



Noise Impact Assessment

South Boundary Road, Knowsley

Reference: 50-611-R1-1

Date: October 2022



NOISE IMPACT ASSESSMENT

**South Boundary Road
Knowsley**

Prepared for:

Redsun Projects Limited

Report Ref: 50-611-R1-1

Date Issued: 7th November 2022

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EXECUTIVE SUMMARY

BACKGROUND

Site Address	South Boundary Road, Knowsley L33 7XT
National Grid Reference	E 343137 N 397845
Proposed Development	Erection of a commercial units together with associated infrastructure including means of access, landscaping and other associated works.
Report Objectives	To identify, measure and assess the potential impact of the proposed commercial development upon existing residential receptors in the immediate vicinity of the Site. To obtain the relevant credit (POL 5) by meeting the requirements set out in BREEAM (2014). The report follows current and relevant British Standards in order to provide a robust assessment.

ASSESSMENT

Surveys Completed	Attended and unattended background sound surveys have been conducted in a position considered representative of the closest existing residential receptors to the development. The sound level meter was located on the eastern boundary of the site and can be considered representative to the rear gardens of plots along Acornfield Close.
Assessments	A BS4142:2014+A1:2019 assessment has been undertaken, in accordance with the requirements of Pol05, accounting for any unloading/loading activities, heavy goods vehicle parking and car park usage associated with the proposed development and noise break-out potential. The predicted rating level has been compared to the existing typical background sound level for the daytime and night-time periods. Consideration has been given to any acoustic characteristics associated with the proposed development. E3P considered the potential increase in traffic due to development flows but it was found the increase would be less than 4% and would not result in a perceptible increase in road traffic sound.
Mitigation Requirements	No mitigation measures are required.

CONCLUSIONS

E3P has undertaken detailed 3D noise modelling of all the proposed sources in order to predict noise levels within gardens and at 1st floor windows for the daytime and night-time periods, in accordance with BS 4142:2014, at the closest receptors.

The assessment has determined that the typical background sound level will not be exceeded at any receptor during both daytime and night-time periods. Levels at the closest noise sensitive receptor are at least 5 dB below the background in both the daytime and night-time periods.

As such, based on the findings of this report, the credit for POL 5 can be awarded.



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1. INTRODUCTION

1.1. BACKGROUND

E3P were commissioned by Redsun Projects Limited to undertake a Noise Impact Assessment for the proposed commercial development at South Boundary Road in Knowsley, to be referred to hereafter as *'the site'*.

This assessment looks to determine the key noise sources associated with the development and undertake an assessment of any impacts upon existing noise sensitive receptors.

1.2. PROPOSED DEVELOPMENT

The client is looking to obtain BREEAM credits, specifically Pol05, for the construction of a commercial unit with car parking and access on a vacant site north of South Boundary Road.

The key sources of sound associated with the development will be Heavy Goods Vehicle (HGV) loading/unloading activities, HGV parking, noise break-out from the units and car park usage.

This assessment has been undertaken in accordance with the following supplied drawings:

-  RIBA Stage 2 Concept Design (12877-AEW-ZZ-SI-DR-A-0004 Rev S2) Date received 12th October 2022.

The Site Plan is shown in Figure 1 of Appendix II.

1.3. LIMITATIONS

Where a noise or vibration survey is required to inform an assessment, E3P will endeavour to ensure that all noise and vibration measurements taken are robust, representative and reliable in order to inform an accurate assessment at the time.

E3P will endeavour to capture all existing and proposed sources of sound and vibration at the time of the surveys and/or assessments. However, should new sources of sound be introduced, existing sources modified/changed, or characteristics of the sound be altered following completion of such, E3P cannot be held accountable for this.

Where mitigation measures are specified in this report, it should be noted that these measures are relative to a specific sound or vibration source, both in terms of the measured sound pressure and vibration level and the character of the sound source. Where either the sound pressure level or the character of the sound varies following completion of the sound survey, E3P cannot be held responsible for any subsequent variations in the proposed mitigation performance, for either absolute levels or frequency content.



2. ASSESSMENT METHODOLOGY

2.1. NATIONAL PLANNING POLICY FRAMEWORK

To prevent unacceptable risks from pollution, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be considered.

