containing Substation
- Title containing BESS Site
- BESS Area

RECEPTOR ID	ADDRESS
R1	80 STONEY CREEK RD
R2	12 BAILEY ST
R3	10 BAILEY ST
R4	8 BAILEY ST
R5	6 BAILEY ST
R6	4 BAILEY ST
R7	2 BAILEY ST
R8	74 GOLDMAN ST
R9	19 STOLTENBERGS RD

Data Sources:
NSW SS.
Aerial imagery: Nearmap (July 2024).
Project Area supplied by client.

0 250 500 m

Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:12,739 at A4
Project Number:	620.V31316
Date Drawn:	28-Aug-2025
Drawn by:	RB

SLR

3.3 Project Description

The Project will involve the development, construction, operation, and eventual decommissioning of a BESS with a capacity of 125 MW connecting via above ground transmission line or underground cable, directly to the existing Narrabri 132/66 kV substation operated by TransGrid. The Project will consist of BESS containers, with each container having the approximate dimensions of 10.50m long, 2.44m wide and 2.94m with an approximate weight of 47,000 kg.

The BESS will be supported by inverters which will convert the electricity from direct current (DC) to alternating current (AC)and connect to the existing TransGrid substation via approximately 340m of new underground and overhead lines. The proposal is considered State Significant under the Planning Systems SEPP, as the proposed electricity generating works are estimated to cost in excess of $30 million.

A summary of the project is detailed in Table 6.

Table 6 Project Summary

Project Element	Description
Proposed Development - Construction and Operation Summary	The Project would generally involve the following components: • Mobilisation and establishment of access, temporary construction facilities and laydown area. • Transport of construction personnel, associated heavy and light vehicles, and materials to and from site on a day-to-day basis, dependent on construction schedule. • Road works to formalise internal site access road to accommodate heavy vehicles, including a new driveway crossover to Stoney Creek Road. • Clearing and grubbing, cut, fill and compaction activities to create level pads. • Installation of drainage. • Installation of concrete footings or pads to support transformers, BESS battery packs, control building and other outdoor electrical infrastructure. • Delivery and placement of all equipment on the footings/pads. • Trenching, installation and backfilling of underground cabling between equipment on the pad including the BESS battery packs, transformers, auxiliary electrical equipment and the control room. • Construction of gravel hardstand, gravel internal roads, control room/switchgear, transformers, circuit breakers, harmonic filters, auxiliary underground transmission lines, car parking, lay down area, security fencing/lighting, and a single demountable building used for storage. • Removal of temporary construction facilities, and rehabilitation of disturbed areas following completion of construction of the Project.
Site Access	Access to the Project Area is proposed to be via Stoney Creek Road via two new driveway crossings. The internal access road is planned to be gravel formalised to accommodate heavy vehicles associated with the construction of the BESS.

Project Element	Description
Grid Connection	A new underground and overhead transmission line will be constructed to connect the BESS substation, to the existing TransGrid Narrabri 132/66kV substation to the immediate southwest of the BESS area.
Total Disturbance Footprint	8.24 hectares (ha)
Construction Duration	Construction of the Project is anticipated to take approximately 12-14 months. Construction is scheduled to commence within 12 months of approval being granted (2026).
Operation Life Expectancy	The operational life of the Project will be determined by the evolving nature of the technology, however, is anticipated that the lifespan will be approximately 25 years. No Subdivision is proposed for this development.
Decommissioning	The Project would be decommissioned, and the infrastructure removed, returning the site to its original use at the end of the project life. The Project however, may continue beyond 25 years if it is deemed viable to extend the lifespan of the development.

3.4 Detailed Project Overview

3.4.1 Construction

Construction of the Project would require heavy vehicles, plant, and equipment for the transportation of components and installation of the components on the site. The Project is likely to require earth-moving equipment for civil and road works, cable trenching equipment, forklifts, and cranes subject to detailed design to install the BESS and complete ancillary works.

A Construction Environmental Management Plan (CEMP) will be prepared, prior to construction describing how the activities will be undertaken during the construction phase of the development and how these activities will be managed to mitigate environmental impacts.

3.4.2 Construction Activities

It is anticipated that the construction and commissioning phase will last approximately 12 – 14 months with the project forecast to commence within 12 months of determination. Over that time, the main construction activities will include:

- Mobilisation and establishment of access, temporary construction facilities and laydown area.
- Transport of construction personnel, associated heavy and light vehicles, and materials to and from site on a day-to-day basis, dependent on construction schedule.
- Road works to formalise internal site access road to accommodate heavy vehicles, including two new crossovers to Stoney Creek Road.
- Clearing and grubbing, cut, fill and compaction activities to create level pads.
- Installation of drainage systems.

- Installation of concrete footings or pads to support transformers, battery containers, inverters, and other outdoor electrical infrastructure.
- Delivery and placement of all equipment on the footings/pads.
- Trenching, installation and backfilling of underground cabling between equipment on the pad including the BESS battery packs, transformers, auxiliary electrical equipment and the control room.
- Construction of an overhead and underground 132 kV TL to facilitate connection to the existing Narrabri 132/66 kV TS and associated high voltage steel poles.
- Construction of hardstand, internal roads, control room/switchgear, transformers, circuit breakers, harmonic filters, auxiliary underground transmission lines, car parking, lay down area, security fencing/lighting, stormwater management infrastructure, fire water tanks, and a single demountable building used for storage.
- Removal of temporary construction facilities, and rehabilitation of disturbed areas following completion of construction of the Project.

3.4.3 Construction Hours and Personnel

For the construction workforce, based on SLR's experience with other BESS facilities, it is expected there will be 48 staff on-site per day (or 56 trip movements per day: 52 light vehicle movements and 4 small bus movements per day).

The proposed development construction timeframe consists of the following:

- On site construction works are anticipated to take approximately 12 months.
- Testing and commissioning of the BESS is anticipated to take approximately 4 months.

The proposed construction hours are anticipated to be as follows:

- Monday to Friday: 7:00 am – 6:00 pm
- Saturday: 8:00am – 1:00pm
- Sunday and Public Holidays – No Work.

No works are proposed to be undertaken outside of the standard construction hours. In the event this is required, Out of Hours (OOH) approval would be sought, and all works would be undertaken in accordance with the appropriate OOH protocols and approval processes.

3.4.4 Construction Traffic

Vehicles during construction will generally involve small/light utility vehicles and some small trucks for delivery of electrical and earth work products. Heavy vehicles will be used to deliver larger hardware.

All construction vehicles and equipment will be parked and located within the project site area. Any temporary parking and set down areas required during the construction phase will be reinstated and landscaped once the facility is operational.

3.4.5 BESS Components

The batteries units will be stored in fully enclosed battery storage containers. The battery storage container will be within shipping or modular containers. Each battery storage

container will be approximately 10.5m long, 2.44m wide and 2.94m high. The battery storage containers will be placed in rows with industry standard separation distances maintained between them.

Each section will consist of BESS containers which will run in two northeast-southwest aligned rows, with one of the rows in a side-by-side formation, along with inverters/ Power Conversion Units.

Inverters and medium voltage (MV) transformers will be required at each battery storage container. The inverters are required to convert direct current (DC) to alternating current (AC) and the transformers are required to step up the voltage to 33kV. The inverters and transformers will be housed in modular containers.

Electrical cabling connecting the onsite infrastructure (e.g. electrical cabling connecting the batteries, inverters and transformers) will be located underground in accordance with relevant Australian Standards.

A 33 kV switch room will be required at the BESS facility to control the delivery of electricity to and from the existing adjacent Narrabri substation.

The BESS facility will require its own substation to transform MV to high voltage (HV), and vice versa.

3.4.6 Operational Phase

The following activities are anticipated during the operational phase of the development:

- 25-year operational period.
- Full servicing of the inverters and substation equipment on a quarterly basis.

3.4.7 Hours of Operation

The BESS will operate at any time of the day with load requirements dependant on energy supply and demand scenarios. However, it will never operate continually 24 hours per day, 7 days per week.

4.0 Assessment

4.1 Assessment Criteria

Background noise monitoring was not undertaken for this assessment as the Project Area is located in a rural area where existing background noise levels are typically very low, dominated by natural sounds such as wind in vegetation and occasional domestic activity. Given the low density of surrounding land uses and low traffic volume on Stoney Creek Road, it was considered reasonable to adopt the minimum assumed RBLs levels for this assessment.

4.1.1 Construction Noise

The NSW *Interim Construction Noise Guideline* (ICNG) is used to assess and manage impacts from construction noise on residences and other sensitive land uses in NSW.

The ICNG contains procedures for determining project specific Noise Management Levels (NMLs) for sensitive receivers based on the existing background noise in the area. Since the existing background noise levels at the closest receivers are expected to be low, the minimum rating background levels from the NPfI were adopted (see Table 7). The ‘worst-

case' noise levels from construction of a proposal are predicted and then compared to the NMLs in a 15-minute assessment period to determine the likely impact of the proposal.

The NMLs are not mandatory limits, however, where construction noise levels are predicted or measured to be above the NMLs, feasible and reasonable work practices to minimise noise emissions are to be investigated.

The ICNG approach for determining NMLs at residential receivers is shown in Table 8.

Table 7 NPfI Minimum Assumed RBLs and Intrusiveness Noise Levels

Time of Day	Minimum Assumed Rating Background Noise Level, dBA	Minimum Project Intrusiveness Noise Levels, L_{eq}, 15 min, dBA
Day	35	40
Evening	30	35
Night	30	35

Table 8 ICNG NMLs for Residential Receivers

Time of Day	NML $L_{Aeq(15minute)}$	How to Apply
Standard Construction Hours Monday to Friday 7:00 am to 6:00 pm Saturday 8:00 am to 1:00 pm No work on Sundays or public holidays	Noise affected RBL[1] + 10 dB	• The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq(15minute)}$ 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 dBA	• The Highly Noise Affected (HNA) level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restructuring the hours that the very noisy activities can occur, taking into account: o Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools or mid-morning or mid-afternoon for works near residences). o If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside Standard Construction Hours	Noise affected RBL + 5 dB	• 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 practises have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community.

Note 1: RBL (Rating Background Level), is determined in accordance with the NSW *Noise Policy for Industry* (NPfI).

The construction NMLs for the proposal, based on minimum RBLs, are shown in Table 9.

Out of hours NMLs would be applicable should works be required to be undertaken outside ICNG standard construction hours.

