REPORT TITLE:

13 Netherhall Gardens, London, NW3 5RN PHASE 3- Plant Noise Impact Assessment.

CLIENT DETAILS:

Re-creo

DATE:

9th August 2022

REPORT REFERENCE:

PC-18-0287-R5

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Document Status and Revision Schedule

Issue/Revision	Description/Comments	Date	Prepared by	Approved by
-	Checked and Authorised	10/08/22	JCB	MJ

1 Summary

Pace Consult Limited was commissioned by Re-creo Architecture to undertake a noise impact assessment from the proposed plant units located on the valley between the two pitched roofs of the new residential building at 13 Netherhall Gardens NW3 5RN affecting the nearest residential dwellings.

This report has been prepared in accordance with national acoustic guidelines and BS such as BS4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial units.*

The noise impact assessment based on the methodology contained within the BS4142:2014 has anticipated that the specific sound levels (noise from plant units) will have a low impact at the nearest noise sensitive receptors.

2 Introduction

Pace Consult Limited was commissioned by Re-creo Architecture to undertake a noise impact assessment from the proposed plant units located on the valley between the two pitched roofs of the new residential building at 13 Netherhall Gardens NW3 5RN affecting the nearest residential dwellings.

This report has been prepared in accordance with national acoustic guidelines and BS such as BS4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial units*.

Pace Consult Ltd completed a background noise survey on site and documented the findings in report PC-18-0287-RP3 dated 23rd March 2022. Noise data representative of the nearest noise sensitive receptors was assessed against the criteria recommended by the most relevant acoustic guidelines.

This report shows the calculated plant noise levels at the nearest residential dwellings, which were compared against the typical measured background noise levels. This is a requirement of the BS4142:2014+A1:2019.

The levels used in the calculations were extracted from the M&E technical submittals and plant manufacturer's data. To undertake the outdoor sound level calculations Part 2 of ISO 9613 Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation was used. This ISO standard is incorporated in the SoundPLAN v 8.2 software. This software was used to generate outdoor sound levels from the plant units to the nearest residential dwellings and to produce noise contour maps.

The sound pressure levels from the proposed plant were assessed during the daytime and night-time with all plant items operating continuously.

3 Assessment Methodology

3.1 BS4142:2014+A1:2019

This standard sets out a methodology for the assessment of noise from factories, industrial premises or fixed installations and sources of an industrial/commercial nature.

The procedure contained in BS4142 for assessing the impact is to compare the measured or predicted noise level from the source in question, the 'specific noise level', at the assessment position with the correct background noise level for the worst-case time of operation.

Where the noise contains a 'distinguishable, discreet, continuous note (whine, hiss, screech, hum etc.) or if there are distinct impulses in the noise (bangs, clicks or clatters), or if the noise is irregular enough to attract attention' then a range of correction factors can be added to the specific noise level as appropriate to obtain the 'rating level'.

As this is a prescriptive report prior to plant installation, overall rating noise levels will be specified for the new installation. Compliance with the rating value will be necessary to provide evidence that significant adverse impact has been avoided as required by the NPSE.

To assess the impact, the measured background noise level is subtracted from the rating noise level. BS4142 states:

The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessment and arriving at decisions, therefore, it is essential to place the sound in context.

Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (See Clause 8) from the rating level (see Clause 9) and consider the following.

a) Typically, the greater the difference, the greater the magnitude of the impact.

b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around 5dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

1) The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

2) The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.

3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as;

i) Façade sound insulation treatment

ii) Ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and Acoustic screening.

4 Plant noise criteria

The plant noise criteria at the nearest residential is included in the table below. The typical background has been calculated based on the statistical analysis recommended by BS4142:2014+A1:2019. The environmental assessment was undertaken in accordance with the methodology described in BS 7445:1997.

Table 1. Measured continuous noise level

Time	**Period $L_{Aeq,\,T}$ dB (Log Average)**	**$L_{A90,T}$ dB** Typical background
MP1		
Day (07:00 – 23:00)	51	47
Night (23:00 – 07:00)	46	39
MP2		
Day (07:00 – 23:00)	50	45
Night (23:00 – 07:00)	43	36

Note. The recommended plant noise criteria are 10 dB below the typical background. Therefore, the noise emission from the plant at the nearest residential dwellings should not exceed 35 L_{Aeq} dB during daytime, and 26 L_{Aeq} dB during night time. This is due to MP2 being representative of the proposed plant location more than MP1.

