



MECHANICAL PLANT NOISE ASSESSMENT

LAND ADJACENT 114- 116 SCHOOL ROAD, TILEHURST, READING RG31 5AX

CHESTERS PLACE LIMITED

JUNE 2022

**MECHANICAL PLANT NOISE ASSESSMENT
LAND ADJACENT 114-116 SCHOOL ROAD,
TILEHURST, READING RG31 5AX**

Our Ref: 5945_002R_1-0_CW.DOCX



Client: Chesters Place Limited

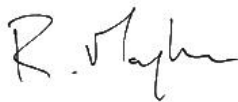
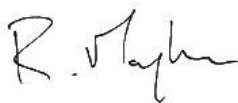
Report by: Anderson Acoustics Ltd
3 Trafalgar Mews
15-16 Trafalgar Street
Brighton
BN1 4EZ

www.andersonacoustics.co.uk

T: 01273 696887

Date: 17 June 2022

Project No: 5230
Status: FINAL

Author	Chris Wood Associate Director MSc MIOA		17 June 2022
Reviewed	Robin Monaghan Director BSc MIOA		17 June 2022
Approved	Robin Monaghan Director BSc MIOA		17 June 2022

This document has been prepared using all reasonable skill and care. Anderson Acoustics Ltd accepts no responsibility or liability for any third party data presented in this report, or used for the basis of drawing any conclusions. This document is confidential to the named client above and Anderson Acoustics Ltd accepts no responsibility or liability resulting from third party use of this document or for a purpose other than for which it was commissioned.

REVISION HISTORY

Version	Comments	Changes made by	Approved by
1.0	First issued version	CW	RM

CONTENTS

1	INTRODUCTION	5
2	SITE DESCRIPTION	6
3	NOISE CRITERIA	10
4	BASELINE NOISE CONDITIONS	12
5	MECHANICAL PLANT NOISE ASSESSMENT	16

APPENDICIES

APPENDIX A	GLOSSARY OF TERMINOLOGY
APPENDIX B	NOISE SURVEY DATA
APPENDIX C	BS 8233 CALCULATIONS
APPENDIX D	GLAZING UNIT TEST DATA

1 INTRODUCTION

Anderson Acoustics Ltd was commissioned by Chesters Place Limited to undertake a noise assessment regarding the potential for air-conditioning plant to be installed as part of the following consented scheme at Land Adjacent 114-116 School Road Tilehurst Reading RG31 5AX (application ref. 220086):

Erection of building to provide ground floor retail unit with 4 no. residential flats above.

The plant would be associated with the retail unit. This report, therefore, presents an assessment of such plant in accordance with the relevant British Standard, **BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound**, and Reading Borough Council's standard requirements.

Accordingly, a brief description of the site and consented development is given in **Section 2**. The relevant noise criteria are presented in **Section 3**. The noise survey details and results are summarised in **Section 4**, whilst the assessment is presented in **Section 5**.

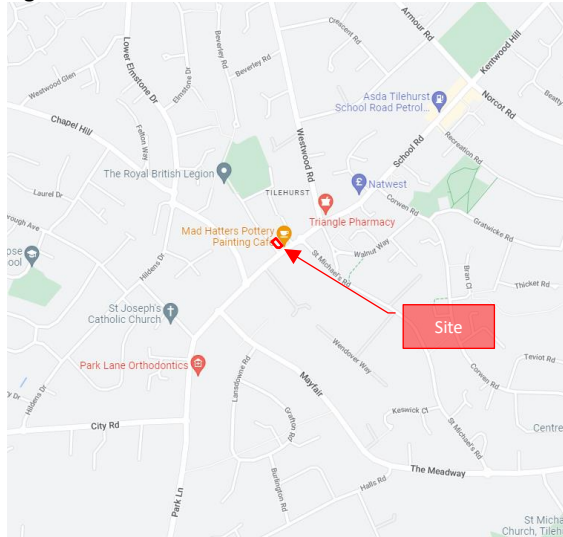
A glossary of the technical terms used in this report is presented as **Appendix A**.

2 SITE DESCRIPTION

2.1 The Application Site

The location of the site is shown in **Figures 2.1a** and **2.1b** below, with Google Street Views and a site photograph presented as **Figures 2.2, 2.3** and **2.4**.

Figures 2.1a and 2.1b: Site location



Source: Google Maps (Map data ©2022)
(annotated by Anderson Acoustics)



Source: Google Maps (Imagery ©2022 Infoterra Ltd & Bluesky,
The GeoInformation Group, Map data ©2022)
(annotated by Anderson Acoustics)

Figure 2.2: Google Street View from School Road (looking north at the front of the site, with Downing Road to the left)



Source: ©2022 Google (Image capture: August 2021)

Figure 2.3: Google Street View from School Road (looking west towards the site, with the fronts of the neighbouring residential and retail units shown)



Source: ©2022 Google (Image capture: August 2021)

Figure 2.4: View from Downing Road (looking south-east at the side/rear of the site, with the side (and residential windows) of the neighbouring mixed residential and retail building shown)



Source: Anderson Acoustics (Image capture: May 2022)

It can be seen that the site is next to a similar, mixed-use building to the consented scheme, with a pair of semi-detached houses located the next building along.

