

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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Northwood URC

Acoustic planning report

London, Manchester, Edinburgh, Birmingham, Belfast, Stevenage

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Version	Date	Comments	Author	Reviewer
A	18 June 20		Artem Khodov	Richard King
B	1 July 20	Updated plant location	Artem Khodov	Richard King

Summary

Sandy Brown has been commissioned by DSA Engineering to provide acoustic advice in relation to the proposed development at Northwood United Reformist Church (URC).

An environmental noise survey has been carried out to determine the existing sound levels in the area. The noise survey was carried out between 13:00 on 4 June 2020 and 13:00 on 9 June 2020.

The representative background sound levels measured during the survey were $L_{A90,15min}$ 43 dB during the daytime and $L_{A90,15min}$ 34 dB at night.

Based on the requirements of the London Borough of Hillingdon and on the results of the noise survey, all plant must be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises does not exceed $L_{Aeq,15min}$ 38 dB during the daytime, and $L_{Aeq,15min}$ 29 dB during the night. These limits are cumulative, and apply with all plant operating under normal conditions. If plant items contain tonal or attention catching features, a penalty based on the type and impact of those features will be applied, and the limits will be more stringent than those set.

An assessment of the proposed plant items associated with the development has been carried out. The daytime criteria set out by London Borough of Hillingdon is expected to be satisfied with the proposed solid screen.

The plant is not intended to be used at night. If this is required in future, a night-time set-back of 7 dB will be required.

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1 Introduction

Sandy Brown has been commissioned by DSA Engineering to provide acoustic advice in relation to the proposed development at Northwood URC.

As part of this, an environmental noise survey is required, the purpose of which is to establish the existing background sound levels in the vicinity of nearby noise sensitive premises and to set appropriate limits for noise egress from building services plant.

This report presents the survey method and results, and a discussion of acceptable limits for noise emissions from building services plant, as well as results of the assessment of proposed plant noise egress.

It should be noted that the noise survey was undertaken during partial lockdown due to Covid 19 restrictions, and so is considered more onerous than normal. This has been considered in determining the representative background noise level.

2 Site description

2.1 The site and its surrounding

The site location in relation to its surroundings is shown in Figure 1, highlighted in red. The site is bound by Joel St to the east and Lichfield Rd to the west.

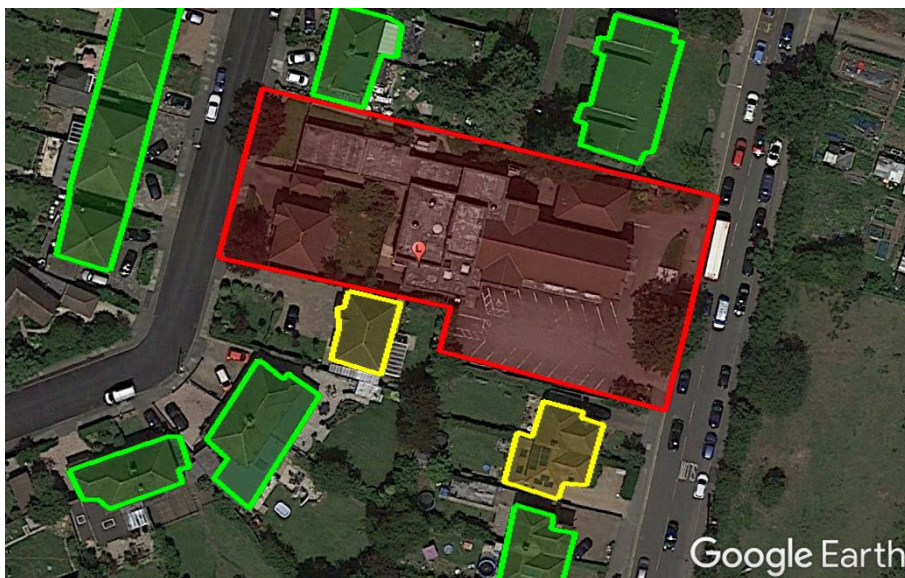


Figure 1 Aerial view of site (courtesy of Google Earth Pro)

2.2 Adjacent premises

The site is located in a residential area, with nearby residential premises shown in green. Premises that will be worst affected by the proposed plant are shown in yellow.

