



Hot Food Takeaway, Harpurhey

Plant Noise Assessment

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prepared for

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1.0 Introduction

1.1 It is proposed that an existing retail unit at Unit 33, Harpurhey Shopping Centre, Manchester M9 4DH be occupied by a hot food takeaway. As part of this, an assessment of noise emissions from the associated mechanical services installation is required.

1.2 A noise survey has been undertaken within the service yard behind the proposed store to determine the noise climate at the residences overlooking the service yard. The survey results have been used to set plant noise limits in line with local authority guidance and are set out herein.

1.3 Given the position of the plant and the screening provided by the surrounding buildings, a desktop assessment has been undertaken to determine the noise levels of the plant at positions outside of the shopping centre.

1.4 The plant noise emissions have been assessed to the nearest residential receptors overlooking the service yard, and on Moston Lane and Coningsby Drive. This report details the assessment methodology and results to show that the atmospheric plant noise will be controlled within the defined limits.

2.0 Site Description

2.1 The site can be found at Unit 33, Harpurhey Shopping Centre. The proposed hot food takeaway is to replace the existing vacant retail unit. The existing neighbouring properties are under mixed retail and office use with residential properties to the south of the service yard, all of which sit within a wider retail park.

2.2 Along the northern boundary of the retail park is Moston Lane, with residences on the northern side of the road. To the east is the Asda Superstore and the North City Family and Fitness Centre, beyond this are residences on Upper Conran Street.

2.3 Immediately to the south are residences overlooking the service yard. Beyond this are a number of large retail units, such as B&M Store, with residences beyond this on Church Lane. To the west is an Iceland Supermarket and a McDonalds with drive through, beyond this is the Manchester Youth Zone building and residences on Coningsby Drive.

2.4 The main noise source incident on the residences overlooking the service yard is plant servicing the neighbouring retail units and office. With road traffic noise from vehicles on Moston Lane and Rochdale Road the prevalent noise sources at the assessment positions outside the shopping centre.

3.0 Plant Noise Criteria

Relevant Criteria

3.1 Manchester City Council's '*Planning and Noise Technical Guidance*' document, published October 2022, provides guidance concerning the assessment and prediction of environmental noise.

3.2 The document draws on number of policies, with reference to BS 4142:2014 +A1 2019¹ made for the consideration of noise from industrial/commercial premises. The following is stated with relation to noise and vibration from fixed plant:

'Noise from fixed plant, equipment or machinery can be very annoying and disruptive to people living nearby particularly where that item involved emits a noise with impulsive or tonal characteristics.'

Many of the complaints Environmental Health receive about noise from plant, equipment and machinery specifically concern the character of the noise emitted. Any noise assessment needs to consider not only the overall level of noise emitted, but also its particular characteristics. The noise assessment should be based on BS 4142, and any application for fixed plant, equipment or machinery must demonstrate that:

'Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location'.

By designing the sound pressure level of any plant items to generate a noise impact of at least 5dB below the existing background level, any plant noise impact should be of a negligible level which should not give rise to complaints from users or occupiers of existing noise-sensitive usages. See Appendix A with regards to the expectation of how to calculate a 'typical' background level.

Past experience has shown that this criterion can be readily achieved. Where available, product specification data for new items should be submitted with the acoustic report. Consultants should be using these to compare with data from the noise survey and propose mitigation where the levels are above those specified in the criterion. Where this information is not available a consultant may choose to measure the noise, levels generated by the equipment in question where the equipment has already been installed elsewhere (and in accordance with BS 4142).

Where fixed plant, equipment or machinery is attached to a building the vibration caused by it can pass through the building structure and cause structure borne noise elsewhere in the building. Where it is to be installed in or on a building containing a noise sensitive use structure borne noise should be considered in the noise assessment and adequate control measures should be proposed. An example of where this would be required is where there is a proposal to install ventilation equipment on the roof of a residential apartment block or it could be an air source heat pump attached to the side of a building.'

3.3 When considering noise emissions from plant, it is normal to follow guidance within BS 4142, the current iteration of which is BS 4142:2014 + A1:2019. The document describes how to assess the noise impact on existing dwellings as a result of any new mechanical services associated with the proposed development. It has been drawn from as appropriate to inform this assessment based on the requirements of Manchester City Council set out above.

3.4 BS 4142 sets out that the rating noise level, $L_{A,T,r}$, is determined by considering noise emissions from a plant item and adjusting the specific level to account for the acoustic characteristics of the noise. Acoustic feature corrections can be made to account for tonality, impulsivity, intermittency, and other characteristics present in the resultant sound at the assessment position. The magnitude or appropriateness of any correction will depend both on the type of noise source and the context in which it is perceived.

¹ BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound

3.5 The higher the excess of rating level over background noise level, the greater the likelihood of an adverse noise impact. BS 4142:2014 gives the following guidance:

'Typically, the greater this difference, the greater the magnitude of the impact.'

