

SHARPS REDMORE

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Report

**Unit 2 Reliance Retail Park,
Manchester**

Environmental Noise Report

Prepared by

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Project No 2120927

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1.0 Introduction

- 1.1 Sharps Redmore (SR) has been instructed to undertake a noise assessment for the site known as Unit 2 Reliance Retail Park, Manchester. The site location is shown in Figure 1 below:

Figure 1: Site Location



- 1.2 The site is located within the administrative area of Manchester City Council. The site is bounded by Reliance Street to the east and Oldham Road (A62) to the south. The site was previously a retail unit but is currently vacant. A former petrol filling station was located at the front of the site but has now been demolished. The surrounding area is mixed use with retail and employment located to the east of Reliance Street (Reliance Trading Park) and south of Oldham Road. The nearest noise sensitive properties to the site are the residential properties in Ivy Graham Close to the immediate west and the residential apartments to the south facing onto Oldham Road.
- 1.3 Planning permission is being sought for change of use to mixed use (sui generis) storage and distribution warehouse and retail with ancillary offices together with warehouse loading bay extension and ancillary works.
- 1.4 The purpose of this assessment is to assess the impact of proposed change of use on surrounding noise sensitive properties by reference to both national and local policy aims.
- 1.5 The main impacts in terms of noise have been identified as follows:
- Noise from installation of new mechanical services plant
 - Noise from car park and delivery arrangements
- 1.6 A guide to the acoustic terminology used within the report is included in Appendix B.

2.0 Assessment methodology and criteria

National Policy

- 2.1 The National Planning Policy Framework (NPPF), July 2021, sets out the Government's planning policies for England and "these policies articulate the Government's vision of sustainable development." In respect of noise, Paragraph 185 of the NPPF states the following:

"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; and*
- c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation".*

- 2.2 Guidance on the interpretation of the policy aims contained within the NPPF is contained within National Planning Policy Guidance (NPPG). The NPPG introduces the concept of a noise exposure hierarchy based on likely average response. The guidance contained in the NPPG is summarised in the table below:

TABLE 1: Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, 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 perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed	

Perception	Examples of Outcomes	Increasing Effect Level	Action
		Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, 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
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

- 2.3 The NPPF and NPPG reinforce the March 2010 DEFRA publication, “Noise Policy Statement for England” (NPSE), which states three policy aims, as follows:

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life.”*

- 2.4 Together, the first two aims require that no significant adverse impact should occur and that, where a noise level which falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect, then according to the explanatory notes in the statement:

“... all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur.”

2.5 Local Policy

With regard to local policy reference is made to Policy DM1 Development Management of the Manchester City Council Core Strategy 2012 to 2027 which in terms of noise states that all development should have regard to specific issues including noise.

Further advice is contained within the saved policies of the Unitary Development Plan including Policy DC26 Development and Noise, which in relation to noise generating states the following:

DC26.3 Developments likely to result in unacceptably high levels of noises will not be permitted

- a. in residential areas;

- b. near schools, hospitals, nursing homes and similar institutions; and
- c. near open land used frequently for recreational purposes.

2.6 Taking an overview of national and local policy aims it is clear that when considering noise, the fact it can be heard and causes impact is not reason to refuse an application. Consideration should be given to the significance of the impact and the mitigation measures available.

Design Guidance

2.8 It is possible to apply objective standards to the assessment of noise and the effect produced by the introduction of a certain noise source may be determined by several methods, as follows:

- i) The effect may be determined by reference to guideline noise values. British Standard (BS) 8233:2014 and World Health Organisation (WHO) *"Guidelines for Community Noise"* contain such guidelines.
- ii) Alternatively, the impact may be determined by considering the change in noise level that would result from the proposal, in an appropriate noise index for the characteristic of the noise in question. There are various criteria linking change in noise level to effect. This is the method that is suited to, for example, the assessment of noise from road traffic because it is capable of displaying impact to all properties adjacent to a road link irrespective of their distance from the road.
- iii) Another method is described within BS 4142:2014 to determine the significance of sound impact from sources of industrial and/or commercial nature. The sources that the newly revised standard is intended to assess are sound from industrial and manufacturing processes, sound from fixed plant installations, sound from loading and unloading of goods at industrial and/or commercial premises and the sound from mobile plant and vehicles, such as forklift, train or ship movements.