The national planning policy framework states that planning policies and decisions should aim to:

- ✚ Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development.
- ✚ Mitigate and reduce to a minimum, other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions.
- ✚ Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established.
- ✚ Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.2. NATIONAL PLANNING PRACTICE GUIDANCE

Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

Local planning authorities' plan-making and decision-making should take account of the acoustic environment and in doing so consider:

- ✚ Whether or not a significant adverse effect is occurring or is likely to occur.
- ✚ Whether or not an adverse effect is occurring or is likely to occur.
- ✚ Whether or not a good standard of amenity can be achieved.

In line with the explanatory note of the NPSE, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase, where applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.



The “observed effect levels” are as follows:

-  **Significant observed adverse effect level:** This is the level of noise exposure above which significant adverse effects on health and quality of life occur.
-  **Lowest observed adverse effect level:** This is the level of noise exposure above which adverse effects on health and quality of life can be detected.
-  **No observed effect level:** This is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Table 2.1 summarises the noise exposure hierarchy, based on the likely average response.

TABLE 2.1 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, or having to close windows for some of the time because of the noise where there is no alternative ventilation. 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 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, having to keep windows closed most of the time because of the noise where there is no alternative ventilation. 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 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 (auditory and non-auditory).	Unacceptable adverse effect	Prevent



The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any situation. These factors include the following:

- ✿ The source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day. The adverse effect can also be greater simply because there is less background noise at night.
- ✿ For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise can be important.
- ✿ The spectral content of the noise and the general character of the noise. The local topology and topography should also be considered along with the existing and, where appropriate, the planned character of the area.

More specific factors to consider when relevant:

- ✿ Where applicable, the cumulative impacts of more than one source should be considered along with the extent to which the source of noise is intermittent and of limited duration.
- ✿ Consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases, a suitable alternative means of ventilation is likely to be necessary.
- ✿ If external amenity spaces are an intrinsic part of the overall design, then the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

2.3. BS 4142: 2014+A1:2019 'METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND'

This standard describes methods for rating and assessing sound of an industrial or commercial nature which includes:

- ✿ Sound from industrial and manufacturing processes.
- ✿ Sound from fixed installations which comprise mechanical and electrical plant and equipment.
- ✿ Sound from the loading and unloading of goods and materials at industrial and / or commercial premises; and
- ✿ Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from processes or premises, such as that from forklift trucks, or that from train or ship movements on or around an industrial or commercial Site.

The procedure detailed in the standard compares the measured or predicted specific noise level from any of the above with the background sound level at a residential dwelling. The measured background sound level at a receptor should be reliable and should not necessarily ascertain a lowest measured background sound level, but rather to quantify what is typical.

The specific noise level also acknowledges the reference time intervals depending upon whether the noise source operates during daytime (1-hour) or night-time (15-minute) periods.



There are several 'penalties' which can be attributed to the specific sound level depending upon the 'acoustic features' of the sound level under investigation as follows:

Tonality

-  +2 dB: where the tonality is just perceptible.
-  +4 dB: where the tonality is clearly perceptible; and
-  +6 dB: where the tonality is highly perceptible.

Impulsivity

-  +3 dB: where the impulsivity is just perceptible.
-  +6 dB: where the impulsivity is clearly perceptible; and
-  +9 dB: where the impulsivity is highly perceptible.

Intermittency

-  +3dB: where the intermittency is readily distinctive against the acoustic environment.

In addition to the above, there is a penalty for 'other sound characteristics' of +3 dB where a sound exhibits characteristics that are neither tonal nor impulsive, though are readily distinctive against the acoustic environment. BS 4142 goes on to state that the rating level is equal to the specific sound level if there are no such features present or expected to be present.

Assessment of the rating level relative to the background sound level can yield the following commentary:

-  Typically, the greater this difference (between the rating level and the background sound level), the greater the magnitude of impact.
-  A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
-  A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and
-  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. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

It is common that a Local Planning Authority (LPA) will specify their own criterion and, where this is the case, this criterion will usually take precedence over a simple comparison of the rating level against the background sound level.