Table 9 Project Specific Noise Management Levels

Receiver Type	Noise Management Level ($L_{Aeq(15minute)}$ – dBA)			
	Standard Construction (RBL +10 dB)[1]	Out of Hours (RBL +5 dB)		
	Daytime	Daytime[2]	Evening	Night-time
Residential (All receivers)	45	40	35	35

Note 1: RBL = Rating Background Level. Minimum RLB levels have been assumed for the assessment.

Note 2: Daytime out of hours is 7 am to 8 am and 1 pm to 6 pm on Saturday, and 8 am to 6 pm on Sunday and public holidays.

In addition to the above NMLs, residential receivers are considered to be 'highly noise affected' if the predicted level exceeds 75 dBA $L_{Aeq(15minute)}$.

4.1.2 Other Sensitive Land Uses and Commercial Receivers

Non-residential land uses have been identified in the study area. The NMLs for 'other' sensitive receivers are shown in Table 10.

Table 10 Construction NMLs for ICNG 'Other Sensitive' Receivers

Land Use	Noise management level $L_{Aeq(15minute)}$ (dBA) (applied when the property is in use)	
	Internal	External
ICNG 'other sensitive' receivers		
Industrial (Narrabri Saleyards)	-	75
Active recreation areas (Narrabri Jockey Club)	-	65
Places of worship (Narrabri Cemetery)	45	55[1]

Note 1: The places of worship criterion applies internally. An equivalent outdoor criterion is considered to be 10 dB higher than the internal level.

4.1.3 Operational Noise

The NSW *Noise Policy for Industry* (NPfI) was released in 2017 and sets out the requirements for the assessment and management of operational noise from industry in NSW.

The NPfI defines how to determine 'trigger levels' for noise emissions from industrial developments. Where a development is likely to exceed the trigger levels at existing noise-

sensitive receivers, feasible and reasonable noise management measures are required to be considered to reduce the impacts.

There are two types of trigger levels – one to account for 'intrusive' noise impacts and one to protect the 'amenity' of particular land uses:

- The **intrusiveness** of an industrial noise source is generally considered acceptable if the L_{Aeq} noise level of the source, measured over a period of 15-minutes, does not exceed the representative background noise level by more than 5 dB. Intrusive noise levels are only applied to residential receivers. For other receiver types, only the amenity levels apply.
- To limit continual increases in noise levels from the use of the intrusiveness level alone, the ambient noise level within an area from all industrial sources should remain below the recommended **amenity** levels specified in the NPfI for that particular land use.

Intrusive and amenity noise levels are not used directly as regulatory limits. They are used to assess the potential impact of noise, assess feasible and reasonable mitigation options and subsequently determine achievable noise requirements.

The NPfI provides guidance on assigning residential receiver amenity noise categories based on the site-specific features shown in Table 11.

Table 11 Residential Receiver Amenity

Receiver Category	Typical Planning Land Use Zoning	Typical Existing Background Noise Levels (RBL)	Description
Rural	RU1 – primary production RU2 – rural landscape RU4 – primary production small lots R5 – large lot residential E4 – environmental living	Daytime <40 dBA Evening <35 dBA Night <30 dBA	Rural – an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels. Settlement patterns would be typically sparse. Note: Where background noise levels are higher than those presented due to existing industry or intensive agricultural activities, the selection of a higher noise amenity area should be considered.

Amenity noise categories for the surrounding receivers have been determined with reference to the minimum assumed rating background noise levels (RBL) and intrusiveness levels defined in the NPfI. The PNTLs are the most stringent of the intrusiveness and amenity trigger level for each period and are highlighted below.

Table 12 Project Noise Trigger Levels

Receiver ID	Period	Amenity Noise Level L_{Aeq} (dBA)	Minimum Assumed RBL(dBA)	Project Noise Trigger Levels $L_{Aeq(15minute)}$ (dBA)	
				Intrusiveness	Amenity[1]
	Day	50	35	**40**	48

Receiver ID	Period	Amenity Noise Level L_{Aeq} (dBA)	Minimum Assumed RBL(dBA)	Project Noise Trigger Levels $L_{Aeq(15minute)}$ (dBA)	
				Intrusiveness	Amenity[1]
All Residential Receivers	Evening	45	30	**35**	43
	Night	40	30	**35**	38
Place of worship (Narrabri Cemetery)	When in use	40 (internal) 50 (external)[2]	-	**-**	**48**
Active recreation (Narrabri Jockey Club)	When in use	-	-	**-**	**53**
Industrial (Narrabri Saleyards)	When in use	-	-	**-**	**68**

Note 1: The recommended amenity noise levels have been reduced by 5 dB, where appropriate, to give the project amenity noise levels due to (possible) other sources of industrial noise being present in the area, as outlined in the NPfI. The project amenity noise levels have been then converted to a 15-minute level by adding 3 dB, as outlined in the NPfI.

Note 2: The criterion is specified as an internal noise level for this receiver category. As the land use is predominately outdoors, it has been assumed that a comparative outdoor amenity level is 10 dB higher than the corresponding internal level.

4.1.3.1 Cumulative Noise Impacts

The NSW Government *Cumulative Impact Assessment Guidelines for State Significant Projects* requires that the potential combined effect of cumulative impacts on all nearby industrial developments to be considered when assessing potential noise impacts from state significant projects. The guideline references the NPfI when determining the approach to assessing the cumulative industrial noise impacts.

The NPfI states that it aims to limit continuing increases in cumulative industrial noise through the application of amenity noise levels, which are applicable to all industrial noise sources in an area.

The NPfI requires that the amenity noise levels which are applied to an individual project be reduced by 5 dB to allow for the potential cumulative impact from multiple sources of industrial noise in an area (including existing and new).

By doing this, the policy accounts for potential cumulative impacts by lowering the criteria for each individual development to ensure that the ambient noise level within an area from all industrial noise sources combined remains below the recommended amenity noise levels, where feasible and reasonable. The NPfI states that *"where the project amenity noise level applies and it can be met, no additional consideration of cumulative industrial noise is required"*.

The projects listed in Table 13 have been identified in the vicinity of the Project, which may overlap in the construction and/or operation phases.

The potential cumulative impacts from the development and other sources of industrial noise in the area are accounted for in the proposal-specific PNTLs for Amenity (see Table 12).

Table 13 Nearby Industrial Projects

Project Name	Distance from Project site	Project Status	Project Summary	Potential Overlap
Department of Planning, Housing and Infrastructure (SSD)				
Silverleaf Solar Farm SSD-9358	4.5 km northwest	Determined (Approved)	Construction and operation of a photovoltaic (PV) generation facility with an estimated capacity of 120 MW; and associated infrastructure	Construction timeframes unknown Operations overlap
Narrabri South Solar Farm SSD-8387	9 km southeast	Determined (Approved)	60 MW solar PV system with a footprint of approximately 152 ha on a site with an area of approximately 190 ha Subsequent modification (powerline realignment and battery system) being prepared.	Construction status unknown Operations overlap
Joint Regional Planning Panel (Northern Region)				
PPSNTH-100	6 km southwest	Determined (Approved)	Establishment of a Solar PV Electricity Generation Facility with Associated Infrastructure	Construction commencement date unknown Operations overlap
PPSNTH-99	3 km south east	Determined (Approved)	Establishment of a 5 MW Solar PV Electricity Generation Facility with Associated Infrastructure	Construction commencement date unknown Operations overlap

Construction Noise

The construction commencement dates of the identified projects are unknown. Given the separation distance of the identified projects (minimum 3 km) adverse cumulative impacts during the construction phase is unlikely.

Operational Noise

The *Noise Policy for Industry* states that it aims to limit continuing increases in cumulative industrial noise through the application of amenity noise levels, which are applicable to all industrial noise sources in an area.

The policy accounts for potential cumulative impacts by lowering the criteria for each individual development to ensure that the ambient noise level within an area from all industrial noise sources combined remains below the recommended amenity noise levels, where feasible and reasonable.

4.1.3.2 Sleep Disturbance

The potential for sleep disturbance from maximum noise level events from the proposal during the night-time period is required to be considered. This is applicable only to residential receivers.

In accordance with the NPfI, a detailed maximum noise level assessment should be undertaken where a development results in night-time noise levels which exceed:

- $L_{eq(15minute)}$ 40 dBA or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- L_{Fmax} 52 dBA or the prevailing RBL plus 15 dB, whichever is the greater.

The sleep disturbance screening level for the proposal are shown in Table 14.

Table 14 Sleep Disturbance Screening Levels

Location	Sleep Disturbance Screening Level (dBA)	
	$L_{eq,15minute}$	L_{max}
All Receivers	40	52

A detailed maximum noise level event assessment should be completed where the sleep disturbance screening level is exceeded. The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the RBL, and the number of times this happens during the night-time period.

The NPfI refers to the *Road Noise Policy* (RNP) for additional information regarding sleep disturbance. Council studies are referenced which indicate that for short-term or transient noise events, for good sleep over eight hours the indoor L_{AFmax} sound pressure level should ideally not exceed around 45 dBA more than 10 or 15 times per night.

The RNP goes on to conclude that from the research on sleep disturbance to date:

- Maximum internal noise levels below 50 dBA to 55 dBA are unlikely to awaken people from sleep.
- One or two events per night with maximum internal noise levels of 65-70 dBA are not likely to affect health and wellbeing significantly.

4.1.3.3 Corrections for Annoying Noise Characteristics

Sources of industrial noise can cause greater annoyance where they contain certain characteristics, such as tonality, intermittency or dominant low-frequency content. The NPfI specifies the following modifying factor corrections, shown in Table 15, which are to be applied where annoying characteristics are present. The corrections are to be added to the noise level at the receiver before comparison with the Project Noise Trigger Levels.

Table 15 NPfI Modifying Factor Corrections

Factor	Assessment/ Measurement	When to Apply	Correction[1]
Tonal noise	One-third octave or narrow band analysis	Level of one-third octave band exceeds the level of the adjacent bands on both sides by the levels defined in the NPfI.	5 dB[2]
Low-frequency noise	Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements	Measure/assess source contribution C and A weighted $L_{eq,t}$ levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and the level to which the thresholds defined in the NPfI are exceeded.	2 or 5 dB[2]
Intermittent noise	Subjectively assessed but should be	The source noise heard at the receiver varies by more than 5 dB and the intermittent nature of the noise is clearly audible.	5 dB[3]

Factor	Assessment/ Measurement	When to Apply	Correction[1]
	assisted with measurement to gauge the extent of change in noise level	The NPfI further defines intermittent noise as noise where the level suddenly drops/increases several times during the assessment period, with a noticeable change in source noise level of at least 5 dB, for example, equipment cycling on and off. The EPA has confirmed[4] that the intermittent correction does not apply to short-term events that emerge above the general industrial noise level and is therefore not applicable to industrial or commercial sites that have vehicle or plant movements at night, including audible reversing alarms. The intermittency correction is not intended to be applied to changes in noise level due to meteorology.	
Maximum adjustment	Refer to individual modifying factors	Where two or more modifying factors are indicated.	Maximum correction of 10 dB[2] (excluding duration correction)

Note 1: Corrections to be added to the measured or predicted levels.

