Calala BESS

Environmental Noise Assessment

S8089C2

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sonus.

Sonus Pty Ltd
17 Ruthven Ave
Adelaide SA 5000
Phone: +61 (8) 8231 2100
Email: info@sonus.com.au
www.sonus.com.au

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Author	: Chris Turnbull, MAAS

1 INTRODUCTION

Sonus has been engaged to conduct an environmental noise assessment for the Battery Energy Storage System (**BESS**) at Calala in New South Wales.

A previous Noise and Vibration Assessment (the **Previous Assessment**) was conducted by Marshall Day Acoustics (**MDA**) for the BESS facility. However, since the Previous Assessment, a new equipment supplier has been selected and this updated assessment (the **Assessment**) has been performed to predict the noise from the revised equipment, to ensure compliance with the relevant criteria. It is to be included as a part of an Amendment Report prepared by Mecone Group Pty Ltd.

The new equipment modelled in this Assessment is the *Tesla Megapack 2XL* (the **Megapack**) units. The following equipment has been modelled:

- 164x *Tesla Megapack 2XL* (2-hour duration)
- 82x 4.6MVA Medium Voltage (**MV**) transformers
- 2x 180MVA High Voltage (**HV**) transformers.

The BESS facility has proximate noise receivers located from the south clockwise around to the north which are generally located at a similar or slightly higher elevation relative to the site. The closest non-associated receivers are R6 to the west and R9 and R10 to the south. R4 is an associated receiver, and as per the Original Assessment, it is understood that R78, which is within the project boundary, will be retained as project infrastructure for the site but will not be used as a dwelling. It has therefore been assessed as an associated receiver. An overview of the subject site and surrounding area is shown in Figure 1.

The assessment has been based on:

- The following drawings received via email on 26 April 2024:
    - “Site layout”
    - “Receptor plan”
    - “Site plan”
    - “Concept plan”
    - “Regional context”
    - “Vegetation management”
    - “Lot details and set-back”

- *EIS NOISE AND VIBRATION ASSESSMENT* for Calala Battery Energy Storage System by Marshall Day Acoustics, Report No. "Rp 001 20220648", dated 18 August 2023.