2.4. BRE GLOBAL (2014) BREEAM UK NEW CONSTRUCTION NON-DOMESTIC BUILDINGS TECHNICAL MANUAL

2.4.1. POL 05

One credit

- 1 There are no noise-sensitive areas within the assessed building or within 800 m radius of the assessed site.
- OR
- 2 Where there are noise-sensitive areas within the assessed building or noise-sensitive areas within 800 m radius of the assessed site, a noise impact assessment compliant with BS 4142:2014 is commissioned. Noise levels must be measured or determined for:
 - 2.a Existing background noise levels:
 - 2.a.i at the nearest or most exposed noise-sensitive to the proposed assessed site.
 - 2.a.ii including existing plant on a building, where the assessed development is an extension to the building.
 - 2.b Noise rating level from the assessed building.
- 3 The noise impact assessment must be carried out by a suitably qualified acoustic consultant.
- 4 The noise level from the assessed building, as measured in the locality of the nearest or most exposed noise-sensitive development, must be at least 5 dB lower than the background noise throughout the day and night.
- 5 If the noise sources from the assessed building are greater than the levels described in criterion 4, measures have been installed to attenuate the noise at its source to a level where it will comply with the criterion.



3. SURVEY RESULTS

3.1. UNATTENDED BACKGROUND AND AMBIENT SOUND SURVEY

E3P have undertaken attended and unattended background and ambient sound surveys in a position considered representative of the closest receptors. It was not possible to leave a meter unattended over a full weekday and weekend time period due to on-site security concerns.

E3P conducted an attended survey during the daytime and an unattended survey over a typical weekday night-time period.

The survey was carried out over the following time periods:

- 📍 10:45 to 12:45 Friday 21st October; and
- 📍 18:00 Monday 24th October to 07:00 Tuesday 25th October 2022

The following noise measurement position was chosen for the Background and Ambient Sound Survey:

- 📍 Noise Measurement Position 1 (NMP1): Located on the eastern boundary in a location representative of the noise sensitive receptors located on Acornfield Close. The microphone of the sound level meter was set at a height of 1.5 m above ground level and in free-field conditions. Sound sources consisted of road traffic on the local road network and occasional commercial sound from the nearby units.

Table 3.1 details the measured background sound levels. The daytime levels correspond to the $L_{A90,1hr}$ and the night-time levels to the $L_{A90,15mins}$.

TABLE 3.1 MEASURED BACKGROUND SOUND PRESSURE LEVELS

DATE	TIME PERIOD	RANGE OF MEASURED BACKGROUND SOUND LEVELS, $L_{A90,T}$ (dB)	MEDIAN MEASURED BACKGROUND SOUND LEVEL, $L_{A90,T}$ (dB)
Friday 21st October 2022	Daytime	50.0-51.0	50
Monday 24th October 2022	Daytime	45.9-53.0	50
	Night-time	40.3-57.7	45

The levels highlighted above are the lowest measured levels to be used to inform the assessment, specifically 46 dB during the day and 40 dB during the night. The lowest measured levels are used here over the lowest median measured levels to inform a worst-case assessment in the absence of a full weekday and weekend noise survey.

Weather forecasts were monitored throughout the surveys to ensure no adverse conditions as the location of the Site was not suitable for the installation of an unattended weather station. During the survey, conditions remained dry and wind speeds rarely exceeded 10 mph.

The equipment outlined in Table 3.2 was used for the noise survey.



TABLE 3.2 NOISE MEASUREMENT EQUIPMENT AND CALIBRATION DATES

MEASUREMENT POSITION	EQUIPMENT DESCRIPTION	MANUFACTURER & TYPE NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE
NMP1	Sound Level Meter	Cirrus CR:171A	G303884	20/09/2024
	Pre-amplifier	Cirrus MV:200F	12731F	
	Microphone	Cirrus MK:224	215899D	
	Calibrator	Cirrus CR:515	99403	20/09/2023

The sound level meter was field calibrated on site using the above-mentioned calibrator prior to and after noise measurements were taken. No significant drift was witnessed as noted above. Calibration certificates are available upon request.



4. NOISE IMPACT ASSESSMENT

This assessment has used previously measured noise levels for HGVs and unloading/loading activities, applied at previous similar B2/B8 use sites, to predict the noise level impact on the existing closest residential dwellings during the daytime and night-time periods. At this stage, it is assumed that the unit will operate 24/7.