Guideline noise values

- 2.9 There are a number of guidance documents that contain recommended guideline noise values. These are discussed below.
- 2.10 British Standard 8233:2014 is principally intended to assist in the design of new dwellings; however, the Standard does state that it may be used in the assessment of noise from new sources being brought to existing dwellings.
- 2.11 The WHO advice is the most useful, comprehensive, and pertinent advice in this case, because it is not specific to the circumstances of the assessment. Instead, it provides guidance on acceptable limits in, for example, schools, dwellings and offices from noise occurring within the community.
- 2.12 The WHO guideline values are appropriate to what are termed "critical health effects". This means that the limits are at the lowest noise level that would result in any psychological or physiological effect. They are, as defined by NPSE, set at the Lowest Observed Adverse Effect Level (LOAEL), but do not define the level above which effects are significant (the SOAEL). Compliance with the LOAEL should, therefore, be seen as a robust aim.

- 2.13 The National Physical Laboratory document *“Health Effect based noise assessment methods; a review and feasibility study”, (September 1998)* contains an “interpretation” of the WHO guidelines (then in draft form) for the DETR. The summary of this section of the NPL report states *“In essence, the WHO guidelines represent a consensus view of international expert opinion on the lowest threshold noise levels below which the occurrence rates of particular effects can be assumed to be negligible. Exceedances of the WHO guideline values do not necessarily imply significant noise impact and indeed, it may be that significant impacts do not occur until much higher degrees of noise exposure are reached”* (paragraph 5.4).
- 2.14 The World Health Organisation/BS 8233 guideline noise values are summarised in the Table 2 below:

TABLE 2: WHO/BS 8233 guideline noise values

Document	Level	Guidance
World Health Organisation “Community Noise 2000”	$L_{AeqT} = 55 \text{ dB}$	Serious annoyance, daytime and evening. (Continuous noise, outdoor living areas)
	$L_{AeqT} = 50 \text{ dB}$	Moderate annoyance, daytime and evening. (Continuous noise, outdoor living areas).
	$L_{AeqT} = 35 \text{ dB}$	Moderate annoyance, daytime and evening. (Continuous noise, dwellings, indoors)
	$L_{AeqT} = 30 \text{ dB}$	Sleep disturbance, night-time (indoors)
	$L_{Amax} = 60 \text{ dB}$	Sleep disturbance, windows open at night. (Noise peaks outside bedrooms, external level).
	$L_{Amax} = 45 \text{ dB}$	Sleep disturbance at night (Noise peaks inside bedrooms, internal level)
BS 8233:2014 “Sound Insulation and noise reduction for buildings”	$L_{AeqT} = 55 \text{ dB}$	Upper limit for external steady noise. (gardens and patios).
	$L_{AeqT} = 50 \text{ dB}$	Desirable limit for external steady noise. (gardens and patios).
	$L_{Aeq \text{ 16 hours}} = 35 \text{ dB}$	Resting, living room day. (Internal – steady noise)
	$L_{Aeq \text{ 16 hours}} = 40 \text{ dB}$	Dining, dining room day. (Internal – steady noise)
	$L_{Aeq \text{ 16 hour}} = 35 \text{ dB}$	Sleeping, bedroom day (Internal – steady noise)
	$L_{Aeq \text{ 8 hours}} = 30 \text{ dB}$	Sleeping, bedroom night (Internal – steady noise)

- 2.15 For L_{AeqT} criteria the time base (T) given in the documents is 16 hours for daytime limits and 8 hours for night time limits.

Changes in noise level

- 2.16 Changes in noise levels of less than 3 dBA are not perceptible under normal conditions and changes of 10 dBA are equivalent to a doubling of loudness. This guidance has been accepted by inspectors, at inquiry, to encompass changes in noise levels in the index L_{AeqT} .

- 2.17 Table 3 below shows the response to changes in noise (known as a semantic scale); this table has been developed from general consensus opinion of acousticians.