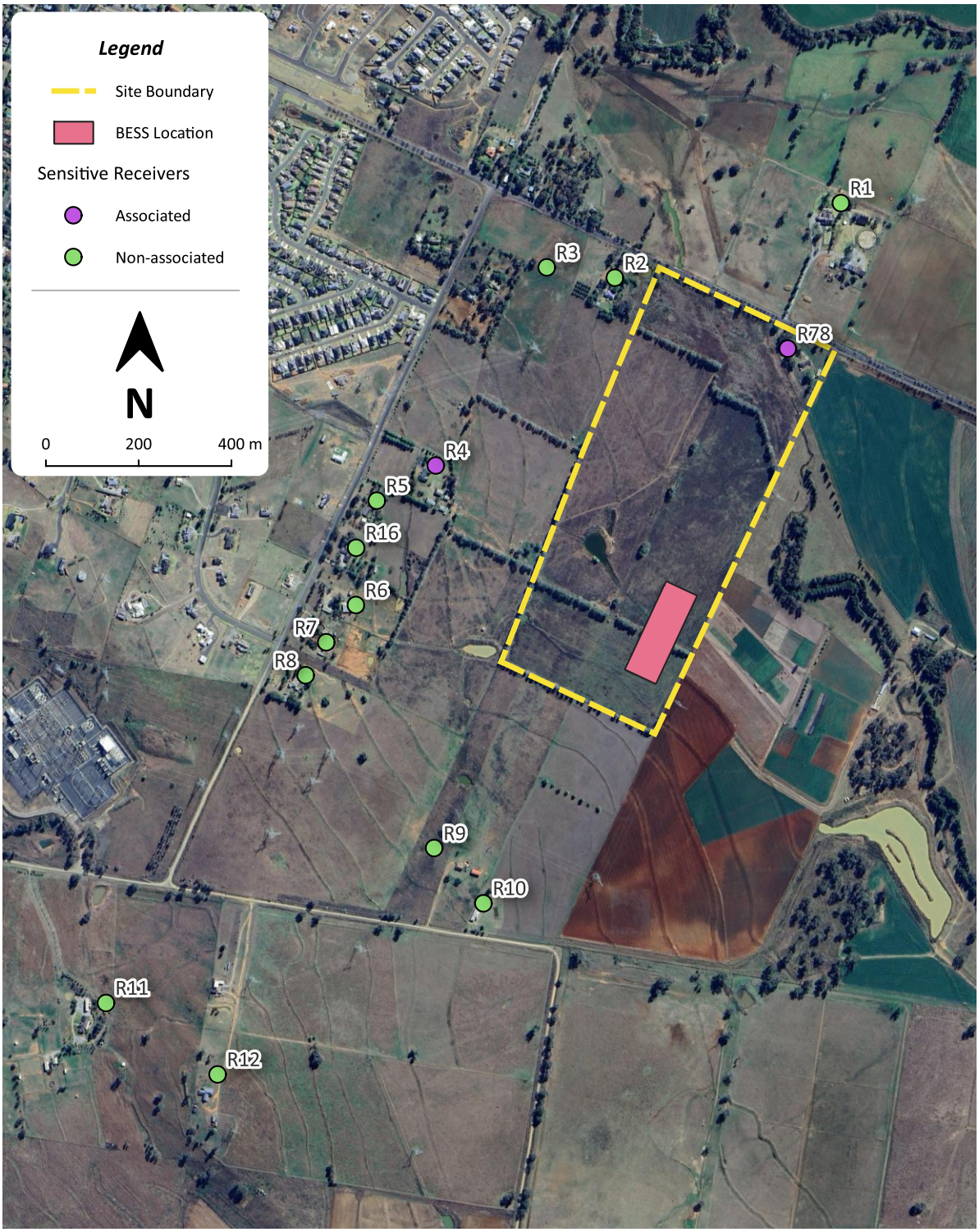


Figure 1: Subject site and locality.

2 CRITERIA

Project noise trigger levels for the BESS were defined in accordance with the *Noise Policy for Industry* (the **NPfI**) in the Original Assessment, and are reiterated below:

- 40 dB(A) during the day (the period from 7:00am to 6:00pm Monday to Saturday or 8:00am to 6:00pm on Sundays and public holidays).
- 35 dB(A) during the evening (the period from 6:00pm to 10:00pm).
- 35 dB(A) during the night (the remaining periods).

The NPfI includes consideration of *Significant Meteorological Effects* and effectively defines these as occurring for at least 30% of a time period (day, evening or night) in any season. For most noise sources, these significant meteorological effects relate to the increased propagation of noise associated with temperature inversions and/or downwind conditions. Where the occurrences of these does not occur for 30% (or more) of a time period in any season, the assessment of typical conditions does not need to include these effects. These worst case effects are however considered in a supplementary worst case assessment with noise criteria relaxed by 5 dB(A).

For a BESS, the noise is predominantly associated with cooling systems. The greatest variation associated with meteorological conditions is therefore related to the speed of fans for different ambient temperatures. The BESS modules are designed such that they have sufficient cooling for the worst case (highest temperature) conditions in all climates. Therefore, the variable speed fans rarely (if ever) all operate at full speed, particularly during the evening and night.

An assessment of expected fan speeds has been conducted by Equis Australia Management Pty Ltd based on the Noise Application Note issued by *Tesla* for "Equis Calala BESS – Battery Energy Storage System". For 'typical' meteorological conditions, the fan speeds are based on ambient temperature conditions which are not exceeded for more than 30% of the time on the hottest day of the year for each time period. On other days in summer and at other times of the year, lower fan speeds would be expected. The worst case assessment has been made to address the highest fan speeds which would occur in any 15 minute period based on a 12 month period of Tamworth Airport *Bureau of Meteorology* data.

The following project noise trigger levels have been used for typical conditions at non-associated receivers:

- 40 dB(A) during the day.
- 35 dB(A) during the evening.
- 35 dB(A) during the night.