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

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

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.'

3.6 In the case of mechanical services noise, this is a constant noise source operating for much of the day and night, and also inherently amenable to noise control. We would therefore typically recommend that plant noise at existing residences should be designed to a rating level 5 dB below the existing representative L_{A90} background noise levels recorded during the relevant time period.

3.7 Section 11(1) of BS 4142 states however:

'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.'

3.8 Considering this point, we would recommend a plant noise emission limit of 30 dB(A), so as to set a pragmatic and achievable limit. This limit should apply 1 metre from the facade of any affected residential building.

3.9 The resultant noise at the assessment position should not have any tonal or intermittent character that would otherwise attract attention to it.

3.10 To put the recommended limit of 30 dB(A) in context, allowing for a typical loss of 13 dB(A) from a partially open window would result in noise levels below 20 dB(A) inside any residences exposed to this level of external plant noise.

3.11 Internal noise levels below 20 dB(A) are more than 10 dB(A) below the guideline internal noise level of 30 dB $L_{Aeq,8h}$ suggested in BS8233:2014 as being appropriate for bedrooms to provide suitable conditions for sleeping.

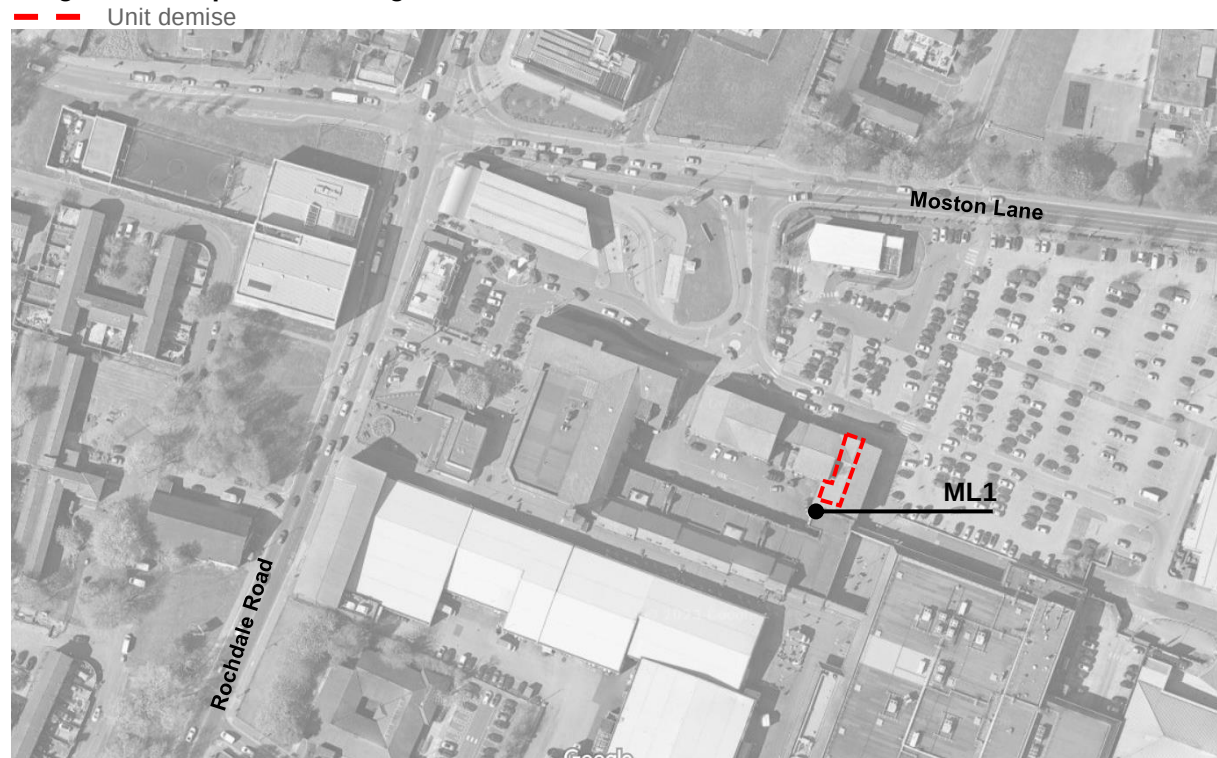
3.12 Full details of the BS 4142:2014 + A1:2019 methodology can be found in **Appendix B** of this document.

4.0 Noise Survey

4.1 An unattended noise survey was undertaken within the service yard of Unit 33, Harpurhey Shopping Centre between 1645 on Wednesday 14th June and 0945 on Thursday 15th June 2023. Further details of the noise survey can be seen in **Appendix A** at the end of this document.

4.2 Monitoring location ML1 was located on the eastern side of the rear yard behind the proposed unit approximately 3 metres above local ground level. The measurement position can be seen on the image below.