With regard to assumptions for the assessment, the following has been considered for the full planning application aspects:

- ✿ Ground elevations have been taken as existing by way of a 2 m grid Digital Terrain Model (DTM) which contains public sector information licensed under the Open Government License v3.0.
- ✿ HGV unloading/loading are inputted as point sources with sound power level of 78 dB, equating to a sound pressure level of 70 dB at 1 m as measured at source. This included for tailgate operation which wouldn't be present at loading bays and so is considered worst case.
- ✿ The daytime period has been assessed between the hours of 07:00 to 23:00. For the assessment, BS 4142:2014+A1:2019 has been used to determine the likelihood of adverse impact within the garden areas over a reference time period of 1 hour.
- ✿ The night-time period has been assessed between the hours of 23:00 and 07:00 for a reference time period of 15 minutes.
- ✿ During the daytime and night-time periods, it is assumed, in order to inform a worst-case assessment, that an HGV will be in attendance at each loading bay at once with HGVs driving up and reversing into the bays and then unloading/loading activities then taking place.
- ✿ The measured on-time periods have been corrected to account for the hourly and 15-minute assessment periods given in BS 4142:2014+A1:2019; and
- ✿ Soft ground attenuation has been applied, where necessary.

At this stage, the exact noise sources for the proposed B2/B8 usage are not known. As such, the only viable sources that can be modelled are HGV movements, HGV parking and unloading/loading activities along with car park usage. Advice is provided on fixed plant sound. This would provide a worst-case assessment for most operations, especially B8 usage.

With regards to B2 usage, this general industrial in nature and there could be any noise source associated with this, but all operations not assessed here or advised upon would be internal only. Given that a minimum sound reduction of 31 dB is expected for a typical industrial building facade and that it is highly unlikely that internal operations at any unit would exceed 80 dB inside, external noise levels at the facades are expected to be, at most, 43 dB radiating from the façade itself. Roller shutter entrances are assumed to be open with a vertical area source sound power level of 74 dB. A simple equation of Sound pressure level outside = Sound pressure level inside – Sound Reduction Index (SRI) of building envelope – 6 dB for diffuse field to free-field correction.

For the BS 4142:2014+A1:2019 assessments, penalties are applied to the specific sound level in order to provide the rating level. These penalties relate to the acoustic features of the sound source. Accordingly, the following subjective features have been accounted for in the assessment, in accordance with the subjective method detailed in BS 4142:2014+A1:2019, for the units as a whole operation. During the daytime periods, no penalties are applied given the surrounding industrial and commercial usage. However, there is potential for new sources of sound at night and so the following applies to these periods only.



TABLE 4.1 ACOUSTIC PENALTIES

SOURCE	CHARACTERISTIC	ATTRIBUTABLE PENALTY	COMMENT
Class B2/B8 Warehouse Unit with Service Bays	Tonality	2 dB	It is assumed all HGVs would be fitted with white noise reverse alarms with tones just perceptible at the receptors.
	Impulsivity	-	No impulsivity is expected from loading/unloading at the loading docks.
	Intermittency	3 dB	Unloading/loading activities are intermittent in nature
	Other Sound Characteristics	-	Other penalties applied.

4.1. DAYTIME ASSESSMENT

Table 4.2 details the resultant rating level at the worst affected receptor along Acornfield Close, output from the model. The grid noise map can be seen in Figure 2 of Appendix II.

The lowest measured background sound level during the daytime periods have been used. This informs a worst-case assessment.

TABLE 4.2 BS 4142:2014+A1:2019 ASSESSMENT - DAYTIME

RECEPTOR	CALCULATED RATING LEVEL, $L_{A,r}$ (dB)	LOWEST MEASURED BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)	POL 05 CRITERION, $L_{A90} = L_{A,r} - 5$ (dB)	DIFFERENCE +/- (dB)
12 Acornfield Close	33	46	41	-8

Table 4.2 indicates that the predicted rating level falls below the Pol 05 criterion during daytime periods at the closest receptors. As such, no consideration towards mitigation measures is required.

As such no mitigation measures are required.

4.2. NIGHT-TIME ASSESSMENT

Table 4.3 details the resultant rating level at the worst affected receptor along Acornfield Close, output from the model. The grid noise map can be seen in Figure 3 of Appendix II.

The lowest measured background sound level during the night-time periods have been used. This informs a worst-case assessment.