Note 2: Where a source emits tonal and low-frequency noise, only one 5 dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.

Note 3: Adjustment to be applied to night-time only.

Note 4: *How to Apply the Noise Policy for Industry Intermittent Modifying Factor Corrections*, NSW Environment Protection Authority, Acoustics Australia Vol. 50, No. 3, September 2022.

4.1.3.4 Residual Impacts

The NPfI defines residual noise impacts as exceedances of the Project Noise Trigger Levels which remain after all feasible and reasonable source and pathway mitigation measures have been considered.

The significance of residual noise impacts, as defined in the NPfI, is shown in Table 16. Examples of receiver-based treatments that can be used to mitigate residual impacts are shown in Table 17.

Table 16 NPfI Significance of Residual Noise Impacts

If the Predicted Noise Level minus the Project Noise Trigger Level is:	And the Total Cumulative Industrial Noise Levels is:	Then the Significance of the Residual Noise Level is:
≤ 2 dBA	Not applicable	Negligible
≥ 3 but ≤ 5 dBA	< 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 dBA	> recommended amenity noise level and the increase in total cumulative industrial noise level resulting from the development is more than 1 dB	Moderate

If the Predicted Noise Level minus the Project Noise Trigger Level is:	And the Total Cumulative Industrial Noise Levels is:	Then the Significance of the Residual Noise Level is:
> 5 dBA	≤ recommended amenity noise level	Moderate
	> recommended amenity noise level	Significant

Table 17 NPfI Examples of Receiver-based Treatments to Mitigate Residual Noise Impacts

Significance of Residual Noise Impact	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 facade elements, such as windows, doors or roof insulation, to further increase the ability of the building facade to reduce noise levels.
Significant	May include suitable commercial agreements where considered feasible and reasonable.

4.1.4 Traffic on Surrounding Roads

The potential impacts from proposal-related traffic on the surrounding public roads are assessed using the NSW EPA *Road Noise Policy* (RNP).

An initial screening test is first applied to evaluate if existing road traffic noise levels are expected to increase by more than 2 dB. Where this is considered likely, further assessment is required using the RNP criteria shown in Table 18.

Table 18 RNP Criteria for Assessing Traffic on Public Roads

Road Category	Type of Project/Land Use	Assessment Criteria (dBA)	
		Daytime (7 am – 10 pm)	Night-time (10 pm – 7 am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hour)}$ 60 (external)	$L_{Aeq(9hour)}$ 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 (external)	$L_{Aeq(1hour)}$ 50 (external)

4.2 Assessment Methodology

A 3D noise model of the study area has been used to predict operational noise levels from the Project to the surrounding receivers.

The model uses the International Organisation for Standardisation (ISO) 9613:1996 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation* (ISO 9613-2) prediction methodology within the SoundPLAN software package.

ISO 9613-2 is an industry standard methodology that is considered suitable for use in the prediction of noise from industrial sources where intervening objects provide acoustic shielding, such as at the subject site and surrounding area.

ISO 9613-2 has been used extensively on industrial projects in Australia over several decades and has been accepted previously by NSW DPE (now DPHI) in numerous environmental noise assessments.

In lieu of a detailed weather analysis to determine the frequency of occurrence of noise-enhancing propagation conditions, it is acceptable to undertake the assessment on the basis that noise-enhancing propagation conditions are a feature of the area and perform predictive noise modelling as such.

Noise from the Project has been predicted in terms of sound pressure levels under noise-enhancing meteorological conditions favourable to downwind propagation, or equivalently, propagation under a well-developed, moderate, ground-based temperature inversion, such as commonly occurs on clear calm nights.

Downwind propagation conditions include wind from source to receiver, with wind speeds of approximately 1 m/s to 5 m/s, measured at a height of 3 to 11m above the ground. These propagation conditions are considered consistent with the noise-enhancing weather conditions specified in *Fact Sheet D: Accounting for noise-enhancing weather conditions* of the NPfI.

The noise model includes ground topography, ground absorption and buildings within the Project Area.

The following ground absorption factors have been used (note: a factor of 0.0 is fully reflective and 1.0 is fully absorptive):

- Site – 0.0
- Agricultural land and grassland beyond the site and to receivers – 0.6.

Modelled at 0.0 (hard ground) within the Project Area, all other ground surfaces in the area were modelled with a ground absorption value of 0.6).

4.2.1 Construction and Operational Vibration

The construction activities and operations at the Project Area would not be expected to generate significant levels of vibration.

Notwithstanding, in terms of vibration emissions, the separation distances to the nearest sensitive receivers will be located well outside the distance at which perceptible ground vibrations would occur for any vibration-intensive construction activities (typically within approximately 100 m for a vibratory roller).

Consequently, further consideration of vibration is not required.

4.2.2 Construction Noise Assessment

4.2.2.1 Construction Activities

Representative scenarios have been developed to assess the likely impacts from the various construction phases of the proposal. These scenarios are shown in Table 19.

The assessment uses ‘realistic worst-case’ scenarios to determine the impacts from the noisiest 15-minute period that are likely to occur for each work scenario, as required by the ICNG. The impacts represent construction noise levels without mitigation applied.

Sound power levels of typical mobile construction plant and equipment, taken from SLR’s noise database of field measurements and BS 5228-1:20091 are summarised in Table 20.

Table 19 Construction Equipment

Scenario	Works Activity	Equipment	Likely Duration
W.01	Earthworks	Dozer, excavator, front end loader, vibratory roller, dump truck, water truck	3 months
W.02	construction of pads and hardstands and cable laying	Concrete pump, concrete truck/agitator, concrete vibrator, cable laying plant; excavator, cable drum	6 months
W.03	Equipment installation	Elevated working platform, flatbed truck, hand tools, mobile crane	12 months

Table 20 Construction Noise Sources

Equipment	Total SWL	Dozer	Excavator (20t)	Front End Loader	Roller - Vibratory[1]	Truck - Dump	Water Truck	Cable Laying Drum	Concrete Pump	Concrete Truck	Concrete Vibrator	Crane - Mobile (100t)	Elevated Working Platform	Hand Tools	Truck - Flatbed
Sound Power Level[2]		116	105	112	114	110	107	105	109	109	113	113	97	104	103
Estimated on-time in any 15 minutes		10	10	10	15	10	10	10	10	15	5	15	15	15	10
Scenario															
W.01Earthworks	119	X	X	X	X	X	X								
W.02 Construction of pads, hardstands & ramps	113		X					X	X	X	X				
W.03 Equipment installation	114											X	X	X	X

Note 1: Equipment classed as 'annoying' in the ICNG and requires a 5 dB correction.

Note 2: Sound power level data is taken from the DEFRA Noise Database, TfNSW *Construction and Vibration Guideline* and TfNSW *Construction Noise and Vibration Strategy*.

4.2.2.2 Off-site Construction Traffic

The proposed heavy vehicle traffic route through the Narrabri town centre is shown in Figure 3. The traffic impact assessment report[2] indicates during the peak construction periods, the worst case 1-hour day period (AM or PM) construction traffic is estimated to be:

- 13 (inbound) plus 13 (outbound) heavy vehicles plus 2 (inbound AM or outbound PM) 22-seater coaster buses.
- 26 (inbound AM or outbound PM) light vehicles.

Local baseline traffic on Stoney Creek Road was assumed to conservatively carry 20 light vehicles and 0 heavy vehicles per hour.

The 2026 baseline AM traffic volumes on Tibbereena Street, was predicted (based on 2025 data) as follows:

- Northbound: 209 light vehicles, 9 heavy vehicles.
- Southbound: 225 light vehicles, 17 heavy vehicles.

All heavy vehicles, once entered Narrabri, will travel along Newell Highway from the west and turn right onto Tibbereena Street. They will continue around to the right on to Fitzroy Street. From there they will turn left onto Barwan Street then right onto Doyle Street. They will follow Doyle Street onto Old Cemetery Road and from there they will turn right onto Stoney Creek Road.

Figure 3 Proposed Heavy Vehicle Route Through Narrabri

[2] SLR report Traffic Impact Assessment dated July 2025 (SLR ref: Ref: 620.31316.00016-R01)

4.2.3 Operational Noise Assessment

The potential noise impacts of the Project have been determined by comparing the predicted worst-case noise levels to the PNTLs in a 15-minute assessment period.

4.2.3.1 Operational Noise Sources and Scenarios

Noise emissions of the BESS equipment are typically dominated by cooling noise sources, which can be variable depending on the percentage of maximum power (charge/discharge) and the prevailing temperatures, both ambient and that being generated by the equipment.

The noise scenario modelled conservatively assumes all equipment items operating at maximum capacity for the entirety of any given 15-minute period.

The worst-case scenario modelled assumes that batteries are charged during the night period. This assumption is conservative, as batteries will typically charge during the day period, and discharge during the evening or night period.

The PCS (Power Conversion System) is marginally louder while charging. Therefore, the worst-case scenario is assessing the noise emission during a charging cycle during the night-time period when PNTLs will be lowest (most stringent).

Furthermore, it is planned to install additional batteries in the future as the capacity of batteries slowly degrades over repeated operational cycles. The assessed 'worst-case' operational noise scenario includes all proposed batteries also operating.

Sound power levels (SWL) and quantities of noise generating equipment presented in Table 21 are based on the Original Equipment Manufacturer (OEM) data with silencing treatment.

The B-Vault battery containers incorporate treatment to be developed by the OEM that achieves necessary noise reduction. The 2.75 MWh batteries are cooled by a 30 kW chiller with an estimated sound pressure level of 75 dBA at 1 m. The equipment noise data sheets for the PCS are provided in Appendix B. Since the silencing treatment for the B-Vault battery containers are in development, a noise guarantee letter from the OEM is also provided in Appendix B that prescribes the acoustic performance of the B-Vault battery containers. The source noise levels presented in Table 21 follow this guarantee.

Table 21 Equipment and Sound Power Levels

Qty	Noise Source Item	Sound Power Level (SWL), per unit $L_{eq\ 15\ min}$, dBA
150 200	B-Vault 7 MWh (with silencing) B-Vault 2.75 MWh (with silencing)	85 83
50	SMA PCS (with silencing)	84
1	High Voltage Transformer	95[1]

Note 1: Based on AS 60076.10:2023 reduced maximum (150 MVA rating).