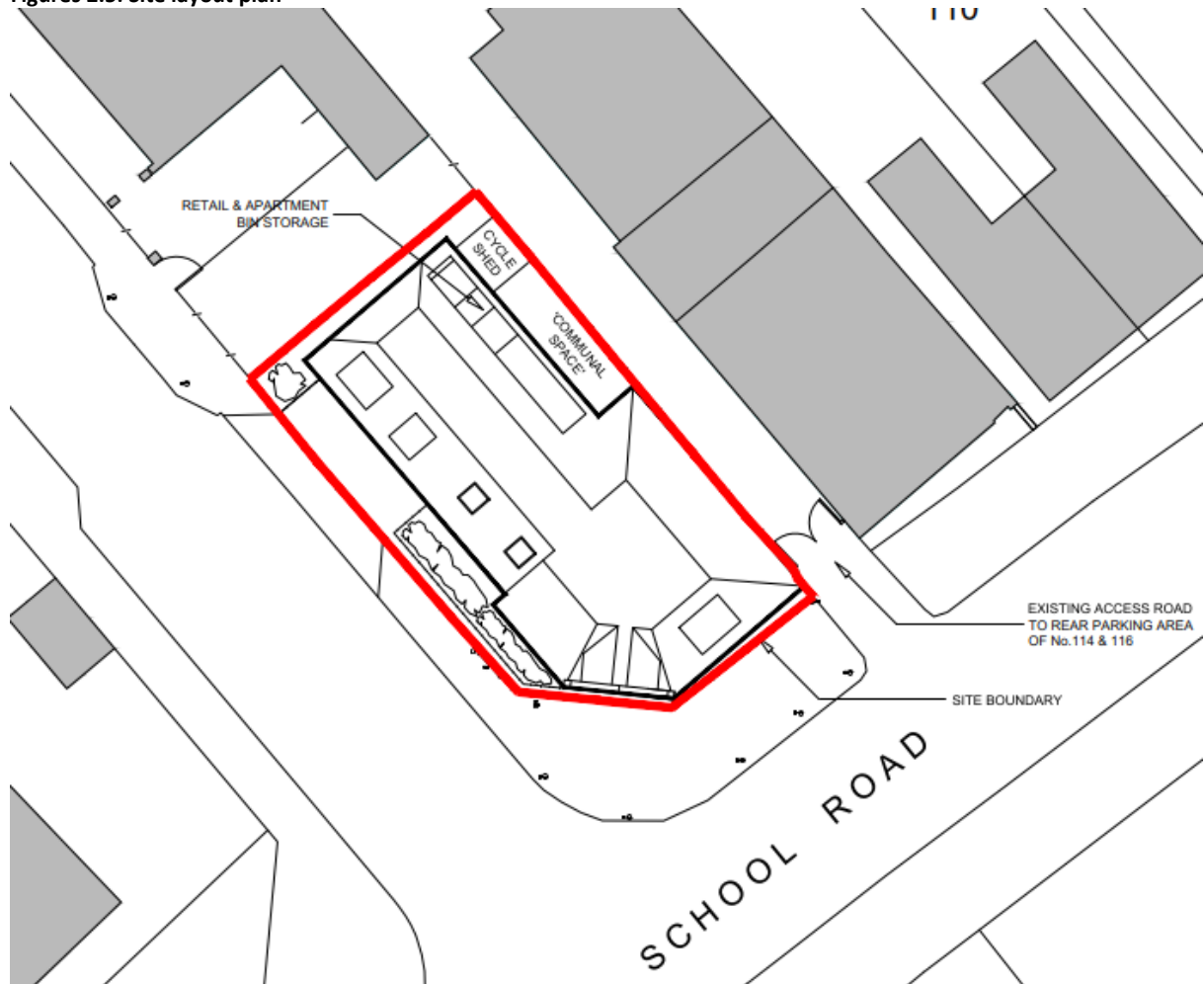
The site was visited by Anderson Acoustics during the daytime on two occasions for the purpose of the baseline survey presented in **Section 3**. The noise environment was found to be dominated by the road traffic on School Road, with some vehicle movements on Downing Road. It was deemed that a night visit wasn't warranted in the absence of any likely sources of significant commercial noise. There is The Prince public house on the other side of School Road, but where other dwellings are notably closer.

There are also the school buildings and sites next door on Downing Road and opposite, on the corner of Downing Road and School Road, but where the main source of noise from which is the associated vehicle movements, but which is not significant compared to the sound from School Road.

2.2 Consented Development

The development comprises the construction of new building to provide ground floor retail unit with 4no. residential flats above. It is shown in the following figures.

Figures 2.5: Site layout plan



Source: Ascot Design Ltd ("Proposed Site Layout", ref.21 – J3733 - 01, dated July 2021)

Figure 2.6: School Road and Downing Road elevations



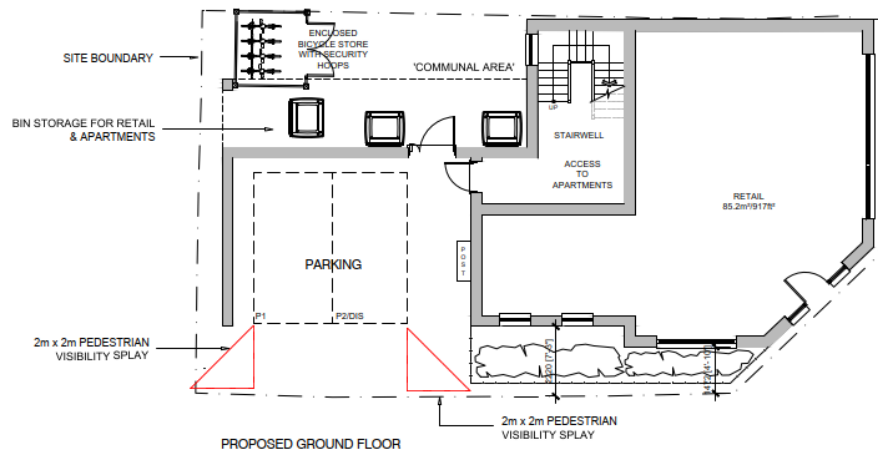
PROPOSED 'DOWNING ROAD' ELEVATION



PROPOSED 'SCHOOL ROAD' ELEVATION

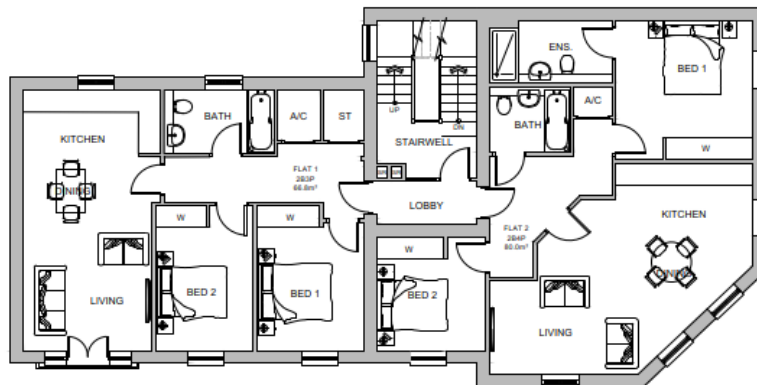
Source: Ascot Design Ltd ("Proposed Elevations", ref.21 – J3733 - 03, dated July 2021)

