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NOISE ASSESSMENT

COMMERCIAL VEHICLE STORAGE AND REPAIR
LAND NORTH OF 51 AND 53 BEDFORD ROAD, ROXTON

[redacted]

FEBRUARY 2022

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Revision	Prepared By	Date
2.1	[redacted]	27/2/22
1.0	[redacted]	28/9/20

CONTENTS

1. Introduction

LF Acoustics Ltd have been retained by [redacted] to prepare a noise assessment to accompany a planning application for a proposed commercial vehicle workshop and associated parking on land to the north of 51 and 53 Bedford Road. Roxton.

[redacted] are seeking to relocate their present operations within Bedford to the new site at Roxton. The main operations would entail servicing and MOT of commercial vehicles, carried out within a new workshop building. Parking facilities are proposed on the land to the west of the proposed workshop building for new and used sales vehicles.

This report presents an updated assessment of the noise levels attributable to the operation of the new workshop and vehicle storage facilities. Revisions to the layout of the site have been to address concerns of officers at Bedford Borough Council. The changes to include a reduction in the size of the workshop and a reduction in the HGV parking within the western area of the site.

The following section of this report presents a summary of the standards and guidance applicable to the proposed development. Section 3 provides a description of the site and its surroundings. Section 4 presents the results of a noise monitoring exercise undertaken to determine the current noise environment at surrounding residential properties. Section 5 presents calculations of the noise levels attributable to the operation and assesses the levels against the appropriate standards. Finally, Section 6 provides a summary of the report.

2. Applicable Standards and Guidance

2.1. A description of the noise units referred to in this report is provided in Appendix A.

2.2. National Planning Policy Framework

The National Planning Policy Framework (NPPF) revised in July 2021 [1], sets out the Government's planning policies for England and how these should be applied. It provides a framework upon which locally prepared plans for housing and other development can be produced.

The purpose of the planning system is to contribute to the achievement of sustainable development and at the heart of the Framework is a presumption in favour of sustainable development.

With regards noise, local 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 noise pollution.
- mitigate and reduce to a minimum, potential adverse impacts resulting from noise from new development (including cumulative effects) – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

Reference is made within the NPPF to the Noise Policy Statement for England [2] (NPSE), which sets out the long term vision of the Government noise policy. Further information has been provided on the assessment of noise within recent Planning Practice Guidance, published in March 2014 and available on the Government planning web site. Whilst this guidance does not provide any objective criteria upon which to base noise assessments, the guidance provides a description of the relevant Effects Levels identified within the NPPF and NPSE and this is reproduced in Table 2.1.

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect (NOEL)	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 (LOAEL)	
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 Adverse Effect Level (SOAEL)	
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

Table 2.1 Significance Criteria

2.3. British Standard BS 4142

BS 4142 [3] is the British Standard for rating and assessing noise of a commercial or industrial nature upon occupants of existing or proposed residential premises.

BS 4142 is a comparative standard in which the estimated noise levels from the proposed development are compared to the representative / typical background noise level from existing uses.

BS 4142 relates the likelihood of adverse impacts to the difference between the Rating Level of the noise being assessed and the background noise level.

The background noise level is the L_{A90} noise level, usually measured in the absence of noise from the source being assessed, but may include other existing industrial or commercial sounds. The background noise levels should generally be obtained from a series of measurements each of not less than 15 minute duration.

The Rating Level of the noise being assessed is defined as its L_{Aeq} noise level (the 'specific noise level'), with the addition of appropriate corrections should the noise exhibit a marked impulsive and/or tonal component, or should the noise be irregular enough in character to attract attention. The extent of the correction is dependent upon the degree of tonality or character in the noise and is determined either by professional judgement, where the plant is not operational at present, or by measurement.

During the daytime, the specified noise levels are determined over a reference time interval of 1 hour, with a 15 minute assessment period adopted at night.

If the Rating Level of the noise being assessed exceeds the background level by 10 dB or more BS 4142 advises that there is likely to be an indication of a significant adverse impact, depending upon context. A difference between background level and Rating Level of around 5 dB is likely to be an indication of an adverse impact, depending upon context. The lower the Rating Level is, relative to the background noise level, the less likely the specific source will have an adverse or significant adverse impact. Where the Rating Level does not exceed the background noise level is an indication of a low impact, depending upon context.

The assessment method outlined above is intended for the assessment of external noise levels and is not intended to assess the extent of impact at internal locations.

Where the initial assessment of impact, based upon and assessment of the external noise levels, needs to be modified due to the context, all pertinent factors should be taken into account, including:

- The absolute level of sound;
- 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; and
- The sensitivity of the receptor and whether the premises will already incorporate measures to ensure good internal and/or external acoustic conditions.

2.4. British Standard BS 8233

British Standard BS 8233 [4] principally provides design guidance for new buildings. For residential premises, the guidance advises for steady external noise sources, levels of noise internally not exceeding 30 dB $L_{Aeq,\ 8\ hour}$ within bedrooms at night are desirable, with a level of 35 dB $L_{Aeq,\ 16\ hour}$ representing a desirable standard of noise within living rooms and bedrooms for resting purposes during daytime periods.

Externally within gardens and amenity spaces, the guidance recommends a general limit of 50 dB $L_{Aeq,\ T}$.

2.5. World Health Organisation Guidelines

The World Health Organisation guidance [5] provides additional guidance upon potential effects in relation to noise.

The guidance advises:

- few people are moderately annoyed by noise levels of below 50 dB L_{Aeq} during the daytime;
- for a good night's sleep, noise levels within bedrooms should not exceed 30 dB L_{Aeq}, with individual noise events not exceeding 45 dB L_{Amax}; and
- special attention should be given to noise sources in an environment with low background noise levels and to noise sources with low frequency components.

Assuming an open window provides a reduction in noise levels of between 10 – 15 dB(A), during the night-time the WHO guidance indicates that external noise levels should remain below 40 – 45 dB L_{Aeq} to maintain the restorative processes of sleep.

The WHO produced additional noise guidance in relation specifically to night-time noise in 2009 [6], which is generally considered to be the most noise sensitive period. This report provides a description of the no observed adverse effect level (which is equivalent to a No Observed Effects Level, NOEL) and advises for night-time noise (which is considered to be the most sensitive period of the day) that this concept is less useful, as the adversity of effects are less clear. Instead, it advises the use of the observed effects thresholds, above which an effect starts to occur or shows itself to be dependent upon the exposure level.

The guidance is presented in terms of external and internal recommendations to minimise any potential adverse effects. Externally, the guidance advises that an average night-time noise level L_{night} (the $L_{Aeq, 8\ hour}$) of 40 dB is equivalent to the Lowest Observed Adverse Effect Level (LOAEL) and advises this guideline value is recommended for the protection of public health from night-noise. However, below this level there was no change in the small number of awakenings identified and hence a reason for considering that the NOEL was not an appropriate descriptor in noise terms for identifying adverse effects and hence recommend the use of the observed effects threshold as an appropriate descriptor to identify the potential for the onset of adverse effects.

The guidance, however, advises that an external night-time noise level of 30 $L_{Aeq, 8\ hour}$ would be equivalent to the NOEL, as their research indicated that there were no detectable effects on sleep observed below this level.

The potential for Significant Observed Adverse Effects (SOAEL) were identified to occur at levels considerably above 40 dB $L_{Aeq, 8\ hour}$.

3. Site Description

The proposed workshop and vehicle storage facility would be located on land to the north of 51 and 53 Bedford Road, Roxton. The site location is indicated on Figure 1.

The site is bounded to the south by Bedford Road and to the north by the A421 dual carriageway, which is within a shallow cutting as it passes the site.

The site would be accessed off an existing junction on Bedford Road.

The site would comprise a main workshop building, located within the eastern part of the site and HGV parking areas within the western part of the site, as indicated on Figure 2. The HGV parking area has been reduced since the previous assessment was undertaken, with no parking now proposed within the westernmost part of the site, thus increasing the separation of site activity from the neighbouring residential properties.

The closest residential properties, which would be potentially affected by noise from the operation of the site are 51 and 53 Bedford Road, which are located to the south of Bedford Road, approximately 180 metres from the closest operational site boundary at the rear of the vehicle parking area and 240 metres from the main workshop building.

The site would be operational on a 24 hour basis.

The main building would house the workshop and offices. There would be two MOT bays at the southern end of the building, with doors either side to allow the vehicles to drive through. There would be a further 5 service bays, with doors along the western side of the building, which would be used for a combination of vehicle servicing and body shop repairs.

The principal operating hours for the site would be during normal daytime periods. During this period, the workshop would be fully operational, with the MOT bays in use, with a vehicle typically passing through every 30 minutes. There would be regular vehicle movements into and out of the site and around the area of the workshop building throughout the day. On occasion the lorry wash would also operate, used principally to clean vehicles following service.

Overnight, the workshop would remain open for the servicing of customer vehicles. The level of activity overnight would be considerably lower than during the daytime period, as the workshop staff tend to collect a vehicle from the customer and bring it directly into the workshop for service, and return it to them afterwards, with only one service bay generally operational.

4. Baseline Noise Monitoring

To evaluate the current noise environment at the neighbouring properties an unattended noise survey was carried out on the land adjacent to the properties between Wednesday 16th and Monday 21st September 2020.

A Rion NL-52 Class 1 Sound Level Analyser was used for the survey. The instrument was calibrated before and after the exercise using a Rion NC-74 Class 1 Acoustic Calibrator, reading 94.0 dB on each occasion. The instruments had been laboratory calibrated within the past 24 months to national standards (the calibration certificates can be provided upon request).

The instrument was set with the microphone at a height of 1.3 metres above the ground and in a freefield location (i.e. at least 3.5 metres from a property façade). The instrument was configured to record over consecutive 15 minute periods during the survey in accordance with the requirements of BS 4142.