3 Development proposals

The proposal includes refurbishment of some of the spaces within the church, including the hall and the flats. A part of this new external air-cooling unit is proposed to be installed on the roof.

4 Building services noise egress criteria

4.1 Standard guidance

BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* (BS 4142) provides a method for assessing noise from items such as building services plant against the existing background sound levels at nearby noise sensitive premises.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background level, it is an indication of having a low impact.

If the noise contains 'attention catching features' such as tones, bangs etc, a penalty, based on the type and impact of those features, is applied.

4.2 Local Authority criteria

In accordance with London Borough of Hillingdon's Noise Supplementary Planning Document, dated April 2006, the industrial noise needs to be assessed in accordance with BS 4142:1997. The document says '*the rating level of noise from the proposed development determined according to BS4142 is at least 5 dB below the background noise level $L_{A90,T}$.*'

As the standard has been superseded by BS 4142:2014+A1:2019, the assessment was done in accordance with the most up to date standard, and the limits are to be set 5 dB below the representative background noise levels as rated in accordance with BS 4142:2014+A1:2019.

5 Noise survey method

The survey included unattended and attended noise measurements.

5.1 Unattended measurements

Unattended noise monitoring was undertaken at the site over 6 days.

Details of the equipment used and the noise indices measured are provided in Appendix A.

The unattended measurements were taken over 15-minute periods between 13:00 on 4 June 2020 and 13:00 on 9 June 2020. The equipment was installed and collected by Artem Khodov.

The measurement position used during the survey is indicated in Figure 1, denoted by the letter 'L'. A photograph showing the measurement location is provided in Figure 2. This location was chosen to be reasonably representative of noise levels at the site and outside the nearest noise sensitive premises.



Figure 2 Logger installed at position 'L'

The measurements were taken at facade level, approximately 1 m away from the facade.

5.2 Weather conditions

Weather conditions during the survey are described in Appendix A.

6 Noise survey results

6.1 Observations

The dominant noise sources observed at the site during the survey were from limited traffic on Joel Street.

Less significant noise sources included distant noise from other roads and pedestrians on Joel Street.

The survey was undertaken during the COVID-19 pandemic of 2020, following the lockdown in the UK. As a result, the measured noise levels are likely to be lower than they would be typically, and on that basis the assessment is quite conservative.

6.2 Noise measurement results

6.2.1 Unattended measurement results

A graph showing the results of the unattended measurements is provided in Appendix B.

Day and night-time ambient noise levels measured during the unattended survey are presented in Table 1.

Table 1 Ambient noise levels measured during the unattended survey

Date	Daytime (07:00 – 23:00)	Night (23:00 – 07:00)
	$L_{Aeq,16h}$ (dB)	$L_{Aeq,8h}$ (dB)
Thursday 4 June 2020	54	47
Friday 5 June 2020	53	47
Saturday 6 June 2020	54	47
Sunday 7 June 2020	52	47
Monday 8 June 2020	53	47
Tuesday 9 June 2020	54	-
Average	53	47

^[1] Measurement not made over full period due to monitoring start and end time (the measurement on 4 June 2020 was over 10 hours, and on 9 June 2020 over 6 hours); not included in the average.

In accordance with BS 4142:2014+A1:2019, representative background sound levels have been determined using statistical analysis of the continuous measurements.

Daytime and night-time statistical analysis of representative values for the site are given in Figure 3 and Figure 4.

As the measurements were taken during the COVID-19 pandemic, following the lockdown, the noise level measurements are expected to be unrepresentatively low. As a result, a median value was used for establishing representative background noise level.