Image 1: Aerial photo showing noise measurement location

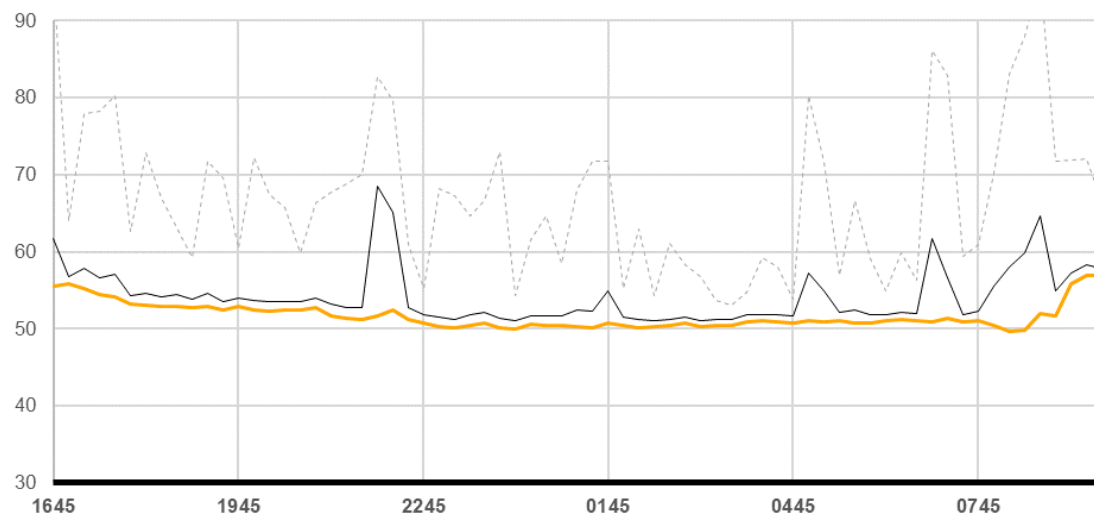


4.3 The following noise levels were measured at positions ML1 over the duration of the noise survey.

Noise Measurement Results at ML1

Graph outlining the measured noise levels over the survey period

■ $L_{Aeq,15min}$, ■ $L_{Amax,f}$, and ■ $L_{A90,15min}$ in terms of sound pressure (dB, x-axis) against time (hhmm, y-axis).



4.4 The noise levels measured over the survey period were controlled by existing plant noise, it is understood that the spikes in the $L_{Aeq,15min}$ can be attributed to deliveries in the early hours and trespassers searching bins during the late evening period.

4.5 The representative measured background noise levels measured over the relevant periods are set out in the following table, found through statistical analysis of the survey data.

Table 1 Representative measured background noise levels

Location	Representative Measured Background Noise Level, $L_{A90,T}$ dB	
	Full Plant Operation Period (1000-0000)	Cold Store Only Operation Period (0000-1000)
ML1	51	50

Plant Noise Limits

4.0.2 Given the significant distance and screening between the proposed mechanical services installation and the residential receptors at AL2 and AL3, it is anticipated that the noise levels from the installation will be significantly mitigated.

4.0.3 Therefore, in lieu of a noise survey in this position and based on the guidance set out above and discussed further within **Appendix B**, plant noise emission limits at AL2 and AL3 (in terms of rating levels) have been set at 30 dB(A) for both the full plant operation period and cold store only operation period as outlined in the table below.

4.0.4 The noise limit at AP3 has been derived from the noise levels measured over the course of the noise survey, in line with the requirements of the local authority, 5 dB below the representative background noise levels.

Table 2 Noise emission limits at the nearest residential receivers

Location	Noise Emission Limit, $L_{A,T,r}$ dB(A)	
	Full Plant Operation Period (1000-0000)	Cold Store Only Operation Period (0000-1000)
AL1	46	45
AL2	30	30
AL3	30	30