The following criteria for worst case conditions at non-associated receivers are proposed:

- 45 dB(A) during the day.
- 40 dB(A) during the evening.
- 40 dB(A) during the night.

3 ASSESSMENT

In order to predict noise at sensitive receivers from operation of the BESS, a noise model of the site and receivers has been developed using *SoundPLANnoise* noise modelling software and the ISO9613-2[1] noise propagation model. The noise model considers the number of units, the sound power level and height of each source, the distance to receivers and the effects of topography and barriers.

Six operational scenarios have been considered, being typical and worst case operations during the day, evening and night periods. Each scenario has different operational fan duties for the Megapack units. It has been assumed that the 4.6 MVA MV transformers (76 dB(A) sound power level (**SWL**)) and 180 MVA HV transformers (92 dB(A) SWL) will operate continuously at the full sound power level. The fan duties, Megapack SWL, and predicted noise levels are shown for each scenario in the following sections.

The predicted noise levels have been based on the incorporation of a 5m high noise wall constructed in the location shown in the "Site layout" provided in Appendix A. Additionally, it has been assumed that the area between the BESS equipment will be covered with gravel rather than concrete.

[1] International Standards Organisation ISO9613-2 *Acoustics – Attenuation of sound during propagation outdoors Part 2: Engineering method for the prediction of sound pressure levels outdoors*

3.1 Day

3.1.1 Typical Operation

Fan Duties

- Battery fans at 40% fan speed for 15 minutes.
- Power electronic fans at 20% fan speed for 15 minutes.
- Overall Megapack 2XL sound power level of 85.5 dB(A).

Based on these fan duties, the noise levels predicted at sensitive receivers are shown in Table 1.

Table 1: Predicted average noise levels at receivers for typical operation during the day.

Receiver	Criterion (dB(A))	Prediction (dB(A))
R1	40	31
R2	40	33
R3	40	32
R4	N/A	35
R5	40	33
R6	40	34
R7	40	33
R8	40	32
R9	40	33
R10	40	33
R11	40	25
R12	40	26
R16	40	33
R78	N/A	37

3.1.2 Worst case Operation

Fan Duties

- Battery fans at 100% fan speed for 2.7 minutes.
- Battery fans at 50% fan speed for 6.15 minutes.
- Battery fans at 40% fan speed for 6.15 minutes.
- Power electronic fans at 100% fan speed for 15 minutes.
- Overall Megapack 2XL sound power level of 98.1 dB(A).

Based on these fan duties, the noise levels predicted at sensitive receivers are shown in Table 2.

Table 2: Predicted average noise levels at receivers for worst case operation during the day.

Receiver	Criterion (dB(A))	Prediction (dB(A))
R1	45	43
R2	45	45
R3	45	44
R4	N/A	47
R5	45	45
R6	45	45
R7	45	45
R8	45	44
R9	45	45
R10	45	44
R11	45	36
R12	45	38
R16	45	45
R78	N/A	49

3.2 Evening

3.2.1 Typical Operation

Fan Duties

- Battery fans at 20% fan speed for 15 minutes.
- Power electronic fans at 40% fan speed for 15 minutes.
- Overall Megapack 2XL SWL of 85.5 dB(A).

Based on these fan duties, the noise levels predicted at sensitive receivers are shown in Table 3.

Table 3: Predicted average noise levels at receivers for typical operation during the evening.

Receiver	Criterion (dB(A))	Prediction (dB(A))
R1	35	31
R2	35	33
R3	35	32
R4	N/A	35
R5	35	33
R6	35	34
R7	35	33
R8	35	32
R9	35	33
R10	35	33
R11	35	25
R12	35	26
R16	35	33
R78	N/A	37

3.2.2 Worst case Operation

During the evening, the fan speeds which are not exceeded for 30% of the hottest day are the also the highest fan speeds expected in any 15 minute period based on 12 months of meteorological data. The analysis for typical operation is therefore repeated below:

Fan Duties

- Battery fans at 20% fan speed for 15 minutes.
- Power electronic fans at 40% fan speed for 15 minutes.
- Overall Megapack 2XL SWL of 85.5 dB(A).