Figure 2.7: Ground floor plan



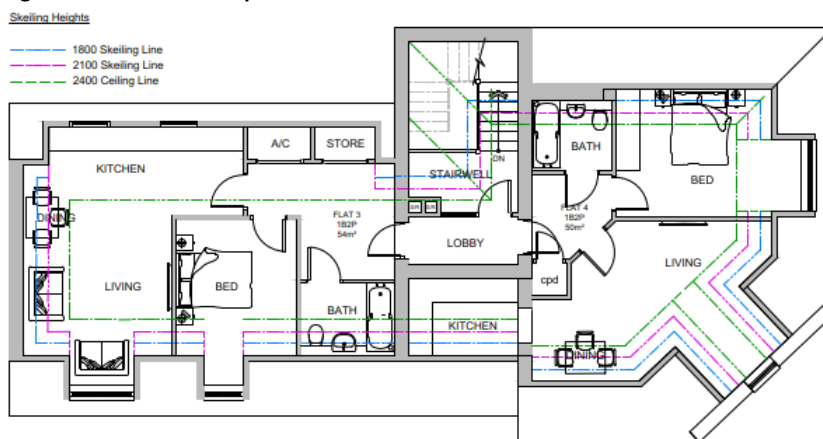
Source: Ascot Design Ltd ("Proposed Floorplans", ref.21 – J3733 - 02, dated July 2021)

Figure 2.8: First floor plan



Source: Ascot Design Ltd ("Proposed Floorplans", ref.21 – J3733 - 02, dated July 2021)

Figure 2.9: Second floor plan



Source: Ascot Design Ltd ("Proposed Floorplans", ref.21 – J3733 - 02, dated July 2021)

It is the retail unit on the ground floor that is the main subject of this report, but where the associated dwellings above represent noise-sensitive receptors.

3 NOISE CRITERIA

The Council's standard requirements are presented in the Council's standard "mechanical plant" noise condition as follows:

No mechanical plant shall be installed until a noise assessment of the proposed mechanical plant has been submitted and approved by the Local Planning Authority. The assessment shall be carried out for in accordance with BS4142:2014 methodology. The predicted specific sound level ($L_{Aeq,TR}$) (with reference to BS4142) as measured at a point 1 metre external to the nearest noise-sensitive facade shall be at least 10dB below the pre-existing background sound level, $L_{A90,T}$ when all plant/equipment (or any part of it) is in operation. The predicted rating level, $L_{Ar,Tr}$ (specific sound level plus any adjustment for the characteristic features of the sound) as measured at a point 1 metre external to the nearest noise-sensitive facade (habitable window of a dwelling) shall not exceed the pre-existing background sound level, $L_{A90,T}$ when all plant/equipment (or any part of it) is in operation. The plant shall thereafter only be installed in accordance with the assessment and shall thereafter be maintained so that it operates to the same standard.

REASON: To safeguard the amenities of the adjoining premises and the area generally, in accordance with Policy CC8 and EN17 of the Reading Borough Local Plan 2019.

The condition references **BS 4142**, with the 2014 version receiving minor amendments in 2019, whereby it is now referred to as **BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound**.

The condition also references the **BS 4142** terms "specific sound level" and "rating level", which are defined as:

- The specific sound level ($L_s = L_{Aeq,Tr}$) is the sound level of the source in question (e.g. the condenser unit) obtained (by measurement or calculation) over a reference period of 1 hour in terms of the daytime (07:00 to 23:00) and 15 minutes during the night-time (23:00 to 07:00).
- The rating level ($L_{Ar,Tr}$) is the specific sound level corrected to account for any acoustic features present in the sound in question, as experienced at the receptor, such as distinguishable, discrete, continuous note (a whine, hiss, screech or hum etc.) or distinct impulses (bangs, clatters or thumps etc.). Where no correction is warranted, the rating level is equal to the specific sound level.

In relation to these two values (which, as stated above, could be the same where no character correction is required), the condition requires that:

- The predicted specific sound level... shall be at least 10dB below the pre-existing background sound level...
- The predicted rating level... shall not exceed the pre-existing background sound level...

These are referred to in **Section 5** as the "1st" and "2nd" limits.

In some instances there could be justification for one or other of these requirements, but were presenting both is an odd approach, as, more often than not, they will not agree. Whilst, strictly, they are both at odds with the guidance in **BS 4142** to take the site-specific context into account. However, to some extent, this is the Council's prerogative.

Notwithstanding this, in addition to determine the specific and/or rating levels, therefore, there is also the need to determine the "background sound level", which is, again, a term from **BS 4142**. The advice is the Standard is that the background sound level ($L_{A90,T}$) should be derived from continuous measurement of normally not less than 15 minute intervals over the period of interest, and that it should not be the lowest level, but representative of typical conditions at the noise-sensitive receiver(s) relevant to the period(s) of operation.

The background, specific and rating levels, together with details of the nearest “noise-sensitive façade”, are presented in the following subsections.

