Memorandum

Eraring Power Station Justification for Urban Classification

Date:	25 February 2022
Project name:	Eraring Battery Energy Storage System
Project no:	IS365800
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1. Introduction

On the 20 December 2021, the Environmental Protection Authority (EPA) provided advice on the Eraring Battery Energy Storage System (BESS) Environmental Impact Statement (EIS). The purpose of this memorandum is to document the clarifications, additional assessment and justification that has led to revisions to the Project noise impact assessment for discussion purposes with Origin, Sonus and the EPA as necessary prior to lodgement of the Response to Submissions. The subsequent sections of this memorandum are intended to be provided within the Response to Submissions document to which the revised noise impact assessment will be appended.

2. Noise from existing premises

The EPA provided the following comment:

"The Noise Policy for Industry (NPfI – EPA, 2017), Fact Sheet A1 indicates that: "For the assessment of modifications to existing premises, the noise from the existing premises should be excluded from background noise measurements". The NIA clearly acknowledges that the background noise monitoring was impacted by noise from the Eraring Power Station (EPS) at Section 6.4.3. That said, the NPfI does allow noise from an existing activity to be included in background noise monitoring for a modification under certain circumstances as outlined further in Fact Sheet A1. These circumstances need to be considered and justified as applicable to the project by the proponent before the approach applied in the NIA can be further considered. If they cannot be justified, the background noise levels will need to be adjusted to remove the influence of the EPS."

Jacobs and Origin note that while the Project is proposed to be developed within an existing scheduled premises, it is not considered to represent a modification of the existing premises on the basis that it would be delivered independently of the operation of the Eraring Power Station. Origin will obtain a separate Environmental Protection Licence for the Project. Consistent with this, Origin have specified the Project to be discrete and independent of the Eraring Power Station. Origin have also established a separate entity for the Project, ACN 649 611 996 Origin Energy Eraring Battery Pty Ltd.

The following additional justification of the retention of the EPS within the background noise measurements is provided with reference to *NPfI* Fact Sheet A1:

- The EPS has been operating continuously and consistently through day, evening and night-time periods for a period in excess of 10 years (40 years), and is considered a normal part of the acoustic environment (noting the EPS site has been central to power generation and coal mining for same period, 40 years);
- Analysis of background noise data, as described in more detail below, indicates the operation of the EPS is a notable and normal existing contributor to the acoustic environment (particularly at night); and
- The EPL does not contain noise criteria and the operation of the EPS adopts industry standard and fit for purpose noise management for a coal fired power station of its age which at the time of approval relied on site selection and establishment and maintenance of buffers to sensitive receptors including

acquisition where necessary to avoid significant noise impacts. Importantly EPS operates without any adverse noise impacts, and Origin have advised that they have received fewer than 3 noise complaints in the past 5 years.

Inclusion of the influence of EPS in background noise levels is justified per *NPfI* Fact Sheet A1. The background noise levels in the revised noise impact assessment have therefore not been revised to remove noise from the Eraring Power Station's ongoing operation.

3. Correction of background noise levels

The EPA provided the following comments:

"The RBLs noted in Table 3 do not correlate with the RBLs and operational project intrusive noise levels and construction noise management levels presented in Tables 4.2, 4.3, 4.5 and 4.9. The anomaly needs to be investigated, explained and corrected. A full assessment of the NIA cannot occur until the noise assessment criteria is confirmed."

"Background noise monitoring was not undertaken in NCA5 and the levels for NCA3 have been adopted for NCA5 in the assessment. NCA5 is further removed from what are described as significant regional noise sources such as Wangi Road, the Main Northern Railway and the Eraring Power Station. There is insufficient justification to accept the noise monitoring results for NCA3 as being representative of NCA5."

Noting the commentary from EPA regarding the background noise levels, Jacobs reviewed the background noise levels presented in the EIS. It was identified that the reason for the erroneous background data was a transcription error (specifically the background levels were incorrectly ordered in Table 3.2 of the EIS, and did not correspond to the correct noise monitoring location). Due to this, while the background levels displayed in Table 3.2 of the EIS were incorrect, it has been validated that the background noise levels used to derive the noise criterion were correct. The correct background noise levels are displayed in Table 3-1 and have been updated within the revised Noise Impact Assessment.