Based on these fan duties, the noise levels predicted at sensitive receivers are shown in Table 4.

Table 4: Predicted average noise levels at receivers for worst case operation during the evening.

Receiver	Criterion (dB(A))	Prediction (dB(A))
R1	40	31
R2	40	33
R3	40	32
R4	N/A	35
R5	40	33
R6	40	34
R7	40	33
R8	40	32
R9	40	33
R10	40	33
R11	40	25
R12	40	26
R16	40	33
R78	N/A	37

3.3 Night

3.3.1 Typical Operation

Fan Duties

- Battery fans at 20% fan speed for 15 minutes.
- Power Electronic fans at 30% fan speed for 15 minutes.
- Overall Megapack 2XL SWL of 83.4 dB(A).

Based on these fan duties, the noise levels predicted at sensitive receivers are shown in Table 5.

Table 5: Predicted average noise levels at receivers for typical operation during the night.

Receiver	Criterion (dB(A))	Prediction (dB(A))
R1	35	29
R2	35	31
R3	35	30
R4	N/A	33
R5	35	32
R6	35	32
R7	35	31
R8	35	31
R9	35	32
R10	35	31
R11	35	23
R12	35	25
R16	35	32
R78	N/A	35

An example noise contour plot for this scenario is shown in Appendix B.

3.3.2 Worst case Operation

Fan Duties

- Battery fans operating at 100% for 0.9 minutes.
- Battery fans operating at 70% for 1.35 minutes.
- Battery fans operating at 60% for 1.35 minutes.
- Battery fans operating at 0% for 11.4 minutes.
- Power Electronic fans operating at 20% for 15 minutes.
- Overall Megapack 2XL SWL of 87.9 dB(A)

Based on these fan duties, the noise levels predicted at sensitive receivers are shown in Table 6.

Table 6: Predicted average noise levels at receivers for worst case operation during the night.

Receiver	Criterion (dB(A))	Prediction (dB(A))
R1	40	33
R2	40	35
R3	40	34
R4	N/A	37
R5	40	36
R6	40	36
R7	40	35
R8	40	34
R9	40	35
R10	40	35
R11	40	27
R12	40	28
R16	40	35
R78	N/A	39