4.0.5 These limits apply at 1m from the outside of the nearest residential windows to the proposed plant.

5.0 Plant Noise Assessment

Proposed Installation

5.1 The following Table 3 outlines the proposed plant items to be installed.

Table 3 Proposed mechanical plant to be used at the site

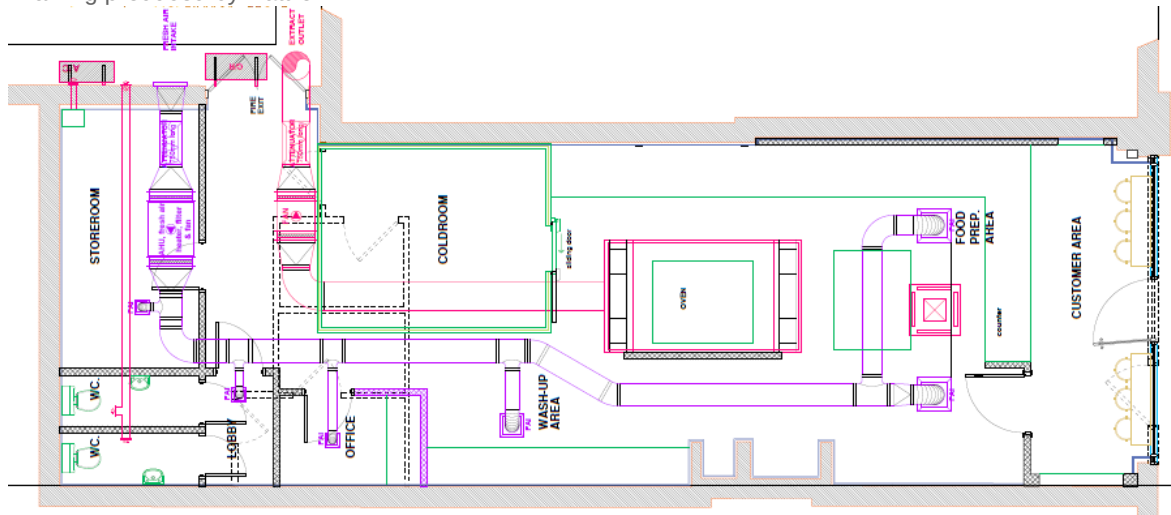
Item	Manufacturer	Type
Air Conditioning Unit	Mitsubishi Heavy Industries	FDC100VNX
Cold Store Condenser	Danfoss	Optyma 114X7061
Extract Fan	Vent-Axia	BSC 50014
Fresh Air Fan	Air Vent Tech	SPW5

5.2 The intake and extract fans are to be housed within the building's demise, with the fresh air fan terminating at the rear façade at high level. The extract fan ductwork terminates at 1 metre above the eaves. All plant is situated within the rear yard area.

5.3 The condensing units are to be mounted on the rear west facing elevation of the building, within the rear yard area. The plant positions can be seen on the *Hattrell LLP* ground floor plan (ref:C5343-A5-05). An excerpt from the proposed plan drawing can be seen on the following **Image 2**.

Image 2: Excerpt from ground floor mechanical services plan

Drawing produced by *Hattrell LLP*



5.4 All units have the potential to run between 1000-0000, an hour before and an hour after the premises' operating hours of 1100-2300 daily, with the exception of the cold store condenser, which will be available to run on a 24-hour basis. The installation will be assessed against these relevant time periods.

Assessment Methodology

5.5 The assessment has been based on manufacturer's noise data for each plant item. This noise data and the expected operational regime of the plant suggests that no acoustic character corrections need be applied.

5.6 Noise emissions from the proposed plant installation have been considered to the nearest residential receivers, as described below:

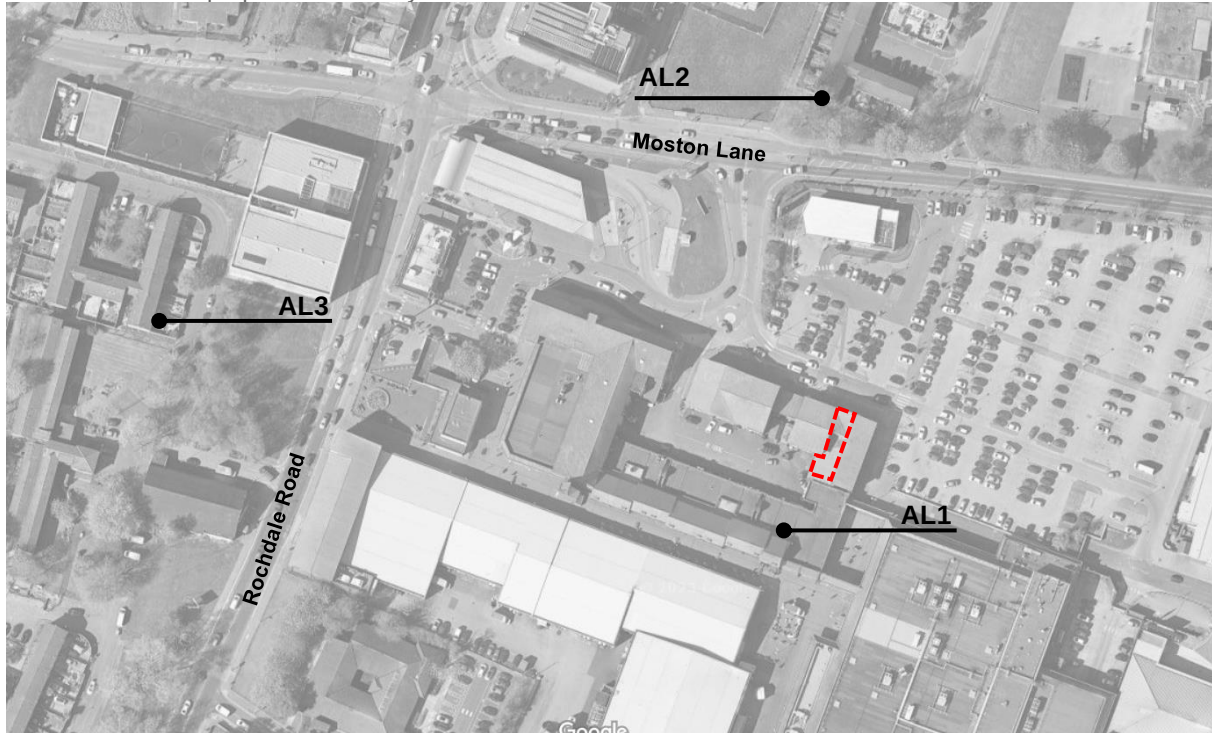
- AL1: Residence to the south at 1st floor level overlooking the service yard
- AL2: Residence to the north at 1st floor level, on Moston Lane
- AL3: Residence to the west at 1st floor level, on Coningsby Drive