Jacobs and Origin Energy acknowledge EPA's comment on the RBLs of NCA 5. Due to NCA 5's greater distance from noise sources such as Wangi Road and the Eraring Power Station, in addition to featuring lower density residential housing, it is highly likely that NCA 5 experiences substantially lower RBLs than NCA 3. For areas containing receivers that are known to have low background noise levels, the NPI nominates a lower limit of RBLs during the Day, Evening and Night time periods that are to be used for the purposes of assessment of noise impacts in relation to Industrial noise sources. Accordingly, following the Response to Submissions the RBLs at NCA 5 have been appropriately revised to adopt the 'minimum assumed RBLs' provided in the NPI (Table 2.1), as shown in the updated background noise levels given in Table 3-1.

Table 3-1 Corrected Background Noise Levels

Monitor ID	NCA	Monitoring Location	Monitoring Duration	Measurement	Measured Noise Level – dB(A)		
					Day (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 7am)
NM1	NCA 1	232 Gradwells Road, Dora Creek	7 June – 21 June 2021	L_{Aeq} (equivalent noise level)	46	45	45
				Rating Background Level (Background L_{A90})	41	39	38
NM2	NCA 2	Adjacent to 102M Dora		L_{Aeq} (equivalent noise level)	49	47	44

Monitor ID	NCA	Monitoring Location	Monitoring Duration	Measurement	Measured Noise Level – dB(A)		
					Day (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 7am)
		Street, Dora Creek		Rating Background Level (Background L_{A90})	40	40	38
NM3	NCA 3	8 Border Street, Eraring		L_{Aeq} (equivalent noise level)	50	48	45
				Rating Background Level (Background L_{A90})	43	39	37
NM4	NCA 4	124 Border Street, Eraring		L_{Aeq} (equivalent noise level)	59	55	53
				Rating Background Level (Background L_{A90})	48	41	37
N/A*	NCA 5	N/A*	N/A*	Rating Background Level (Background L_{A90})	35	30	30

** Note: RBLs have been adopted as equal to the NPI's 'minimum assumed RBLs'.*

4. Justification of amenity area classification

The EPA provided the comment:

"Table 4.7 presents the project amenity noise levels (PANL). TANU notes that the noise amenity area derived from zoning considerations only been adjusted based on the background noise monitoring results. As alluded to above, there appears to be some confusion about the background noise monitoring results that needs to be resolved in the first instance before further consideration can be given to the adjusted noise amenity area. However, as an initial observation, the daytime and evening background noise levels as a group do not support allocation of the urban noise amenity area to NCAs 1,3 and 4. EPAs initial position is that a suburban category would apply unless further justification can be supplied."

Jacobs' and Origin Energy's response is detailed in the sections below.

4.1 Amenity area characteristics

The following sections make reference to the characteristics defined in Table 2.3 of the *NPfI* to provide justification for adoption of the 'Urban' amenity area at NCA 1, NCA 3 and NCA 4.

Amenity noise levels for residential receivers are defined based on three amenity noise areas: urban, suburban and rural. These are defined based on a number of factors detailed in Table 2.3 of the NPI. The table has been duplicated in Table 4-1 below.

Table 4-1 Determining which of the residential receiver categories applies. (Table 2.3 of the NPI)

Receiver Category	Typical planning zoning – standard instrument*	Typical existing background noise levels	Description
Rural Residential	RU1 – primary production RU2 – rural landscape RU4 – primary production small lots R5 – large lot residential E4 – environmental living	Daytime RBL <40 dB(A) Evening RBL <35 dB(A) Night RBL <30 dB(A)	**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 in column 3 due to existing industry or intensive agricultural activities, the selection of a higher noise amenity area should be considered
Suburban Residential	RU5 – village RU6 – transition R2 – low density residential R3 – medium density residential E2 – environmental conservation E3 – environmental management	Daytime RBL <45 dB(A) Evening RBL <40 dB(A) Night RBL <35 dB(A)	**Suburban** – an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristic: evening ambient noise levels defined by the natural environment and human activity.
Urban Residential	R1 – general residential R4 – high density residential B1 – neighbourhood centre (boarding houses and shop-top housing) B2 – local centre (boarding houses) B4 – mixed use	Daytime RBL >45 dB(A) Evening RBL >40 dB(A) Night RBL >35 dB(A)	**Urban** – an area with an acoustical environment that: ▪ is dominated by 'urban hum' or industrial source noise, where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources ▪ has through-traffic with characteristically heavy and continuous traffic flows during peak periods ▪ is near commercial districts or industrial districts ▪ has any combination of the above

4.2 Additional detailed data analysis

In order to confirm the appropriate amenity area classification for NCA 1 and NCA 3, further detailed post-processing of raw measured background noise data has been undertaken. Specifically, the raw data has been analysed to isolate and identify the contribution of existing industrial noise sources in the area to the measured background noise levels.

