

Noise impact assessment of a proposed nursery

73 Bushey Hall Road, Bushey WD23 2EN



Client: The Harkalm Group

Report Reference: 210210-R001B

Date: 23rd April 2021

Revision:	Date:	Author:	Checked:
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CONTENTS

0. SUMMARY	2
1. INTRODUCTION	3
2. RELEVANT POLICIES, STANDARDS, & GUIDANCE DOCUMENTS	3
2.1 National Planning Policy Framework and Noise Policy Statement for England	3
2.2 Planning Practice Guidance – Noise	5
2.3 British Standard BS 8233:2014	6
2.4 IEMA Guidelines for Environmental Noise Impact Assessment	7
2.5 BS 4142:2014+A1:2019	9
3. REVIEW OF SITE LOCATION & DEVELOPMENT PROPOSALS	10
4. BACKGROUND SOUND LEVEL SURVEY	12
5. SOUND LEVEL SURVEY AT EXISTING NURSERY PLAY GARDEN	14
6. NOISE IMPACT ASSESSMENT OF PLAY GARDEN	18
7. NOISE FROM MECHANICAL SERVICES PLANT AND EQUIPMENT	21
8. CONCLUSION	22

0. SUMMARY

- 0.1. The client proposes to convert an existing hotel into a new day nursery at 73 Bushey Hall Road, Bushey. ACA Acoustics Limited has been commissioned by The Harkalm Group to assess the acoustic impact on existing noise-sensitive properties from an external play space which will be associated with the new nursery.
- 0.2. A sound level survey was carried out between the 24th and 26th February 2021 at a position representative of the acoustic soundscape at the closest noise sensitive residential dwellings. Whilst on site, the author considered the sound climate during the daytime was moderate and comprised primarily of road traffic on nearby routes. Existing ambient sound levels during the daytime were measured at LAeq 52dB. It is of benefit to consider that government lockdown restrictions will have impacted on the acoustic climate and sound levels during 'normal' conditions may be higher.
- 0.3. There is a 3-storey block of flats immediately bordering the southern curtilage of the site and a dwelling immediately to the west. The flats are the most noise-sensitive receptor, however the degree of sensitivity significantly varies depending on the position of the windows in relation to the external play area. It is understood the windows closest to the play area are kitchens i.e., not a room where people typically rest and therefore is not typically considered a noise-sensitive room.
- 0.4. Acoustic modelling shows that although the closest windows (which are for kitchens) will experience a 'moderate' impact, this diminishes to 'slight' and 'none' at the other windows across the remaining flats within the block. A management plan will be implemented, including establishing breaks between play sessions throughout the day and limiting use of the external play space to between 08:00 and 18:00 hours during weekdays only. If the site were continued to be used as a hotel or changed to a restaurant or bar, the external amenity area would likely be used for longer periods and during more unsocial hours.
- 0.5. It is anticipated that the new nursery will incorporate new mechanical services equipment, including air conditioning plant. This will enable windows to the nursery to be kept closed, mitigating potential for adverse impacts due to noise emissions from inside the nursery.
- 0.6. The site is at an early stage of development and specific items of mechanical plant are yet to be finalised. Therefore, a maximum permissible noise limit is proposed for any new mechanical plant to ensure compliance with the local authority requirements.
- 0.7. In accordance with relevant policies, Standards, and guidance documents, it is the author's assessment that the levels from the proposed nursery in use will not be disproportionately detrimental to the amenity of nearby residential occupants.

1. INTRODUCTION

The client proposes to convert the existing hotel into a new day nursery at 73 Bushey Hall Road, Bushey.

ACA Acoustics Limited has been commissioned by The Harkalm Group to assess the acoustic impact on existing noise-sensitive properties from the new nursery.

Assessment of the external play space has been undertaken to ensure that noise from children using the play space in use will not be disproportionately detrimental to the amenity of nearby residential occupants.

The assessment also considers the acoustic impact of new mechanical services equipment associated with the new nursery.

2. RELEVANT POLICIES, STANDARDS, & GUIDANCE DOCUMENTS

There is no specific British Standard or guidance document which considers noise emissions from children using an external play space. Therefore, it is necessary to consider guidance within other relevant Standards and documents. Discussion of these is provided below.

2.1 National Planning Policy Framework and Noise Policy Statement for England

The current revision of the National Planning Policy Framework (referred to as NPPF) was published in February 2019. The NPPF sets out the Government's planning policies for England and provides guidance on how these are expected to be applied, providing a framework within which Local Authorities can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

Paragraph 170 of the NPPF states that,

“planning policies and decisions should contribute to and enhance the natural and local environment by ... preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability”.