The figures below include the statistical analysis to derive the typical background.

- MP1 typical background. Day Time

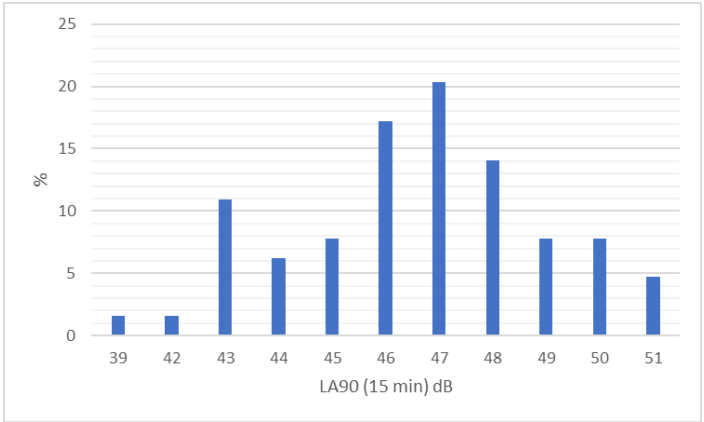

Figure 1. MP1 typical background. Day Time.

- MP1 typical background. Night-time.

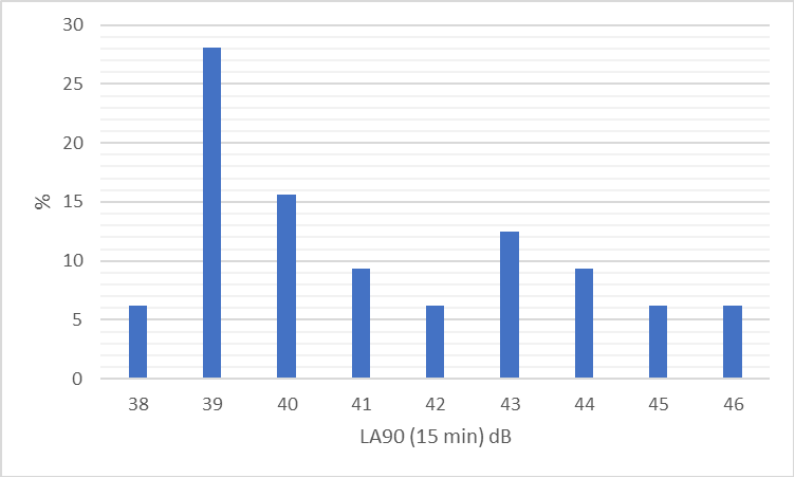

Figure 2. MP1 typical background. Night Time.

- MP2 typical background. Day Time

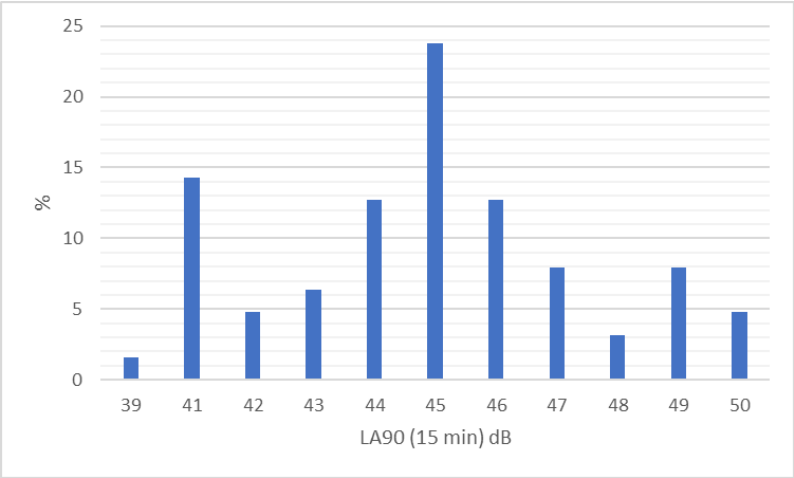

Figure 3. MP2 typical background. Day Time.