TABLE 4.3 BS 4142:2014+A1:2019 ASSESSMENT – NIGHT-TIME

RECEPTOR	CALCULATED RATING LEVEL, $L_{A,r}$ (dB)	LOWEST MEASURED BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)	POL05 CRITERION, $L_{A90} = L_{A,r} - 5$ (dB)	DIFFERENCE +/- (dB)
12 Acornfield Close	35	40	35	0

Table 4.3 indicates that the predicted rating level achieves the Pol 05 criterion during night-time periods at the closest receptors. As such, no consideration towards mitigation measures is required.

4.3. PROPOSED FIXED PLANT – POL 05 BREEAM

At the time of submission, details of proposed fixed plant items were unknown. As such, the following recommendations have been made:

- ✚ Any fixed plant items should be located within the site and not at the rear of the facades as, more often than not, these facades face noise sensitive receptors.
- ✚ The resultant rating level from the cumulative impact of all proposed fixed plant items must not exceed the existing background sound levels, accounting for the above proposed noise levels, at the closest receptors.

It is assumed that any fixed plant items proposed would have a low noise level and most likely will consist of A/C units. Considering the typical noise levels of these units and the surrounding existing usage, the impact of these would be negligible.

Where this is not the case, it is recommended that an acoustician is involved to ensure the plant to be installed will not adversely affect the receptors. Indeed, the rating level of any building services plant must be 5 dB below the existing background sound level in order to achieve the credit for Pol 05.

4.4. DEVELOPMENT GENERATED TRAFFIC

In addition to the BS 4142 assessment, consideration has been to potential increases in road traffic sound, specifically along Gale Road where the site is accessed.

Baseline and development flows have been provided by Mode Transport, as follows:

- ✚ 24-hour flow along Gale Road (Baseline) – 4,550 vehicles (631 HGVS included).
- ✚ 24-hour development flows – 207 vehicles (no HGV numbers provided).

This would result in a 3.5 % increase in traffic along Gale Road with a lower contribution on the wider, busier road network. In noise terms, this would be less than 0.5 dB increase in road traffic noise levels and would not be perceptible to the human ear.

As such, no impact due to development generated traffic along the existing road network is predicted.



5. CONCLUSION AND RECOMMENDATIONS

E3P were commissioned by Redsun Projects Limited to undertake a Noise Impact Assessment for the proposed commercial development at South Boundary Road, Knowsley.

This assessment looked to determine the key noise sources associated with the development and undertake an assessment of any impacts upon existing noise sensitive receptors.

Attended and unattended background and ambient sound surveys have been undertaken in order to capture worst case baseline noise levels.

E3P has undertaken detailed 3D noise modelling of all the proposed sources in order to predict noise levels at ground and 1st floor windows for the daytime and night-time periods respectively, in accordance with BS 4142:2014+A1:2019, at the closest receptors to the site.

The assessment has shown that the predicted rating level falls below the typical measured background sound level by at least 5 dB during the daytime and night-time periods.

The report has also shown compliance with and provided advice for building services plant in order to achieve Pol 05 for BREEAM.

This assessment has shown that there should be no adverse impact upon existing residential receptors due to the proposed operations. As such, noise should not be a determining factor in the determination of the planning application.

END OF REPORT



APPENDIX I

GLOSSARY OF ACOUSTIC TERMINOLOGY

NOISE

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source. The most widely used weighting mechanism that best corresponds to the response of the human ear is the "A"-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective but, as a general guide, a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE A1 TYPICAL SOUND PRESSURE LEVELS

SOUND PRESSURE LEVEL	LOCATION/EXAMPLE
0	Threshold of hearing
20–30	Quiet bedroom at night
30–40	Living room during the day
40–50	Typical office
50–60	Inside a car
60–70	Typical high street
70–90	Inside a factory
100–110	Burglar alarm at 1 m away
110–130	Jet aircraft on take off
140	Threshold of pain



ACOUSTIC TERMINOLOGY

TABLE A2 TERMINOLOGY

DESCRIPTOR	EXPLANATION
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2E-05 Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. "A" weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
L_{Aeq, T}	L _{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
L_{Amax}	L _{Amax} is the maximum A-weighted sound pressure level recorded over the period stated. L _{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L _{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the "fast" sound level meter response.
L₁₀ and L₉₀	If a non-steady noise is to be described, it is necessary to know both its level and the degree of fluctuation. The L _n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L ₁₀ is the level exceeded for 10% of the time and as such can be regarded as the "average maximum level". Similarly, L ₉₀ is the "average minimum level" and is often used to describe the background noise. It is common practice to use the L ₁₀ index to describe traffic noise.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally, as measured outside and away from buildings.
Fast	A time weighting used in the root-mean-square section of a sound level meter with a 125-millisecond time constant.
Slow	A time weighting used in the root-mean-square section of a sound level meter with a 1000-millisecond time constant.