In response to the questions raised in the Response to Submissions, the data has been further analysed by identifying and extracting periods of sound recordings during which industrial noise was dominant, deriving a frequency filter based on that data, and then applying that frequency filter to other time periods containing other ambient noise sources. The frequency-filtered measurement results were then inspected to confirm that the industrial noise levels were indeed stable and constant throughout all time periods.

The results of the detailed data analysis undertaken since the Response to Submissions indicates that the sources of industrial noise at NCA 1 are a combination of noise from the Eraring Power Station (EPS) (approx. 1.5km away from the noise logger), as well as the Centennial Coal Mine Entrance (580m away).

In comparison, L_{A90} noise levels at the Border Street (NCA 3) noise logging location are dominated by the nearby EPS Inlet Plant (330m away). Additionally, traffic along Wangi Road, which runs along the top of a ridge between the NCA 3 receiver and the EPS Inlet Plant, provides a loud and semi-constant noise source, which increases the background noise. However, the frequency filtering process was specifically devised to exclude the influence of traffic noise from the results so that the reported industrial noise levels at NCA 3 are comprised mostly of noise from Eraring Power Station.

The data analysis procedure enabled extraction of the industrial-sources-only noise levels from the raw measured noise levels that by default include the combined contributions of all noise sources in the environment, whether the sources were natural, domestic, transport or industrial in origin.

The output of this detailed data analysis is discussed in Sections 4.3 and 4.4 below.

4.3 Justification of Urban Amenity Area at NCA 1 and NCA 3

The adoption of an urban amenity area classification for NCA 1 and NCA 3 is further demonstrated by the detailed data analysis described above. The measured noise data and the audio sound recordings were reviewed to identify time periods when industrial noise was clearly audible and was obviously the dominant source of noise in the environment at the time. These data samples were then used to identify and isolate additional time periods throughout the monitoring period during which the power station and/or the nearby coal mine were the most audible noise sources. It was clear from inspection of the monitoring data that regardless of the variation of noise from other environmental noise sources at any time during the day, evening or night, the noise levels at NCA 1 and NCA 3 never dropped below the baseline level of industrial noise, which remained relatively constant. It was found that the industrial noise created a 'floor' for background noise, which held the prevailing background noise of the area to between 35 and 40 dB(A). This is displayed in the red circled areas in Figure 4-1 below.