4.2.3.2 Noise Sources with Potential for Sleep Disturbance

As the development is proposed to operate at any time during a 24-hour hour period, noise emissions during the night-time require assessment for potential sleep disturbance at the nearest residential receivers. However, the noise sources proposed for the development are generally steady-state within the assessment periods and do not exhibit characteristics of impulsiveness and intermittency.

4.2.3.3 Off-site Road Traffic

The site typically is proposed to operate autonomously without needing staff on-site. The site staff are anticipated to be limited, and maximum of up to 5 light vehicles per day.

4.2.3.4 Weather Conditions

Fact Sheet D of the NPfI requires noise assessments to consider the potential effects of noise-enhancing weather conditions, such as wind from the source to the receiver and/or temperature inversions.

The nearest sensitive receivers are within 400m of the proposal site and the effects of weather on noise levels are expected to be minimal. Notwithstanding, the noise prediction modelling uses ISO 9613-2 algorithms which include noise-enhancing weather conditions including downwind propagation, or equivalently, propagation under a well-developed moderate ground-based temperature inversion.

When a downwind propagation along with temperature inversion effects are considered, the predicted noise levels may increase further by up to 2 dB. However, such scenarios are generally unlikely as temperature inversion effects normally occur only during calm wind conditions.

As such, the assessment has applied noise-enhancing weather conditions for all periods as per Option 1 of Fact Sheet D of the NPfI.

4.3 Predicted Noise Levels and Assessment

4.3.1 Construction Noise

The predicted noise levels at the identified receivers surrounding the site are shown in **Table 22.**

The predictions represent a realistic worst-case scenario where the plant/equipment in each scenario is working concurrently and at the nearest location to each receiver. Consequently, it is expected that actual construction noise levels would frequently be lower than the worst-case levels shown in Table 22.

Table 22 Predicted Construction Noise Levels – Standard Daytime Construction Hours

Receiver	NML	Predicted Noise Level – $L_{eq(15minute)}$ (dBA)		
		W0.1 Earthworks	W0.2 Pad construction	W0.3 Equipment instillation
R1	45	45	40	40
R2	45	45	40	40
R3	45	45	40	40
R4	45	45	40	40
R5	45	45	40	40
R6	45	45	40	40
R7	45	45	40	40
R8	45	42	37	37
R9	45	39	34	34

Receiver	NML	Predicted Noise Level – $L_{eq(15minute)}$ (dBA)		
		W0.1 Earthworks	W0.2 Pad construction	W0.3 Equipment instillation
NR1	75	43	38	38
NR2	55	53	48	48
NR3	65	42	37	37

It can be seen in Table 22 that construction noise, during the noisiest activities/works, The above worst-case predictions show the following:

Construction noise levels are not expected to exceed the Noise Management Levels .

Nonetheless, feasible and reasonable construction noise mitigation measures should be applied the minimise the risk of exceeding the NML. Construction noise mitigation and management measures are discussed in Section 5.1.

Off-site Construction Traffic

The results of the off-site traffic assessment are shown in Table 23. Stoney Creek Road carries approximately 20 light vehicle movements per hour, the worst case 1 hr construction activity predicts 26 light vehicle and 15 heavy vehicle (inbound) and 13 heavy vehicle (outbound) movements.

Table 23 Construction Traffic Noise Assessment

Receiver Location	Road	RNP Increase Criterion (dB)	Predicted Change (dB)	RNP Criteria (dBA)	Predicted Noise Level (dBA)
R2	Bailey Street (off Stoney Creek Road)	2	12.5	55	65
Tibbereena Street		2	1.5	55	68
Fitzroy Street, Barwan Street and Doyle Street		2	2.6	55	66

The above assessment shows that the predicted change in road noise levels at receivers on Fitzroy Street, Barwan Street, Doyle Street and receiver R2 on Bailey Street (off Stoney Creek Road) from construction-related vehicles are expected to exceed 2 dB. As such, a further assessment comparing the predicted noise level against the RNP criteria was carried out.

The result shows that the predicted worst 1 hr construction-traffic noise level may also exceed the RNP criterion of 55 dBA as shown in Table 23.

The nearest facade of R2 is approximately 15m from Stoney Creek Road. Up to 93 identified noise sensitive buildings fronting the proposed heavy vehicle route in the Narrabri township may be impacted by construction traffic noise during the most intense earthworks construction phase.

Consequently, mitigation measures should be considered as part of the Construction Noise and Vibration Management Plan (CNVMP) and this has been discussed in Section 5.1.

4.3.2 Operational Noise

4.3.2.1 Corrections for Annoying Noise Characteristics

The potential annoying noise characteristics and modifying factor corrections relevant to the proposal are tonality, low-frequency noise and intermittent noise.

An example of the tonality and low-frequency assessment results is shown in Table 24 based on the predicted operational noise levels at the most-affected residential receiver (R2).

The assessment has been undertaken for all applicable receivers to determine the applicable corrections for annoying noise characteristics, detailed as follows:

- **Tonality** – The inverter, transformers and batteries are not predicted to be tonal at the receivers, and hence no tonal corrections have been applied to the assessment.
- **Low frequency noise** – noise levels at residential receivers from development-related equipment were analysed as per the requirements of the NPfI and are not expected to result in low frequency noise impacts. No corrections have been applied.
- **Intermittent noise** – the NPfI defines intermittent noise as noise heard at the receiver where the level suddenly drops or increases several times during the assessment period, with a noticeable change of at least 5 dB. No sources have been identified with potential intermittent characteristics as the equipment are steady state noise sources.

Table 24 Assessment of Annoying Noise Characteristics

1/3 Octave Frequency (dBZ)	Predicted $L_{eq(15minute)}$ Noise Level at Most-Affected Residential Receiver (dB)	Tonal Trigger	Low Frequency Trigger
Total (dBZ)	42	No	No
Total (dBA)	34		
Total (dBC)	41		
25	25		
31.5	28		
40	27		
50 Hz	32		
63 Hz	32		
80 Hz	31		
100 Hz	27		
125 Hz	29		
160 Hz	34		
200 Hz	27		
250 Hz	27		
315 Hz	32		
400 Hz	28		

1/3 Octave Frequency (dBZ)	Predicted $L_{eq(15minute)}$ Noise Level at Most-Affected Residential Receiver (dB)	Tonal Trigger	Low Frequency Trigger
500 Hz	27		
630 Hz	27		
800 Hz	27		
1 kHz	26		
1.25 kHz	24		
1.6 kHz	21		
2 kHz	17		
2.5 kHz	12		
3.15 kHz	10		
4 kHz	-6		
5 kHz	-23		

A summary of the worst-case operational noise assessment at the receivers surrounding the Project is presented in Table 25.

Table 25 Noise Assessment – Worst-case Operations

Receiver ID	PNTL Night Period, dBA	Predicted Noise Level, dBA $L_{Aeq(15min)}$	Compliance?
R1	35	35	Yes
R2	35	34	Yes
R3	35	34	Yes
R4	35	34	Yes
R5	35	34	Yes
R6	35	34	Yes
R7	35	34	Yes
R8	35	32	Yes
R9	35	31	Yes
NR1	68	31	Yes
NR2	48	39	Yes
NR3	53	31	Yes

The above assessment indicates that noise from the Project during ‘worst-case’ operations is predicted to comply with the night-time PNTL at all receivers during weather conditions that enhance noise propagation from the site. Therefore, compliance is also expected during the day and evening periods when PNTLs would be equivalent or higher.

The predictions show compliance with the PNTLs based on the nominated OEM plant which incorporates noise control features. The noise assessment must be reviewed if plant with louder SWL values relative to Table 21 is nominated during the detailed design process or if operational conditions may occur that would result in higher noise emission.

4.3.3 Cumulative Impacts

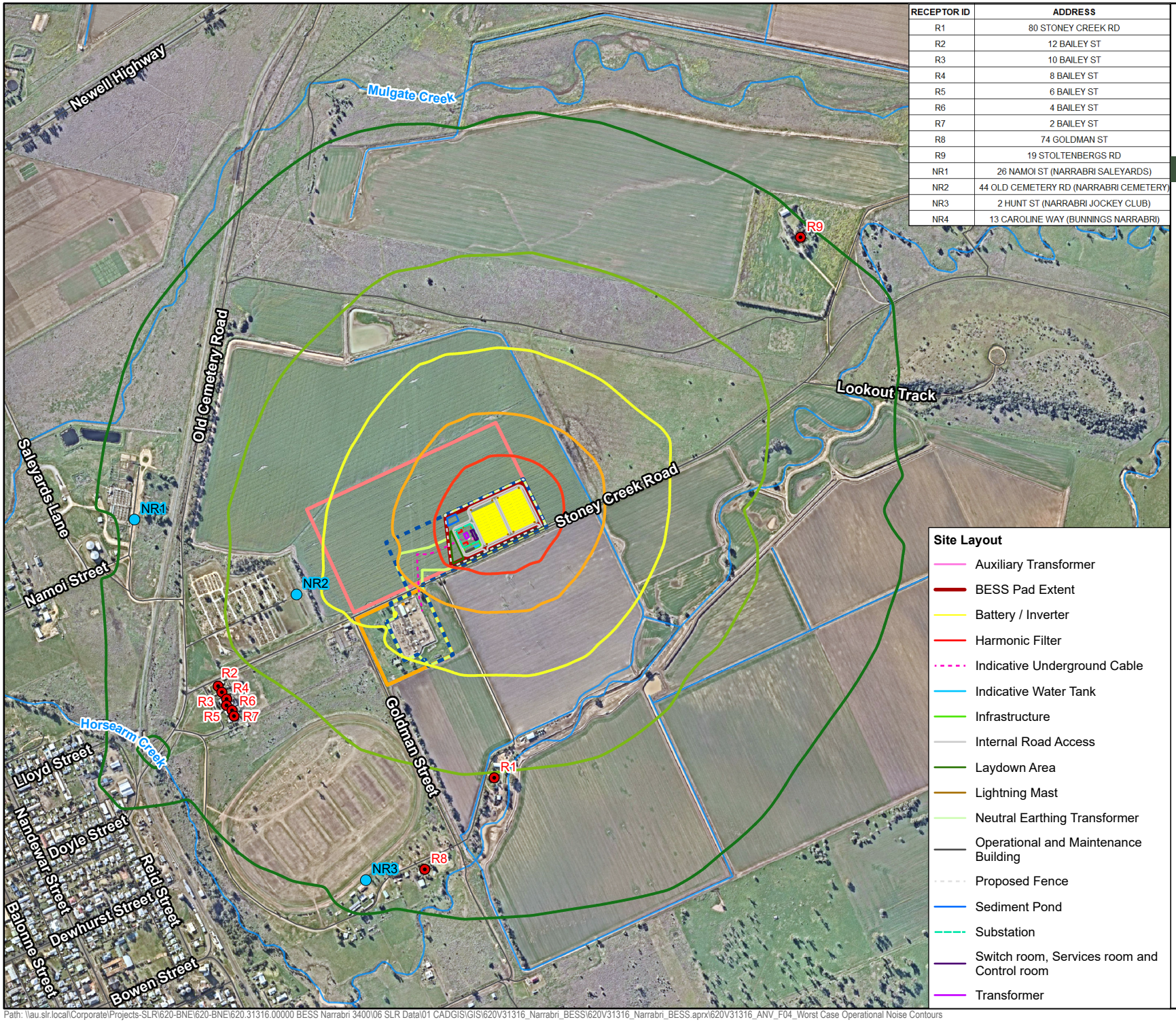
As discussed in Section 4.1.3.1, the potential cumulative impacts from the proposal and other potential sources of industrial noise in the area are accounted for in the proposal-specific PNTLs and, therefore, do not require further consideration.