APPENDIX II

MEASURED SOUND PRESSURE LEVELS

TABLE A1: HOURLY AMBIENT AND BACKGROUND SOUND LEVEL DATA – NMP1

PERIOD START	AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB)	BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
Friday 21st October		
21/10/2022 10:45	56.1	51.0
21/10/2022 11:45	54.0	50.4
21/10/2022 12:45	52.9	50.0
Monday 24th October – Tuesday 25th October		
24/10/2022 18:02	56.1	53.0
24/10/2022 19:02	54.6	51.0
24/10/2022 20:02	52.7	50.0
24/10/2022 21:02	51.5	48.5
24/10/2022 22:02	50.2	45.9
24/10/2022 23:02	49.6	45.8
25/10/2022 00:02	48.7	45.3
25/10/2022 01:02	45.6	41.5
25/10/2022 02:02	44.9	42.4
25/10/2022 03:02	46.3	42.7
25/10/2022 04:02	48.7	45.2
25/10/2022 05:02	52.9	49.6
25/10/2022 06:02	57.9	54.6

TABLE A2: 15-MIN NIGHT-TIME AMBIENT AND BACKGROUND SOUND LEVEL DATA – NMP1

PERIOD START	AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB)	BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
24/10/2022 23:02	48.4	45.7
24/10/2022 23:17	49.4	45.8
24/10/2022 23:32	51.1	46.8
24/10/2022 23:47	49.1	45.4
25/10/2022 00:02	49.2	45.9
25/10/2022 00:17	48.3	45.5
25/10/2022 00:32	48.2	45.2
25/10/2022 00:47	48.9	44.9



PERIOD START	AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB)	BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
25/10/2022 01:02	47.0	44.0
25/10/2022 01:17	46.5	43.4
25/10/2022 01:32	42.6	40.3
25/10/2022 01:47	45.3	42.4
25/10/2022 02:02	44.6	42.0
25/10/2022 02:17	45.2	42.6
25/10/2022 02:32	44.0	42.4
25/10/2022 02:47	45.5	42.7
25/10/2022 03:02	45.3	41.5
25/10/2022 03:17	45.2	42.7
25/10/2022 03:32	46.6	44.1
25/10/2022 03:47	47.8	44.3
25/10/2022 04:02	46.5	44.6
25/10/2022 04:17	46.9	44.9
25/10/2022 04:32	49.7	47.1
25/10/2022 04:47	50.3	47.8
25/10/2022 05:02	50.5	48.8
25/10/2022 05:17	51.9	49.7
25/10/2022 05:32	54.4	52.6
25/10/2022 05:47	53.9	52.4
25/10/2022 06:02	55.4	53.5
25/10/2022 06:17	57.8	56.1
25/10/2022 06:32	58.9	57.7
25/10/2022 06:47	59.0	57.6