4 BASELINE NOISE CONDITIONS

4.1 Introduction

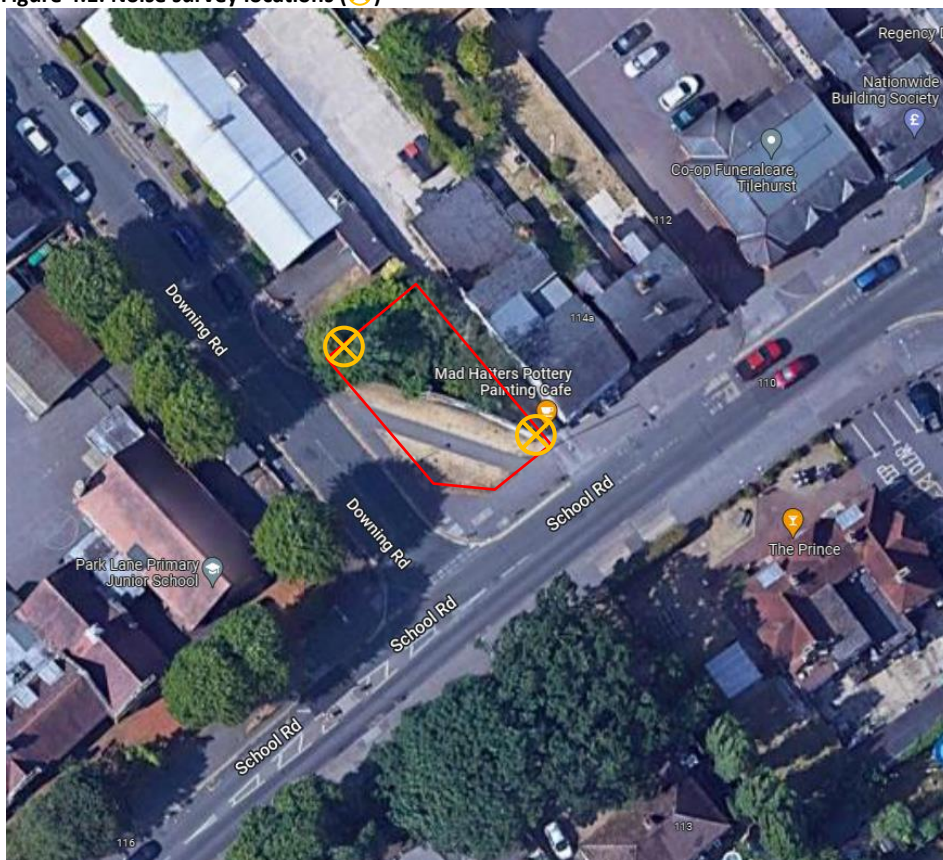
To determine the baseline noise conditions on site, two sound level meter were installed along the School Road and Downing Road boundaries on the site. They were installed during the **afternoon of Thursday 26th May 2022 and removed the morning of the following Wednesday, 1st June**. The meter at the front of the site operated for the entire 6/7 day period, but where the microphone extension cable at the side/rear of the site was cut through (i.e. sabotaged) on the Sunday evening, after 3/4 days' monitoring. However, more than enough data have been gathered for the purpose of a robust assessment nonetheless. This includes the fact that the second "week" of the survey was a school holiday period, but where the data (as shown below) can be seen to be very consistent despite this.

The survey details and results are presented below.

4.2 Survey Details

The survey locations are shown in **Figures 4.1, 4.2 and 4.3** below, whilst the equipment details are presented in **Section 4.3**. The microphones were mounted on poles such that they were between 2-3 m above the local ground with clear line of sight to the respective roads. Given the proximity of the billboard and the neighbouring building to the front position, the position is a quasi-free-field/façade, likely affected to some degree by sound reflected from these structures, but where the data are treated as if free-field as worst case. The other location was free-field, being generally away from hard, reflective vertical surfaces.

Figure 4.1: Noise survey locations (⊗)



Source: Google Maps (Imagery ©2022 Infoterra Ltd & Bluesky, The GeoInformation Group, Map data ©2022) (annotated by Anderson Acoustics)

Figure 4.2: Front/School Road noise survey location



Source: Anderson Acoustics (Image capture: may 2022)

Figure 4.3: Side/Downing Road noise survey location



Source: Anderson Acoustics (Image capture: may 2022)

The measurement chains were field-calibrated before the survey/measurements using an acoustic calibrator. The level was checked at the end of the survey/measurements, and no significant drift was observed. Both the sound level meters and calibrator have been calibrated by a UKAS accredited laboratory with the standard intervals of 24 months and 12 months, respectively.

The meters were set to store the “A” weighted sound levels every 5 minutes, from which period L_{eq} levels have been determined, together with the “Fast” time-weighted levels, from which the L_{90} levels have been determined. The results are presented in **Section 4.4** below and **Appendix B**.

As stated earlier, the sources audible at the times on site (i.e. during daytime hours) included the road traffic on School Road, with some vehicle movements on Downing Road. Only the road traffic on School Road being considered of significance.

At night, it is anticipated the noise environment remains dominated by the vehicles on School Road, with perhaps additional road traffic noise in the distances, with, no doubt, some natural sounds, including bird song/dawn chorus and the movement of leaves in trees.

There is a condenser unit (i.e. air-conditional plant) on the neighbouring building, as shown in **Figure 2.4** earlier, likely associated with the retail unit, but which was not observed to operate during the site visits, and with no discernible operation from the sound level data (see **Figure B.2 of Appendix B**). In any case, as shown in **Section 2.2**, the only scheme windows overlooking this location belong to non-habitable/low noise-sensitive spaces, whereby no issues are anticipated in this regard.

The weather conditions were noted at the time of the site attendance and from the BBC website during the survey. Conditions were dry, with little wind, throughout, and thus conducive to reliably data. It is not a location anticipated to be significantly affected by changes in meteorological conditions.

4.3 Survey Equipment Details

Table 4.1: Survey equipment details

Equipment (ID)	Make & Model	Serial No.	Date Laboratory Calibrated	Calibration Certification Number ¹
School Road Sound Level Meter (AA-SLM-09)	Rion NL-52	610202	22 nd December 2020 ²	UCRT20/2264
Downing Road Sound Level Meter (AA-SLM-11)	Rion NL-52	732147	18 th December 2020 ²	UCRT20/2259
Calibrator (AA-CAL-05)	Rion NC-74	35015349	5 th April 2022 ³	1502107-3

1 Certificates available on request.

2 Valid for two years.

3 Valid for one year.

4.4 Survey Results

The background (L_{AF90}) sound levels were obtained for each consecutive 5-minute period for the duration of the monitoring. Whilst this is a shorter period than the example (15-minute) period given in **BS 4142**, this is not unusual and is of little consequence in practice.

In keeping with the guidance in **BS 4142**, the period levels have been processed to determine the modal (i.e. most commonly occurring) values, and where the data obtained at the rear/Downing Road monitoring position are considered sufficiently representative of the nearest noise-sensitive façade. This is taken to be that of the neighbouring building, 114-116 School Road, as shown in **Figure 2.4** earlier, where the nearest windows are understood to be residential/habitable.

Table 4.2: Summary of measured/determined sound levels, dB

Date (2022)	Typical Daytime (07-23) $L_{AF90,5min}^1$		Typical Night-time (23-07) $L_{AF90,5min}^1$	
	School Rd	Downing Rd	School Rd	Downing Rd
Thu 26 May	58 ²	51 ²	33	39
Fri 27 May	56	48	37	37
Sat 28 May	55	46	30	36
Sun 29 May	53	- ³	25	- ³
Mon 30 May	55	- ³	35	- ³
Tue 31 May	55	- ³	37	- ³
Wed 1 June	54 ²	- ³	-	-

1 Lowest modal value of the $L_{AF90,5min}$ levels.

2 Part data from before/after the equipment was installed.

3 No data due to cable being cut.

Since the retail unit is permitted to operate during daytime hours only, the assessment in **Section 5** is presented on this basis. For the two full days of monitoring at the rear/Downing Road position, before the cable was cut, the lowest daytime modal values can be seen to be 48 dB (on the Friday) and 46 dB (on the Saturday). Conversely, the equivalent levels at the front/School Road location ranged (per day) from 53 to 56 dB, and so notably higher (but actually closer to the windows than the adopted, Downing Road position).