STONEY CREEK BESS

'WORST CASE' OPERATIONAL NOISE CONTOURS

FIGURE 4

RECEPTOR ID	ADDRESS
R1	80 STONEY CREEK RD
R2	12 BAILEY ST
R3	10 BAILEY ST
R4	8 BAILEY ST
R5	6 BAILEY ST
R6	4 BAILEY ST
R7	2 BAILEY ST
R8	74 GOLDMAN ST
R9	19 STOLTENBERGS RD
NR1	26 NAMOI ST (NARRABRI SALEYARDS)
NR2	44 OLD CEMETERY RD (NARRABRI CEMETERY)
NR3	2 HUNT ST (NARRABRI JOCKEY CLUB)
NR4	13 CAROLINE WAY (BUNNINGS NARRABRI)



Site Layout

- Auxiliary Transformer
- BESS Pad Extent
- Battery / Inverter
- Harmonic Filter
- Indicative Underground Cable
- Indicative Water Tank
- Infrastructure
- Internal Road Access
- Laydown Area
- Lightning Mast
- Neutral Earthing Transformer
- Operational and Maintenance Building
- Proposed Fence
- Sediment Pond
- Substation
- Switch room, Services room and Control room
- Transformer

LEGEND

- Receiver
- Non Dwelling Receiver
- Road
- Watercourse
- Disturbance Footprint
- Project Area
- Title Containing Substation
- Title containing BESS Site
- BESS Area

Operational Contour (dBA)

- 30
- 35
- 40
- 45
- 50

Data Sources:
NSW SS.
Aerial imagery: Nearmap (July 2024).
Project Area supplied by client.

0 250 500 m

Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:15,000 at A4
Project Number:	620.V31316
Date Drawn:	23-Feb-2026
Drawn by:	RB

SLR

Path: \\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.31316.00000 BESS Narrabri 3400\06 SLR Data\01 CADGIS\GIS\620V31316_Narrabri_BESS\620V31316_Narrabri_BESS.aprx\620V31316_ANV_F04_Worst Case Operational Noise Contours

5.0 Recommended Mitigation Measures

5.1 Construction Noise

The impacts during construction of the proposal are predicted to be consistent with major construction work near sensitive receivers. No works outside of Standard Construction Hours are currently proposed.

The use of standard mitigation measures to minimise the impacts is considered sufficient to control the majority of the impacts. Examples of measures that could be applied to the work are provided in the Transport for NSW *Construction Noise and Vibration Guideline* (see **Appendix C**).

Construction impacts are expected to be minimal at the nearest sensitive receivers, however best practice noise management measures should be implemented to control potential noise impacts.

Management of construction traffic noise should include as a minimum:

- Scheduling and routing of vehicle movements.
- Speed of vehicles.
- Driver behaviour and avoidance of engine compression brakes.
- Ensuring vehicles are adequately maintained and silenced.
- Vehicles are to be turned off when not in use.

A Construction Noise and Vibration Management Plan (CNVMP) would be prepared before any work begins. This would identify all potentially impacted receivers, assess the potential noise and vibration impacts from the proposal and provide details regarding how the impacts would be minimised through the use of all feasible and reasonable mitigation measures. The CNVMP would also contain procedures for community engagement, handling complaints, should they occur, and detail any compliance monitoring requirements.

5.2 Operational Noise Impacts

Where operational noise impacts from the development are predicted to exceed the relevant noise criteria, feasible and reasonable operational noise mitigation and management measures should be considered, with the aim of reducing noise emissions to the relevant criteria.

The typical hierarchy for mitigation and management of industrial noise sources is as follows:

- Reducing noise emissions at the source (ie noise source control).
- Reducing noise in transmission to the receiver (ie noise path control).
- Reducing noise at the receiver (ie at-receiver control).

General recommendations for the Project are provided in Appendix D in accordance with NPfI. A detailed assessment of potential feasible and reasonable mitigation measures that can be applied to the development to minimise the operational noise impacts has been completed and is summarised in Table 26.

Table 26 Operational Noise Mitigation Options

Ref.	Mitigation Option	Noise Impact/Benefit	Feasible and Reasonable to Apply
Source Control			
S1	Optimised site layout to minimise noise emissions from the site	Where possible, the site layout has been designed so that the buildings screen the noisier areas of the development from the nearest receivers.	Yes – applied during design of the concept
S2	Limit vehicle movements	A reduction in concurrent vehicle movements across the site by staggering delivery/pickup times and/or employee shift change times could reduce noise emissions. In practice, this would occur naturally due to operational requirements.	No – Vehicle movements are a negligible contributor to noise emissions from the site.
S3	Use broadband and/or ambient sensing alarms on heavy vehicles where they are required to reverse during the night-time.	Reduce potential for annoying noise emissions during the night-time.	Yes – encourage use of broadband and/or ambient sensing alarms on heavy vehicles where they are required to reverse during the night-time (if such vehicles are required for maintenance purposes).
S4	Appropriate specification and location of plant items during detailed design.	Potential noise impacts from plant items have been identified based on the indicative units selected by the project team. The following mitigation measures have been included in the noise model: - Battery unit with silencing kit as provided by the supplier. - Inverter unit with attenuator as provided by the supplier.	Yes – the specified mitigation measures minimise noise impacts from plant items. The noise impacts from all noise-generating plant items would be reviewed during detailed design stage to confirm unit selections and any mitigation requirements.
Path Control			
P1	Not considered required	n/a	n/a
Receiver Control			
R1	Not considered required	n/a	n/a

6.0 Conclusions

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Enervest Operations Pty Ltd (Enervest) to prepare a Noise and Vibration Assessment (NVA) for a Battery Energy Storage System (BESS) facility in Narrabri, New South Wales.

Based on the analysis and discussion documented in this report, the following is concluded:

- The potential noise and vibration emissions from the Project have been assessed against the noise and vibration requirements specified in the Secretary's Environmental Assessment Requirements.
- The predicted noise levels at the identified noise sensitive receivers for construction and operation were assessed against the various requirements of the NSW *Noise Policy for Industry* and the NSW *Interim Construction Noise Guideline*.
- Vibration from construction and operational activities is unlikely to be perceptible at nearby receivers due to large separation distance from the site to the receivers.
- Construction noise on site at all receivers is expected to comply with project criteria at all times during the construction program. However, during peak construction periods (anticipated during earthworks), dwellings along Fitzroy Street, Barwan Street and Doyle Street are expected to experience higher levels of traffic noise.
- Noise control treatments and management practices are recommended to be implemented where reasonable and feasible to so. A range of suitable measures has been provided in this report and would be confirmed as part of a site-specific Construction Noise and Vibration Management Plan (CNVMP).
- The operational noise assessment indicates that standard proprietary noise controls incorporated to the nominated OEM plant/equipment is to be used at the Project.
- With the inclusion of the proposed OEM plant/equipment with noise control (such as silencers), operational noise levels are expected to comply with the trigger levels at the nearest receivers at all times during noise-enhancing weather conditions when the operations at the site are worst case. Further noise mitigation (i.e. noise walls) are not deemed required.
- The potential operational impacts and requirements for mitigation would be reviewed during further acoustic assessments completed during detailed design if required.

7.0 References

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

DECCW (2011), NSW Road Noise Policy.

NSW Department of Environment and Conservation – NSW Environmental Noise Management – Assessing Vibration: A Technical Guideline (AVTG), February 2006

NSW Department of Environment and Climate Change (DECC) – NSW Interim Construction Noise Guideline (ICNG), July 2009.

Standards Australia AS 2436–2010 (AS 2436, 2010) – Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites.

Roads and Maritime Services (RMS) - Construction Noise and Vibration Guideline (CNVG), dated August 2016

Transport for NSW (TfNSW) - Construction Noise and Vibration Strategy (CNVS), ST-157/4.1, April 2019

NSW Environment Protection Authority – Noise Policy for Industry (NPfI), October 2017.

DPE (2022), Cumulative Impact Assessment Guidelines for State Significant Projects.

Appendix A:

Acoustic Terminology

1. Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that 'noise' often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2. 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB(lin) or dB.

3. Sound Power Level

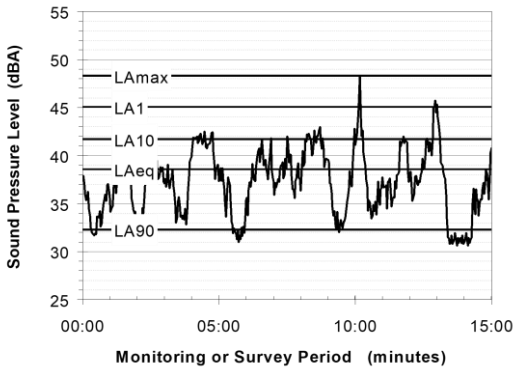
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4. Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

LA1 The noise level exceeded for 1% of the 15 minute interval.

LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

5. Frequency Analysis

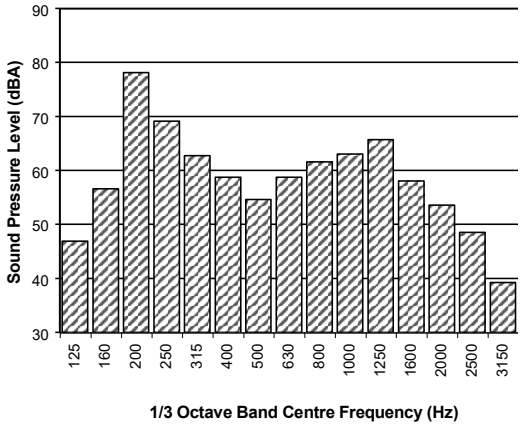
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



6. Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- **Tonality** - tonal noise contains one or more prominent tones (ie differences in distinct frequency components between adjoining octave or 1/3 octave bands), and is normally regarded as more annoying than 'broad band' noise.
- **Impulsiveness** - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.
- **Intermittency** - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.
- **Low Frequency Noise** - low frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.

7. Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements (ie vertical, longitudinal and transverse).

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/Vo), where Vo is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used.

8. Human Perception of Vibration

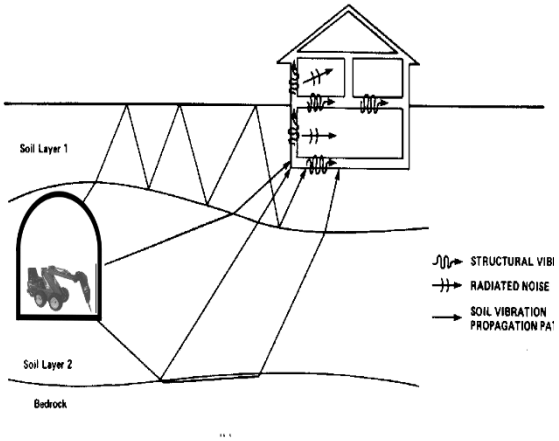
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

9. Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents an example of the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise.

Appendix B:

BESS Equipment Data

Energy Vault Pty Ltd
A.C.N. 660 841 878
Suites 7 & 8, 425
Docklands Dr
Docklands, VIC, 3006

August 8th, 2025

Attention: Delia Xie
Enervest Operations Pty Ltd
Level 6, 627 Chapel Street
South Yarra, VIC, 3141

Stoney Creek BESS – Equipment Noise Guarantee (Sound Power Level)

This letter outlines the equipment sound power level noise guarantees applicable to the battery energy storage system ('the Equipment') supplied for the Stoney Creek BESS Project (the 'Project'). These guarantees are intended to achieve compliance with the NSW Noise Policy of Industry (NPfI - 2017) based on the acoustic modelling undertaken to date.

1.0 Equipment Sound Power Level Guarantees

Equipment Sound Power Level Guarantees

The Equipment will not exceed the sound power limits provided in **Table 1** and be absent from annoying noise characteristics as defined in the NPfI Fact Sheet C Table C1 (i.e. tonal noise, low frequency noise and intermittent noise).

The Equipment will also have spectral noise characterised as *generally consistent* with the levels presented in **Table 2.** We note that tolerances of +3 dB for 1/3 octave levels are allowed however the overall levels in **Table 1** will not be exceeded and annoying characteristics will not be introduced. If the measured level in any 1/3 octave band exceeds this tolerance, Energy Vault will perform further acoustic modelling to ensure the measured spectral noise levels are compliant.

In the event that the actual measured data shows that the Equipment exhibits any of the characteristics in Fact Sheet C Table C1 of NSW NPfI, then the actual measured data must be used to determine performance.

Overall equipment sound power levels and 1/3 octave spectra will be measured in accordance with ISO 3744:2010.

Table 1 Equipment Sound Power Level

Equipment	Model	Sound Power Level Limit (dBA, re 1 pW)	Comment
Battery Container	Platform 2 40ft 8-rack B-Vault DC with 392Ah batteries	Day period: 89 Evening and night: 85	Will be achieved via noise attenuation packages and/or reduced compressor fan speeds.
	Augmentation Vault with 392Ah batteries and either 2 or 4 racks with DC/DC converters	Day period: 87 Evening and night: 83	

If Energy Vault proposes alternative spectral limits to those outlined in **Table 2** below;

1. Energy Vault will demonstrate (by measurement) compliance with the Sound Power Limits in **Table 1** and will also maintain the guaranteed active power capacity at all times.
2. Noise will be absent of annoying characteristics as defined in the NPfI.
3. Energy Vault will submit for review the relevant testing and modelling results (including verification by an independent acoustic consultant) that validates that the alternative spectral limits proposed are compliant.
4. Energy Vault will verify the proposed alternative spectral limit(s) by way of factory acceptance test results.

If the BESS layout is altered, Energy Vault will ensure continued compliance at the most noise sensitive receivers is maintained through updated noise modelling.

Table 2 Equipment Spectral Limits: Battery Enclosure

Centre Frequency, Hz	Sound Power Level (SWL), Linear Weighted, 1/3 octave			
	Platform 2 B-Vault DC		Augmentation Vault	
	Day Period	Evening and Night Period	Day Period	Evening and Night Period
50	82	77	85	80
63	80	75	82	78
80	79	74	88	82
100	80	75	86	79
125	84	79	91	84
160	88	83	87	82
200	82	77	91	86
250	82	77	89	83
315	87	82	83	78
400	83	78	79	73
500	82	77	77	72
630	83	78	75	71
800	80	75	74	70

Centre Frequency, Hz	Sound Power Level (SWL), Linear Weighted, 1/3 octave			
	Platform 2 B-Vault DC		Augmentation Vault	
	Day Period	Evening and Night Period	Day Period	Evening and Night Period
1k	80	75	74	69
1.25k	80	75	74	69
1.6k	77	72	74	69
2k	76	71	73	68
2.5k	74	69	74	69
3.15k	72	67	74	69
4k	70	65	74	69
5k	66	61	72	68
6.3k	63	58	70	65
8k	66	61	68	63
10k	57	52	64	60

Sincerely,

Farzin Rabiee
Lead Project Development Engineer - APAC
Energy Vault
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Disclaimer:

This document and the noise level data provided herein is intended solely for the purpose of supporting the development of the Stoney Creek BESS project and for inclusion in submissions made to the NSW Department of Planning, Housing and Infrastructure (DPHI). This information may only be relied upon by DPHI and Energy Vault may provide further updated information to DPHI as the project progresses.

This information is specific to the context of the aforementioned project and must not be relied upon, used, or referenced by any third party for any purpose, including but not limited to design, construction, procurement, or regulatory submissions unrelated to this project.

Neither Energy Vault nor its representatives accept any responsibility or liability for the use or interpretation of this information outside the scope expressly stated above.

MV POWER STATION
4000-S2 / 4200-S2 / 4400-S2 / 4600-S2

MVPS-4000-S2 / MVPS-4200-S2 / MVPS-4400-S2 / MVPS-4600-S2

Robust
- Station and all individual components type-tested
- Optimally suited to extreme ambient conditions

Easy to Use
- Plug and play concept
- Completely pre-assembled for easy set-up and commissioning

Cost-Effective
- Easy planning and installation
- Low transport costs due to 20-foot skid

Flexible
- One design for the whole world
- DC-Coupling Ready
- Numerous options

MV POWER STATION 4000-S2 / 4200-S2 / 4400-S2 / 4600-S2

Turnkey Solution for PV Power Plants and large-scale storage systems

With the power of the new robust central inverters, the Sunny Central UP or Sunny Central Storage UP, and with perfectly adapted medium-voltage components, the new MV Power Station offers even more power density and is a turnkey solution available worldwide. Being the ideal choice for the new generation of PV power plants operating at 1500 VDC, the integrated system solution is easy to transport and quick to assemble and commission. The MVPS and all components are type-tested. The MV Power Station combines rigorous plant safety with maximum energy yield and minimized deployment and operating risk. The MV Power Station is prepared for DC coupling.

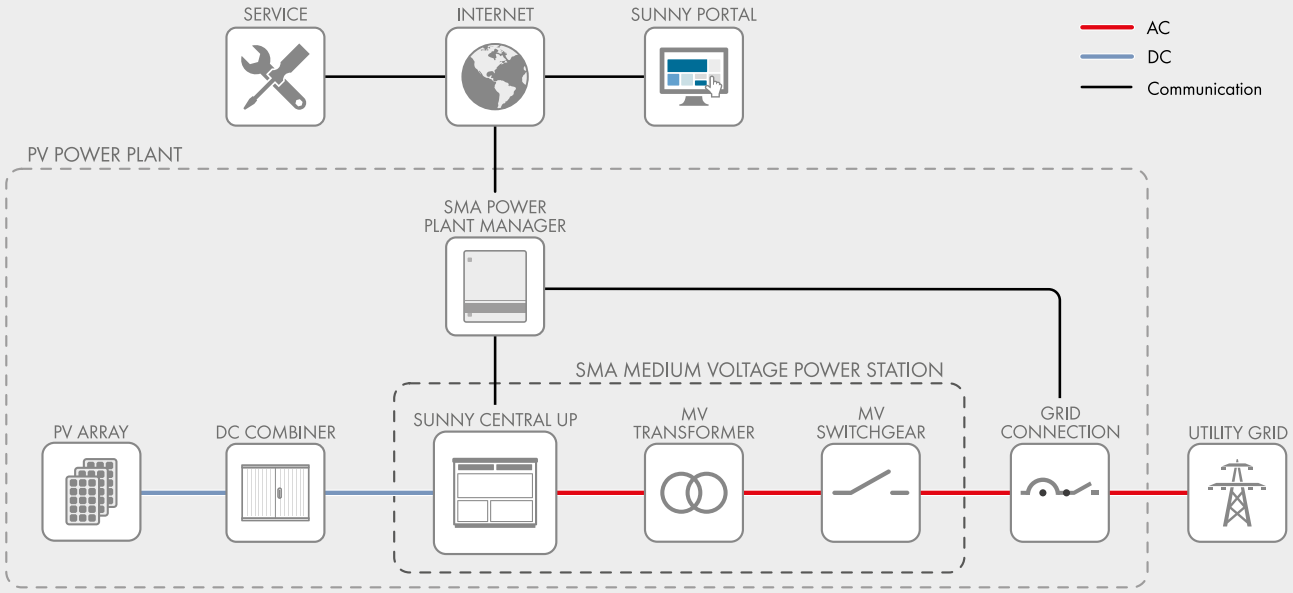
MV POWER STATION
4000-S2 / 4200-S2 / 4400-S2 / 4600-S2