TABLE 3: Change in noise level

Change in noise level L_{AeqT} dB	Response	Impact
<3	Imperceptible	None
3 – 5	Perceptible	Slight/moderate
6 – 10	Up to a doubling	Moderate/significant
11 – 15	More than a doubling	Substantial
>15	-	Severe

- 2.18 Where the existing ambient noise level is already above the criteria developed from the various guidance documents, it may be considered unreasonable to adopt such criteria. It would be reasonable, however, given the above statement, to consider criteria which do not exceed the existing noise climate, thus giving rise to an overall 3 dB increase i.e. the minimum perceptible. If it is less than the minimum perceptible it cannot be described as disturbing or to affect the amenity of residents.

Assessment using BS 4142:2014+A1:2019

- 2.19 BS 4142 describes a method for rating and assessing sound of industrial and/or commercial nature, including unloading of goods, according to the following summary process:
- Carry out a numerical assessment by comparing the rating level of sound from deliveries (specific sound plus feature correction) against the existing background noise level. The greater the difference between the two the greater the impact. Differences (rating – background) of around +10 dB is likely to be an indication of significant adverse impact (SOAEL) depending on context; a difference of +5 dB is likely to be an indication of adverse impact, depending on context. 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 upon context.
 - Consider the impact of noise from deliveries against the context of the site in which it is placed. There are many contextual points to consider when determine the impact of the sound including the following:
 - The absolute level of sound;
 - The character and level of the specific sound compared to the existing noise climate;
 - The sensitivity of the receptors;
 - The time and duration that the specific sound occurs;
 - The conclusions of assessments undertaken using alternative assessment methods, for example WHO guideline noise values or change in noise level;

- The ability to mitigate the specific sound through various methods.

2.20 It is therefore entirely possible that whilst the numerical outcome of a BS 4142 assessment is indicative of adverse or even significant adverse impact, when the proposal is considered in context the significance of the impact is reduced to an acceptable level.

Local Design Guidance

2.21 Local Design Guidance is contained within the Manchester City Council Planning and Noise Technical Guidance (December 2015). For industrial/commercial developments BS4142 should be used to assess the likely of noise from industrial and commercial sources at noise sensitive premises. The design objective should be:

'The development should be designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.'

In addition to the above, maximum noise levels should be also be adequately controlled. Where uses generated high noise levels of short duration (e.g. loud bangs) on a regular basis, these should aim to be controlled so as not to exceed 60 dB (L_{Amax}) at the façade of noise sensitive premises.

2.22 The guidance continues to recommend that deliveries and collections are unusually controlled by restricting operational hours but depending on the extent of these activities, a Noise Management Plan (NMP) may be requested which would include an assessment of noise. This would usually involve the assessing the noise upon arrival, loading/unloading period and then departure.

3.0 Noise Survey Details

- 3.1 A noise survey was undertaken at the site between 18 and 19 January 2022 to obtain measurements of the existing noise climate. Measurements were taken at two locations at the rear of the site and within the car park at the front of the site. The monitoring locations were chosen to represent the nearest noise sensitive receptors to the site. The monitoring locations are shown in Figure 2 and described in Table 4 below.

FIGURE 2: Monitoring Location



TABLE 4: Description of Monitoring Locations

Location	Site Description
NL 1	Norsonic 140 Sound Level Meter set up at the boundary of the site with properties in Ivy Graham Close. The microphone was located on a mast in free-field conditions. Measurements were recorded continually at 15-minute intervals from 1600 hours on 18 January to 0930 hours on 19 January 2022
NL 2	Attended measurements taken in car park of existing site. Measurements taken between 0800 and 0900 hours and 2000 and 2100 hours, these being the most sensitive times the site may trade. Measurements were recorded using a Norsonic 118 Type 1 sound level meter positioned on a tri-pod 1.3m above ground level in free-field conditions.

- 3.2 The weather conditions during the survey were noted from site observations and from on-line weather mapping and were cold, dry with clear skies and a light northerly breeze. Weather conditions were suitable for taking sound level measurements. At each location the sound level meter was calibrated before and after the survey with no drift in accuracy noted.
- 3.3 A summary of the survey results are shown in Tables and Figures below. Full survey details are available in Appendix A to this report.