Weather conditions for the survey were good, remaining dry, with either calm conditions or light south westerly winds observed.

Noise levels monitored were influenced by a mix of road traffic noise attributable to vehicles travelling along Bedford Road and the A421 to the north. Traffic using Bedford Road tended to fall away during the evening period, with noise levels overnight principally attributable to the A412 traffic and traffic travelling along the A1, which runs further to the east.

The results of the survey are presented graphically in Appendix B.

The background (L_{A90}) noise levels have been analysed over the day (07:00 – 19:00 hours), evening (19:00 – 23:00 hours) and night-time (23:00 – 07:00 hours) periods to derive a typical background noise level for each period, using a statistical approach in accordance with the methodology presented in BS 4142.

The overall analysis is presented in Appendix B and summarised in the table below.

Date	**Typical Background (LA90) Noise Levels [dB]**					
	Daytime (07:00 – 19:00)		**Evening (19:00 – 23:00)**		**Night (23:00 – 07:00)**	
	$L_{Aeq,T}$	**L_{A90}**	$L_{Aeq,T}$	L_{A90}	$L_{Aeq,T}$	L_{A90}
Wednesday 16/9/20	60	55	56	43	54	39
Thursday 17/9/20	61	52	56	48	54	42
Friday 18/9/20	63	53	59	46	53	40
Saturday 19/9/20	60	53	56	45	50	37
Sunday 20/9/20	59	53	56	47	54	38
Monday 21/9/20	61	50	-	-	-	-
Overall	**60**	**53**	**56**	**46**	**53**	**42**

Table 4.1 Results of Unattended Noise Survey

5. Calculation and Assessment of Noise Levels

5.1. Calculation of Noise Levels

Noise levels attributable to the operation of the new workshop and vehicle parking area have been modelled at the surrounding properties using the SoundPlan computer modelling package.

The model utilises the calculation methodology from ISO 9613-2.

Ground levels for the site and surrounding area have been obtained from LiDAR mapping data.

The building will be clad using composite panels, with Kingspan KS1000 proposed to be used. The acoustic specification assumed is provided in Appendix B.

The noise modelling has been based upon noise measurements obtained at the existing [redacted] workshop in Milton Keynes, which is of an equivalent size to that proposed at Roxton.

Noise levels monitored within the Milton Keynes workshop, indicated a general level of 67 dB $L_{Aeq,T}$, attributable to the general workshop activities, including vehicle movements internally and normal servicing operations. During shorter periods, whilst vehicle engines were being tested at higher speeds for example, noise levels were noted to be between 70 – 72 dB L_{Aeq} within the workshop. To provide a reasonable worst case scenario, noise levels within the workshop have been modelled on the basis of an internal noise level of 75 dB $L_{Aeq,\ 1\ hour}$.

During the daytime periods, the majority of the doors to the workshop would remain open, to allow vehicles to move in and out, with only the doors to the bodyshop areas likely to remain closed. To provide worst case conditions, it has been assumed the doors would all be open during the day. Overnight, there would be considerably less activity on the site, with only a small number of vehicles being serviced and it has been assumed one door would remain open overnight.

Externally, the main sources of noise would be attributable to the vehicle movements. The calculations have assumed 12 vehicles entering / leaving the site for servicing / general workshop use during the daytime period, with a further 2 vehicles per hour using the site for MOTs. Overnight, 1 vehicle into and out of the site has been assumed over a 15 minute period, reflecting a vehicle being brought in for servicing and a second being returned to a customer during this period. A number of the vehicles using the site would be fitted with reversing signals, which may be audible at the neighbouring properties. To ensure any potential disturbance associated with their use was minimised, these would be switched off overnight, during periods when it was safe to do so and as number of staff working on site would be lower.

The source term noise levels used within the calculations are presented below.

Activity	Source Noise Level [dB]	
	Noise Level	Equivalent Sound Power Level (dB(A) SWL)
Noise level within workshop	75 dB $L_{Aeq,T}$	-
Vehicle movements	72.6 dB L_{Aeq} / 81.6 dB $L_{Amax,F}$ @10 metres	104.9
Vehicle wash, full wash cycle	64.0 dB $L_{Aeq,T}$ @10 metres	94.0

Table 5.1 Source Term Noise Levels

The results of the modelling are provided in Appendix C and presented graphically on Figure 3 for the daytime period and figure 4 for the night-time period.

5.2. Assessment

During the daytime period, the calculations indicate noise levels of 39 - 41 dB $L_{Aeq,1\ hour}$, at ground and first floor facades of the closest properties, associated with the general daytime operations.

Overnight, the calculations indicate noise levels of 34 dB $L_{Aeq,\ 15\ min}$ at the first floor façade of the closest properties.

The character of the noise attributable to the operation of the workshop would be predominantly attributable to vehicle engine noise, which would be of a similar character to the general road traffic in the surrounding area and thus not considered characteristic in nature. The operation of tools within the workshop, particularly during the daytime periods may be just audible at times at the properties during the periods when the workshop doors were open and potentially characteristic in nature. On this basis, it has been considered appropriate to apply a 3 dB(A) correction when deriving the rating level during the daytime period. To provide a worst case assumption, the same correction has been applied when assessing noise from the night-time operations.

An initial BS 4142 assessment has been made against the prevailing background noise levels, which is presented in the table below.

	Assessment Period	
	Daytime	Night-time
Specific Noise Level	41	34
Acoustic Feature Correction	3	3
Rating Level	44	37
Background Noise Level [dB L_{A90}]	53	42
Excess of Rating Over Background Level	-9	-5
Likelihood of Impact	Indication of Low Impact	Indication of Low Impact

Table 5.2 BS 4142 Assessment – 51 & 53 Bedford Road

The initial assessment of daytime noise levels at 51 & 53 Bedford Road indicates that the rating level of noise would remain at least 5 dB(A) below the prevailing background noise levels, indicating the low potential for an adverse noise impact.

Furthermore, the noise levels attributable to the operation of the site would be over 15 dB(A) below the measured daytime ambient (L_{Aeq}) noise levels, which would indicate that the activities would not be generally audible at the neighbouring properties during the daytime periods.

Overnight, the assessment indicates a rating level 5 dB(A) below the prevailing background noise levels, again indicating a low potential for an adverse impact at the properties. BS 4142 advises that it is often more important to consider the absolute levels of noise rather than the difference between the background noise levels. The calculations indicate a level of 34 dB $L_{Aeq,15\ min}$ at the properties, which would remain in excess of 10 dB(A) below the prevailing ambient noise levels, which are principally attributable to traffic travelling along the A421 and A1 overnight. On this basis, the operational noise would not be generally audible at the properties and would have no effect on the ambient noise levels.

Consideration has also been given to the WHO night-noise guidance. The noise levels attributable to the night-time operations would remain 6 dB(A) below a level which is considered to represent the Lowest Observed Adverse Effects Level (LOAEL) and thus a further positive indication that the night-time operation of the site would not result in any adverse impacts.

The above assessment indicates that the operation of the proposed workshop and vehicle storage would not result in adverse noise impacts at the neighbouring properties, during the day or night-time periods, with noise levels remaining below the prevailing background noise. The proposed operation would therefore fully comply with the requirements of the NPPF in ensuring that there were no significant adverse impacts.

6. Summary

LF Acoustics Ltd were appointed by [redacted] to undertake a noise assessment in support of a planning application for a new workshop and vehicle storage facility on land to the north of 51 and 53 Bedford Road, Roxton.

A noise monitoring exercise has been carried out to determine the existing noise levels at the surrounding properties and to identify the main influences on the current noise environment upon which to base the assessment.

This report has presented an updated assessment of the noise levels attributable to the operation of the new workshop and vehicle storage facilities. Revisions to the layout of the site have been to address concerns of officers at Bedford Borough Council. The changes to include a reduction in the size of the workshop and a reduction in the HGV parking within the western area of the site, with the proposed operational areas now located further from the neighbouring residential properties.

Calculations of the noise levels attributable to the operation of the proposed workshop and vehicle movements have been undertaken, based upon measurements obtained at an existing [redacted] workshop, which indicated low levels of noise at the neighbouring properties, attributable to the proposed day and night-time operations.

An assessment has been made against the requirements of BS 4142, which indicated a low potential for adverse impacts and would ensure that the occupants of the neighbouring properties were not exposed to any adverse noise impacts. Noise levels would therefore be acceptable and achieve the requirements of the NPPF.

References

1. Ministry of Housing, Communities and Local Government. National Planning Policy Framework. July 2021.

2. Department for Communities and Local Government. Noise Policy Statement for England. 2010.

3. British Standards Institute. Methods for Rating and Assessing Industrial and Commercial Sound. BS 4142:2014 + A1:2019.