- MP2 typical background. Night-time

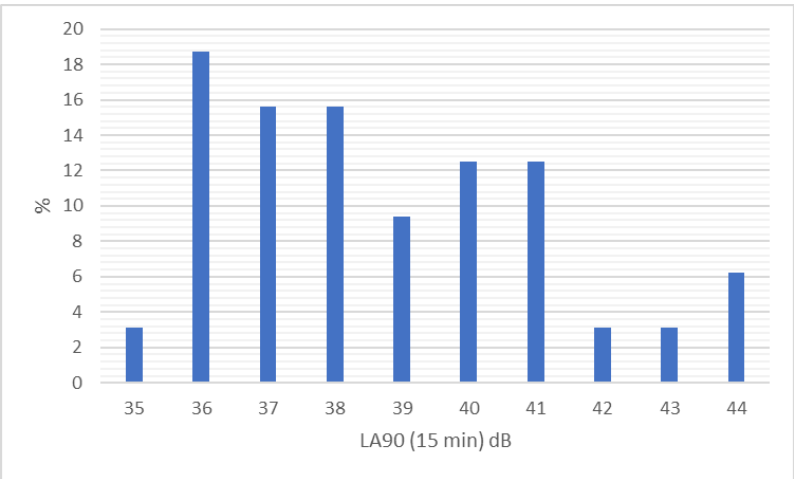

Figure 4. MP2 typical background. Night-time.

The measurement locations are included below.

Figure 5. Measurement positions, and plant enclosure location.

4.1 Nearest residential dwellings.

The nearest residential dwellings which have the potential to be affected by the plant noise emission are included below.

Figure 6. Nearest residential dwellings..

R1 and R2 .13 Netherthall Gardens.

R3. No 11 Netherthall Gardens

R4. No 16 Netherthall Gardens

R5. No 18A Netherthall Gardens.

5 Calculation assumptions

The noise data used for the calculations is as advised by the mechanical engineer, the figure below shows the location of the noise source used in the calculations.

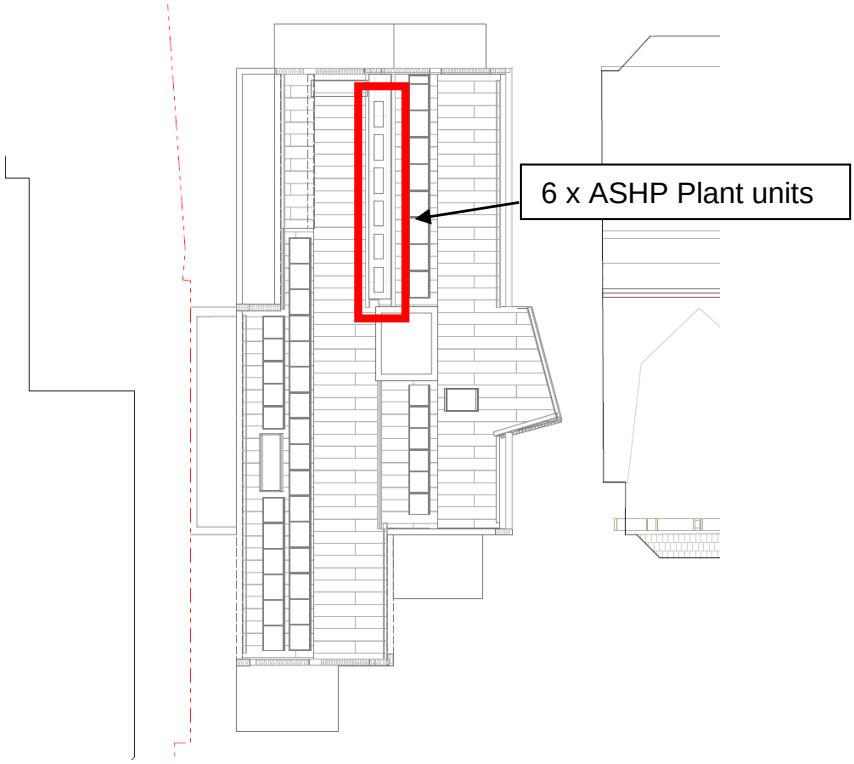

Figure 7. Location and dimmentions of the acoustic enclosure.

The noise levels of the proposed ASHP units provided by the manufacturer are included below.

Table 2. ASHP noise level

Model	Sound Power LWA dB Day Time Cooling	Sound Power LWA dB Night Time Cooling
Daikin ERLQ016CV3	**69**	**61**

Note. The above table included the highest noise emission of the proposed unit (Cooling mode).

Noise mitigation (acoustic enclosure).

The sound reduction provided by the proposed acoustic enclosure is included below.