Technical Data	MVPS 4000-S2	MVPS 4200-S2
Input (DC)		
Available inverters	1 x SC 4000 UP or 1 x SCS 3450 UP or 1 x SCS 3450 UP-XT	1 x SC 4200 UP or 1 x SCS 3600 UP or 1 x SCS 3600 UP-XT
Max. input voltage	1500 V	1500 V
Number of DC inputs	dependent on the selected inverters	
Integrated zone monitoring	○	
Available DC fuse sizes (per input)	200 A, 250 A, 315 A, 350 A, 400 A, 450 A, 500 A	
Output (AC) on the medium-voltage side		
Rated power at SC UP (at -25°C to + 35°C / 40°C optional 50°C)[1)]	4000 kVA / 3600 kVA	4200 kVA / 3780 kVA
Rated power at SCS UP (at -25°C bis +25°C / 40°C optional 50°C)[1)]	3450 kVA / 2930 kVA	3620 kVA / 3075 kVA
Charging power at SCS UP-XT (at -25°C bis +25°C / 40°C optional 50°C)[1)]	3590 kVA / 3000 kVA	3770 kVA / 3150 kVA
Discharging power at SCS UP-XT (at -25°C bis +25°C / 40°C optional 50°C)[1)]	4000 kVA / 3400 kVA	4200 kVA / 3570 kVA
Typical nominal AC voltages	10 kV to 35 kV	10 kV to 35 kV
AC power frequency	50 Hz / 60 Hz	50 Hz / 60 Hz
Transformer vector group Dy11 / YNd11 / YNy0	● / ○ / ○	● / ○ / ○
Transformer cooling methods	KNAN[2)]	KNAN[2)]
Transformer no-load losses Standard / Eco Design 1 / Eco Design 2	● / ○ / ○	● / ○ / ○
Transformer short-circuit losses Standard / Eco Design 1 / Eco Design 2	● / ○ / ○	● / ○ / ○
Max. total harmonic distortion	< 3%	
Reactive power feed-in (up to 60% of nominal power)	○	
Power factor at rated power / displacement power factor adjustable	1 / 0.8 overexcited to 0.8 underexcited	
Inverter efficiency		
Max. efficiency[3)] / European efficiency[3)] / CEC weighted efficiency[4)]	98.8% / 98.6% / 98.5%	98.8% / 98.7% / 98.5%
Protective devices		
Input-side disconnection point	DC load-break switch	
Output-side disconnection point	Medium-voltage vacuum circuit breaker	
DC overvoltage protection	Surge arrester type I	
Galvanic isolation	●	
Internal arc classification medium-voltage control room (according to IEC 62271-202)	IAC A 20 kA 1 s	
General Data		
Dimensions (W / H / D)	6058 mm / 2896 mm / 2438 mm	
Weight	< 18 t	
Self-consumption (max. / partial load / average)[1)]	< 8.1 kW / < 1.8 kW / < 2.0 kW	
Self-consumption (stand-by)[1)]	< 370 W	
Ambient temperature -25°C to +45°C / -25°C to +55°C / -40°C to +45°C	● / ○ / ○	
Degree of protection according to IEC 60529	Control rooms IP23D, inverter electronics IP54	
Environment: standard / harsh	● / ○	
Degree of protection according to IEC 60721-3-4 (4C1, 4S2 / 4C2, 4S4)	● / ○	
Maximum permissible value for relative humidity	95% (for 2 months/year)	
Max. operating altitude above mean sea level 1000 m / 2000 m	● / ○	
Fresh air consumption of inverter	6500 m³/h	
Features		
DC terminal	Terminal lug	
AC connection	Outer-cone angle plug	
Tap changer for MV-transformer: without / with	● / ○	
Shield winding for MV-Transformer: without / with	● / ○	
Monitoring package	○	
Station enclosure color	RAL 7004	
Transformer for external loads: without / 10 / 20 / 30 / 40 / 50 / 60 kVA	● / ○ / ○ / ○ / ○ / ○ / ○	
Medium-voltage switchgear: without / 1 feeder / 3 feeders 2 cable feeders with load-break switch, 1 transformer feeder with circuit breaker, internal arc classification IAC A FL 20 kA 1 s according to IEC 62271-200	● / ○ / ○	
Short circuit rating medium voltage switchgear (20 kA 1 s / 20 kA 3 s / 25 kA 1s)	● / ○ / ○	
Accessories for medium-voltage switchgear: without / auxiliary contacts / motor for transformer feeder / cascade control / monitoring	● / ○ / ○ / ○ / ○	
Integrated oil containment: without / with	● / ○	
Industry standards (for other standards see the inverter datasheet)	IEC 60076, IEC 62271-200, IEC 62271-202, EN50588-1, CSC Certificate	
● Standard features ○ Optional features – Not available		
Type designation	MVPS-4000-S2	MVPS-4200-S2

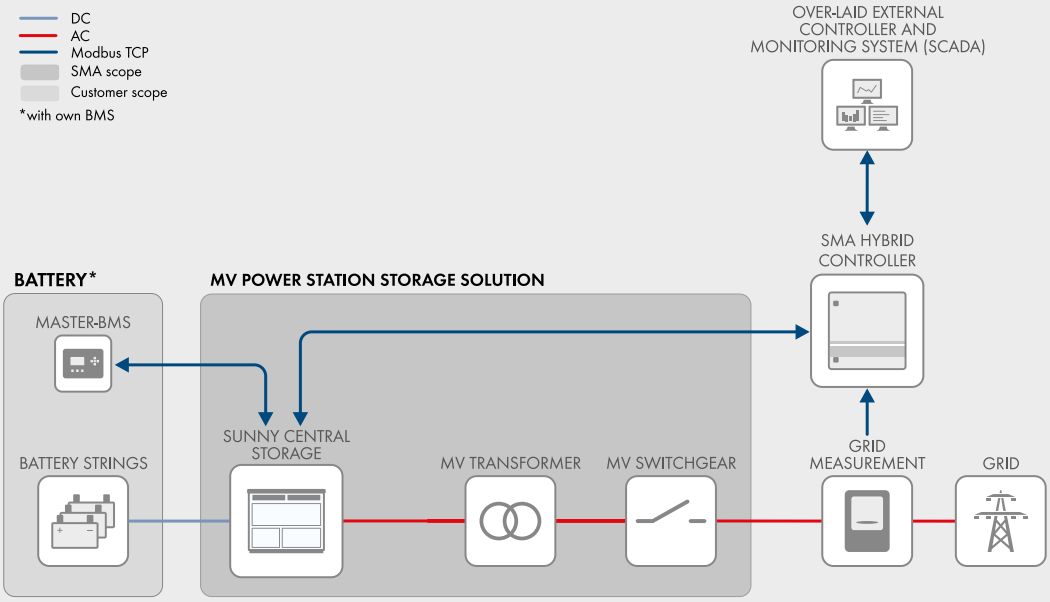
1) Data based on inverter. Further details can be found in the data sheet of the inverter.
2) KNAN = Ester with natural air cooling
3) Efficiency measured at inverter without internal power supply
4) Efficiency measured at inverter with internal power supply

Technical Data	MVPS 4400-S2	MVPS 4600-S2
Input (DC)		
Available inverters	1 x SC 4400 UP or 1 x SCS 3800 UP or 1 x SCS 3800 UP-XT	1 x SC 4600 UP or 1 x SCS 3950 UP or 1 x SCS 3950 UP-XT
Max. input voltage	1500 V	1500 V
Number of DC inputs	dependent on the selected inverters	
Integrated zone monitoring	○	
Available DC fuse sizes (per input)	200 A, 250 A, 315 A, 350 A, 400 A, 450 A, 500 A	
Output (AC) on the medium-voltage side		
Rated power at SC UP (at -25°C to + 35°C / 40°C optional 50°C)[1]	4400 kVA / 3960 kVA	4600 kVA / 4140 kVA
Rated power at SCS UP (at -25°C bis +25°C / 40°C optional 50°C)[1]	3800 kVA / 3230 kVA	3960 kVA / 3365kVA
Charging power at SCS UP-XT (at -25°C bis +25°C / 40°C optional 50°C)[1]	3950 kVA / 3300 kVA	4130 kVA / 3455 kVA
Discharging power at SCS UP-XT (at -25°C bis +25°C / 40°C optional 50°C)[1]	4400 kVA / 3740 kVA	4600 kVA / 3910 kVA
Typical nominal AC voltages	10 kV to 35 kV	10 kV to 35 kV
AC power frequency	50 Hz / 60 Hz	50 Hz / 60 Hz
Transformer vector group Dy11 / YNd11 / YNy0	● / ○ / ○	● / ○ / ○
Transformer cooling methods	KNAN[2]	KNAN[2]
Transformer no-load losses Standard / Eco Design 1 / Eco Design 2	● / ○ / ○	● / ○ / ○
Transformer short-circuit losses Standard / Eco Design 1 / Eco Design 2	● / ○ / ○	● / ○ / ○
Max. total harmonic distortion	< 3%	
Reactive power feed-in (up to 60% of nominal power)	○	
Power factor at rated power / displacement power factor adjustable	1 / 0.8 overexcited to 0.8 underexcited	
Inverter efficiency		
Max. efficiency[3] / European efficiency[3] / CEC weighted efficiency[4]	98.8% / 98.7% / 98.5%	98.8% / 98.7% / 98.5%
Protective devices		
Input-side disconnection point	DC load-break switch	
Output-side disconnection point	Medium-voltage vacuum circuit breaker	
DC overvoltage protection	Surge arrester type I	
Galvanic isolation	●	
Internal arc classification medium-voltage control room (according to IEC 62271-202)	IAC A 20 kA 1 s	
General Data		
Dimensions (W / H / D)	6058 mm / 2896 mm / 2438 mm	
Weight	< 18 t	
Self-consumption (max. / partial load / average)[1]	< 8.1 kW / < 1.8 kW / < 2.0 kW	
Self-consumption (stand-by)[1]	< 370 W	
Ambient temperature -25°C to +45°C / -25°C to +55°C / -40°C to +45°C	● / ○ / ○	
Degree of protection according to IEC 60529	Control rooms IP23D, inverter electronics IP54	
Environment: standard / harsh	● / ○	
Degree of protection according to IEC 60721-3-4 (4C1, 4S2 / 4C2, 4S4)	● / ○	
Maximum permissible value for relative humidity	95% (for 2 months/year)	
Max. operating altitude above mean sea level 1000 m / 2000 m	● / ○	
Fresh air consumption of inverter	6500 m³/h	
Features		
DC terminal	Terminal lug	
AC connection	Outer-cone angle plug	
Tap changer for MV-transformer: without / with	● / ○	
Shield winding for MV-Transformer: without / with	● / ○	
Monitoring package	○	
Station enclosure color	RAL 7004	
Transformer for external loads: without / 10 / 20 / 30 / 40 / 50 / 60 kVA	● / ○ / ○ / ○ / ○ / ○ / ○	
Medium-voltage switchgear: without / 1 feeder / 3 feeders 2 cable feeders with load-break switch, 1 transformer feeder with circuit breaker, internal arc classification IAC A FL 20 kA 1 s according to IEC 62271-200	● / ○ / ○	
Short circuit rating medium voltage switchgear (20 kA 1 s / 20 kA 3 s / 25 kA 1s)	● / ○ / ○	
Accessories for medium-voltage switchgear: without / auxiliary contacts / motor for transformer feeder / cascade control / monitoring	● / ○ / ○ / ○ / ○	
Integrated oil containment: without / with	● / ○	
Industry standards (for other standards see the inverter datasheet)	IEC 60076, IEC 62271-200, IEC 62271-202, EN50588-1, CSC Certificate	
● Standard features ○ Optional features – Not available		
Type designation	MVPS-4400-S2	MVPS-4600-S2

System diagram with Sunny Central UP



System diagram with Sunny Central Storage UP



White Paper BU-LS-004: Sunny Central Storage UP

Sound Power Measurements on SCS 3950 UP-XT central inverter (with and without Silencer Kit)

Performed by:
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Summing up of the Situation

Measurements were taken for SCS 3950 UP-XT. The sound power measurements were performed in accordance with the EN ISO 9614-2:2016 German Version, "Determination of sound power levels of noise sources using sound intensity".