4. British Standards Institute. Guidance on Sound Insulation and Noise Reduction in Buildings. BS 8233: 2014.

5. World Health Organisation. Guidelines for Community Noise. 1999. WHO Geneva.

6. World Health Organisation. Night Noise Guidelines for Europe. 2009.

Figures

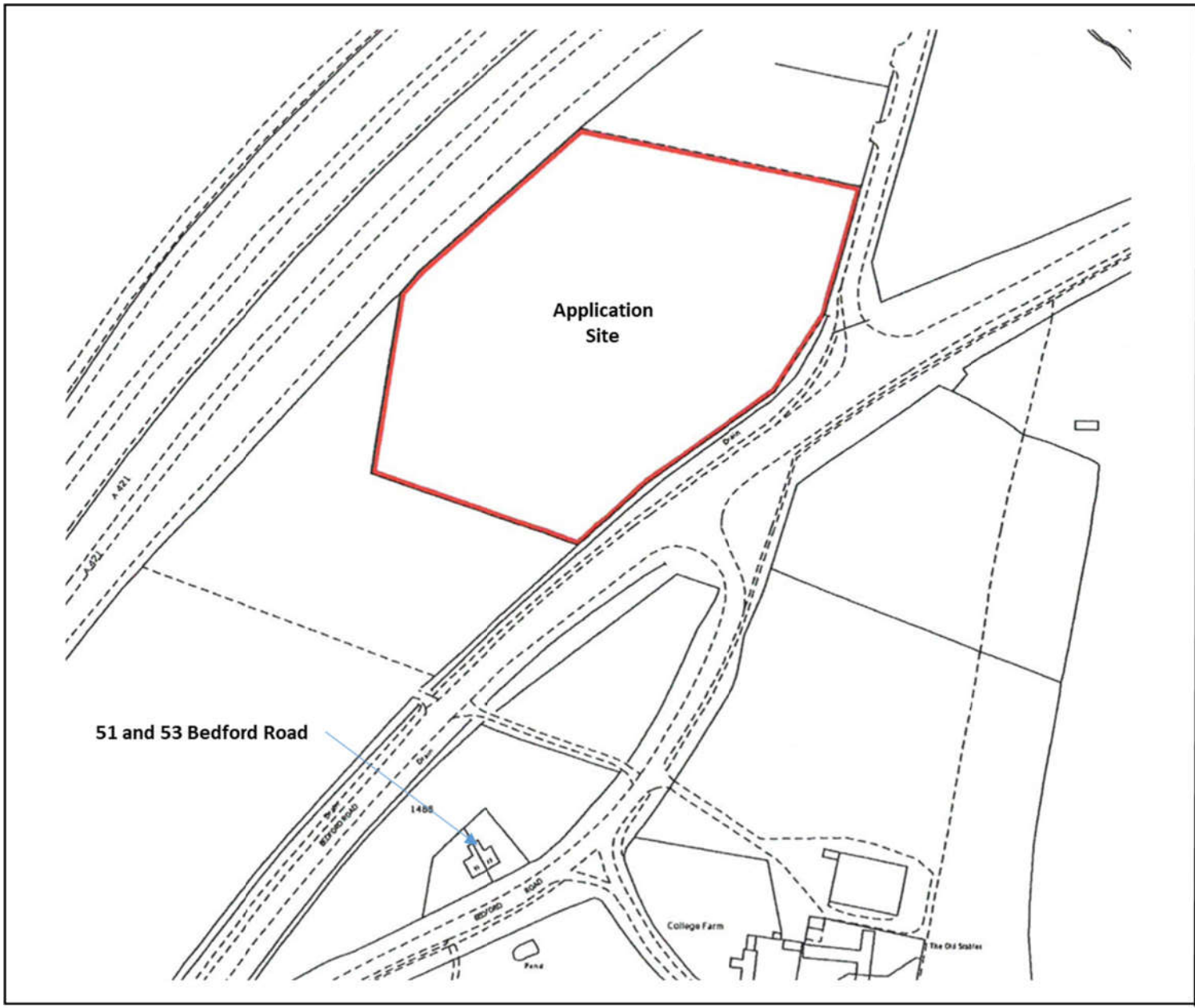

Figure 1:
Site Location

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SITE AREA

4.32 acres (17,496m2)

PROPOSED VMU GROSS EXTERNAL FLOOR AREA & PARKING ALLOCATION

985m2 (10,600sq ft approx) 31 parking spaces

Parking allocation based on Bedford Borough Council Parking Standards for Non-Residential B2 use class as noted below.

B2 General Industry
1 space per 30m2 below 500m2 plus 1 space per 100m2 above 500m2

Minimum Parking Calculation:
Total Office Floor Area: 372m2 / 30 = 13 Spaces
Total Workshop Area: 728m2 / 100 = 8 Spaces

Minimum Spaces Required = 21 Spaces

Figure 2:
Proposed Site Layout

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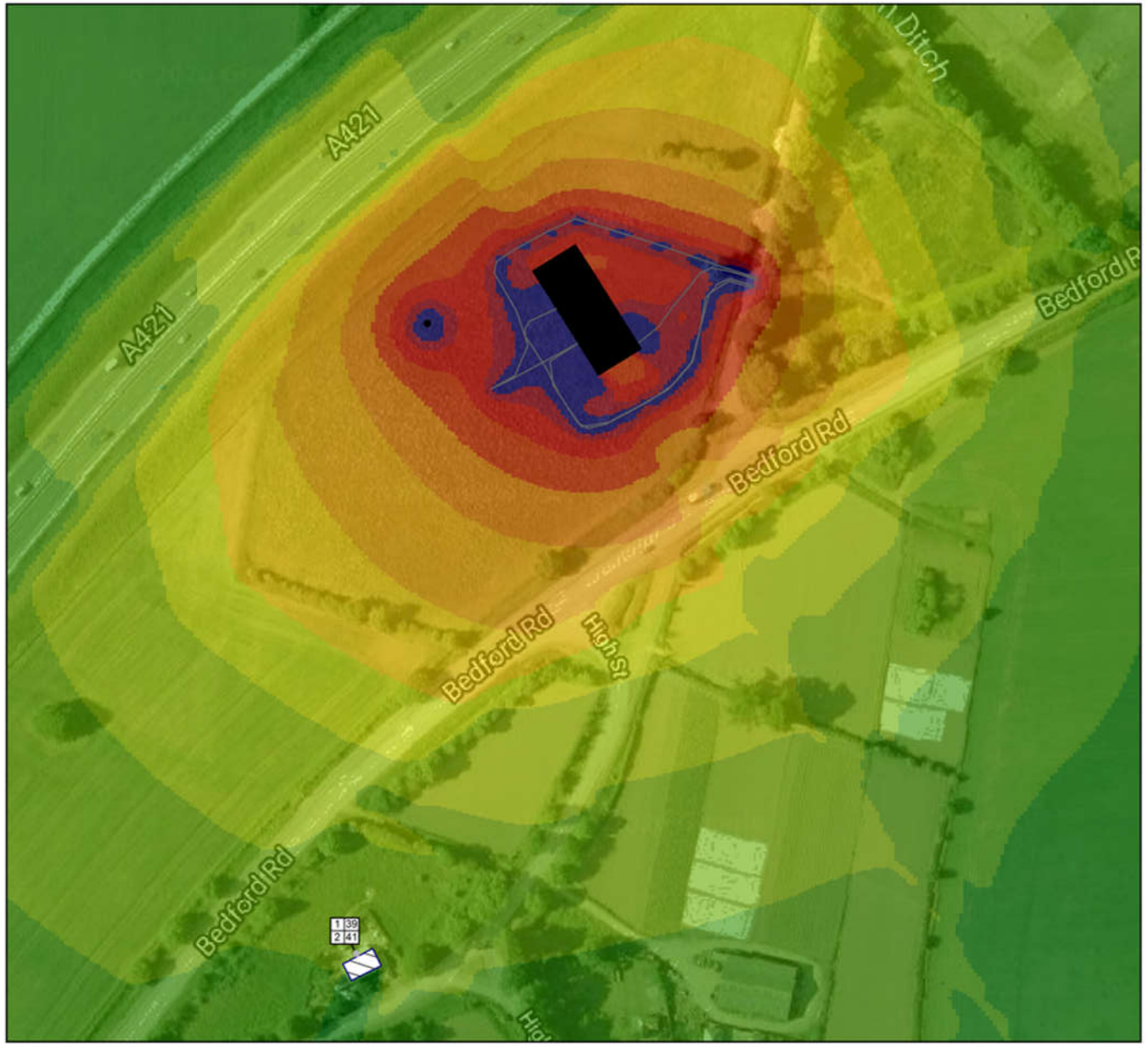

Noise Level LAeq,T
in dB(A)

<	35
35	38
38	41
41	44
44	47
47	50
50	53
53	56
56	59
59	62
62	65
>=	65

1	32
2	33

Floor
Facade $L_{Aeq,T}$

Note:
Contours Calculated for Ground Floor (1.5 metres) Worst Case

Figure 3:
Calculated Noise Levels
Daytime

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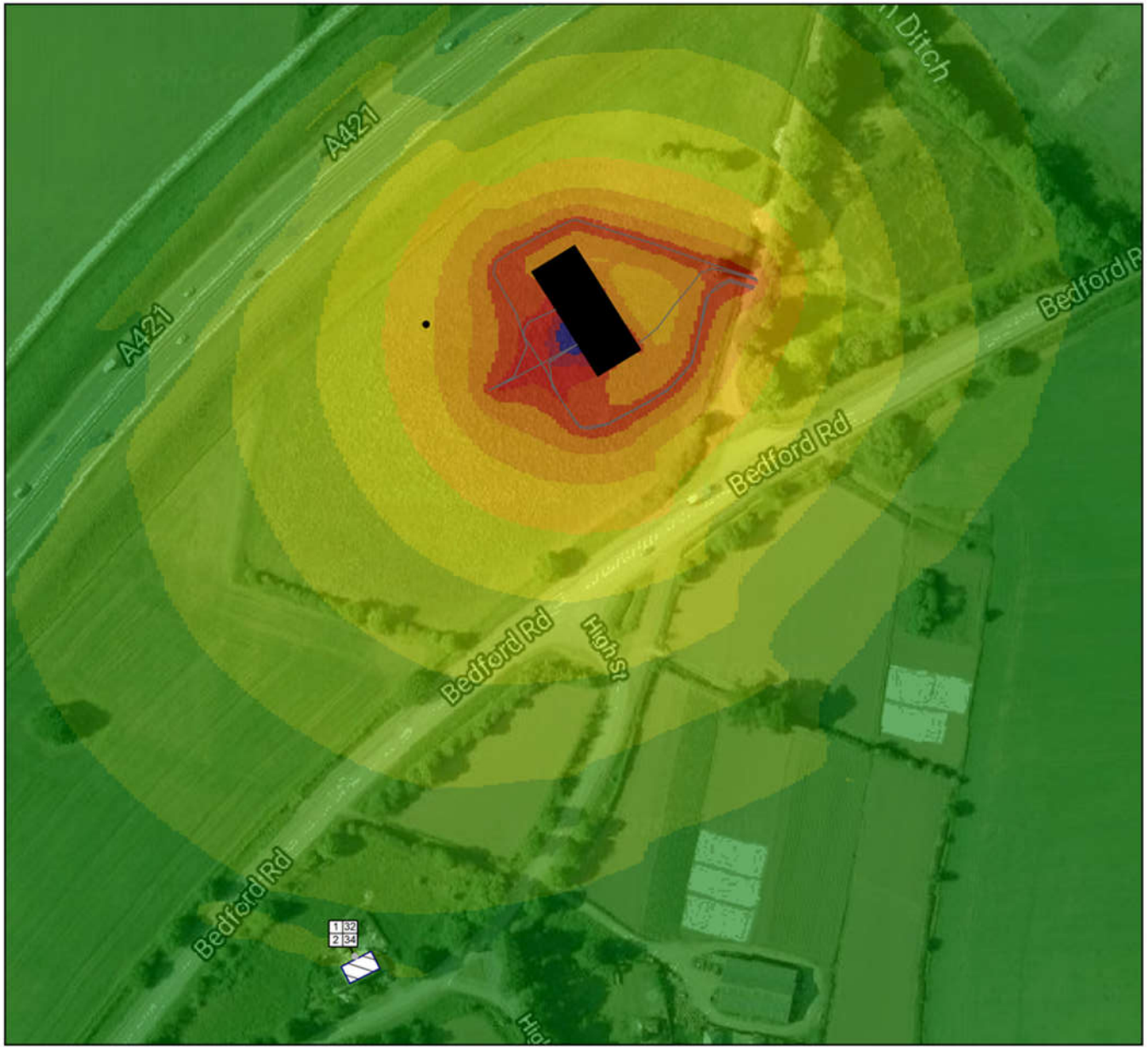