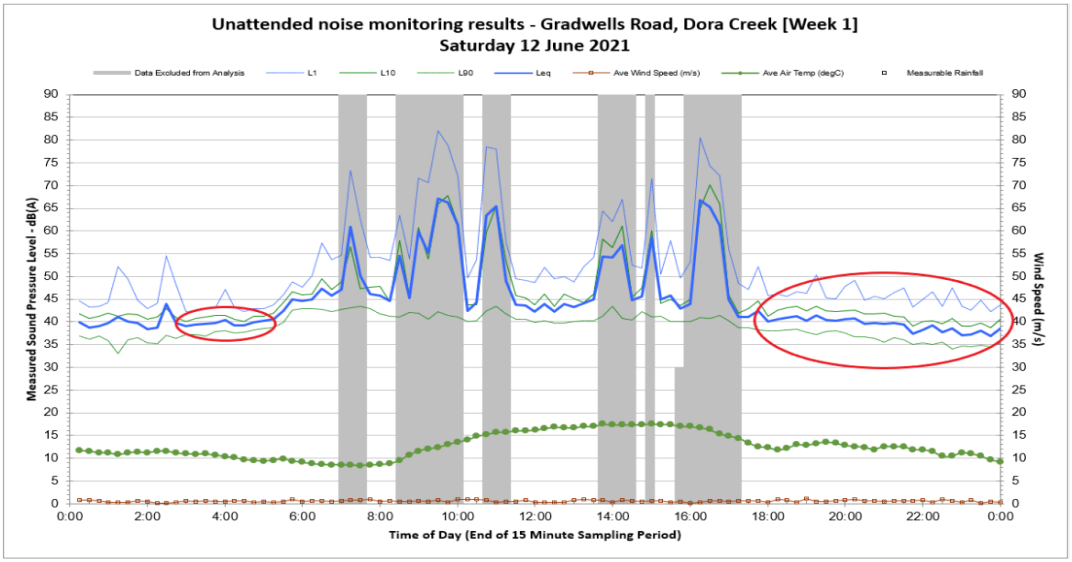

Figure 4-1 Examples of the time periods during which industrial noise was clearly dominant, and isolated from the overall background noise levels for further analysis

After identification of the time periods when industrial noise was dominant, the isolated sections of the audio recordings were passed through a digital signal filter to eliminate frequencies greater than 800Hz (since based on Jacobs' experience, frequencies less than 800Hz are typical of industrial noise).

The results of this analysis are provided in Table 4-2. As displayed in the table, when isolated from the overall ambient noise environment and filtered to reduce the influence of extraneous noise sources, noise from industrial noise sources ranges from 40 – 41 dB(A) L_{eq} and 36 dB(A) 10th percentile L_{A90}.

Table 4-2 Additional data analysis results - isolated industrial noise levels compared to overall noise levels

	Parameter	NCA 1	NCA 3
Industrial Noise Isolated (all time periods)	L_{Aeq}	43	41
	10th percentile L_{A90} (filtered & isolated)	38	37[1]
Industrial Noise Isolated and Frequency Filtered (all time periods)	L_{Aeq}	41	40
	10th percentile L_{A90} (filtered & isolated)	**36**	**36[1]**
Overall (Day Period)	L_{Aeq}	46	50
	RBL (10th percentile L_{A90})	41	43
Overall (Evening Period)	L_{Aeq}	45	48
	RBL (10th percentile L_{A90})	39	39
Overall (Night Period)	L_{Aeq}	45	45
	RBL (10th percentile L_{A90})	38	37

Note 1: The data analysis procedure was considered to be effective at removing most extraneous noise sources, however due to the proximity of Wangi Road the frequency filtered and isolated 10th percentile L_{A90} noise levels at NCA-3 may contain a small residual influence of road traffic noise

As shown in Table 4-2, the data analysis indicates that the 10th percentile L_{A90} noise levels solely due to industrial noise at NCA 1 and NCA 3 was found to be approximately 36 dB(A) consistently throughout all measurement periods. In comparison, the overall RBL (which consists of the combination of all ambient environmental noise sources) ranged between 38 to 41 dB(A) at NCA 1 and between 37 and 43 dB(A) at NCA 3. Indeed the overall Night RBL at NCA 1 and NCA 3 was only 1 to 2 dB(A) higher than the industrial-only noise levels. In terms of relative sound energy composition, this means that the RBL during the Night time period consists of approximately 80% industrial noise.

Similarly, during the Evening the RBL at NCA 1 and NCA 3 was only 3 dB(A) higher than the industrial-only noise levels. This means that the RBL during the Evening is made up of approximately 50% industrial noise.

During the Day, the RBL is approximately 5 to 7 dB(A) above the industrial-only noise levels, which means that the RBL during the Day is composed of approximately 20% to 30% industrial noise.

Furthermore, the data clearly shows that the L_{A90} background noise levels never drops below the industrial-only noise level which is consistently maintained at approximately 36 dB(A). It is important to note that the dominant industrial noise sources in the area that control the background noise environment (EPS and Centennial mine) are both 24-hour noise sources, and both produce constant noise emissions throughout the Day, Evening and Night time periods. The data therefore shows that the floor of the background noise

environment at NCA 1 and NCA 3 is controlled during all time periods by the constant industrial noise from the Eraring Power Station and the Centennial Coal Mine.

The above data analysis results can be used to identify the Receiver Category (refer Table 4-1) applicable to the receiver areas NCA 1 and NCA 3.