The measurements were taken under nominal operating conditions for the inverters, with all inverter fans operating at maximum speed.

Inspection Reference According to EN ISO 3744:2011-02

EN ISO 3744 is used as the basis for determining the noise emissions of the unit under test according to EN ISO 12001:05-2007.
As part of the acoustics, it includes the determination of the sound level of noise sources using the enveloping surface method of accuracy class 2 for essentially free field conditions over a reflective plane. Measurements must be carried out in compliance with IEC 551 and DIN EN 45645-1 according to DIN EN ISO 3744. To position the measurement instruments, the enclosure of the unit under test is considered a main radiation area.

Inspection Reference According to EN ISO 9614-2:2010-11

The sound level is determined according to DIN EN ISO 9614-2 "Determination of sound power levels of noise sources using sound intensity", Part 2: "Measurement by scanning".
This measurement procedure keeps interference on the measurement result caused by noises from the environment to a minimum.

Type of Test / Thresholds and Requirements:

Type of Test / Thresholds and Requirements:	Sound level measurement according to DIN EN ISO 3744:2011-02 and DIN EN ISO 9614-2:2010-11 of sinusoidal, irregularly shaped, transient signals. Classification of ambient conditions in compliance with the German Noise Control Guidelines (TA Lärm). (according to Section 2)
Result:	**The requirements were fulfilled.**

Result of Measurements

The following sound power measurements performed with SCS 3950UP-XT with S_rated for grid-feed 4600kVA @25°C and with S_rated for charging 4129kVA @25°C.

Apparent Power [kVA]	Sound Power [dB_A] without Silencer Kit	Sound Power [dB_A] with Silencer Kit	Difference
Grid-feed with 4600 (100%)	91,85	83,20	8,65
Charging with 4129 (100%)	90,57	85,90	4,67

It is known from previous tests that the 2-stack device is 2 dB(A) quieter, although this was not the subject of the measurements.

The following tables show the sound power for the SCS UP-XT with silencer kit for grid-feed and charging at partial load.

Apparent Power Grid-feed [kVA]	Apparent Power / Apparent Power_rated [%]	Sound Power [dB_A] with Silencer Kit
4600	100	83,2
4370	95	83,0
3680	80	82,3
3220	70	78,9
2760	60	75,6
1936	42	74,3
960	21	66,9

Apparent Power Charging [kVA]	Apparent Power / Apparent Power_rated [%]	Sound Power [dB_A] with Silencer Kit
4129	100	85,9
3680	89	84,4
3220	78	83,2
2760	67	79,6
1840	45	73,5
960	23	71,1

Information:

The detailed test report may be requested from SMA Solar Technology AG if necessary.

Appendix C:

CNVG Mitigation Measures

CNVG Standard Mitigation and Management Measures

Action Required	Applies To	Details
Management measures		
Implementation of any project specific mitigation measures required.	Airborne noise	Implementation of any project specific mitigation measures required.
Implement community consultation or notification measures.	Airborne noise Ground-borne noise & vibration	Notification detailing work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night-time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required. Please contact TfNSW Communication and Stakeholder Engagement for guidance. Website (If required) Contact telephone number for community Email distribution list (if required) Community drop-in session (if required by approval conditions).
Site inductions	Airborne noise Ground-borne noise & vibration	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures • site opening/closing times (including deliveries) • environmental incident procedures.
Behavioural practices	Airborne noise	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Airborne noise Ground-borne noise & vibration	Where specified under Appendix C of the CNVG a noise verification program is to be carried out for the duration of the works in accordance with the Construction Noise and Vibration Management Plan and any approval and licence conditions.
Attended vibration measurements	Ground-borne vibration	Where required attended vibration measurements should be undertaken at the commencement of vibration generating activities to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage.
Update Construction	Airborne noise	The CEMP must be regularly updated to account for changes in noise and vibration management issues and strategies.

Action Required	Applies To	Details
Environmental Management Plans	Ground-borne noise & vibration	
Building condition surveys	Vibration Blasting	Undertake building dilapidation surveys on all buildings located within the buffer zone prior to commencement of activities with the potential to cause property damage
Source controls		
Construction hours and scheduling	Airborne noise Ground-borne noise & vibration	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Construction respite period during normal hours and out-of-hours work	Ground-borne noise & vibration Airborne noise	See Appendix C of the CNVG for more details on the following respite measures: • Respite Offers (RO) • Respite Period 1 (R1) • Respite Period 2 (R2) • Duration Respite (DR)
Equipment selection.	Airborne noise Ground-borne noise & vibration	Use quieter and less vibration emitting construction methods where feasible and reasonable. For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration benefits. Ensure plant including the silencer is well maintained.
Plant noise levels.	Airborne-noise	The noise levels of plant and equipment must have operating Sound Power or Sound Pressure Levels compliant with the criteria in Appendix H of the CNVG. Implement a noise monitoring audit program to ensure equipment remains within the more stringent of the manufacturers specifications or Appendix H of the CNVG.
Rental plant and equipment.	Airborne-noise	The noise levels of plant and equipment items are to be considered in rental decisions and in any case cannot be used on site unless compliant with the criteria in Table 2 of the CNVG.
Use and siting of plant.	Airborne-noise	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers. Only have necessary equipment on site.
Plan worksites and activities to minimise noise and vibration.	Airborne noise Ground-borne vibration	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible.

Action Required	Applies To	Details
		Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters. If programmed night work is postponed the work should be re-programmed and the approaches in this guideline apply again.
Reduced equipment power	Airborne noise Ground-borne vibration	Use only the necessary size and power.
Non-tonal and ambient sensitive reversing alarms	Airborne noise	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work. Consider the use of ambient sensitive alarms that adjust output relative to the ambient noise level.
Minimise disturbance arising from delivery of goods to construction sites.	Airborne noise	Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers. Select site access points and roads as far as possible away from sensitive receivers. Dedicated loading/unloading areas to be shielded if close to sensitive receivers. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible. Avoid or minimise these out of hours movements where possible.
Engine compression brakes	Construction vehicles	Limit the use of engine compression brakes at night and in residential areas. Ensure vehicles are fitted with a maintained Original Equipment Manufacturer exhaust silencer or a silencer that complies with the National Transport Commission's 'In-service test procedure' and standard.
Path controls		
Shield stationary noise sources such as pumps, compressors, fans etc.	Airborne noise	Stationary noise sources should be enclosed or shielded where feasible and reasonable whilst ensuring that the occupational health and safety of workers is maintained. Appendix D of AS 2436:2010 lists materials suitable for shielding.
Shield sensitive receivers from noisy activities.	Airborne noise	Use structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when situating plant.
Receiver controls		
Structural surveys and vibration monitoring	Ground-borne vibration	Pre-construction surveys of the structural integrity of vibration sensitive buildings may be warranted. At locations where there are high-risk receivers, vibration monitoring should be conducted during the activities causing vibration.

Action Required	Applies To	Details
See Appendix C of the CNVG for additional measures	Airborne noise Ground-borne vibration	In some instances, additional mitigation measures may be required.

Appendix D:

NPF1 Mitigation Measures

Best Management Practice (BMP)

Best management practice (BMP) is the application of particular operational procedures that minimise noise while retaining productive efficiency.

Where applied, these measures and practices are often documented in a noise management plan so that operational practices and undertakings are clearly understood and applied at all levels of an industrial operation. Application of BMP can include the following types of practice:

- Using the quietest plant that can do the job.
- Scheduling the use of noisy equipment at the least-sensitive time of day.
- Not operating, or reducing operations at night.
- Siting noisy equipment behind structures that act as barriers, or at the greatest distance from the noise-sensitive area or orienting the equipment so that noise emissions are directed away from any sensitive areas, to achieve the maximum attenuation of noise.
- Where there are several noisy pieces of equipment, scheduling operations so they are used separately rather than concurrently.
- Keeping equipment well-maintained and operating it in a proper and efficient manner.
- Using ‘quiet’ practices when operating equipment, for example, positioning idling trucks in appropriate areas.
- Running staff-education programs and regular tool box talks on the effects of noise and the use of quiet work practices.

For many industries there are a wide range of factors that can restrict the feasibility and reasonableness of applying BMP measures on a particular site. Work health and safety considerations must also be taken into account as well as any other regulatory and process requirements.

Best Available Technology Economically Achievable (BATEA)

With ‘Best available technology economically achievable’ (BATEA), equipment, plant and machinery that produce noise incorporate the most advanced and affordable technology to minimise noise output. Affordability is not necessarily determined by the price of the technology alone. Increased productivity may also result from using more advanced equipment, offsetting the initial outlay, for example, using ‘quieter’ equipment that can be operated over extended hours. Old or badly-designed equipment can often be a major source of noise.

Where BMP fails to achieve the required noise reduction by itself, the BATEA approach should then be considered. Examples of uses of BATEA include:

- Considering alternatives to tonal reversing alarms (where work health and safety is appropriately considered).
- Using equipment with efficient muffler design.
- Using quieter engines, such as electric instead of internal combustion.
- Fitting and maintaining noise reduction packages on plant and equipment.
- Using efficient enclosures for noise sources.
- Damping or lining metal trays or bins.

- Active noise control.

For many industries there are a wide range of factors that can restrict the feasibility and reasonableness of applying BMP or BATEA measures on a particular site. Work health and safety considerations must also be taken into account as well as any other regulatory and process requirements.

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