FIGURE 3: NL1 – 7 – 10 January 2022

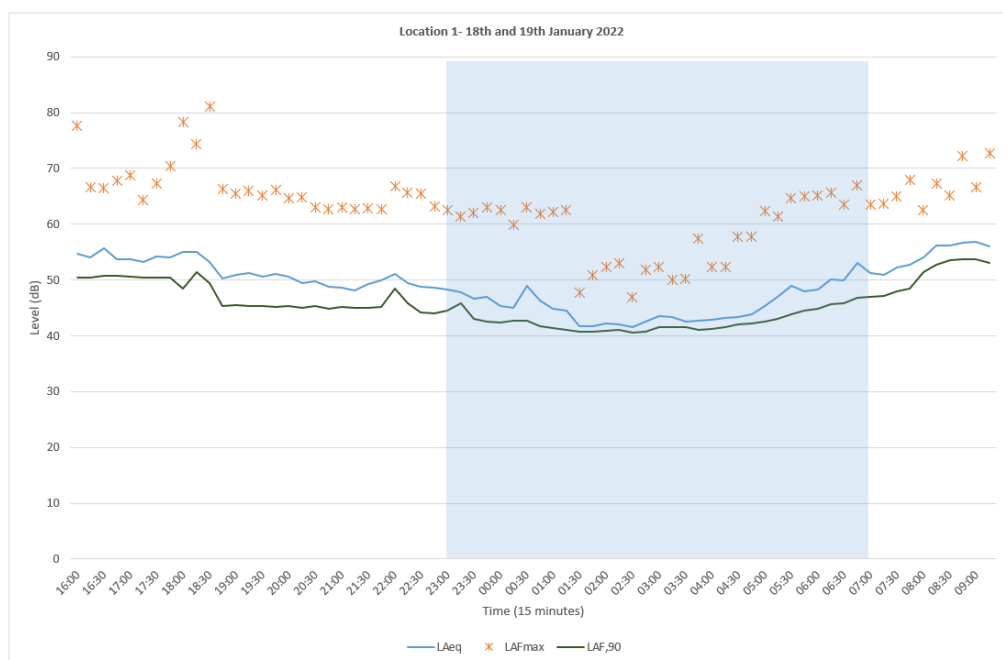


TABLE 5: Survey Results NL2

Date	Noise Levels dB		
	L _{Aeq}	L _{Afmax}	L _{Af90}
(2022/01/18 20:04:01.00)	58.4	67.6	51.4
(2022/01/18 20:19:23.00)	58.1	73.8	49
(2022/01/18 20:36:38.00)	57.8	72.4	49.2
(2022/01/18 20:52:05.00)	58	73.5	50.1
(2022/01/19 08:00:00.00)	64.5	75.4	57.7
(2022/01/19 08:14:59.00)	66.2	83.8	59.4
(2022/01/19 08:30:00.00)	64.6	77.8	58.4
(2022/01/19 08:45:00.00)	64.2	77.8	57.8
(2022/01/19 09:00:00.00)	63.9	77.9	57.2

3.6 Noise levels, L_{AeqT} and L_{A90} were dominated by road traffic noise Based on the measured noise levels representative background noise levels at each location have been determined.

- NL1 – Daytime – 45 dB, Night time 41 dB
- NL2 – Daytime - 50 dB

4.0 Noise Assessment

- 4.1 As identified in section 1.0 of the report, the main noise impacts associated with the proposed change of use have been identified as follows:

- Noise from mechanical services plant;
- Noise from delivery activity;
- Noise from car parking activity

Noise from new mechanical services plant

- 4.2 With regard to the assessment of industrial noise sources in commercial premises BS 4142:2014 enables the resultant noise from new equipment to be compared to the existing background noise level (L_{A90}) of an area to assess the significance of impact. Whilst the exact type and location of the plant is not known at this stage, it is likely to include refrigeration plant which will be located at the rear of the site adjacent to the loading bay. The plant will operate 24-hours a day.
- 4.3 The nearest noise sensitive receptors to the plant area are the residential properties in Ivy Graham Close to the west of the site. In determining suitable plant noise criteria measured background noise levels at NL1 during the late evening and night time periods have been considered.
- 4.4 To prevent significant adverse impacts on the health and quality of life of existing noise sensitive receptors, the “rating noise level” (the predicted noise level plus any penalty for character), should not exceed the typical measured daytime and night time background noise level by more than 10 dB and to prevent adverse harm by around 5 dB depending on context. Noise levels below existing background noise levels, L_{A90} , would be indication of low impact subject to context.
- 4.5 As advised in section 2.0 of this report, for similar developments Manchester City Council have required that noise from new plant should be 5 dB below the existing background noise level. Based on the measured background noise levels (para. 3.6) at each location the following noise criteria have been determined.