Accordingly, as worst case, a level of 46 dB ($L_{AF90,5min}$) has been assumed for the assessments presented below.

5 MECHANICAL PLANT NOISE ASSESSMENT

5.1 Initial Assessment

When the time comes, it understood a DAIKIN SkyAir Alpha-series RZAG71N2V1B external condenser unit would be used, which has a quoted sound power level of 64 dBA.

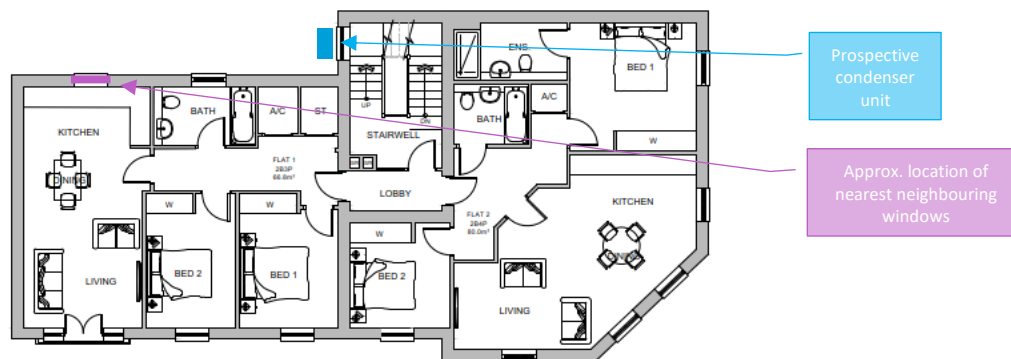
It is further understood the unit would be located within the communal/bin storage area, as indicated below.

Figures 5.1: Location of prospective external plant and nearest neighbouring windows



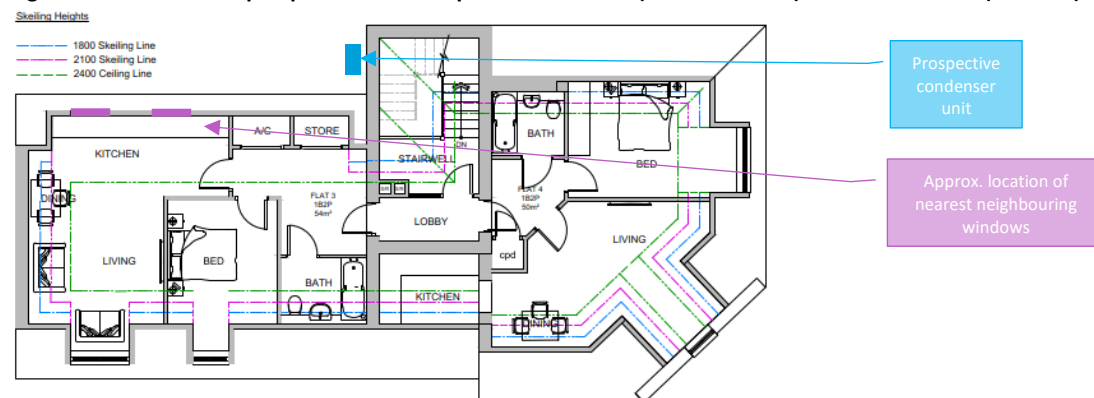
Source: Ascot Design Ltd ("Proposed Site Layout", ref.21 – J3733 - 01, dated July 2021) (annotated by Anderson Acoustics)

Figures 5.2: Location of prospective external plant and nearest (noise-sensitive) scheme windows (1st floor)



Source: Ascot Design Ltd ("Proposed Floorplans", ref.21 – J3733 - 02, dated July 2021) (annotated by Anderson Acoustics)

Figures 5.3: Location of prospective external plant and nearest (noise-sensitive) scheme windows (2nd floor)



Source: Ascot Design Ltd ("Proposed Floorplans", ref.21 – J3733 - 02, dated July 2021) (annotated by Anderson Acoustics)

Based on the above, the determination of the specific and rating levels is presented in the following table.

Table 5.1: Assessment of the plant sound level at the nearest neighbouring and scheme noise-sensitive windows

Description	Value per Receptor			Notes
	Adjacent Building	Flat 1	Flat 3	
Plant sound power level	64 dB			This assumes that all plant would be operating at the same time as worst case, but which would likely be the exception rather than the norm.
Distance from the plant item to 1 m outside the nearest receptor façade	5 m	8 m	9.5 m	These are based on the slant distance, with heights of 4.5 m assumed for the first floor windows and 7 m for the second floor windows.
Distance correction	-25 dB	-29	-30	This assumes geometric spreading of sound from a point source.
Directivity correction	6 dB			This accounts for the unit being at the junction of two surfaces.
Screening correction	-10 dB	0 dB		Since the unit will be fully screened from the neighbouring windows by the boundary fence, a correction has been assumed.
Façade reflection correction	0 dB			Whilst the Council’s requirement is for the level to be determined at 1 m from the façade – a location that, under measurement, would be subject to façade-reflected sound – since this is both a predictive exercise and the background data were obtained under free-field conditions, no such correction is applicable.
On-time correction	0 dB			Since, when operational, the plant could operate (continuously) for longer than the 1-hour assessment period, no correction is applicable.
Specific sound level at 1 m from the façade	35 dB	41 dB	40 dB	This is the sound level from the plant without any character correction.
1 st limit	36 dB			This is based on the lowest of the two modal background sound levels (46 dB) minus 10 dB, as for the Council’s standard condition.
Difference between the specific level and 1 st limit	-1 dB	5 dB	4 dB	The 1 st limit is met at the neighbouring façade, but not at the flats associated with the scheme. It should be noted, however, that the nearest windows belong to kitchens, and are, therefore, likely to be less noise sensitive.
Character correction	3 dB			For such plant, where the sound is broadband in nature and typically operating for prolonged periods at a time, many would argue that a correction wouldn’t apply, regardless of the relationship between the specific and background (and ambient) conditions. However, as part of a robust assessment, it is considered that at least a small correction would apply in most instances, and where, based on the guidance in BS 4142 for “other sound characteristics”, a correction of 3 dB has been applied.
Rating level at 1 m from the façade	38 dB	44 dB	43 dB	This is the specific sound level with the character correction applied.
2 nd limit	46 dB			This is based on the lowest of the two modal background sound levels (46 dB) with no correction, as for the Council’s standard condition.
Difference between the rating level and 2 nd limit	-8 dB	-2 dB	-3 dB	The 2 nd limit is met in all instances.