Noise Level LAeq,T
in dB(A)

<	35
35 -	38
38 -	41
41 -	44
44 -	47
47 -	50
50 -	53
53 -	56
56 -	59
59 -	62
62 -	65
>=	65

1	32
2	33

Floor — Facade $L_{Aeq,T}$

Note:
Contours Calculated for First Floor (4 metres)

Figure 4:
Calculated Noise Levels
Night-time

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Appendix A
Noise Units

Decibels (dB)

Noise can be defined as unwanted sound. Sound in air can be considered as the propagation of energy through the air in the form of oscillatory changes in pressure. The size of the pressure changes in acoustic waves is quantified on a logarithmic decibel (dB) scale firstly because the range of audible sound pressures is very great, and secondly because the loudness function of the human auditory system is approximately logarithmic.

The dynamic range of the auditory system is generally taken to be 0 dB to 140 dB. Generally, the addition of noise from two sources producing the same sound pressure level, will lead to an increase in sound pressure level of 3 dB. A 3 dB noise change is generally considered to be just noticeable, a 5 dB change is generally considered to be clearly discernible and a 10 dB change is generally accepted as leading to the subjective impression of a doubling or halving of loudness.

A-Weighting

The bandwidth of the frequency response of the ear is usually taken to be from about 18 Hz to 18,000 Hz. The auditory system is not equally sensitive throughout this frequency range. This is taken into account when making acoustic measurements by the use of A-weighting, a filter circuit which has a frequency response similar to the human auditory system. All the measurement results referred to in this report are A-weighted.

Units Used to Describe Time-Varying Noise Sources (L_{Aeq}, L_{A90} and L_{Amax})

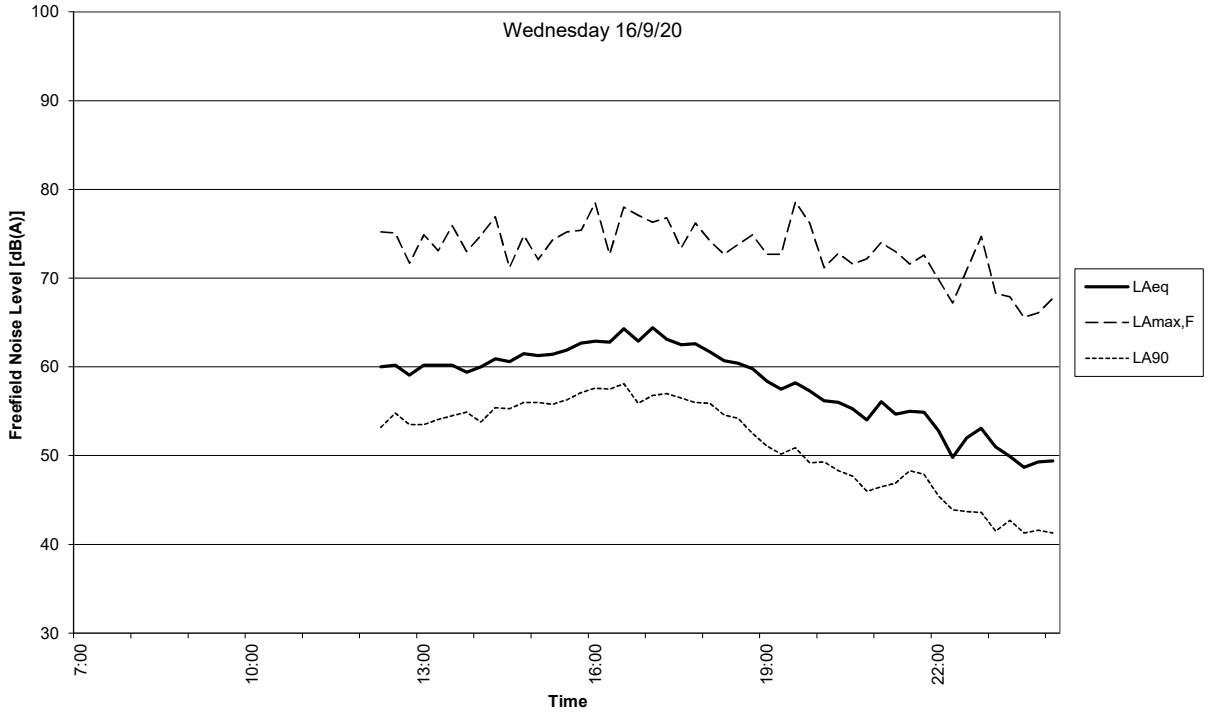
Instantaneous A-weighted sound pressure level is not generally considered as an adequate indicator of subjective response to noise because levels of noise usually vary with time.

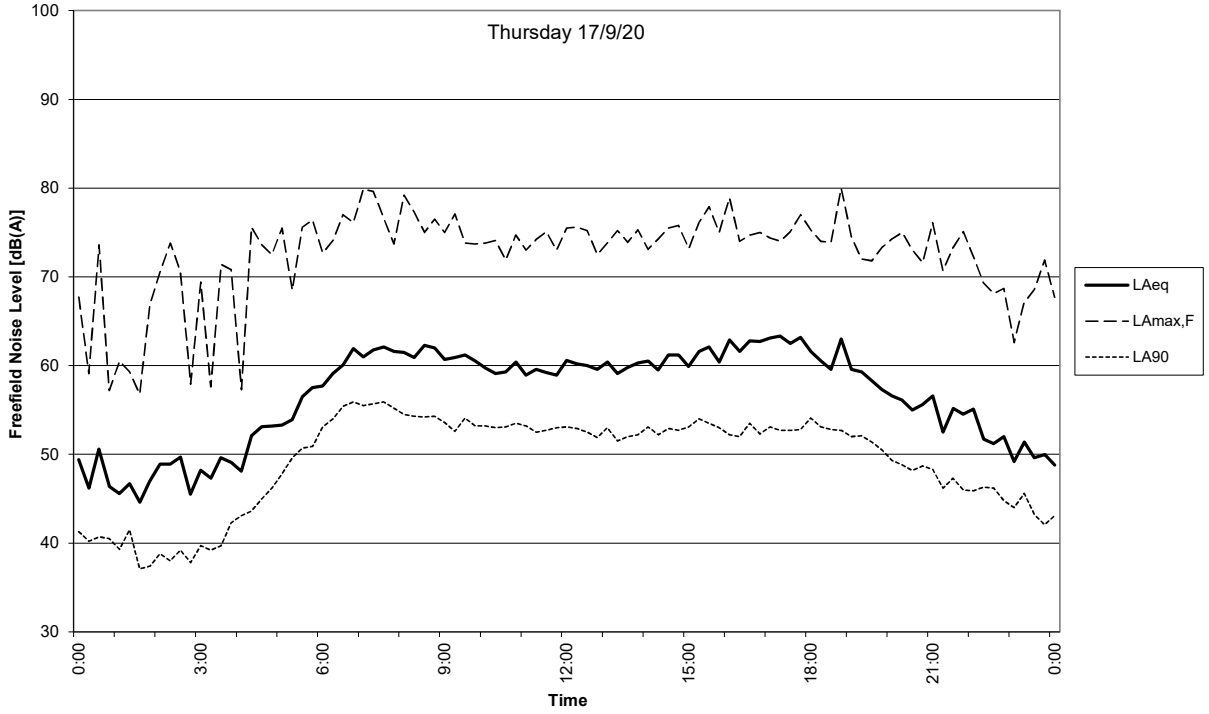
For many types of noise the Equivalent Continuous A-Weighted Sound Pressure Level ($L_{Aeq,T}$) is used as the basis of determining community response. The $L_{Aeq,T}$ is defined as the A-weighted sound pressure level of the steady sound which contains the same acoustic energy as the noise being assessed over a specific time period, T.

The L_{A90} is the noise level exceeded for 90% of the measurement period. It is generally used to quantify the background noise level, the underlying level of noise which is present even during the quietest part of the measurement period.

The L_{Amax} is the maximum value that the A-weighted sound pressure level reaches during a measurement period. $L_{Amax,F}$, or Fast, is averaged over 0.125 of a second.