Northwoor URC
Statistical analysis of day time background sound level at Position L
4 June 2020 to 9 June 2020
Daytime period (07:00 to 23:00)

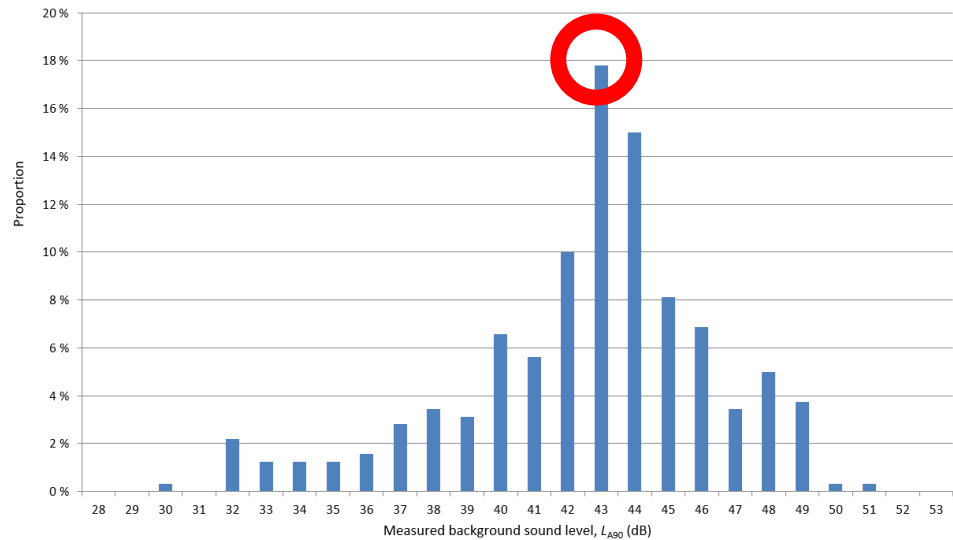


Figure 3 Statistical analysis of daytime background noise levels

Northwood URC

Statistical analysis of night time background sound level at Position L

4 June 2020 to 9 June 2020

Night-time period (23:00 - 07:00)

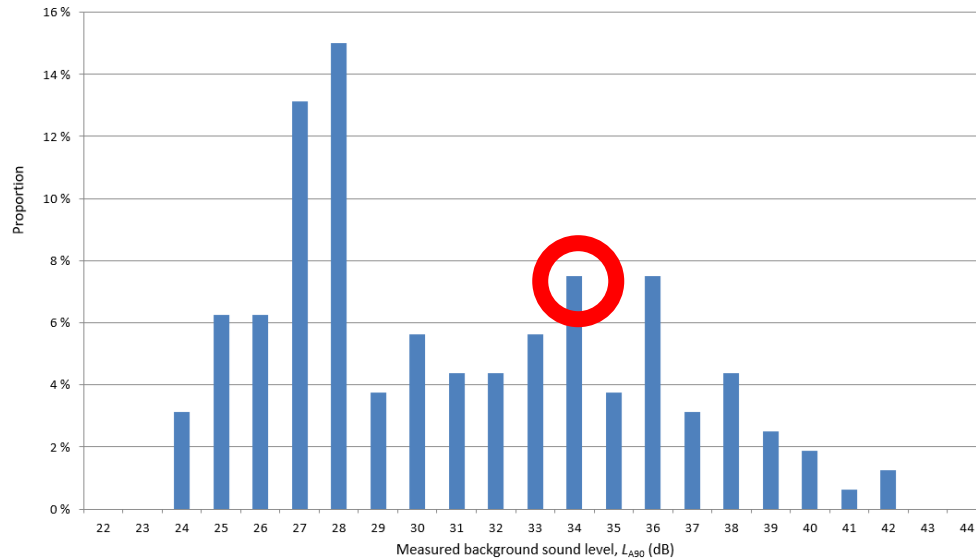


Figure 4 Statistical analysis of night-time background noise levels

6.3 Basic limits

Based on the above criteria and the measurement results, the cumulative noise level from the operation of all new plant should not exceed the limits set out in Table 2.