The key factors from the data analysis results and site observations relevant to the classifications of receiver areas NCA 1 and NCA 3 are:

- The RBL during the Night time period is >35 dB(A)
- The component of the Night RBL that is comprised solely of industrial noise is >35 dB(A)
- The background noise of the acoustical environment is dominated by constant industrial noise during all time periods
- The area is affected by noise from a major road that carries characteristically heavy and continuous flows during peak periods

According to NPI Table 2.3 (refer Table 4-1), the above observations for both NCA 1 and NCA 3 are consistent with the descriptors of the 'Urban residential' receiver category.

It is noted that the RBL measured at NCA 1 and NCA 3 during the Evening and the Day time periods were not greater than 40 dB(A) and 45 dB(A) respectively, however this does not preclude these receiver areas from the classification of 'Urban residential' receiver category as NPI Table 2.3 refers to these RBL as "Typical existing background noise levels". NPI Table 2.3 does not specifically require that classification of receiver areas be strictly assessed based on these "Typical" RBL values necessarily being exceeded during background noise measurements.

It is also noted that the descriptions of the 'Suburban residential' and 'Rural' receiver categories are entirely inappropriate for the receivers in NCA 1 and NCA 3. Specifically, the following descriptions are readily identified as being inappropriate:

> ***"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."*
>
> …
>
> ***"Suburban** – an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristic: evening ambient noise levels defined by the natural environment and human activity."*

The data analysis and site observations described above have clearly demonstrated that neither of the above descriptions from NPI Table 2.3 (refer Table 4-1) are applicable to the receivers in NCA 1 or NCA 3.

In regards to the "Typical existing background noise levels" nominated in NPI Table 2.3 (refer Table 4-1) ,the variation in RBL during the different time periods is due to diurnal fluctuations in the combination of all noise sources such as industrial sources, traffic, residential noise and natural noise. In areas where the RBL is controlled by constant 24-hour industrial noise sources, it is typical that the industrial noise would determine the floor of the $L_{A90(15\ minute)}$ during all time periods, but the RBLs during the Day and Evening time periods may or may not exceed the Typical RBLs for the Urban amenity classification. Consequently in areas where the Night RBL is controlled by 24-hour industrial noise sources, it is considered that the RBL during the night time period is the critical factor regarding the classification of the receivers' amenity category.

Since the acoustical environment of an area is dominated by industrial noise, the industrial noise sources are constant 24-hour operations, and the industrial noise controls the floor of the background noise levels during all time periods, it is considered reasonable to classify a receiver amenity area as 'Urban Residential' based solely on the RBL during the Night period.

In summary, the classification of the Urban Amenity Area receiver category for NCA 1 and NCA 3 is considered to have justification consistent with the NPI since:

1. The measured night time RBL is higher than the Urban amenity classification for the night time period,
2. The existing background noise environment is dominated by industrial noise during the night time period,
3. The 10th percentile L_{A90} due to industrial noise alone is higher than the Urban amenity classification during the night time period
4. The proposed noise emissions during under-load operations of the BESS would be consistent during the Day, Evening and Night time periods
5. The noise assessment criterion is lower during the Night than the Day or Evening time periods
6. (Based on 4. and 5. above) The Night time period is the deciding time period for the purpose of achieving and assessing compliance
7. For a proposed 24-hour noise source, since the receiver area conforms to the requirements of an Urban Amenity Area classification for the night time period, it should be recognised that the RBL during the Day and Evening periods are of lesser relevance. Therefore it is considered that the Night time period is the appropriate time period relevant to the proposal.

4.4 Justification of Urban Amenity Criteria at NCA 4

As displayed above with the correct background noise levels in Table 3-1, the correct background noise levels can be used to justify the classification of the urban criteria at NCA 4. Through traffic along Wangi Road controls background noise levels at NCA 4, and is by far the dominant noise source in the catchment area during all time periods. As displayed above, the RBLs at NCA 4 for Day, Evening and Night are all greater than the 'typical existing background noise levels' for an urban amenity area. As these RBLs are driven by the through traffic noise, it is justifiable to classify the NCA as Urban.

Table 4-3 Justification of Urban classification at NCA 4

Noise Catchment Area	Noise Amenity Area	Reasoning (In reference to Table 2.3 of the Noise Policy for Industry)
NCA 4	Urban Residential	Land is predominately zoned as RU4 – Primary Production Small Lots under the Lake Macquarie Local Environmental Plan 2014. However: ▪ Day, Evening and Night RBLs match the 'Typical existing background noise levels' for an Urban Receiver; ▪ Acoustic environment and background levels are strongly influenced by the typically continuous and heavy through-traffic along Wangi Road (which all receivers in the NCA are in close proximity to), with additional influence from the nearby EPS; and ▪ Noise recordings undertaken during unattended noise monitoring identified instances where industrial noise was audible within the NCA.