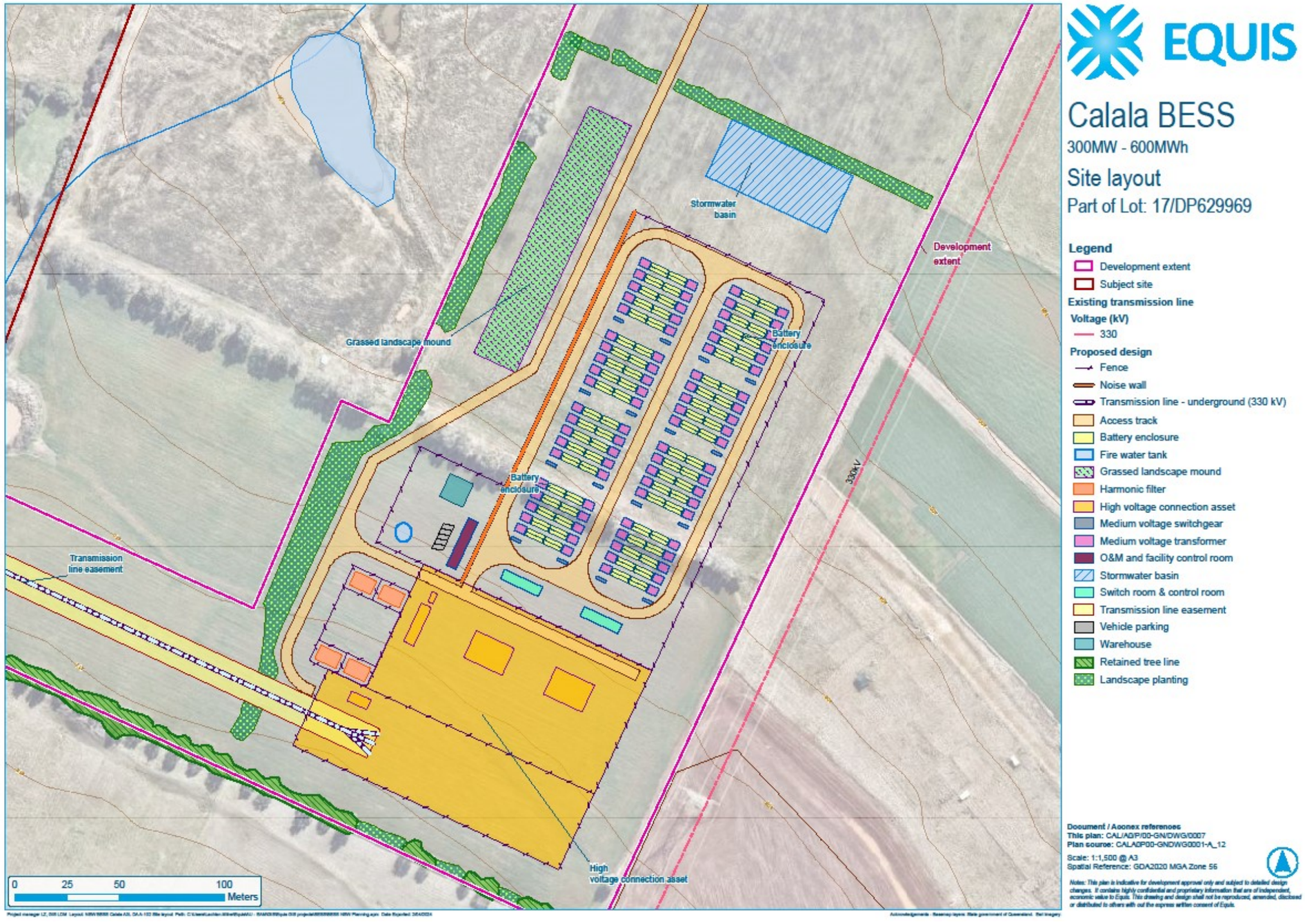
It is noted that there is potential for tonality when assessing BESS facilities, as some individual components can include tonality. For a tonal penalty to apply, the overall noise level at receivers must be tonal (rather than just individual components). For example, there is the potential for tonality from a single fan operating at a fixed speed. However, as the cooling systems of each unit operate independently using variable speed fans, there will be a large range of fan speeds at any time and therefore any potential for a tone will be removed. Therefore, it is not considered that any corrections for annoying characteristics are warranted.

4 CONCLUSION

An environmental noise assessment has been conducted for the proposed Calala BESS to account for revised equipment selections.

The assessment considers typical noise levels expected on the hottest day as well as worst case noise levels in any 15 minute period for the day, evening and night. With the proposed noise wall in place, the noise from each of the scenarios is predicted to comply with the relevant noise criteria.

APPENDIX A: SITE PLAN



EQUIS

Calala BESS

300MW - 600MWh

Site layout

Part of Lot: 17/DP629969

Legend

- Development extent
- Subject site

Existing transmission line

Voltage (kV)

- 330

Proposed design

- Fence
- Noise wall
- Transmission line - underground (330 kV)
- Access track
- Battery enclosure
- Fire water tank
- Grassed landscape mound
- Harmonic filter
- High voltage connection asset
- Medium voltage switchgear
- Medium voltage transformer
- O&M and facility control room
- Stormwater basin
- Switch room & control room
- Transmission line easement
- Vehicle parking
- Warehouse
- Retained tree line
- Landscape planting

Document / Aconex references
This plan: CAL/AD/P/00-GN/DWG/0007
Plan source: CALAD/P00-GN/DWG/0001-A_12

Scale: 1:1,500 @ A3
Spatial Reference: GDA2020 MGA Zone 56

APPENDIX B: EXAMPLE NOISE CONTOUR PLOT - "TYPICAL" NIGHT OPERATION