5.7 Levels of plant noise have been calculated at the assessment positions by correcting for radiation, screening, distance, duct and bend losses and façade reflections where appropriate. Calculation sheets are not included for the sake of brevity but can be provided upon request.

5.8 The position of these receivers can be seen on the following **Image 3**.

Image 3: Aerial photo showing the assessment locations

Red line indicates proposed takeaway demise



Aerial imagery courtesy Google Maps

Results

5.9 With the plant items installed as set out within the previous sections, the following plant noise levels are predicted at the assessment positions.

Table 4 Noise emission levels at the nearest noise sensitive receivers

Location	Assessed Rating Noise Level, $L_{Ar,Tr}$ dB(A) (Limit)	
	Full Plant Operation Period (1000-0000)	Cold Store Only Operation Period (0000-1000)
AL1: Residence to the south	41 (46)	36 (45)
AL2: Residence to the north	8 (30)	0 (30)
AL3: Residence to the west	15 (30)	0 (30)

5.10 With the proposed installation in place, the noise limits set out within this report are not expected to be exceeded.

6.0 Conclusions

6.1 It is proposed that an existing retail unit at Unit 33, Harpurhey Shopping Centre, Manchester M9 4DH be occupied by a hot food takeaway. As part of this, an assessment of noise emissions from the associated mechanical services installation is required.

6.2 A noise survey has been undertaken within the service yard behind the proposed store to determine the noise climate at the residences overlooking the service yard. The survey results have been used to set plant noise limits in line with local authority guidance.

6.3 The assessment outlined within this report shows that without mitigation measures in place, the plant noise limits will be met at all times.