5. Transformer Noise Characteristics

The EPA provided the following comment:

"The assessment of proposed transformer noise against the NPfI low frequency noise and tonality requirements (NPfI – Facts Sheet C) has been largely based on anecdotal assumptions about the performance of the existing EPS transformers. If the assessment is to rely on the existing performance of the EPS transformers, quantitative data should be supplied."

In order to address this comment, Jacobs has adopted a noise spectrum for the 92 dB(A) MVA transformers from the *Heatherton Terminal Station Noise Emissions Report* (Vipac, 2014). The spectrum was then adjusted to match the noise levels of the MVAs.

5.1 Tonality

As per the Fact Sheet C of the NPI, tonality is assessed based on a 1/3 octave band analysis using the *Objective method for assessing the audibility of tones in noise – simplified method* (ISO1996.2-2007 – Annex D). The NPI details that a 5 dB(A) penalty should be applied when the level of any of the one-third octave frequency bands exceeds the level of the adjacent bands on both sides by:

- 5 dB or more if the centre frequency of the band containing the tone is in the range 500–10,000 Hz
- 8 dB or more if the centre frequency of the band containing the tone is in the range 160–400 Hz
- 15 dB or more if the centre frequency of the band containing the tone is in the range 25–125 Hz.

As displayed in Table 5-1, with the Project's predicted noise emissions updated to include an estimated 1/3 octave band spectrum for the MVA transformers, noise from the Project is not expected to exhibit tonal components according to the assessment method prescribed in NPI Fact Sheet C.

Table 5-1 Project Noise Levels Tonality Assessment with sound emissions of MVA Transformers based on estimated 1/3 Octave frequency data

Parameter	1/3 Octave Band Frequencies (unweighted dB)																									
	25Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1k Hz	1.25k Hz	1.6k Hz	2k Hz	2.5k Hz	3.15k Hz	4k Hz	5k Hz	6.3k Hz	8k Hz	10k Hz
At Source																										
Sound Power Level	83.6	78.6	75.6	81.6	96.6	96.6	99.6	90.6	92.6	91.6	87.6	93.6	88.6	84.6	80.6	79.6	78.6	77.6	76.6	74.6	72.6	71.6	69.6	66.6	63.6	60.6	57.6
Level above Left Neighbour	N/A	-5.0	-3.0	6.0	15.0	0.0	3.0	-9.0	2.0	-1.0	-4.0	6.0	-5.0	-4.0	-4.0	-1.0	-1.0	-1.0	-1.0	-2.0	-2.0	-1.0	-2.0	-3.0	-3.0	-3.0	-3.0
Level above Right Neighbour	5.0	3.0	-6.0	-15.0	0.0	-3.0	9.0	-2.0	1.0	4.0	-6.0	5.0	4.0	4.0	1.0	1.0	1.0	1.0	2.0	2.0	1.0	2.0	3.0	3.0	3.0	3.0	N/A
Penalty Triggered?	N/A	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	N/A
Nearest Receiver in NCA 1 (R2)																										
Sound Pressure Level	20.6	15.6	12.6	18.6	33.6	33.6	41.6	37.8	37.2	35.4	41.8	29.9	31.0	37.4	34.5	32.5	26.7	30.6	25.9	23.6	19.4	20.1	13.6	2.0	-14.0	-38.0	-72.4
Level above Left Neighbour		-5.0	-3.0	6.0	15.0	0.0	8.0	-3.8	-0.6	-1.8	6.4	-11.9	1.1	6.3	-2.9	-2.0	-5.9	4.0	-4.8	-2.3	-4.2	0.7	-6.4	-11.6	-16.0	-24.0	-34.4
Level above Right Neighbour	5.0	3.0	-6.0	-15.0	0.0	-8.0	3.8	0.6	1.8	-6.4	11.9	-1.1	-6.3	2.9	2.0	5.9	-4.0	4.8	2.3	4.2	-0.7	6.4	11.6	16.0	24.0	34.4	
Penalty Triggered?	N/A	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	N/A