Appendix B
Results and Analysis of Unattended Noise Survey


Wednesday 16/9/20
Freefield Noise Level [dB(A)]
100
90
80
70
60
50
40
30
7:00
10:00
13:00
16:00
19:00
22:00
Time
LAeq
LAmax,F
LA90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Freefield Noise Level [dB(A)]
100
90
80
70
60
50
40
30
0:00
3:00
6:00
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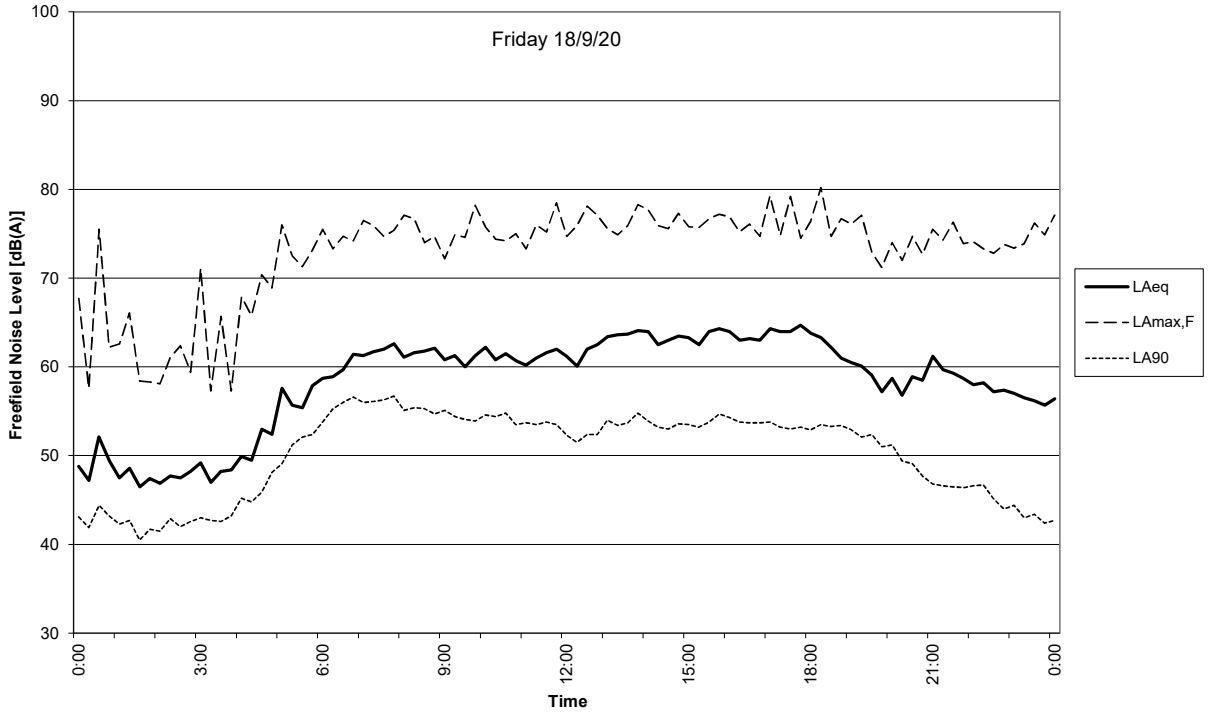
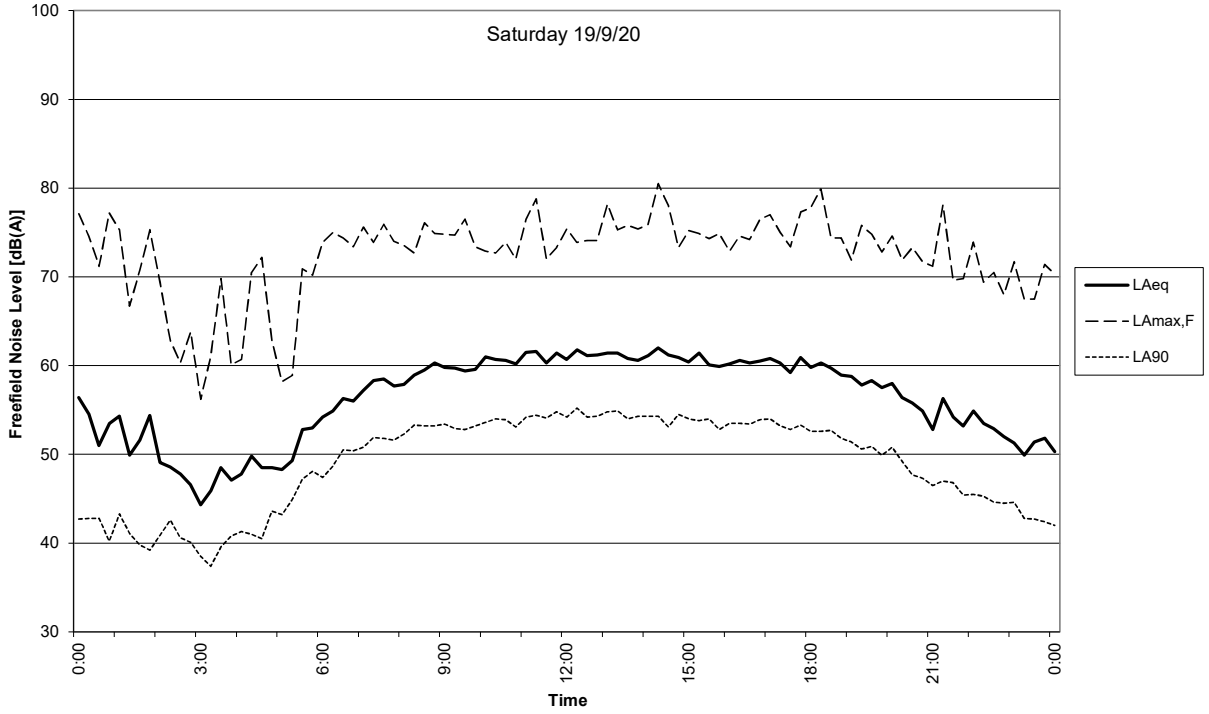
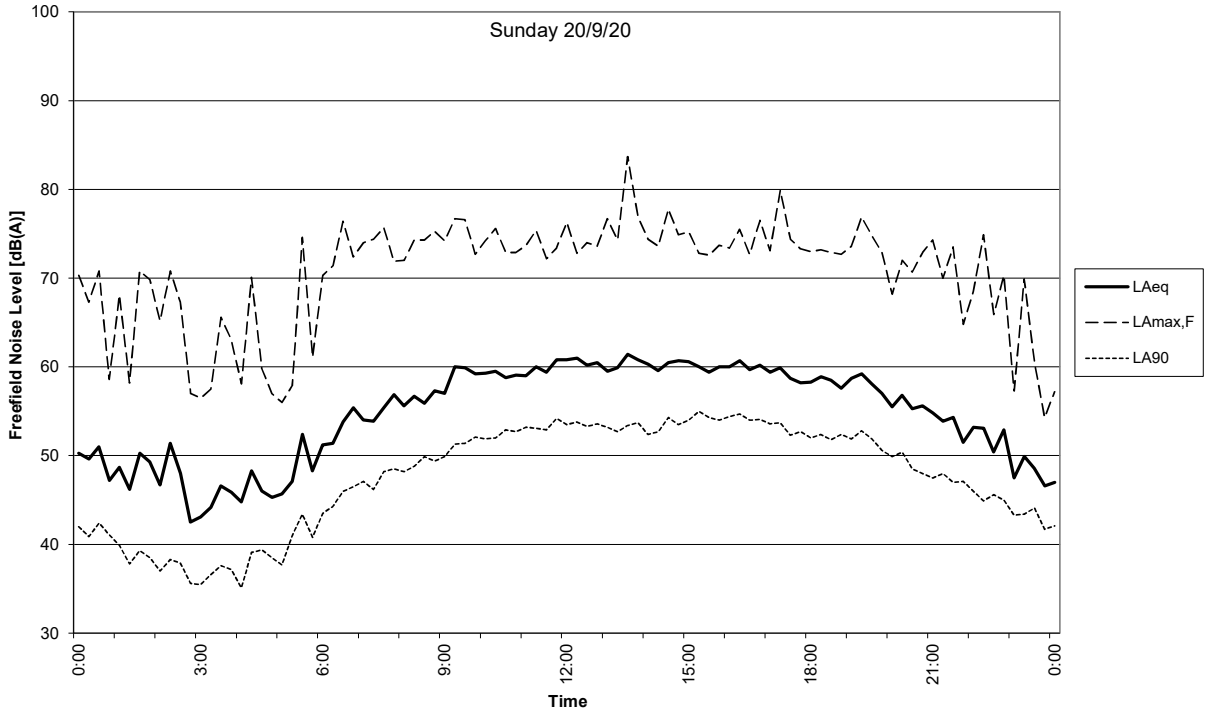
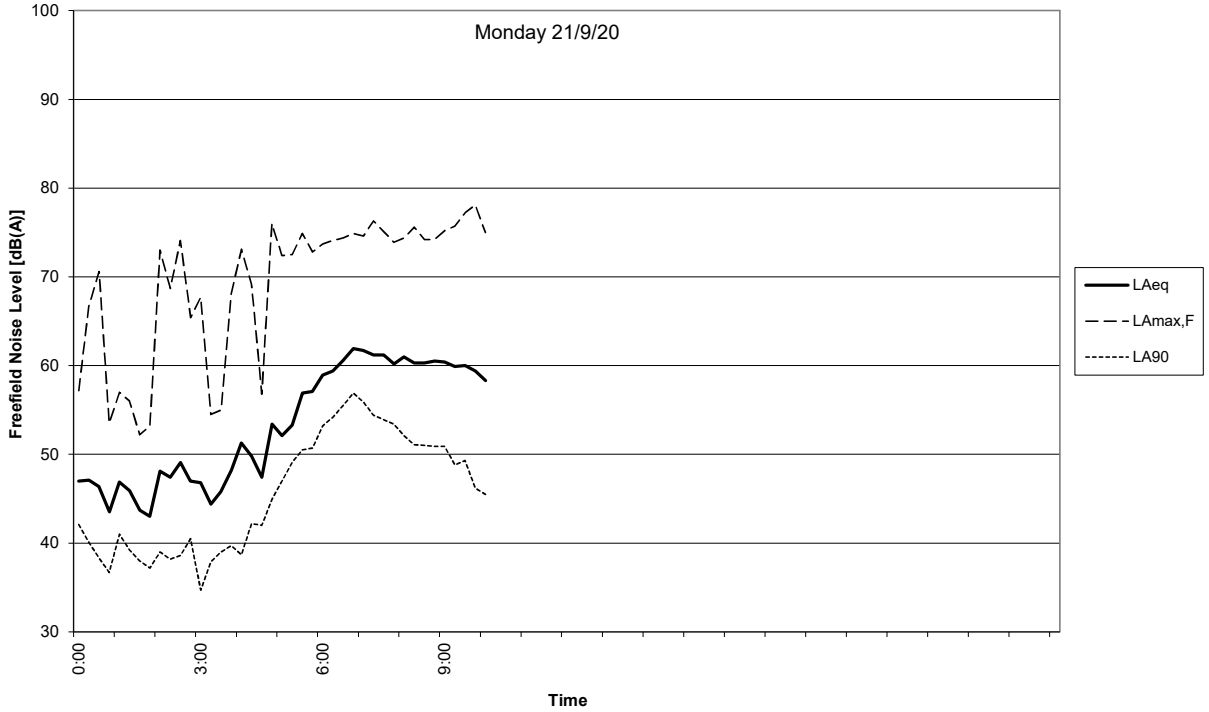
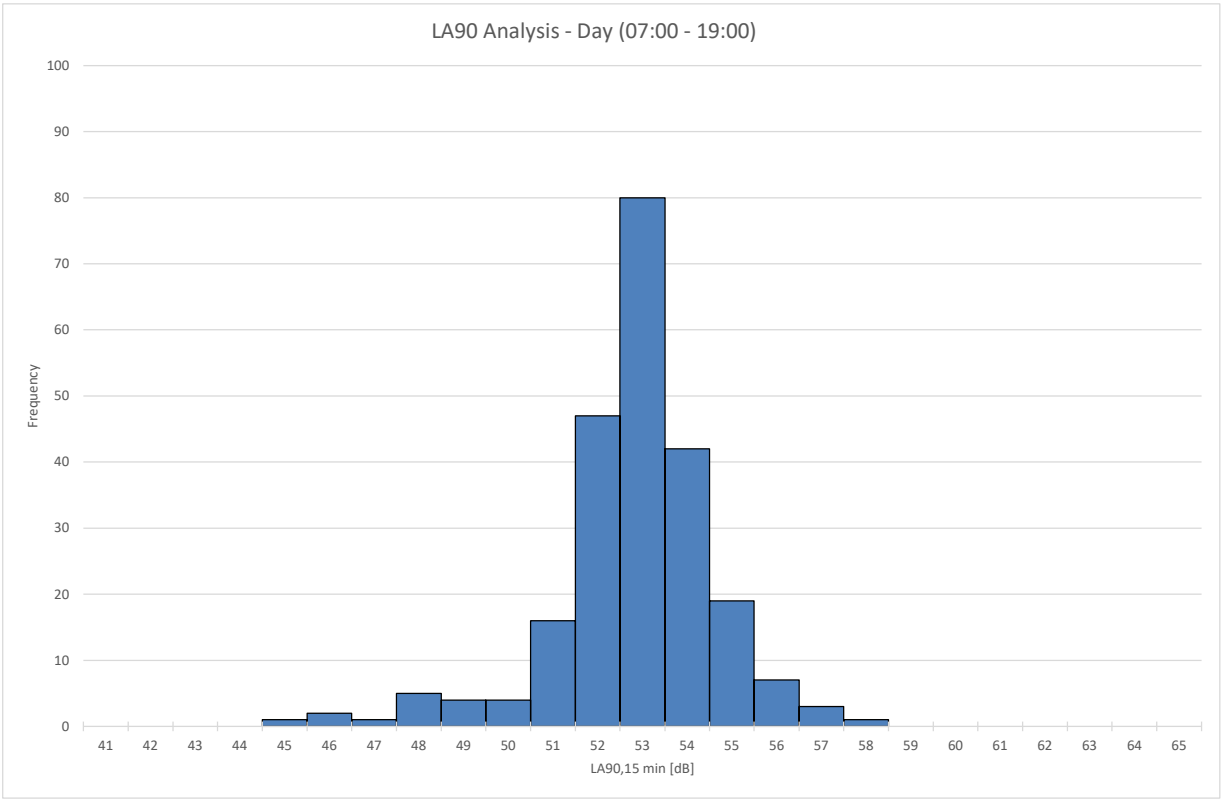
Time
LAeq
LAmax,F
LA90