It can be seen from the above that whilst the "1st limit" is exceeded at the two flats (but met at the neighbouring building), the "2nd limit" is met in all three instances. And it is arguably the 2nd limit that is more in keeping with the guidance in **BS 4142**, whereby the situation is considered to be acceptable. This is further explored in the subsection below on "context".

5.2 Consideration of Context

In accordance with **BS 4142**, the noise impact in practice will be subject to context. In terms of context, it is recommended in the Standard that consideration be given to:

- 1) the absolute level of sound;
- 2) the character and level of “residual sound” compared to the character and level of the specific sound; and
- 3) the sensitivity of the receptor and whether design measures are in place that secure good acoustic conditions (such as façade insulation treatment).

In terms of the first point, an external level of 50 dB ($L_{Aeq,T}$) would typically be considered sufficiently low for residential amenity (as detailed in **BS 8233**), and that whilst a lower limit should apply where the sound in question contains a specific character, an alternative approach is to compare the threshold with the rating level determined in accordance with **BS 4142**. At up to 44 dB ($L_{Ar,1h}$), therefore, the rating levels can be seen to be below this threshold.

By comparison with the measured ambient levels, where daytime ($L_{Aeq,16h}$) levels were 56 dB at the rear/Downing Road position on average, it can also be seen that the rating levels are also below the current ambient conditions. And whilst the existing and scheme windows may be more screened from both School Road and Downing Road that the measurement location, ambient levels are still anticipated to be higher than 50 dB.

The “residual sound” referenced in the second point above relates to the existing, ambient ($L_{Aeq,T}$) sound conditions, as compared to the rating level above. But where, in addition to considering the “level,” the second point refers to the “character” of the residual sound vs the specific sound. Since there is already a mix of residential and commercial/retail uses, and which the consented scheme is in keeping with, it could be argued that there should be some expectation for some sounds of a commercial nature from both the existing and future occupants.

The third point applies where the receptor in question is less sensitive to noise than would typically be the case, due to, for example, measures that might have been put in place due to an existing noise source, either when the dwelling was built or retrospectively. This is presumably not the case for the existing building, but where both the Council’s requirements are met in any case, but where the consented scheme is to be fitted with MVHR units, whereby the occupants will have the option to keep windows closed for at least the majority of the time, should they wish to do so. In terms of plant noise, however, for the reasons given above, we do not see this being necessary in practice.

5.3 Overall Assessment

Even with a character correction having been applied, the rating levels are below the adopted background sound level, whereby, if there were to be any noise impact, it would likely be low, at most. In practice, taking the site-specific context into account, which includes the already mixed-use nature of the location, and that the flats will be fitted with MVHR units, no noise impact is anticipated.

Accordingly, it is considered that any such plant can be installed as presented in this report whilst being compliant with the relevant guidance and local policy.

APPENDIX A

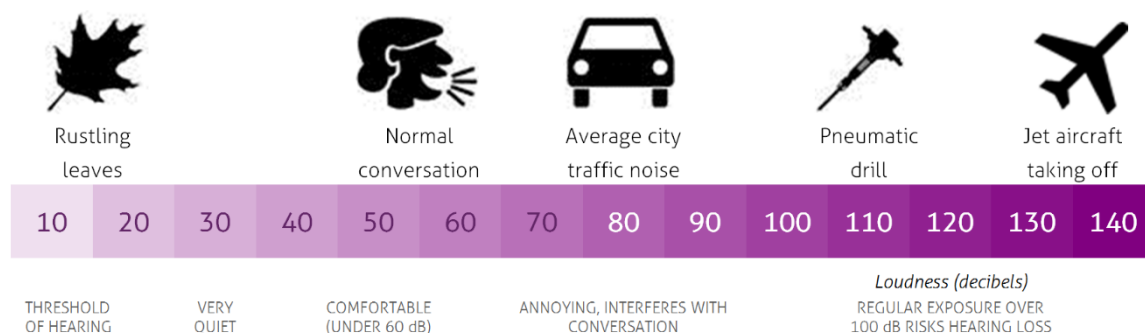
GLOSSARY OF TERMINOLOGY

There is a ten million to one ratio between the threshold of hearing and the highest tolerable sound pressure. Sound is therefore measured using a logarithmic scale, to account for this wide range, called the decibel (dB) scale. Noise is defined as unwanted sound and the range of audible sound varies from around 0 dB to 140 dB.

The human ear is capable of detecting sound over a range of frequencies from around 20 Hz to 20 kHz; however, its response varies depending on the frequency and is most sensitive to sounds in the mid frequency range of 1 kHz to 5 kHz. Instrumentation used to measure sound is therefore weighted across the frequency bands to represent the sensitivity of the ear. This is called 'A weighting' and is represented as dB(A), dBA or L_{Aeq} for example (see also below).

It is generally accepted that under normal conditions humans are capable of detecting changes in steady sound levels of 3 dB, whilst a change of 10 dB is perceived as a doubling or halving of the sound level. An indication of the range of sound levels commonly found in the environment is given below.

Figure A1: Typical sound levels



A number of different indices are used to describe the fluctuations in sound level over certain time periods. The main indices include:

- $L_{A90,T}$** This is the sound level exceeded for 90% of the measurement period and provides a measurement of relatively continuous sounds that make up quieter 'lull' periods in between sound events. It is often referred to as the background sound level, and usually measured using the 'fast' time response (hence sometimes written $L_{AF90,T}$).
- $L_{Aeq,T}$** This is the "equivalent continuous A weighted sound pressure level" and is the level of a notional steady sound which has the same acoustic energy as the fluctuating sound over a specified time period. It is often used for measuring all sources of sound in the environment, which can be referred to as the ambient sound.
- $L_{Amax,F}$** This is the maximum sound pressure level measured in a given time period with the sound level meter set to 'fast' response. Also written $L_{Amax,fast}$ OR L_{AFmax} .