The limits apply at 1 m from the worst affected windows of the nearest noise sensitive premises and are presented as facade levels. In this case these limits would apply at the nearest noise sensitive premises labelled in yellow in Figure 1

Table 2 Plant noise limits at 1 m from the nearest noise sensitive premises

Time of day	Maximum sound pressure level at 1 m from noise sensitive premises, $L_{Aeq,15min}$ (dB)
Daytime (07:00-23:00)	38
Night-time (23:00-07:00)	29

[1] The limits set out in Table 2 do not include any attention catching features. Penalty corrections for attention catching features may be significant and will need to be considered as the building services design progresses. This is discussed in Appendix C.

6.4 Plant noise assessment

The proposal includes installing an air source heat pump on the southern first floor flat roof of site as shown in green in Figure 5. The plant is proposed to be surrounded by a solid screen, extending to the top of the unit. An elevation drawing showing the plant screen is shown in Figure 6.

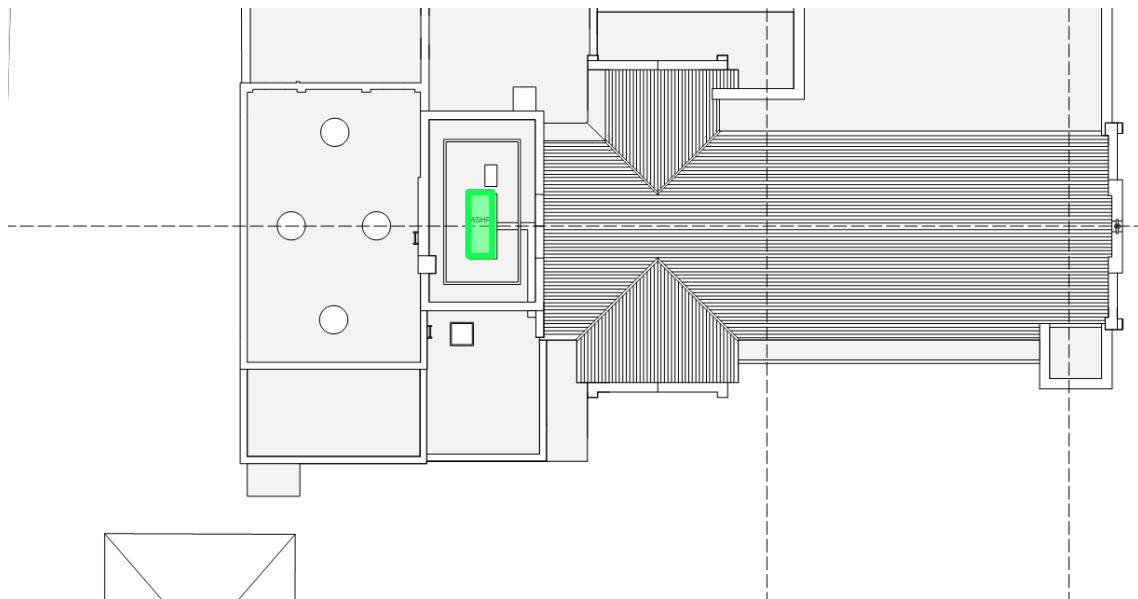


Figure 5 Location of the proposed plant



Figure 6 Elevation showing the screen

The proposed unit is Mitsubishi air source heat pump. The sound pressure level data for the unit, measured 10 m from the unit, provided by the manufacturer is shown in Table 3.

Table 3 Unit sound pressure level provided by the manufacturer, dB re 2×10^{-5} Pa

	Octave band sound pressure level (dB)								dB(A)
	63	125	250	500	1000	2000	4000	8000	
SPL@10 m	57	54	51	49	49	43	38	30	52

The distance between the proposed plant location and the windows of the nearest noise sensitive property is 18 m. The distance to the next noise sensitive property is 25 m. Due to distance attenuation, compliance with the limit at the first property will ensure compliance with the limits at other nearby noise sensitive premises.

An assessment has been undertaken, details of which can be found in Appendix D.