Paragraph 180 also talks specifically about noise and advises,

“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:

- *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 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.”*

The Government’s long-term policy aims relating to noise are contained in the Noise Policy Statement for England (referred to as NPSE). Stated aims of the NPSE are:

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy of 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.”*

Paragraphs 2.19 to 2.24 clarify the above aims, referring to established concepts from toxicology; NOEL (No Observed Effect Level) and LOAEL (Lowest Observed Adverse Effect Level). It also introduces a new concept relating to “*significant adverse*” of SOAEL (Significant Observed Adverse Effect Level), however noting,

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

The first aim of NPPF Paragraph 180 and the second underlying aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development, as set out in the NPPF. As neither the NPPF nor NPSE includes any numerical criteria, it is necessary to consider guidance provided in other documents to determine suitable limits that would define the LOAEL on an individual basis.

Finally, it is also of benefit to consider Paragraph 2.7, which advises that,

“... the application of the NPSE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a particular policy, development or other activity may not have been given adequate weight when assessing the noise implications”.

This provides clear guidance that noise must not be considered in isolation but as part of the overall scheme taking into account the overall sustainability and associated impacts of the proposed development; there is no benefit in reducing noise to an excessively low level if this creates or increases some other adverse impact. Similarly, it may be appropriate in some cases for noise to have an adverse impact if this is outweighed by the reduction or removal of some other adverse impact that is of greater significance to the development.

2.2 Planning Practice Guidance – Noise

Related to the NPSE and the NPPF, The Department for Communities and Local Government has published additional guidance and clarifications within the Planning Practice Guidance – Noise (PPG-N), available at <https://www.gov.uk/guidance/noise--2>.

Paragraph 003 of the PPG advises,

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

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

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure ... is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.”

This guidance is like that set out in the NPPF and NPSE, however, Paragraph 005 of the PPG provides outline guidance on the definition of ‘significant adverse effect’ and ‘adverse effect’. A copy of the table appended to Paragraph 005 is repeated in Figure 1.

Although the table in Figure 1 provides descriptive definitions for the NOEL, LOAEL, and SOAEL, as with the NPPF and the NPSE there are no numerical values provided and it is necessary to consider guidance in other documents.

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

Figure 1: Noise exposure hierarchy, taken from Planning Practice Guidance - Noise

2.3 British Standard BS 8233:2014

The introduction to the Standard advises that,

“Noise control in and around buildings is discussed in this British Standard guide on an objective and quantifiable basis as far as is currently possible. For many common situations, this guide suggests criteria, such as suitable sleeping/resting conditions, and proposes noise levels that normally satisfy these criteria for most people.”

It also notes that,

“the standard is intended to be used routinely where noise sources are brought to existing noise-sensitive buildings”.

Section 7.7.3.2 relates to design criteria for external noise and recommends,

“For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50dB LAeq,T with an upper guideline value of 55dB LAeq,T which would be acceptable in noisier environments”.

These criteria may therefore be considered to equate to the level of LOAEL, defined within the NPSE, NPPF, and PPG-N. Section 7.7.3.2 continues that,

“It is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres ... a compromise between elevated noise levels and other factors, such as ... making efficient use of land resources ... might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.”.

This compliments guidance within the NPPF, such that significant adverse impacts are avoided, but adverse impacts are mitigated and minimised to the lowest practicable level.

The author considers that an upper criterion of LAeq, 16-hour 55dB should be targeted to minimise adverse impacts on the amenity of nearby residential occupants. It is of benefit to consider that children will only be playing outside for a portion of the time and therefore the overall 16-hour sound level will be consequently lower than the level calculated from the play space.

The BS 8233:2014 upper desirable limit of LAeq, 16-hour 55dB has been established based on guidance from the World Health Organisation’s *“Guidelines for Community Noise 1999”*. It is important to note however that the National Physics Laboratory has reviewed the WHO guidelines and advised that,

“Exceedance of the WHO guideline values does not necessarily imply significant noise impact and indeed, it may be that significant impacts do not occur until much higher levels of noise exposure are reached.”

This confirms that the LAeq, 16-hour 55dB limit is not the SOAEL but is likely to be between the LOAEL and SOAEL, fully acceptable in accordance with the NPPF, NPSE, and PPG-N so long as potential adverse impacts have been mitigated and minimised where practical, within the framework of sustainable development.

2.4 IEMA Guidelines for Environmental Noise Impact Assessment

A general principle that can be employed in situations of potential noise disturbance where there is no formal assessment methodology is to consider whether the new noise source will likely cause a significant increase over the current sound level or a change of character compared to the existing noise climate.

The basis for this form of assessment is discussed in the *Guidelines for Environmental Noise Impact Assessment*, written by the Institute of Environmental Management and Assessment (IEMA).