Parameter	1/3 Octave Band Frequencies (unweighted dB)																									
	25Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1k Hz	1.25k Hz	1.6k Hz	2k Hz	2.5k Hz	3.15k Hz	4k Hz	5k Hz	6.3k Hz	8k Hz	10k Hz
Nearest Receiver in NCA 2 (R6)																										
Sound Pressure Level	15.7	10.7	7.7	13.7	28.7	28.7	36.5	32.7	32.0	31.8	37.9	25.6	26.7	32.5	29.0	24.5	18.0	21.1	14.3	10.4	3.7	0.4	-12.2	-33.4	-64.4	-112.0	0.0
Level above Left Neighbour		-5.0	-3.0	6.0	15.0	0.0	7.8	-3.8	-0.6	-0.2	6.1	-12.3	1.1	5.8	-3.5	-4.5	-6.6	3.2	-6.9	-3.9	-6.7	-3.3	-12.5	-21.2	-31.0	-47.6	112.0
Level above Right Neighbour	5.0	3.0	-6.0	-15.0	0.0	-7.8	3.8	0.6	0.2	-6.1	12.3	-1.1	-5.8	3.5	4.5	6.6	-3.2	6.9	3.9	6.7	3.3	12.5	21.2	31.0	47.6	-112	
Penalty Triggered?	N/A	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	N/A
Nearest Receiver in NCA 3 (R10)																										
Sound Pressure Level	21.3	16.3	13.3	19.3	34.3	34.3	42.1	38.3	37.8	37.1	43.5	31.6	32.4	38.6	35.7	32.7	26.7	30.6	25.2	22.8	18.2	18.4	11.2	-1.7	-19.6	-46.8	-86.1
Level above Left Neighbour		-5.0	-3.0	6.0	15.0	0.0	7.8	-3.8	-0.6	-0.7	6.4	-11.9	0.8	6.2	-2.8	-3.0	-6.0	3.9	-5.4	-2.5	-4.5	0.2	-7.2	-12.9	-17.9	-27.1	-39.3
Level above Right Neighbour	5.0	3.0	-6.0	-15.0	0.0	-7.8	3.8	0.6	0.7	-6.4	11.9	-0.8	-6.2	2.8	3.0	6.0	-3.9	5.4	2.5	4.5	-0.2	7.2	12.9	17.9	27.1	39.3	
Penalty Triggered?	N/A	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	N/A

Parameter	1/3 Octave Band Frequencies (unweighted dB)																									
	25Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1k Hz	1.25k Hz	1.6k Hz	2k Hz	2.5k Hz	3.15k Hz	4k Hz	5k Hz	6.3k Hz	8k Hz	10k Hz
Nearest Receiver in NCA 4 (R12)																										
Sound Pressure Level	23.8	18.8	15.8	21.8	36.8	36.8	36.4	31.8	30.3	29.4	35.0	22.2	21.4	27.3	23.1	18.9	12.1	15.2	9.3	7.0	2.9	3.5	-2.6	-13.8	-29.1	-52.1	-84.9
Level above Left Neighbour		-5.0	-3.0	6.0	15.0	0.0	-0.4	-4.6	-1.4	-0.9	5.6	-12.8	-0.9	5.9	-4.2	-4.2	-6.8	3.1	-5.9	-2.3	-4.1	0.6	-6.2	-11.2	-15.3	-23.0	-32.8
Level above Right Neighbour	5.0	3.0	-6.0	-15.0	0.0	0.4	4.6	1.4	0.9	-5.6	12.8	0.9	-5.9	4.2	4.2	6.8	-3.1	5.9	2.3	4.1	-0.6	6.2	11.2	15.3	23.0	32.8	
Penalty Triggered?	N/A	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	N/A
Nearest Receiver in NCA 5 (R15)																										
Sound Pressure Level	16.6	11.6	8.6	14.6	29.6	29.6	33.6	29.6	28.8	27.4	33.5	21.1	23.3	29.0	25.4	21.6	14.9	17.9	10.8	6.6	-0.6	-4.9	-18.6	-41.6	-75.5		
Level above Left Neighbour		-5.0	-3.0	6.0	15.0	0.0	4.0	-4.0	-0.8	-1.3	6.0	-12.4	2.3	5.6	-3.5	-3.8	-6.7	3.0	-7.1	-4.2	-7.2	-4.3	-13.7	-23.0	-33.9	75.5	
Level above Right Neighbour	5.0	3.0	-6.0	-15.0	0.0	-4.0	4.0	0.8	1.3	-6.0	12.4	-2.3	-5.6	3.5	3.8	6.7	-3.0	7.1	4.2	7.2	4.3	13.7	23.0	33.9	-75.5	0.0	
Penalty Triggered?	N/A	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	N/A