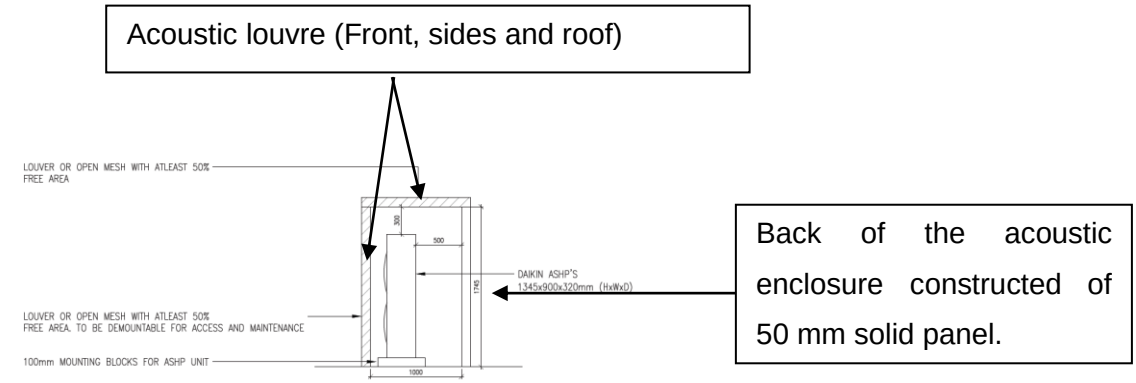

Figure 8. Proposed acoustic enclosure.

Acoustic enclosure 50 mm solid panel.

Table 2 Sound transmission:

Panel	63	125	250	500	1k	2k	4k	8kHz
50mm	15	20	25	32	38	45	47	40

Figure 9. Solid panel sound reduction R_w dB.

Acoustic louvres.

Acoustic Data	dB in each Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Sound reduction index	7	8	13	23	37	33	29	29
Weighted sound reduction index (Rw)				25				

Chevron Acoustic Louvre, Standard Performance Profile, 600mm Deep

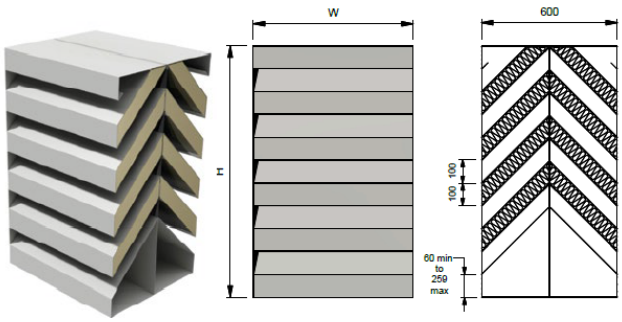

Figure 10. Proposed acoustic louvres sound reduction Rw dB.

6 Calculation Summary

The table below shows the calculated sound levels at the nearest noise sensitive receptors based on the acoustic assumptions included in the previous section.

The noise impact during night-time have been completed according to the night-time noise emission relative to the background noise level for the same period which is considerably lower than the noise levels present during daytime.

It should be noted that the M&E subcontractor will set up the specific day and night operation in order to guarantee that the units in fact operate at their night-time set back noise level. This is to avoid noise nuisance at the nearest residential dwellings should they operate at daytime rates, overnight.

The noise impact is completed during day and night-time based on the proposed unit's different operation noise levels for each period.

Table 3. Calculated Sound Pressure Level dBA **Day Time**	
ID	Calculated Sound Pressure Level dBA
R1	11
R2	23
R3	23
R4	11
R5	12

Table 4. Calculated Sound Pressure Level dBA **Night-time**	
ID	Calculated Sound Pressure Level dBA
R1	3
R2	15
R3	15
R4	3
R5	4

The table overleaf shows the sound propagation calculation at each receiver during daytime.