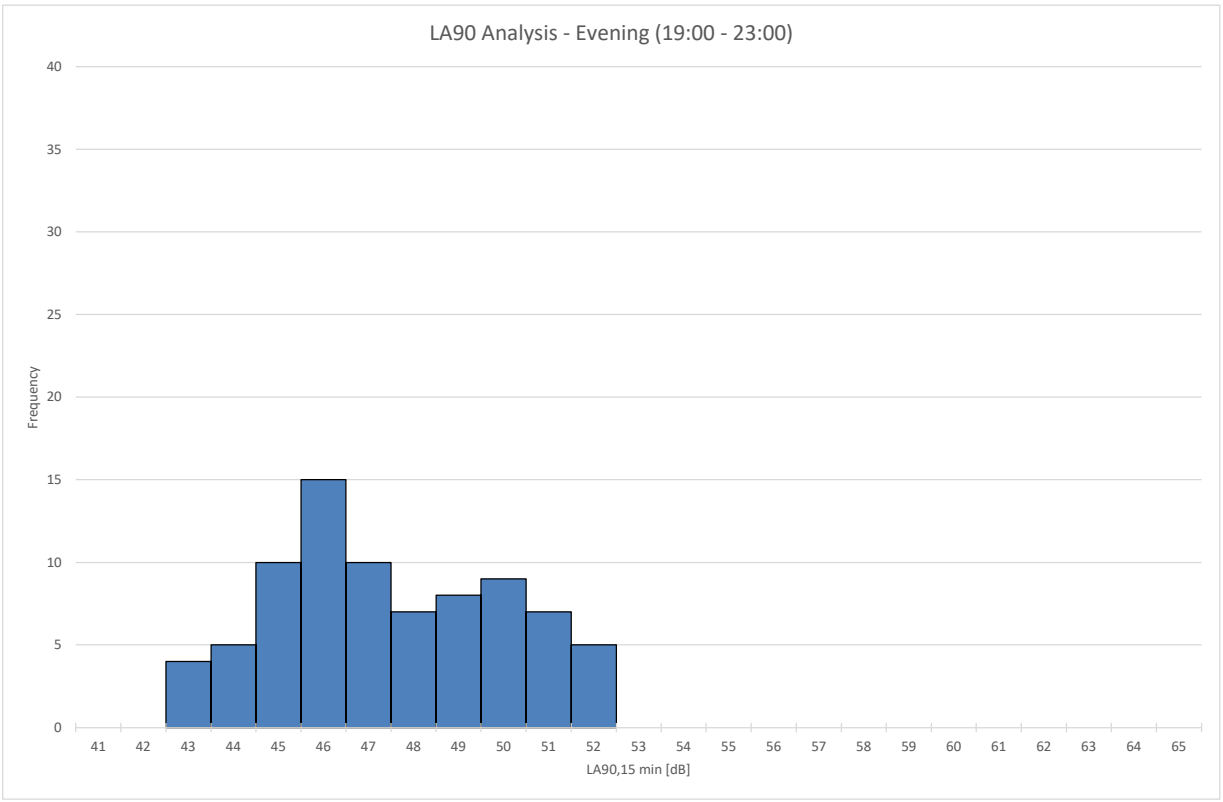

Friday 18/9/20
Freefield Noise Level [dB(A)]
100
90
80
70
60
50
40
30
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90