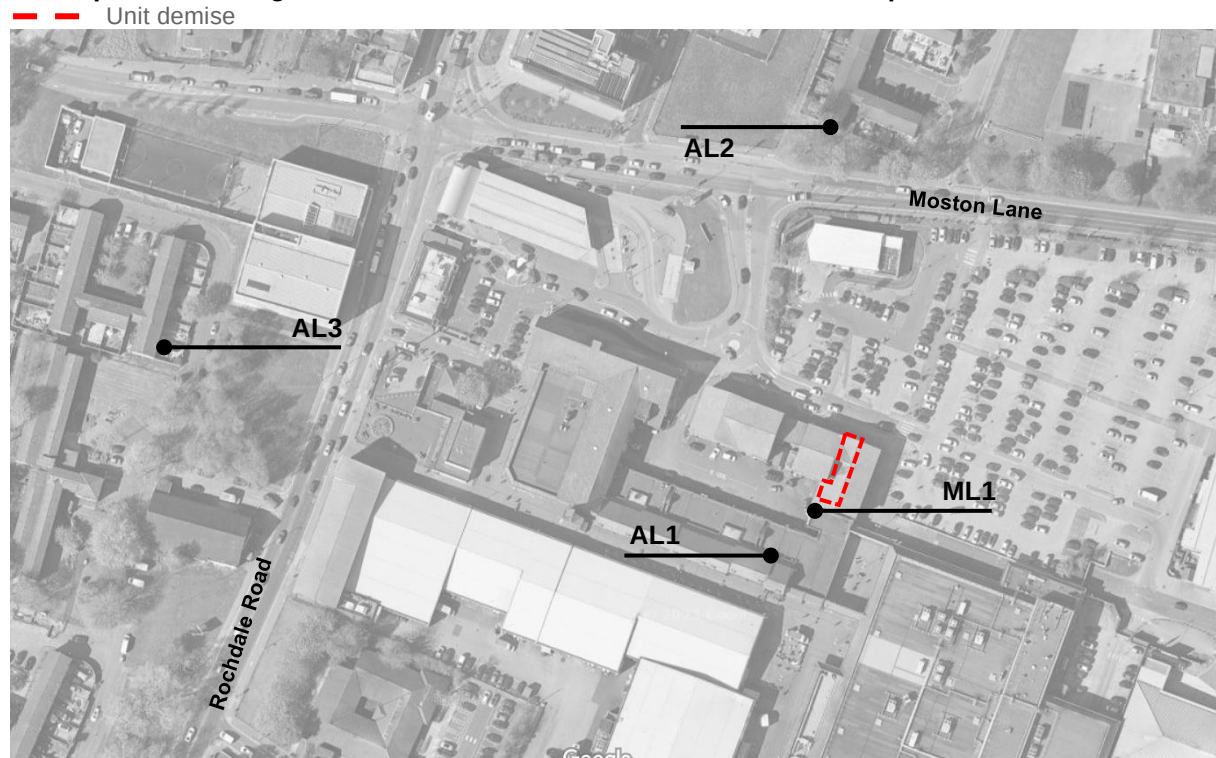
Appendix A: Noise Survey

Details and results of the unattended noise survey

Methodology and Equipment

An unattended noise survey was undertaken at a single position in the service yard behind the proposed unit between 1645 on Wednesday 14th June and 0945 on Thursday 15th June 2023. The measurements were taken at a secure position representative of the conditions at the nearest noise sensitive receptor, overlooking the service yard. This position is denoted as 'ML1' on the following image, while the assessment positions have been added as AL1 - AL3.

Aerial photo showing noise measurement location and assessment positions



Aerial imagery courtesy Google Maps

Noise measurements were made using the equipment set out within the following table. The unattended sound level meter was fitted within a weatherproof enclosure, and the meter was calibrated both before and after the survey in order to confirm an acceptable level of accuracy. No significant drift was noted to have occurred.

Table 5 Measurement equipment

Location	Item	Detail
ML1	Sound level analyser	Svantek 971A
	Outdoor microphone kit	Svantek SA 271A
	Acoustic calibrator	Svantek SV33B

Measurements of the L_{Aeq} , L_{Amax} and L_{A90} indices were recorded over consecutive 15-minute periods for the duration of the unattended survey.

A summary of site observations made at the measurement position is set out in the following table.

Table 6 Measurement location

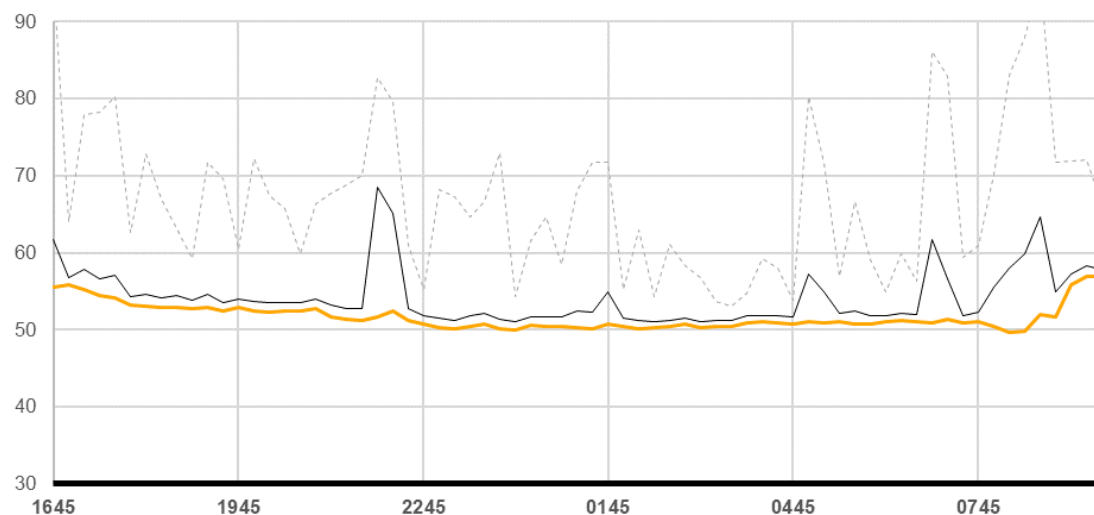
Location	Detail
ML1	Microphone at approximately 3 m above local ground level to the eastern side of the service yard, a free field position. Measurements were unattended. The noise climate was dominated by existing plant items in the service yard.

The weather conditions during the survey were warm, bright and dry with little breeze. Historical weather data² has been used to confirm that suitable weather conditions prevailed for the duration of the survey.

The following time history graphs present the measured noise levels captured at positions ML1 throughout the survey.

Noise Measurement Results at ML1

■ $L_{Aeq,15min}$, ■ $L_{Amax,f}$, and ■ $L_{A90,15min}$ in terms of sound pressure (dB, x-axis) against time (hhmm, y-axis).



The representative background noise levels³ captured over the relevant periods are set out within the following table.

² Weather data taken from wunderground.com, station ID ISTOCK567

³ Typical L_{A90} background noise levels quoted at the highest single values where the cumulative total of $L_{A90,15min}$ values in the relevant time period equals $\leq 25\%$.