Table 5. Noise propagation calculations. Day Time														
Source	Source type	Li dB(A)	R'w dB	L'w dB(A)	Lw dB(A)	l or A m,m²	Ko dB	S m	Adiv dB	Agr dB	Abar dB	Aatm dB	dLrefl dB(A)	Lr dB(A)
R1														
50 mm panel	Area	62	36	33.6	44.7	13	3	17.55	-35.9	1.1	-19.7	0	2.7	-4
Long side Louvre	Area	62	25	46.2	48.1	1.6	3	14.77	-34.4	1.1	-18.5	0	2.8	2
Roof Louvre	Area	62	25	45.7	54.3	7.3	0	17.49	-35.8	1.1	-18.5	0	3.4	5
Short side Louvre	Area	61	25	45.5	47.7	1.7	3	20.45	-37.2	1.1	-19.4	0	2.6	-2
Short side Louvre	Area	62	25	45.3	56.5	13.1	3	16.95	-35.6	1.1	-19.2	0	2.6	9
R2														
50 mm panel	Area	62	36	33.6	44.7	13	3	9.16	-30.2	1.2	-14.1	0	3.3	8
Long side Louvre	Area	62	25	46.2	48.1	1.6	3	10.02	-31	1.1	-14.3	0	3.3	10
Roof Louvre	Area	62	25	45.7	54.3	7.3	0	9.14	-30.2	1.2	-11.8	0	3.3	17
Short side Louvre	Area	61	25	45.5	47.7	1.7	3	8.56	-29.6	1.1	-12.8	0	2.6	12
Short side Louvre	Area	62	25	45.3	56.5	13.1	3	8.32	-29.4	1.2	-13.3	0	2.7	21
R3														
50 mm panel	Area	62	36	33.6	44.7	13	3	14.07	-34	1.2	-9.5	0	2.8	8
Long side Louvre	Area	62	25	46.2	48.1	1.6	3	13.93	-33.9	1.2	-9.2	0	3.5	13
Roof Louvre	Area	62	25	45.7	54.3	7.3	0	14.63	-34.3	1.2	-6.5	0	3.8	19
Short side Louvre	Area	61	25	45.5	47.7	1.7	3	15.84	-35	1.2	-7.6	0	2.2	12
Short side Louvre	Area	62	25	45.3	56.5	13.1	3	15.01	-34.5	1.2	-10.3	0	3.9	20
R4														
50 mm panel	Area	62	36	33.6	44.7	13	3	52	-45.3	1	-7.4	0	2.4	-2
Long side Louvre	Area	62	25	46.2	48.1	1.6	3	48.27	-44.7	1	-7.1	0	2.3	3
Roof Louvre	Area	62	25	45.7	54.3	7.3	0	52.11	-45.3	1	-6.1	0	2.5	6
Short side Louvre	Area	61	25	45.5	47.7	1.7	3	55.96	-46	1	-11.3	0	1.9	-4
Short side Louvre	Area	62	25	45.3	56.5	13.1	3	51.96	-45.3	1	-9.9	0	2.2	8
R5														
50 mm panel	Area	62	36	33.6	44.7	13	3	57.31	-46.2	1	-11.1	0	4.5	-4
Long side Louvre	Area	62	25	46.2	48.1	1.6	3	53.83	-45.6	1	-8.6	0	4.1	2
Roof Louvre	Area	62	25	45.7	54.3	7.3	0	57.4	-46.2	1	-6.1	0	4.4	7
Short side Louvre	Area	61	25	45.5	47.7	1.7	3	60.74	-46.7	1	-9.6	0	3.2	-1
Short side Louvre	Area	62	25	45.3	56.5	13.1	3	56.94	-46.1	1	-9.3	0	3.1	8

The figure below includes the legend of the acoustic parameters used to calculate the sound pressure level at receivers.

Legend

Source		Source name
Source type		Type of source (point, line, area)
Li	dB(A)	Level inside
R'w	dB	Rated transmission loss
L'w	dB(A)	Sound power level per m, m²
Lw	dB(A)	Sound power level per unit
l or A	m,m²	Size of source (length or area)
Ko	dB	Correction for propagation in limited spacial angle
S	m	Distance source - receiver
Adiv	dB	Mean attenuation due to geometrical spreading
Agr	dB	Mean attenuation due to ground effect
Abar	dB	Mean attenuation due to screening
Aatm	dB	Mean attenuation due to air absorption
dLrefl	dB(A)	Level increase due to reflections
Lr	dB(A)	Assessed level of time slice

Figure 11. Legend of acoustic parameters used in the noise propagation calculations.

The figure below includes the calculated noise map during day time.