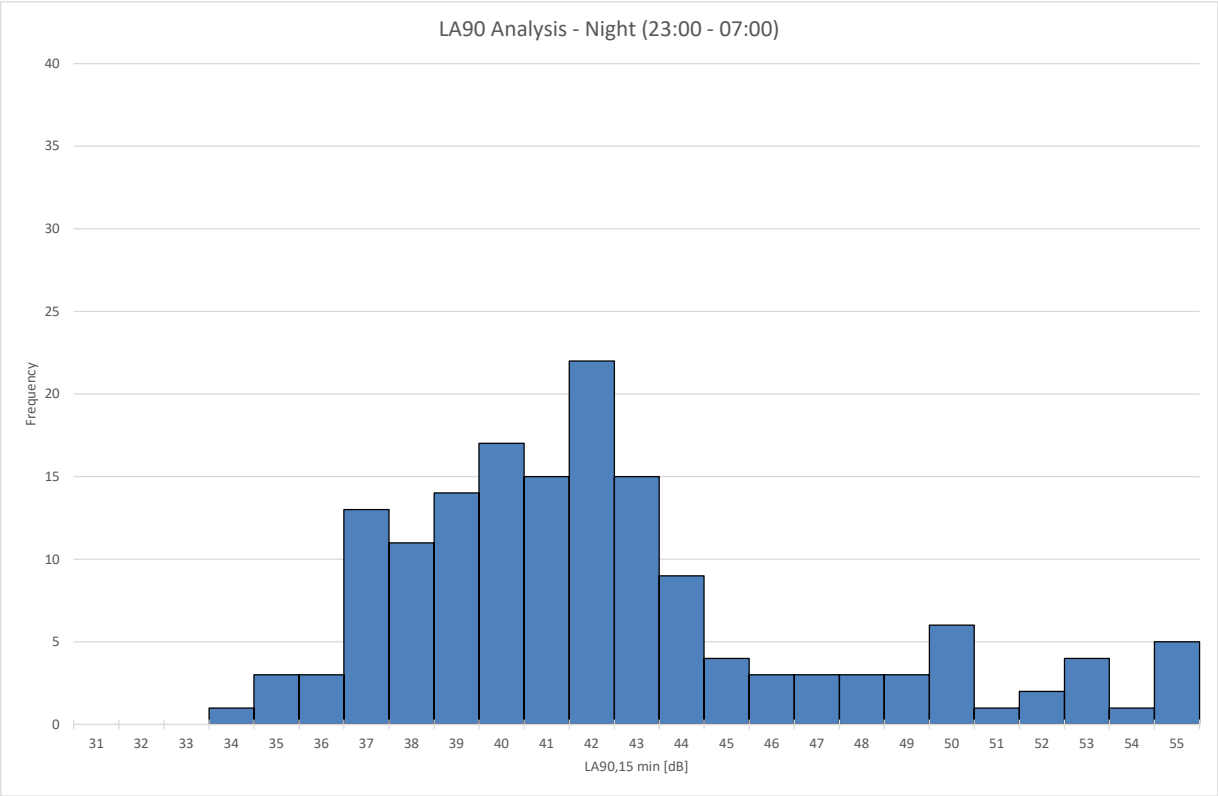

Saturday 19/9/20
Freefield Noise Level [dB(A)]
100
90
80
70
60
50
40
30
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90


Sunday 20/9/20
Freefield Noise Level [dB(A)]
100
90
80
70
60
50
40
30
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90


Monday 21/9/20
Freefield Noise Level [dB(A)]
100
90
80
70
60
50
40
30
0:00
3:00
6:00
9:00
Time
LAeq
LAmax,F
LA90


LA90 Analysis - Day (07:00 - 19:00)
Frequency
100
90
80
70
60
50
40
30
20
10
0
41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65
LA90,15 min [dB]


LA90 Analysis - Evening (19:00 - 23:00)
Frequency
40
35
30
25
20
15
10
5
0
41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65
LA90,15 min [dB]

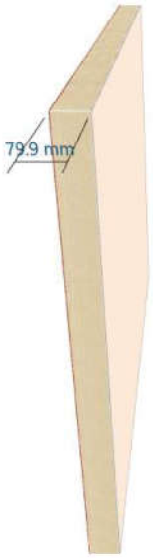

LA90 Analysis - Night (23:00 - 07:00)
Frequency
40
35
30
25
20
15
10
5
0
31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55
LA90,15 min [dB]

Appendix C
Calculation Results

Sound Insulation Prediction (v9.0.22)

Program copyright Marshall Day Acoustics 2017
Margin of error is generally within Rw ±3 dB
LF Acoustics Ltd - Key No. 1503
Job Name:
Job No.: Initials:les_kgn57p6
Date:28/09/2020
File Name:

Notes:



Rw 24 dB
C -2 dB
Ctr -3 dB

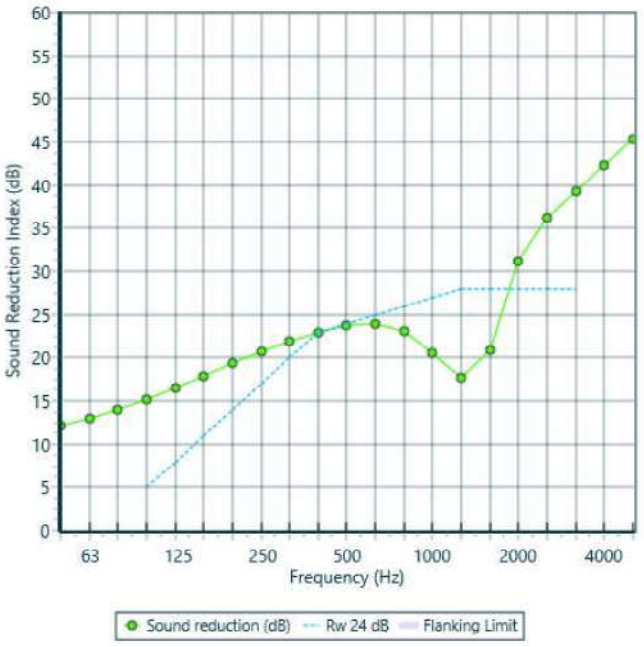
Panel Size = 2.7 m x 4.0 m

Partition surface mass = 11 kg/m²

System description

Panel 1 : 1 x 79.9 mm Kingspan KS1000 RW 80/100/120mm

freq.(Hz)	R(dB)	R(dB)
50	12	
63	13	13
80	14	
100	15	
125	17	16
160	18	
200	19	
250	21	21
315	22	
400	23	
500	24	24
630	24	
800	23	
1000	21	20
1250	18	
1600	21	
2000	31	25
2500	36	
3150	39	
4000	42	42
5000	45	



Legend

Source		Source name
Source type		Type of source (point, line, area)
Time slice		Name of time slice
L'w	dB(A)	Sound power level per m, m²
Lw	dB(A)	Sound power level per unit
l or A	m,m²	Size of source (length or area)
S	m	Distance source - receiver
Adiv	dB	Mean attenuation due to geometrical spreading
Agr	dB	Mean attenuation due to ground effect
Abar	dB	Mean attenuation due to screening
Aatm	dB	Mean attenuation due to air absorption
dLrefl	dB	Level increase due to reflections
Ls	dB(A)	Unassessed sound pressure level at receiver
Ls=Lw+Ko+ADI+Adiv+Agr+Abar+Aatm+Afol_site_house+Awind+dLrefl		
dLw	dB	Correction due to source operation time
Lr	dB(A)	Assessed level of time slice

Brian Currie Roxton
Mean propagation Leq - Daytime

Source	Source type	Time slice	L'w	Lw	l or A	S	Adiv	Agr	Abar	Aatm	dLrefl	Ls	dLw	Lr
			dB(A)	dB(A)	m,m²	m	dB	dB	dB	dB	dB(A)	dB(A)	dB	dB(A)
Receiver High Street Fl GF Lday,lim dB(A) LAeq,Typ 38.9 dB(A)														
General Vehicle Movements	Line	LAeq,Typ	59.1	84.5	344.6	259.65	-59.3	1.9	-2.9	-2.4	1.0	22.8	10.8	33.6
Workshop -Door	Area	LAeq,Typ	71.7	85.6	24.6	244.87	-58.8	1.7	-0.7	-2.5	0.0	28.3	0.0	28.3
Workshop -Door	Area	LAeq,Typ	71.7	85.7	25.0	247.89	-58.9	1.7	-0.7	-2.6	0.0	28.3	0.0	28.3
Workshop -Door	Area	LAeq,Typ	71.7	85.7	25.0	250.98	-59.0	1.7	-0.7	-2.6	0.0	28.2	0.0	28.2
Jet Wash	Point	LAeq,Typ	92.0	92.0		245.46	-58.8	-4.6	0.0	-0.5	0.0	31.2	-3.0	28.2
Workshop -Door	Area	LAeq,Typ	71.7	85.7	25.0	254.16	-59.1	1.8	-0.6	-2.6	0.0	28.1	0.0	28.1
Workshop -Door	Area	LAeq,Typ	71.7	85.7	25.0	257.42	-59.2	1.8	-0.6	-2.6	0.0	28.0	0.0	28.0
Workshop -Door	Area	LAeq,Typ	71.7	85.7	25.0	260.73	-59.3	1.8	-0.6	-2.7	0.0	28.0	0.0	28.0
Workshop -Door	Area	LAeq,Typ	71.7	85.7	25.0	264.14	-59.4	1.9	-0.6	-2.7	0.0	27.8	0.0	27.8
MOT In	Line	LAeq,Typ	59.1	81.1	158.5	250.62	-59.0	1.8	-2.4	-2.4	0.9	20.0	3.0	23.0
MOT Movement Out	Line	LAeq,Typ	59.1	76.9	60.0	285.12	-60.1	2.0	-1.8	-2.5	0.0	14.6	3.0	17.6
Workshop -S Facade	Area	LAeq,Typ	48.7	69.7	125.2	250.69	-59.0	1.4	-0.2	-1.3	0.0	13.6	0.0	13.6
Workshop -Roof 02	Area	LAeq,Typ	48.7	74.3	362.3	257.91	-59.2	0.6	-2.2	-1.3	0.0	12.1	0.0	12.1
Workshop -Door	Area	LAeq,Typ	71.7	85.8	25.6	260.61	-59.3	1.8	-18.8	-1.5	0.0	10.9	0.0	10.9
Workshop -Roof 01	Area	LAeq,Typ	48.7	74.3	362.3	265.40	-59.5	0.6	-4.9	-1.2	0.0	9.3	0.0	9.3
Workshop -SW Facade	Area	LAeq,Typ	48.7	65.7	50.1	253.91	-59.1	1.1	-0.6	-1.3	0.0	8.9	0.0	8.9
Workshop -Door	Area	LAeq,Typ	71.7	85.8	25.6	263.67	-59.4	1.8	-21.3	-1.7	0.0	8.2	0.0	8.2
Workshop -NE Facade	Area	LAeq,Typ	48.7	71.1	173.2	271.53	-59.7	1.7	-18.3	-0.8	0.0	-3.0	0.0	-3.0
Receiver High Street Fl F 1 Lday,lim dB(A) LAeq,Typ 40.9 dB(A)														
General Vehicle Movements	Line	LAeq,Typ	59.1	84.5	344.6	259.70	-59.3	2.6	-0.9	-1.7	1.0	26.1	10.8	36.9
Workshop -Door	Area	LAeq,Typ	71.7	85.6	24.6	244.91	-58.8	2.0	-0.1	-2.2	0.0	29.6	0.0	29.6
Workshop -Door	Area	LAeq,Typ	71.7	85.7	25.0	247.92	-58.9	2.1	-0.1	-2.2	0.0	29.6	0.0	29.6
Workshop -Door	Area	LAeq,Typ	71.7	85.7	25.0	251.01	-59.0	2.1	-0.1	-2.2	0.0	29.5	0.0	29.5
Workshop -Door	Area	LAeq,Typ	71.7	85.7	25.0	254.20	-59.1	2.1	-0.1	-2.2	0.0	29.4	0.0	29.4
Workshop -Door	Area	LAeq,Typ	71.7	85.7	25.0	257.45	-59.2	2.1	-0.1	-2.3	0.0	29.3	0.0	29.3
Workshop -Door	Area	LAeq,Typ	71.7	85.7	25.0	260.77	-59.3	2.1	0.0	-2.3	0.0	29.2	0.0	29.2
Workshop -Door	Area	LAeq,Typ	71.7	85.7	25.0	264.17	-59.4	2.2	0.0	-2.3	0.0	29.1	0.0	29.1
Jet Wash	Point	LAeq,Typ	92.0	92.0		245.51	-58.8	-4.4	0.0	-0.5	0.0	31.4	-3.0	28.4
MOT In	Line	LAeq,Typ	59.1	81.1	158.5	250.67	-59.0	2.5	-0.5	-1.7	0.9	23.3	3.0	26.3
MOT Movement Out	Line	LAeq,Typ	59.1	76.9	60.0	285.16	-60.1	2.7	-0.5	-1.8	0.0	17.2	3.0	20.2
Workshop -S Facade	Area	LAeq,Typ	48.7	69.7	125.2	250.72	-59.0	1.7	-0.1	-1.2	0.0	14.1	0.0	14.1
Workshop -Roof 02	Area	LAeq,Typ	48.7	74.3	362.3	257.90	-59.2	1.1	-1.6	-1.3	0.0	13.2	0.0	13.2
Workshop -Door	Area	LAeq,Typ	71.7	85.8	25.6	260.64	-59.3	2.1	-18.5	-1.4	0.0	11.7	0.0	11.7
Workshop -SW Facade	Area	LAeq,Typ	48.7	65.7	50.1	253.93	-59.1	1.6	-0.1	-1.2	0.0	9.9	0.0	9.9
Workshop -Roof 01	Area	LAeq,Typ	48.7	74.3	362.3	265.38	-59.5	1.1	-5.0	-1.2	0.0	9.8	0.0	9.8
Workshop -Door	Area	LAeq,Typ	71.7	85.8	25.6	263.70	-59.4	2.2	-21.1	-1.5	0.0	8.9	0.0	8.9
Workshop -NE Facade	Area	LAeq,Typ	48.7	71.1	173.2	271.55	-59.7	2.1	-18.4	-0.8	0.0	-2.7	0.0	-2.7