Table 7 Representative measured background noise levels

Location	Representative Measured Background Noise Level, $L_{A90,T}$ dB	
	Full Plant Operation Period (1000-0000)	Cold Store Only Operation Period (0000-1000)
ML1: Rear service yard	51	50

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Appendix B: Planning Policy, Guidance and Criteria

Assessment of Noise Effects from On-site Activity

National Policy

Noise Planning Policy Framework

The NPPF is the relevant document for defining the national policy toward noise sensitive development. The document was originally published in March 2012 and most recently updated in July 2021.

Paragraph 130 states that planning policies and decisions should ensure that developments:

“create places that [...] promote health and well-being, with a high standard of amenity for existing and future users...”

Further to this and on the subject of noise, paragraph 174 states that planning policies and decisions should contribute to and enhance the natural and local environment by:

“preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution”

Paragraph 185 of the NPPF states:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;”*

Clause “a)” in paragraph 185 makes reference the Noise Policy Statement for England which is discussed in the following section.

The July 2018 edition of NPPF introduced the 'agent of change' principle in paragraph 187. In terms of noise, this principle requires that those proposing a new noise sensitive development incorporate sufficient mitigation such that the operation of existing premises in the area is not unreasonably restricted in order to control noise impact upon the new development:

“Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.”

Noise Policy Statement for England

The NPSE (March 2010) also does not set quantitative guidelines for the suitability of noise sensitive development in an area depending on the prevailing levels of noise. Absent, therefore, is reference to specific noise thresholds which determine whether noise sensitive development is suitable and, if so, whether mitigation factors need to be considered.

Instead, the NPSE sets out the principle of “SOAEL, LOAEL and NOEL” which are defined as follows:

Significant Observed Adverse Effect Level (SOAEL): This is the level [of noise exposure⁴] above which significant adverse effects on health and quality of life occur.

Lowest Observed Adverse Effect Level (LOAEL): This is the level [of noise exposure²] above which adverse effects on health and quality of life can be detected.

No Observed Effect Level (NOEL): This is the level [of noise exposure²] below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

Given the overall thrust of the NPSE, the SOAEL is an important assessment threshold although the NPSE also comments in section 2.22 that:

“It is not possible to have a single objective noise based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times.”

Attention is drawn to the fact that the SOAEL is the level above which significant adverse effects can be observed. Importantly, it should be noted again in respect of the NPPF that the overall objective is to avoid or minimise significant adverse impacts; some degree of impact is acceptable, and it is not necessary or reasonable to seek to achieve no impact at all.

In addition to the principles set out above, the NPSE sets out three key aims:

The first aim of the Noise Policy Statement for England

“Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.”

The second aim of the Noise Policy Statement for England

“Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.”

The third aim of the Noise Policy Statement for England

“Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.”

⁴ Additional text drawn from the Planning Practice Guidance Definition

Paragraph 2.24 of the NPSE states that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life. It also states that this does not mean that such adverse effects cannot occur.

Each development site must be judged on its ability to deliver on each of these aims, and while rating the prevailing noise against predefined thresholds is no longer necessary, defining the prevailing noise levels is an essential first step in assessing a given site under the current regime.

Planning Practice Guidance (PPG)

In March 2014 the Department for Communities and Local Government (DCLG) launched the national Planning Practice Guidance (PPG) web-based resource. The PPG on Noise (last updated in July 2019) expands upon the NPPF and NPSE and sets out more detailed guidance on noise assessment.

Like the NPPF and NPSE, the guidance does not include any specific noise levels but sets out further principles that should underpin an assessment. The PPG includes a section on noise, paragraph 003 of the which states:

“Plan-making and decision making need to take account of the acoustic environment and in doing so consider:

- whether or not a significant adverse effect is occurring or likely to occur;*
- whether or not an adverse effect is occurring or likely to occur; and*
- whether or not a good standard of amenity can be achieved.”*

It then refers to the NPSE and states that the aim is to identify where the overall effect of the noise exposure falls in relation to the relevant SOAEL, LOAEL and, by inference, the NOEL. Definitions for these thresholds are provided again with the PPG, which differ very slightly in wording to the NPSE, but are taken to be identical in their meaning.

In relation to the SOAEL, LOAEL and NOEL, the PPG makes the following important statement:

“Although the word ‘level’ is used here, this does not mean that the effects can only be defined in terms of a single value of noise exposure. In some circumstances adverse effects are defined in terms of a combination of more than one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of day the noise occurs.”

The guidance then presents a table, which is reproduced in the following table. The implication of the final line of the table is that only the 'present and very disruptive' outcomes are unacceptable and should be prevented. All other outcomes (i.e. all other lines in the table) can be acceptable, depending upon the specific circumstances and factors such as the practicalities of mitigation.

On that basis, noise levels deemed to be below the SOAEL can be considered acceptable providing noise has been mitigated and reduced to a minimum.

Table 1.1. Planning Practice Guidance summary of noise exposure hierarchy.