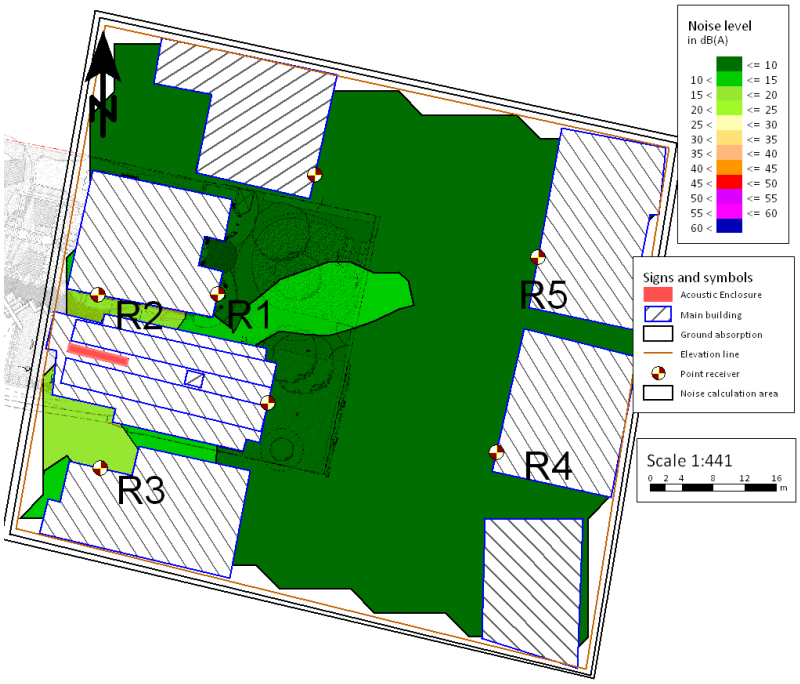

Figure 12. Noise map day time.

The figure below includes the calculated noise map during night time.

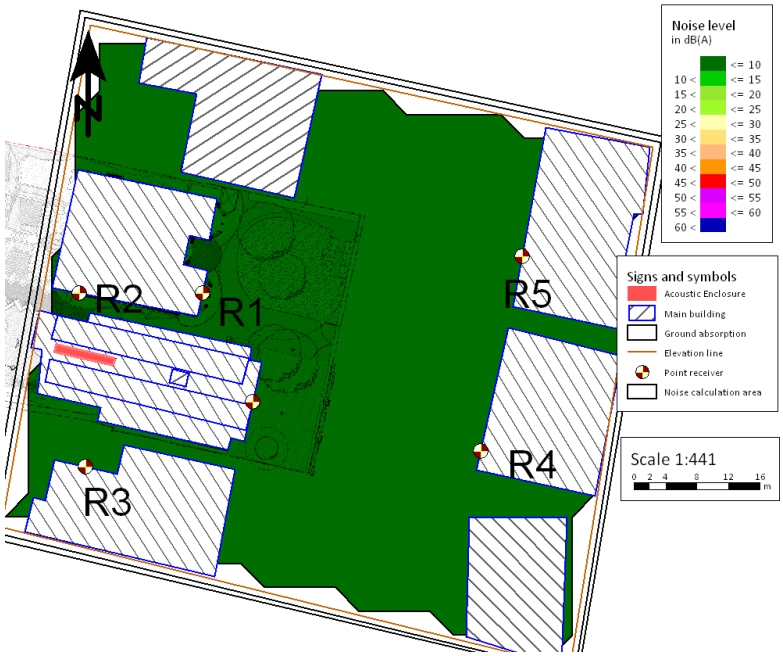

Figure 13. Noise map night time.

Note. The above noise map is calculated at 2.0 m above ground level.

7 BS4142:2014 Assessment

The table below shows the assessment method recommended by BS4142:2014 *Method for rating and assessing industrial and commercial sound.* The calculated sound levels were corrected by tonality as per BS4142:2014 methodology.

Table 6. BS4142:2014 Assessment. **Day Time.**				
ID	Calculated Sound Pressure Level dBA	correction as discussed in BS4142:2014	LA90 dB	Excess of rating over background level
R1	11	0	45	-34
R2	23			-22
R3	23			-22
R4	11			-34
R5	12			-33

Table 7. BS4142:2014 Assessment. **Night Time.**				
ID	Calculated Sound Pressure Level dBA	correction as discussed in BS4142:2014	LA90 dB	Excess of rating over background level
R1	3	0	36	-33
R2	15			-21
R3	15			-21
R4	3			-33
R5	4			-32

As the calculated noise levels are very low, and more than 10 dB below the typical background, a noise penalty for tonality has not been considered within the assessment as it is highly likely that such operation would be subjectively detectable.

As can be seen from the assessment table the rating level is more than 10 dB below the typical background, which is a positive indication of the specific sound source (noise from the proposed plant unit) having a low impact at the nearest residential dwellings.

8 Conclusions

The BS4142:2014+A1:2019 noise impact assessment has anticipated that the specific sound levels (noise from plant) will have a low impact at the nearest noise sensitive receptors.