With the screening provided by the proposed solid screen, which extends to the top of the unit, the sound pressure level at the windows of worst affected receptor is expected to be L_{Aeq} 36 dB. This is 2 dB below the daytime criteria and 7 dB above the night-time criteria. If the plant is to be used at night, it needs to be confirmed that a 7 dB setback can be accommodated at night.

7 Conclusion

The representative background sound levels from the noise survey were $L_{A90,15min}$ 43 dB during the day, and $L_{A90,15min}$ 34 dB during the night.

Based on the requirements of the Local Authority, the relevant plant noise limits at the worst affected existing noise sensitive premises are L_{Aeq} 38 dB during the day, and L_{Aeq} 29 dB during the night.

These limits are cumulative and apply with all plant operating under normal conditions. If plant items contain tonal or attention catching features, the limits will be more stringent than those set out above. If plant items contain tonal or attention catching features, a penalty based on the type and impact of those features will be applied.

An assessment of the proposed plant items associated with the development has been carried out. The daytime criteria set out by London Borough of Hillingdon is expected to be satisfied with the proposed solid screen.

The plant is not intended to be used at night. If this is required in future, a night-time set-back of 7 dB will be required.

Appendix A - Survey details

Equipment

The unattended noise measurements were taken using a Rion NL-52 sound level meter.

Calibration details for the equipment used during the survey are provided in Table A1

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	NL-52/00375679	Rion	9 Jul 21	TCRT19/1541
Microphone	UC-59/11168	Rion	9 Jul 21	TCRT19/1541
Pre-amp	NH-25/65806	Rion	9 Jul 21	TCRT19/1541
Calibrator	SV30A/10576	Svan	9 Jul 21	TCRT19/1539

Calibration of the meters used for the measurements is traceable to national standards. Calibration certificates for the sound level meter used in this survey are available upon request.

Calibration checks were carried out on the meters and their measurement chains at the beginning and end of the survey. No significant calibration deviation occurred.

Noise indices

Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{AFmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a fast time weighting.
- $L_{ASmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a slow time weighting.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures*.