- Ivy Graham Close – Daytime - 40 dB
Night time – 36 dB

- 4.6 The above plant limits can be secured by a suitably worded planning condition.

Noise from car parking activity and delivery activity

- 4.7 In 2012 planning permission¹ was granted by Manchester City Council to sub-divide the unit into two A1 retail units. Permissions was granted subject to planning conditions including 12 and 13 which restricted trading and delivery hours to the following:

Trading Hours –	Monday to Saturday:	0800 – 2200 hours
	Sunday and Bank Holidays:	1000 – 1800 hours
Delivery House -	Monday to Saturday:	0730 – 2000 hours
	Sundays and Bank Holidays:	1100 – 1500 hours

¹ Planning Application 100782/FO/2012/N1

Car Parking

- 4.7 SR have been advised that the cash and carry will trade from 9am to 8pm (Monday to Saturday) and between 10am to 6pm (Sundays). Noise from car parking activity associated with the cash and carry will be similar in character and level to that associated with the extant retail use of the site.
- 4.8 The proposed trading hours are no greater than those permitted and therefore the impact will be negligible compared to the existing use.

Delivery activity

- 4.9 Similar to the existing permitted use servicing will take place at the rear of the site with access to the service area via a dedicated route off Reliance Street. Unlike the existing loading arrangements goods will be unloaded directly into the unit using a new level dock extension. In terms of noise the benefits of such a system are as follows:
- a) Goods are wheeled directly into the warehouse. There are no movement of goods/empty cages in the open air;
 - b) The duration of the deliveries is typically less.
 - c) The loading dock extension will screen the nearest noise sensitive properties in Ivy Graham Close.
- 4.10 SR has measured noise levels of servicing activity, arrival, loading/unloading, departure at similar sites and the following maximum levels have been recorded. All measurements are normalised to 10 metres

TABLE 7 – Service yard noise levels (10m)

Event Noise Level						
Arrival		Unloading		Departure		Overall
Duration (Mins)	L _{AeqT} (dB)	Duration (Mins)	L _{AeqT} (dB)	Duration (Mins)	L _{AeqT} (dB)	L _{AMAX} (dB) Arrival-departure/Unloading
2	67	40	58	0.5	69	75 /79

- 4.11 Based on a worst case of an articulated HGV being unloaded the specific level of noise from servicing activity including arrival, loading and departure at the nearest noise sensitive receptors in Ivy Graham Close has been calculated. The calculations take into account the distance to the nearest receptors and the screening provided by the loading bay. No screening has been for the arrival and departure.
- 4.12 SR has been advised that both deliveries and dispatches will be limited to daytime hours only, therefore the assessment is based on first floor receptors only.

TABLE 8: Predicted noise levels

Assessment project: Unit 2 Reliance Park	Delivery component		
	Arrival	Unloading	Departure
Delivery noise activity - predicted ambient noise levels ($L_{Aeq\ T}$) *			
Closest residential property address:	Ivy Graham Close		
Source noise level at 10 metres $L_{Aeq\ T}$	67	58	69
Time - minutes	2	40	0.5
Distance between noise source and residential property in metres	60	30	60
Screening attenuation dB	5	15	5
Convert to 1 hour - dB	-14.8	-1.8	-20.8
Convert to 15 mins - dB	-8.8	0.0	
Distance attenuation correction - dB	-15.6	-9.5	-15.6
Activity $L_{Aeq\ 1\ hr}$	31.7 dB	31.7 dB	27.6 dB
Rating level correction	5 dB	0 dB	5 dB
Resultant daytime rating level $L_{Ar,\ Tr}$	36.7 dB	31.7 dB	32.6 dB
Overall delivery activity noise (arrival, unloading, departure) $L_{Aeq\ 1\ hr}$	35 dB		
Rating level dB $L_{Aeq\ 1\ hr}$	39 dB		
Delivery noise activity - predicted peak noise levels (L_{Amax})			
Source noise level at 10 metres L_{amax}	75	79	75
Distance between noise source and residential property in metres	60	30	60
Screening attenuation dB	5	15	5
Distance attenuation correction - dB	-15.6	-9.5	-15.6
Peak noise level L_{Amax}	54 dB	54 dB	54 dB