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not present	No Effect	No Observed Effect	No specific measures required
NOEL - No Observed Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
LOAEL - Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
SOAEL - Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

It is noteworthy that the PPG states that:

“Noise impacts may be partially offset if residents have access to one or more of:

- a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling;

- a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony).
Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced if this area is exposed to noise levels that result in significant adverse effects;

- a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or

- a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minute walking distance).

Relevant Guidance

British Standard BS 4142 – Mechanical Services Noise

British Standard 4142:2014+A1:2019 (Methods for rating and assessing industrial and commercial sound) states in section 1.1:

'This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

a) sound from industrial and manufacturing processes;

b) sound from fixed installations which comprise mechanical and electrical plant and equipment;

c) sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and

d) sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from fork-lift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.'

The standard states its applications as,

'This standard is applicable to the determination of the following levels at outdoor locations:

*a) rating levels for sources of sound of an industrial and/or commercial nature; and
b) ambient, background and residual sound levels,*

for the purposes of:

*1) investigating complaints;
2) assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and
3) assessing sound at proposed new dwellings or premises used for residential purposes.'*

Section 1.3 of the standard sets out its limitations in terms of how it should be used and states the following:

'The determination of noise amounting to a nuisance is beyond the scope of this British Standard.

Sound of an industrial and/or commercial nature does not include sound from the passage of vehicles on public roads and railway systems.'

BS 4142 sets out a daytime assessment period of 1 hour and night time period of 15 minutes. The assessment methodology requires that a "specific level" from a given noise source is determined considering these time periods. Character corrections should be added if the noise has tonality, impulsivity, intermittency or other such characteristics; this gives the "rating level" of a given noise source. The level of the correction is based upon how the noise is perceived, as set out in the standard.

The rating level of noise ($L_{A,r,T}$) for the relevant assessment period is the calculated noise level at the nearest receiver location, adjusted to take into account the acoustic characteristic of the noise. Acoustic feature corrections can be made to account for tonality, impulsivity, intermittency and other characteristics present in the resultant sound at the receiver position. The magnitude or appropriateness of any correction will depend both on the type of noise source and the context in which it is perceived. Similarly, in accordance with BS 4142, the period of time for which an individual noise source is active during the relevant reference time period will also be considered in establishing the rating level.

It will also be necessary to consider the existing noise climate and what sound sources contribute to it. For example, where a noise generating activity is proposed adjacent to an existing similar noise generating site, the impact of the new noise source would be less than if it were to be planned in a location where its character and type is different to and more noticeable than any existing noise source nearby.

With regard to the background sound level against which the rating level is compared, the standard states the following:

'In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.'

The periods of interest over a 24 hour day are usually related to day time activities (0700-2300) and night time (2300-0700). However the standard makes the following statement:

'Among other considerations, diurnal patterns can have a major influence on background sound levels and, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes. Furthermore, in this general context it can also be necessary to separately assess weekends and weekday periods.'

Therefore, the periods of time which can be considered as 'waking up' and 'falling asleep' stages, for example 0600 to 0700 and 2300 to 2400, may need to be considered independently. Alternative periods may also be identified where breakdown beyond the standard day and night time analysis will be necessary, for example where background sound levels are shown to be regularly elevated.

Once the rating level at each receptor has been calculated, reference can be made to the following commentary in BS 4142 in relation to conducting an initial assessment of the impact, based on the difference between the rating level of the noise source and the pre-existing background sound level.

'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.

NOTE 1 More than one assessment might be appropriate.

a) Typically, the greater this difference [between industrial site noise rating level and baseline background level], the greater the magnitude of the impact.

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

c) A difference of around +5 dB 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.

NOTE 2 Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.'

In situations where background sound levels are low, it is important to again consider context, rather than simply basing an assessment of impact on a difference in noise level, as suggested above. With regards to context in relation to absolute noise levels, the standard states 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.'

British Standard BS 4142:2014 does not set out guidance for what constitutes low background noise levels. Instead, it can be inferred from the World Health Organisation Night Guidelines for Europe (2009) that a noise level of ≥ 30 dB $L_{\text{night, outside}}$ is not likely to give rise to any substantial observed noise effects.

Although the above criterion relates to an 8-hour period between 2300 and 0700 (i.e. the night time), the application of the criterion to any given 15 minute period during the night time (or one hour if applied to the daytime) effectively makes the criterion more stringent.

Taking into account the above therefore, it is suggested that noise limits for mechanical services plant equipment should be set with a lower threshold of 30 dB $L_{A,T,r}$. Noise levels equal to or below this threshold figure would not be expected to give rise to substantial observed effects (i.e. the impact would be low).

From the above, it can be inferred that ensuring noise emissions from a given site or activity do not exceed noise limits set at a level 5 dB above the representative background noise levels at a given receptor (or at the 30 dB $L_{Aeq,T_{ref}}$ threshold where background sound level are low) will provide an indication that noise adverse effect will not occur. For the purposes of this assessment, mechanical services noise limits have been established at a level equal to the prevailing background noise level.