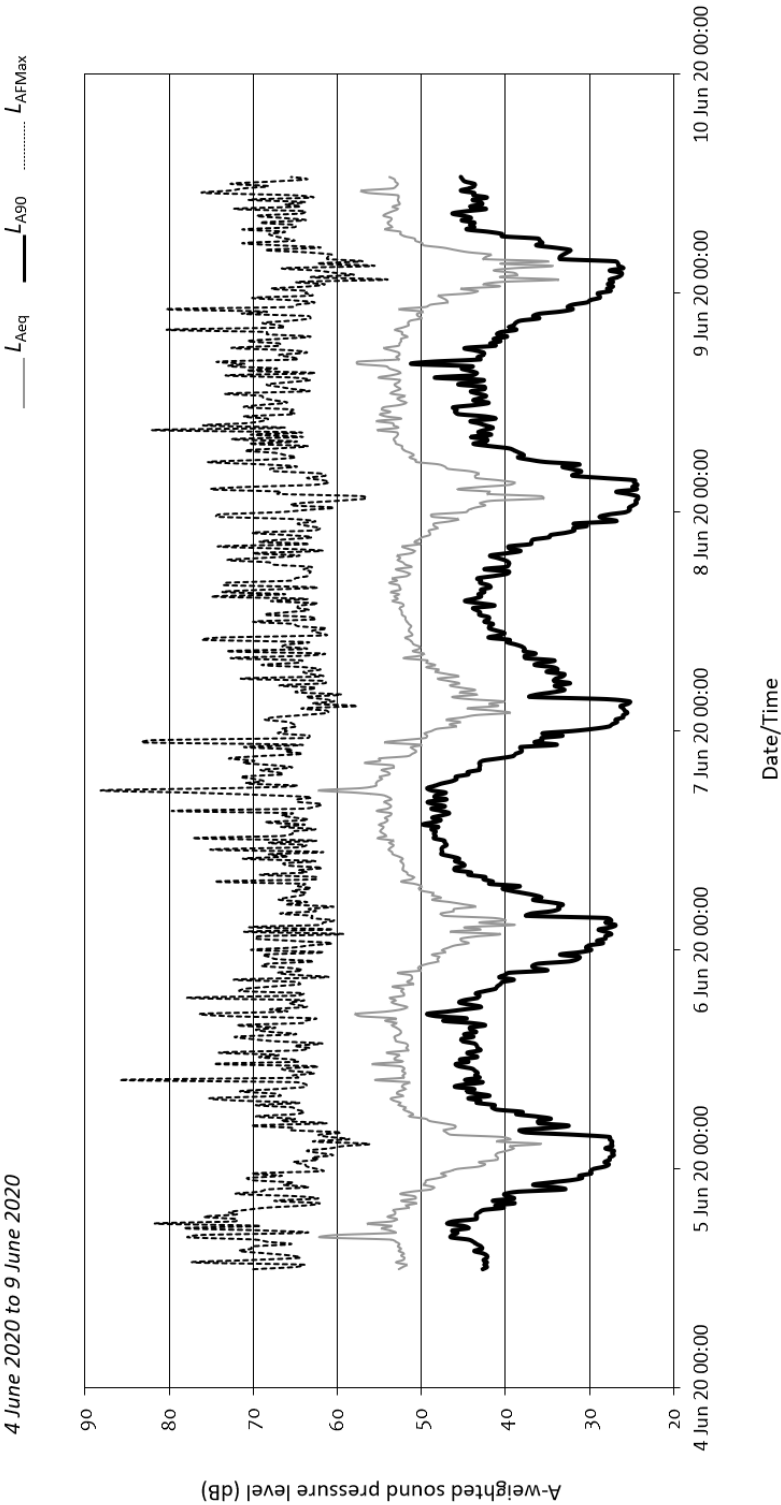
Weather conditions

During the unattended noise measurements, weather reports for the area indicated that temperatures varied between 15°C at night and 25°C during the day, and the wind speed was less than 5 m/s.

These weather conditions are considered suitable for obtaining representative measurements.

Appendix B - Results of unattended measurements at Location L

Northwood URC
Results of noise logging survey at Position L
4 June 2020 to 9 June 2020



Appendix C - BS 4142 corrections for attention catching features

The following applies where plant noise is assessed in accordance with BS 4142:2014+A1:2019.

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), penalty corrections should be applied based on the type and impact of the features.

If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible.

Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor:

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible.

For noise which is equally both impulsive and tonal, then both features can be accounted for by linearly summing the corrections for both characteristics.

If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

If a subjective assessment of tonality is not appropriate, an objective assessment can be made by analysis of time-averaged, third-octave band sound pressure levels. A noise source is deemed to be tonal if the level in a third-octave band exceeds the level in adjacent third-octave bands by the level differences given below:

- 15 dB in the low frequency third-octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency third-octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency third-octave bands (500 Hz to 10000 Hz).

If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.

Appendix D – Plant noise assessment

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Project name		Northwood URC			Project number		20220			
Calculation revision		1								
Engineer		Ak			Date created		25/06/2020			
Checked by		RK			Date checked					
Calculation description		Noise egress daytime same height barrier								
Comments										
Octave band centre frequency (Hz)										
631252505001000200040008000dBA										
Plant item 1										
Sound pressure level at 10m		57	54	51	49	49	43	38	30	52
Adjustment to spectrum to be dBA		0	0	0	0	0	0	0	0	
Correction for 1 units		0	0	0	0	0	0	0	0	
Total sound pressure level at 10m		57	54	51	49	49	43	38	30	52
Losses										
Distance attenuation - Point source, r=18m		5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	
Screening loss - Path difference = 0.147m		5.9	6.7	8.0	10.0	12.5	15.3	18.3	21.3	
Total losses		11	12	13	15	18	20	23	26	
Sound pressure level after losses		46	42	38	34	31	23	15	4	36
Total sound pressure level at receptor		46	42	38	34	31	23	15	4	36
Criteria										
Criteria										
Difference										