Brian Currie Roxton
Mean propagation Leq - Night

Source	Source type	Time slice	L'w dB(A)	Lw dB(A)	l or A m,m²	S m	Adiv dB	Agr dB	Abar dB	Aatm dB	dLrefl dB(A)	Ls dB(A)	dLw dB	Lr dB(A)
Receiver High Street Fl GF	Ln,lim dB(A)	LAeq,15min 31.8 dB(A)												
General Vehicle Movements	Line	LAeq,15min	59.1	84.5	344.8	259.64	-59.3	1.9	-2.9	-2.4	1.0	22.8	6.0	28.8
Workshop -Door	Area	LAeq,15min	71.7	85.7	25.0	254.16	-59.1	1.8	-0.6	-2.6	0.0	28.1	0.0	28.1
Workshop -S Facade	Area	LAeq,15min	48.7	69.7	125.2	250.69	-59.0	1.4	-0.2	-1.3	0.0	13.6	0.0	13.6
Workshop -Roof 02	Area	LAeq,15min	48.7	74.3	362.3	257.91	-59.2	0.6	-2.2	-1.3	0.0	12.1	0.0	12.1
Workshop -Roof 01	Area	LAeq,15min	48.7	74.3	362.3	265.40	-59.5	0.6	-4.9	-1.2	0.0	9.3	0.0	9.3
Workshop -SW Facade	Area	LAeq,15min	48.7	65.7	50.1	253.91	-59.1	1.1	-0.6	-1.3	0.0	8.9	0.0	8.9
Workshop -Door	Area	LAeq,15min	52.0	65.9	24.6	244.87	-58.8	1.7	-0.7	-2.9	0.0	8.3	0.0	8.3
Workshop -Door	Area	LAeq,15min	52.0	66.0	25.0	247.89	-58.9	1.7	-0.6	-2.9	0.0	8.3	0.0	8.3
Workshop -Door	Area	LAeq,15min	52.0	66.0	25.0	250.98	-59.0	1.8	-0.6	-3.0	0.0	8.2	0.0	8.2
Workshop -Door	Area	LAeq,15min	52.0	66.0	25.0	257.42	-59.2	1.8	-0.6	-3.0	0.0	8.0	0.0	8.0
Workshop -Door	Area	LAeq,15min	52.0	66.0	25.0	260.73	-59.3	1.9	-0.5	-3.0	0.0	8.0	0.0	8.0
Workshop -Door	Area	LAeq,15min	52.0	66.0	25.0	264.14	-59.4	1.9	-0.6	-3.1	0.0	7.8	0.0	7.8
Workshop -NE Facade	Area	LAeq,15min	48.7	71.1	173.3	271.53	-59.7	1.7	-18.3	-0.8	0.0	-3.0	0.0	-3.0
Workshop -Door	Area	LAeq,15min	52.0	66.1	25.6	260.61	-59.3	1.8	-19.0	-1.7	0.0	-9.1	0.0	-9.1
Workshop -Door	Area	LAeq,15min	52.0	66.1	25.6	263.61	-59.4	1.9	-21.5	-1.8	0.0	-11.8	0.0	-11.8
Jet Wash	Point	LAeq,15min	92.0	92.0		245.46	-58.8	-4.6	0.0	-0.5	0.0	31.2		
MOT In	Line	LAeq,15min	59.1	81.1	158.5	250.62	-59.0	1.8	-2.4	-2.4	0.9	20.0		
MOT Movement Out	Line	LAeq,15min	59.1	76.9	60.0	285.12	-60.1	2.0	-1.8	-2.5	0.0	14.6		
Receiver High Street Fl F 1	Ln,lim dB(A)	LAeq,15min 34.2 dB(A)												
General Vehicle Movements	Line	LAeq,15min	59.1	84.5	344.8	259.69	-59.3	2.6	-0.9	-1.7	1.0	26.1	6.0	32.2
Workshop -Door	Area	LAeq,15min	71.7	85.7	25.0	254.20	-59.1	2.1	-0.1	-2.2	0.0	29.4	0.0	29.4
Workshop -S Facade	Area	LAeq,15min	48.7	69.7	125.2	250.72	-59.0	1.7	-0.1	-1.2	0.0	14.1	0.0	14.1
Workshop -Roof 02	Area	LAeq,15min	48.7	74.3	362.3	257.90	-59.2	1.1	-1.6	-1.3	0.0	13.2	0.0	13.2
Workshop -SW Facade	Area	LAeq,15min	48.7	65.7	50.1	253.93	-59.1	1.6	-0.1	-1.2	0.0	9.9	0.0	9.9
Workshop -Roof 01	Area	LAeq,15min	48.7	74.3	362.3	265.38	-59.5	1.1	-5.0	-1.2	0.0	9.8	0.0	9.8
Workshop -Door	Area	LAeq,15min	52.0	65.9	24.6	244.91	-58.8	2.0	-0.1	-2.5	0.0	9.6	0.0	9.6
Workshop -Door	Area	LAeq,15min	52.0	66.0	25.0	247.92	-58.9	2.1	-0.1	-2.5	0.0	9.6	0.0	9.6
Workshop -Door	Area	LAeq,15min	52.0	66.0	25.0	251.01	-59.0	2.1	-0.1	-2.5	0.0	9.5	0.0	9.5
Workshop -Door	Area	LAeq,15min	52.0	66.0	25.0	257.45	-59.2	2.1	0.0	-2.6	0.0	9.3	0.0	9.3
Workshop -Door	Area	LAeq,15min	52.0	66.0	25.0	260.77	-59.3	2.2	0.0	-2.6	0.0	9.2	0.0	9.2
Workshop -Door	Area	LAeq,15min	52.0	66.0	25.0	264.17	-59.4	2.2	0.0	-2.6	0.0	9.1	0.0	9.1
Workshop -NE Facade	Area	LAeq,15min	48.7	71.1	173.3	271.56	-59.7	2.1	-18.4	-0.8	0.0	-2.7	0.0	-2.7
Workshop -Door	Area	LAeq,15min	52.0	66.1	25.6	260.64	-59.3	2.1	-18.7	-1.5	0.0	-8.3	0.0	-8.3
Workshop -Door	Area	LAeq,15min	52.0	66.1	25.6	263.64	-59.4	2.2	-21.2	-1.7	0.0	-11.1	0.0	-11.1
Jet Wash	Point	LAeq,15min	92.0	92.0		245.51	-58.8	-4.4	0.0	-0.5	0.0	31.4		
MOT In	Line	LAeq,15min	59.1	81.1	158.5	250.67	-59.0	2.5	-0.5	-1.7	0.9	23.3		
MOT Movement Out	Line	LAeq,15min	59.1	76.9	60.0	285.16	-60.1	2.7	-0.5	-1.8	0.0	17.2		