- 4.12 The rating level includes a feature correction of 5 dB (3dB for impulsivity and 2 dB for tonality). The predicted rating level is 39 dB with maximum noise levels no greater than 54 dB L_{Amax} .
- 4.13 The predicted rating level will be below the daytime background level measured at NL1 of 45 dB L_{A90} and therefore the impact of serving activity will be low. Maximum noise levels L_{Amax} will also be below the suggested criteria in the Manchester City Council Design Guidance of 60 dB. It is therefore concluded that servicing activity (deliveries and dispatches) could take place between the hours of 0700 and 2300 without causing significant impact to local residents.
- 4.14 BS 4142 requires that uncertainty is taking into account when carrying out an assessment. The assessment is based on lowest background levels measured on a weekday. It is unlikely that background noise on a Sunday will vary significantly from those measured, however even if slightly lower the impact of the noise from deliveries would remain the same i.e. low.
- 4.15 It is therefore concluded that servicing of the site could take place between the hours of 0700 and 2300 without causing adverse impact to local residents.

5.0 Summary and Conclusions

5.1 Sharps Redmore has undertaken an environmental noise assessment for change of use of Unit 2 Reliance Retail Park, Manchester. The following activities have been assessed.

- Fixed mechanical plant
- Car park and delivery arrangements

5.2 Surveys have been carried out at locations representative of the existing noise sensitive properties.

5.3 In terms of noise the following matters are relevant.

- Plant noise will be controlled by condition ensuring that the rating level of plant is below the existing background noise levels in accordance with local design guidelines.
- The impact of car park activity will be negligible.
- Noise from deliveries will be received via a new loading bay, which will enable goods to be unloaded directly into the store via a level dock system. Noise from servicing activity has been assessed in accordance with BS 4142 and the impact during the day will be low. Noise from servicing activity will be within the suggested noise criteria in the Manchester City Council Design Guidance on Noise.

5.4 Taking into account the above and having assessed the main noise impacts from the development against national standards, taking into account the existing noise climate and extant use of the site, it is concluded that the site can be developed as outlined within the report without causing significant impact or disturbance to local residents as advised by the National Planning Policy Framework.