Reference is often made to acoustic measurements being undertaken in 'free-field' or 'façade' locations. Free-field measurements represent a location away from vertical reflecting surfaces, normally by at least 3.5 m. A façade measurement is taken or calculated to a position 1 m from an external façade and a correction of up to 3 dB can be applied to account for the sound reflected from the façade. This latter position is often used when assessing the impact of external noise affecting residents inside properties.

In terms of the use of "sound" and "noise", strictly "sound" can be measured by a sound level meter or other measuring system, whilst "noise" is related to a human response, and is routinely described as unwanted sound, or sound that is considered undesirable or disruptive. Care has been taken in this document to use the most relevant of these terms; however, in most reference documents, and, indeed, generally, these terms are used interchangeably, with noise being used, in correctly, more often than sound, and so a mix is presented in this document. Consequently, just because the term noise is used, doesn't necessarily mean a negative effect exists or will occur, and the context of the accompanying text should be taken into account. Further definitions relating to this report are given overleaf.

Definitions

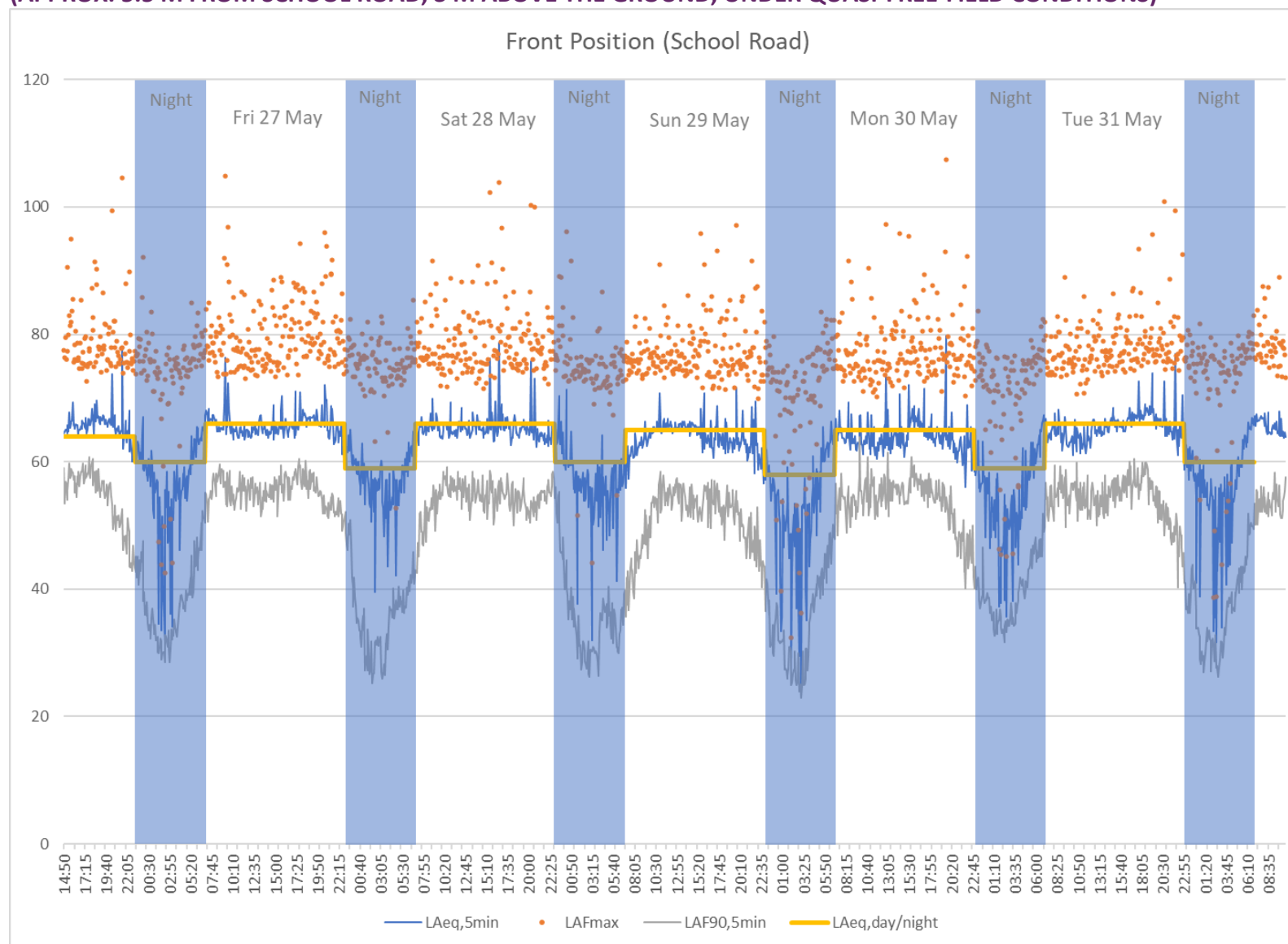
- Airborne Sound: Sound that reaches the point of interest by propagation through air.
- Ambient Sound: Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far.
- A-weighting, dB(A): The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
- Background sound: Underlying level of sound over a period, T, which might in part be an indication of relative quietness at a given location.
- Calibration: The measurement system/ chain should be periodically calibrated, within a laboratory, against traceable calibration instrumentation, to either National Standards or as UKAS-Accredited, as required. The calibration of the system should also be checked in the field using a portable calibrator before and after each short term measurements, and periodically for longer term monitoring.
- Decibel (dB): A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds (s_1 and s_2) is given by $20 \log_{10} (s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20 \mu\text{Pa}$.
- Dwelling: A building used for living purposes. A mobile home used for permanent living should be included in an assessment. If calculations are being conducted for compensation purposes, then some mobile homes are dealt with under the Highways Noise Payments and Moveable Homes Regulations.
- Façade/ Façade Level: At a distance of 1 m in front of a large sound reflecting object such as a building façade. According to BS 8233:2014, "Façade level measurements of L_{pA} are typically 1 dB to 2 dB higher than corresponding free-field measurements because of the reflection from the façade." The Calculation of Road Traffic Noise (1988) uses 2.5 dB, whilst BS 5228-1:2009+A1:2014 recommends 3 dB. Owing to the latter examples, together with other historical documents, it is more usual to apply 3 dB.
- Fast time-weighting (F): Averaging time used in sound level meters. Defined in BS EN 61672-2:2013 *Electroacoustics. Sound level meters. Pattern evaluation tests*.
- Free-field/ Free-field Level: Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 m away.
- Hertz (Hz): The unit of Frequency or Pitch of a sound. One hertz equals one cycle per second. 1 kHz = 1000 Hz, 2 kHz = 2000 Hz, etc.
- IOA: The Institute of Acoustics is the UK's professional body for those working in acoustics, noise and vibration. It was formed in 1974 from the amalgamation of the Acoustics Group of the Institute of Physics and the British Acoustical Society (a daughter society of the Institution of Mechanical Engineers). It is a nominated body of the Engineering Council, offering registration at Chartered and Incorporated Engineer levels. Our consultants/engineers are individual Members.
- $L_{AF90,T}$: The A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time fast time-weighting (F). Generally used to describe the 'background' sound conditions.
- $L_{eq,T}$: A sound level index called the equivalent continuous sound level over the time period, T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded. Where the value is A-weighted, it will be presented ' $L_{Aeq,T}$ ' or ' $\text{dBA } L_{eq,T}$ ', otherwise it should be an un-weighted (or linear) value.
- L_p : See Sound Pressure Level.