APPENDIX III

FIGURES

Client:
Redsun Projects Limited

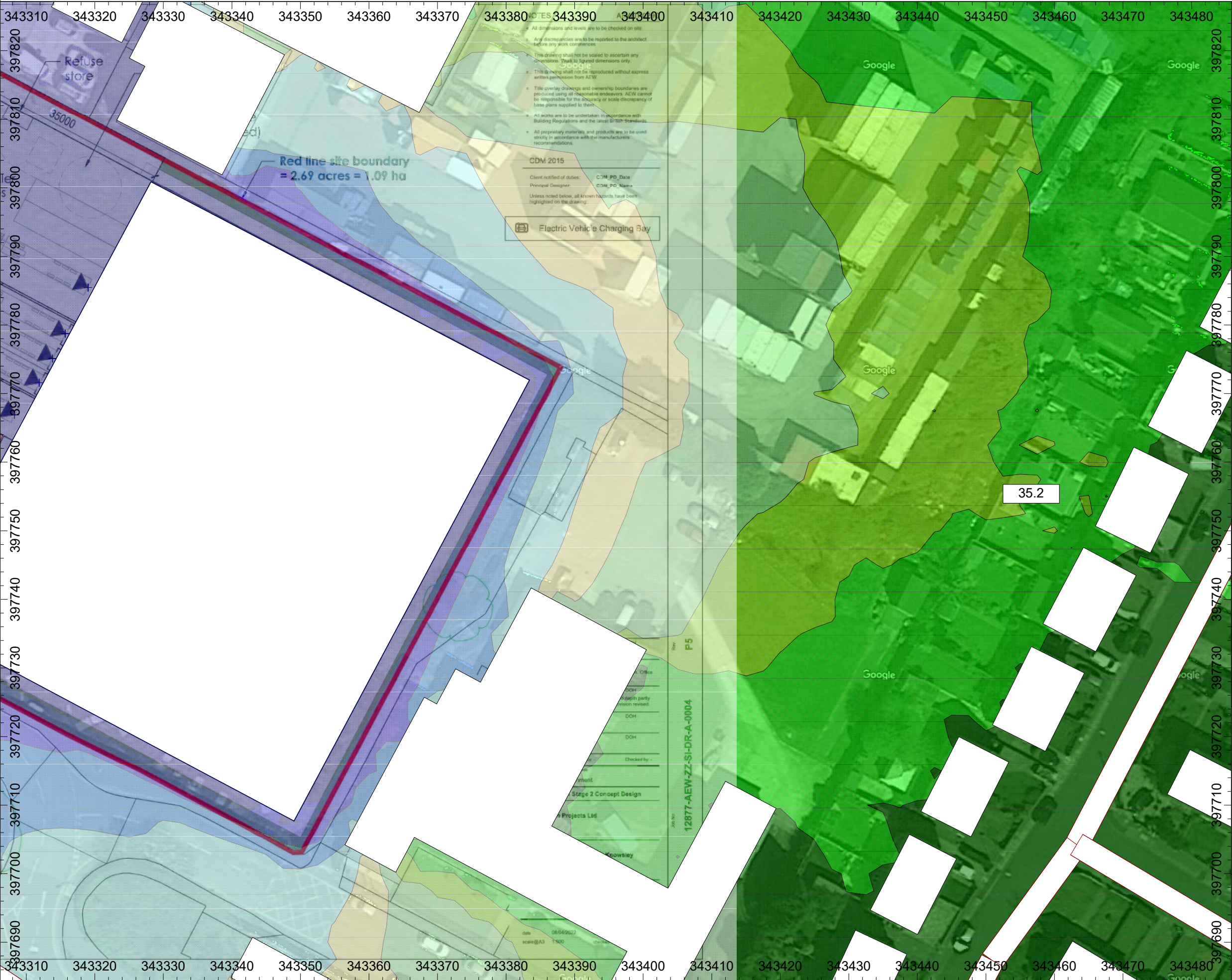
...	≤ 38
38 < ...	≤ 40
40 < ...	≤ 42
42 < ...	≤ 45
45 < ...	≤ 48
48 < ...	≤ 50
50 < ...	≤ 52
52 < ...	≤ 55
55 < ...	

- + Point Source
-  Area Source
-  vert. Area Source
-  Road
-  Parking Lot
-  Building
-  Calculation Area



Project Engineer: Scott Boughton
Date: 25/10/2022

Figure 3 - Night-time Grid Noise Map - Calculation at 4.5m above ground level



Project:
South Boundary Road, Knowsley

Project-No:
50-611

Client:
Redsun Projects Limited

Night-time Noise Level, LA,r (dB)	
...	<= 32
32 < ...	<= 35
35 < ...	<= 38
38 < ...	<= 40
40 < ...	<= 42
42 < ...	<= 45
45 < ...	<= 48
48 < ...	<= 50
50 < ...	

Noise Map Objects	
+	Point Source
▨	Area Source
—	vert. Area Source
—	Road
▨	Parking Lot
□	Building
□	Calculation Area



Project Engineer: Scott Boughton
Date: 25/10/2022