APPENDIX A

SURVEY RESULTS

Date	Noise Level dB				
	L _{Aeq}	L _{Afmax}	L _{Afmin}	L _{Af10}	L _{Af90}
(2022/01/18 16:00:00.00)	54.7	77.7	48.5	56.6	50.5
(2022/01/18 16:15:00.00)	54.1	66.6	48.5	56.4	50.5
(2022/01/18 16:30:00.00)	55.7	66.5	48.3	59.6	50.7
(2022/01/18 16:45:00.00)	53.8	67.7	48.9	55.7	50.7
(2022/01/18 17:00:00.00)	53.7	68.9	49.2	55.9	50.6
(2022/01/18 17:15:00.00)	53.3	64.3	49	54.9	50.5
(2022/01/18 17:29:59.00)	54.2	67.3	48.2	58	50.4
(2022/01/18 17:45:00.00)	54.1	70.4	48.9	56.2	50.4
(2022/01/18 18:00:00.00)	55	78.2	46.1	57.4	48.5
(2022/01/18 18:15:00.00)	55.1	74.4	47.7	56.3	51.5
(2022/01/18 18:30:00.00)	53.2	81.1	45.6	53.6	49.4
(2022/01/18 18:45:00.00)	50.3	66.3	44	51	45.3
(2022/01/18 19:00:00.00)	51	65.5	44	52.3	45.5
(2022/01/18 19:15:00.00)	51.3	66	44.2	51.9	45.4
(2022/01/18 19:29:59.00)	50.6	65.1	44.1	49.7	45.4
(2022/01/18 19:44:59.00)	51.1	66.1	44.2	52.7	45.2
(2022/01/18 20:00:00.00)	50.6	64.6	43.8	50.5	45.4
(2022/01/18 20:15:00.00)	49.4	64.9	43.5	49.1	45.1
(2022/01/18 20:29:59.00)	49.8	63	44.3	50.1	45.3
(2022/01/18 20:45:00.00)	48.8	62.8	43.5	48.4	44.9
(2022/01/18 21:00:00.00)	48.6	63	43.3	49.1	45.2
(2022/01/18 21:15:00.00)	48.1	62.8	43.8	47.7	45
(2022/01/18 21:30:00.00)	49.3	62.9	43.5	49.6	45
(2022/01/18 21:45:00.00)	49.9	62.8	43.7	50.2	45.2
(2022/01/18 22:00:00.00)	51.1	66.9	47.3	51.4	48.4
(2022/01/18 22:15:00.00)	49.5	65.7	44.7	50.4	45.8
(2022/01/18 22:30:00.00)	48.8	65.5	42.8	48.7	44.2
(2022/01/18 22:45:00.00)	48.6	63.1	43	48.5	44.1
(2022/01/18 23:00:00.00)	48.3	62.6	43.5	47.8	44.5
(2022/01/18 23:15:00.00)	47.8	61.5	44.2	47.9	45.8
(2022/01/18 23:30:00.00)	46.7	62	41.9	45.9	43
(2022/01/18 23:45:00.00)	47	63	41.6	45.5	42.5
(2022/01/19 00:00:00.00)	45.3	62.4	41.3	44.3	42.4
(2022/01/19 00:14:59.00)	45	59.9	41.3	44.7	42.8
(2022/01/19 00:30:00.00)	49	63	41.6	47.9	42.7
(2022/01/19 00:44:59.00)	46.3	61.9	40.7	44.7	41.8
(2022/01/19 01:00:00.00)	44.8	62.2	40.2	44.5	41.4
(2022/01/19 01:15:00.00)	44.6	62.5	39.9	43.3	41
(2022/01/19 01:30:00.00)	41.7	47.7	39.7	42.6	40.8
(2022/01/19 01:45:00.00)	41.7	50.9	39.6	42.5	40.7
(2022/01/19 02:00:00.00)	42.2	52.3	39.7	43.4	40.9
(2022/01/19 02:15:00.00)	42.1	53.1	40	43.1	41
(2022/01/19 02:30:00.00)	41.6	47	38.9	42.6	40.6
(2022/01/19 02:45:00.00)	42.5	51.9	39.4	43.9	40.8
(2022/01/19 03:00:00.00)	43.5	52.3	40.3	45.2	41.6

Date	Noise Level dB				
	L _{Aeq}	L _{Afmax}	L _{Afmin}	L _{Af10}	L _{Af90}
(2022/01/19 03:15:00.00)	43.3	50.1	39.9	45	41.6
(2022/01/19 03:30:00.00)	42.6	50.2	40.2	43.7	41.5
(2022/01/19 03:44:59.00)	42.8	57.5	39.8	44.3	41
(2022/01/19 04:00:00.00)	42.9	52.3	40	44.6	41.2
(2022/01/19 04:15:00.00)	43.2	52.4	40.2	44.8	41.6
(2022/01/19 04:30:00.00)	43.4	57.7	40.4	44.4	42
(2022/01/19 04:45:00.00)	43.9	57.7	40.6	45.1	42.2
(2022/01/19 05:00:00.00)	45.4	62.3	41.4	45.1	42.5
(2022/01/19 05:15:00.00)	47	61.4	41.6	47.4	43.1
(2022/01/19 05:30:00.00)	48.9	64.8	42.2	46.5	43.9
(2022/01/19 05:45:00.00)	48	65	43.4	47.2	44.6
(2022/01/19 06:00:00.00)	48.3	65.2	43.2	48.2	44.8
(2022/01/19 06:15:00.00)	50.1	65.6	43.8	49.7	45.6
(2022/01/19 06:29:59.00)	50	63.4	44.4	51.4	45.9
(2022/01/19 06:45:00.00)	53.1	67	45.2	57.5	46.9
(2022/01/19 07:00:00.00)	51.2	63.6	45.2	53	47
(2022/01/19 07:15:00.00)	50.9	63.7	45.5	51.6	47.2
(2022/01/19 07:30:00.00)	52.2	65	46.2	53.8	48
(2022/01/19 07:45:00.00)	52.7	68	47	55.4	48.5
(2022/01/19 08:00:00.00)	54.1	62.5	48.7	55.9	51.5
(2022/01/19 08:15:00.00)	56.2	67.3	50.8	58.7	52.7
(2022/01/19 08:30:00.00)	56.2	65.2	51.8	58.1	53.6
(2022/01/19 08:45:00.00)	56.7	72.2	51.6	59	53.8
(2022/01/19 09:00:00.00)	56.8	66.6	51.7	58.8	53.7