5.2 Low Frequency Noise

To assess low frequency noise, the predicted noise from the MVA Transformers was added to the predicted noise from the BESS setup to determine the total, cumulative, low frequency noise impact.

As per the Fact Sheet C of the NPI, and as described in the NPI, in order to account for potential low frequency noise impacts, a correction is applied to noise levels based on a two-step criterion. The first step is to analyse the difference between the C-weighted and A-weighted noise levels predicted at the assessed receivers. If the difference between the C-weighted and A-weighted noise levels is greater than 15 dB, the second step of the assessment will be undertaken. The comparison of the difference in C and A weighted noise levels, and whether each exceeds the NPI criterion is detailed below in Table 5-2.

Table 5-2 Predicted Operational Noise Levels (C and A weighted)

Noise Sensitive Receiver	**Difference between C and A weighted predicted noise levels $L_{eq,15min}$ dB**	
	Noise-Enhancing conditions	**Requires assessment at the octave band level to determine the level of adjustment due to LFN?**
NCA 1 Nearest Residential Receiver (R2)	48 dB(C) – 41 dB(A) = 7 dB	No
NCA 2 Nearest Residential Receiver (R6)	43 dB(C) – 35 dB(A) = 8 dB	No
NCA 3 Nearest Residential Receiver (R10)	49 dB(C) – 42 dB(A) = 7 dB	No
NCA 4 Nearest Residential Receiver (R12)	43 dB(C) – 31 dB(A) = 12 dB	No
NCA 5 Nearest Residential Receiver (R15)	40 dB(C) – 31 dB(A) = 9 dB	No

As displayed, the difference between C and A weighted noise levels do not exceed the 15 dB criteria at each nearest receiver. To provide a more robust understanding of Project low frequency noise, the low frequency third octave noise contribution at each nearest receiver was compared to the criterion presented in Table C2 of the NPI in Table 5-3.

Table 5-3: Predicted Low Frequency Contribution

Noise Sensitive Receiver	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz
NPI Table C2 Threshold Levels	89	86	77	69	61	54	50	50	48	48	46	44
NCA 1 Nearest Residential Receiver (R1)	-	-	-	19.8	14.8	11.8	17.8	32.8	32.8	41.4	37.8	37.2
NCA 2 Nearest Residential Receiver (R6)	-	-	-	15.0	10.0	7.0	13.0	28.0	28.0	36.4	32.6	32.0
NCA 3 Nearest Residential Receiver (R10)	-	-	-	20.6	15.6	12.6	18.6	33.6	33.6	42.0	38.3	37.7
NCA 4 Nearest Residential Receiver (R12)	-	-	-	23.1	18.1	15.1	21.1	36.1	36.1	36.3	31.7	30.3
NCA 5 Nearest Residential Receiver (R15)	-	-	-	15.9	10.9	7.9	13.9	28.9	28.9	33.5	29.6	28.7

As shown in Table 5-3, the Project noise level spectra, with the MVA Transformers included, do not exceed the NPI Table C2 Threshold Levels at any of the nearest receivers.

6. Modelling of Worst Affected Receivers

EPA provided the comment:

"The NIA at Section 7.2.2 suggests that the modelling has not considered the potentially worst affected receivers in NCA3. The proponent should confirm that the worst affected receiver locations for each NCA have been considered and presented in the NIA i.e. "Table 5.6: Receivers used to Predict Noise Impacts""

Jacobs have responded to this comment by performing noise modelling at all receivers within each NCA. Jacobs can confirm that the receivers selected as receivers at NCA 3 are adequate in accounting for the most impacted receivers which are also closest to the proposal (i.e. the receivers at which if compliance is achieved, all receivers in the NCA would comply). Revisions to the selected receivers at NCA 1, NCA 2 and NCA 5 have been made, however these are minor in nature and no non-compliances have been predicted as a result.