- Octave/ octave band: Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit. For example, the 1000 Hz (1 kHz) octave band contains noise energy at all frequencies from 707 to 1414 Hz.
- Percentile Level: The sound pressure level exceeded for $N\%$ of a specified time interval, see $L_{AF90,T}$ etc.
- Sound Level Metrics, Indices or Parameters: Sound levels usually fluctuate over time, so it is often necessary to consider an average or statistical sound level. This can be done in several ways, so a number of different metrics have been defined, according to how the averaging or statistics are carried out.
- Sound Pressure Level (Sound Level), L_p : The sound level is the sound pressure relative to a standard reference pressure of $20 \mu\text{Pa}$ (20×10^{-6} Pascals) on a decibel scale.
- Sound Pressure: Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.

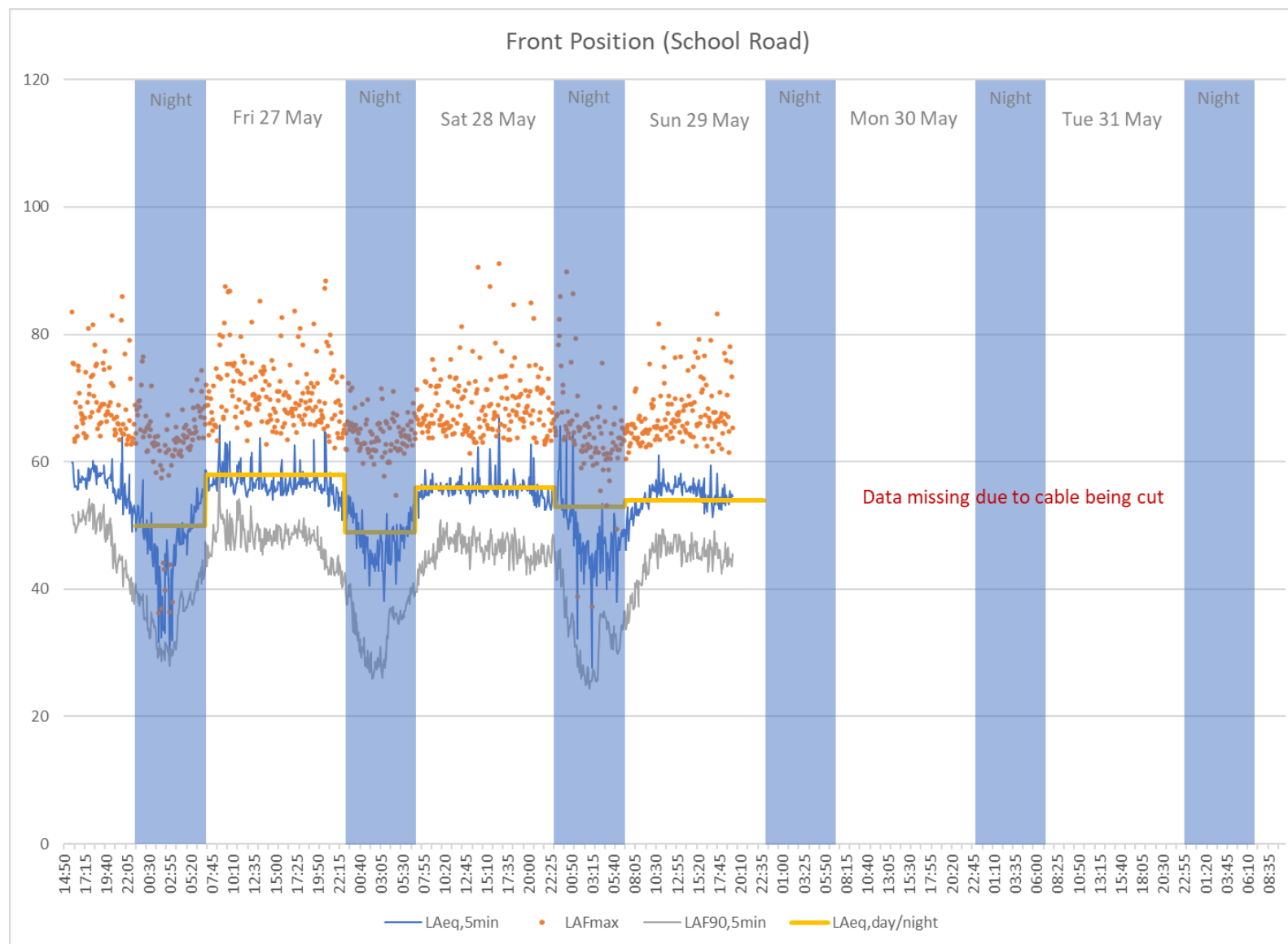
APPENDIX B

NOISE SURVEY DATA

NOISE SURVEY DATA FROM THE FRONT/SCHOOL ROAD POSITION
(APPROX. 5.5 M FROM SCHOOL ROAD, 3 M ABOVE THE GROUND, UNDER QUASI-FREE-FIELD CONDITIONS)



NOISE SURVEY DATA FROM THE REAR/DOWNING ROAD POSITION
(APPROX. 3 M FROM DOWNING ROAD, 26 M FROM SCHOOL ROAD, 2 M ABOVE THE GROUND, UNDER FREE-FIELD CONDITIONS)



REPORT END