APPENDIX B

ACOUSTIC TERMINOLOGY

Acoustic Terminology

- B1 Noise, defined as unwanted sound, is measured in units of decibels, dB. The range of audible sounds is from 0 dB to 140 dB. Two equal sources of sound, if added together will result in an increase in level of 3 dB, i.e. $50\text{ dB} + 50\text{ dB} = 53\text{ dB}$. Increases in continuous sound are perceived in the following manner:

1 dB increase - barely perceptible.

3 dB increase - just noticeable.

10 dB increase - perceived as twice as loud.

- B2 Frequency (or pitch) of sound is measured in units of Hertz. 1 Hertz (Hz) = 1 cycle/second. The range of frequencies audible to the human ear is around 20Hz to 18000Hz (or 18kHz). The capability of a person to hear higher frequencies will reduce with age. The ear is more sensitive to medium frequency than high or low frequencies.

- B3 To take account of the varying sensitivity of people to different frequencies a weighting scale has been universally adopted called "A-weighting". The measuring equipment has the ability automatically to weight (or filter) a sound to this A scale so that the sound level it measures best correlates to the subjective response of a person. The unit of measurement thus becomes dBA (decibel, A-weighted).

- B4 The second important characteristic of sound is amplitude or level. Two units are used to express level, a) sound power level - L_w and b) sound pressure level - L_p . Sound power level is an inherent property of a source whilst sound pressure level is dependent on surroundings/distance/directivity, etc. The sound level that is measured on a meter is the sound pressure level, L_p .

- B5 External sound levels are rarely steady but rise or fall in response to the activity in the area - cars, voices, planes, birdsong, etc. A person's subjective response to different noises has been found to vary dependent on the type and temporal distribution of a particular type of noise. A set of statistical indices have been developed for the subjective response to these different noise sources.

- B6 The main noise indices in use in the UK are:

L_{A90} : The sound level (in dBA) exceeded for 90% of the time. This level gives an indication of the sound level during the quieter periods of time in any given sample. It is used to describe the "background sound level" of an area.

L_{Aeq} : The equivalent continuous sound level in dBA. This unit may be described as "the notional steady noise level that would provide, over a period, the same energy as the intermittent noise". In other words, the energy average level. This unit is now used to measure a wide variety of different types of noise of an industrial or commercial nature, as well as aircraft and trains.

LA10: The sound level (in dBA) exceeded for 10% of the time. This level gives an indication of the sound level during the noisier periods of time in any given sample. It has been used over many years to measure and assess road traffic noise.

LAMAX The maximum level of sound measured in any given period. This unit is used to measure and assess transient noises, i.e. gun shots, individual vehicles, etc.

- B7** The sound energy of a transient event may be described by a term SEL - Sound Exposure Level. This is the L_{Aeq} level normalised to one second. That is the constant level in dBA which lasting for one second has the same amount of acoustic energy as a given A weighted noise event lasting for a period of time. The use of this unit allows the prediction of the L_{Aeq} level over any period and for any number of events using the equation;

$$L_{AeqT} = SEL + 10 \log n - 10 \log T \text{ dB.}$$

Where

n = Number of events in time period T.

T = Total sample period in seconds.

- B8** In the open, known as free field, sound attenuates at a rate of 6 dB per each doubling of distance. This is known as geometric spreading or sometimes referred to as the Inverse Square Law. As noise is measured on a Logarithmic scale, this attenuation in distance = $20 \log$ (ratio of distances), e.g. for a noise level of 60 dB at ten metres, the corresponding level at 160 metres is:

$$60 - 20 \log \frac{160}{10} = 60 - 24 = 36 \text{ dB}$$