Having established the likely change in sound levels due to the new activity, an initial indication of the significance of the change can be determined from the table below, taken from Table 7-12 of the Guidelines.

Effect Description	Definition
None / Not significant	Less than LAeq 2.9dB change in sound level and/or all receptors are of negligible sensitivity to noise.
Slight	A LAeq 3dB to 4.9dB change in sound level at a receptor of some sensitivity.
Moderate	A LAeq 3dB to 4.9dB change in sound level at a sensitive or highly sensitive receptor, or a greater than LAeq 5dB change in sound level at a receptor of some sensitivity.
Substantial	Greater than LAeq 5dB change in sound level at a noise-sensitive receptor, or a LAeq 5dB to 9.9dB change in sound level at a receptor of high sensitivity to noise.
Severe	Greater than LAeq 10dB change in sound level at a receptor of high sensitivity to noise.

Table 1: Effect descriptors for change in sound level taken from Table 7-12 of the Guidelines for Environmental Noise Impact Assessment

Note that defining the change of loudness to one decimal place is not a reflection of the accuracy of any assessment undertaken but rather to provide a clear threshold between adjacent effect descriptions.

Section 7 of the Guidelines advises that the change in sound level provides an initial estimate of the impact, which should then be examined considering the context of the development, the type of noise source, nature of the change, and other factors. Paragraph 7.6 summarises that,

“In some situations, the conclusions about the degree of the impact will be clear and straightforward; but in others it is likely that, ultimately, a professional judgement will have to be made by the assessor. It must be remembered that the effects of noise are primarily subjective, and while it is desirable to include as much objectivity as possible into the assessment process in order to obtain consistency, there should be no concern in allowing professional judgement to come into the final analysis. However, the basis for the judgement made must be clearly set out so that it is clear how the conclusion has been reached.”

Once the initial estimate of the impact has been corrected to account for the context of the assessment, the magnitude of the impact and significance of the effects can be reviewed against Table 7-7 of the Guidelines, copied below.

Magnitude of Impact	Description of Effect
Negligible	No discernible effect on the receptor.
Slight	Receptor perception = Non-intrusive Noise impact can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the character of the area but not such that there is a perceived change in the quality of life.
Moderate	Receptor perception = Intrusive Noise impact can be heard and causes small changes in behaviour and/or attitude. Potential for non-awakening sleep disturbance. Affects the character of the area such that there is a perceived change in the quality of life.
Substantial	Receptor perception = Disruptive Causes a material change in behaviour and/or attitude. Potential for sleep disturbance. Quality of life diminished due to change in character of the area.
Severe	Receptor perception = Physically harmful Significant changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects.

Table 2: Relationship between noise impact and noise effects

It is of benefit to notice the similarity between the effect descriptions in Table 2 with the examples of outcome in Figure 1, taken from the PPG-N. From this, achieving a magnitude of impact of “negligible” or “slight” corresponds to designing noise to below the LOAEL. Where an assessment indicates a “moderate” impact then in accordance with the NPPF and PPG-N these adverse impacts should be mitigated and minimised where practical. A “substantial” or “severe” magnitude would equate to a significant adverse impact and should be avoided.

2.5 BS 4142:2014+A1:2019

The scope of BS 4142:2014+A1:2019 *Methods of rating and assessing industrial and commercial sound* advises that,

This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature ... The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling...

ACA Acoustics considers that assessment of noise from any new mechanical plant falls within the scope of BS 4142:2014+A1:2019 and use of this method is appropriate to determine any potential adverse impact on nearby residents.

It should however be noted that the Standard specifically confirms that use of the assessment method is not appropriate for various noise sources, including human voices. Therefore, the BS 4142 assessment method is not suitable to determine the impact of the proposed play space and alternative methods described above remain applicable.

The assessment method of BS 4142:2014+A1:2019 corrects the specific sound level from the source under investigation to account for characteristics that could make the sound more obtrusive to obtain a rating level. This rating level is compared against the prevailing background sound level outside the noise-sensitive property. Section 11 of BS 4142:2014+A1:2019 provides a commentary of the assessment result and advises that:

- a) Typically, the greater this difference [between the rating level and the background sound level], the greater the magnitude of the impact;*
- b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;*
- c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context;*
- d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*

It is important to note however, that this initial assessment conclusion is dependent on the context of the assessment specific to that site and receptor, which may materially alter the assessment result.

3. REVIEW OF SITE LOCATION & DEVELOPMENT PROPOSALS

The surrounding area predominantly comprises of residential dwellings, along with a primary school and nursery around 80m to the north east.

The site is currently a closed hotel and plans are to be submitted for change of use into a day nursery with an external play area to the rear.

Figure 2 shows the location of the site including the proposed external play area, most noise-sensitive receptor (NSR), and measurement position.

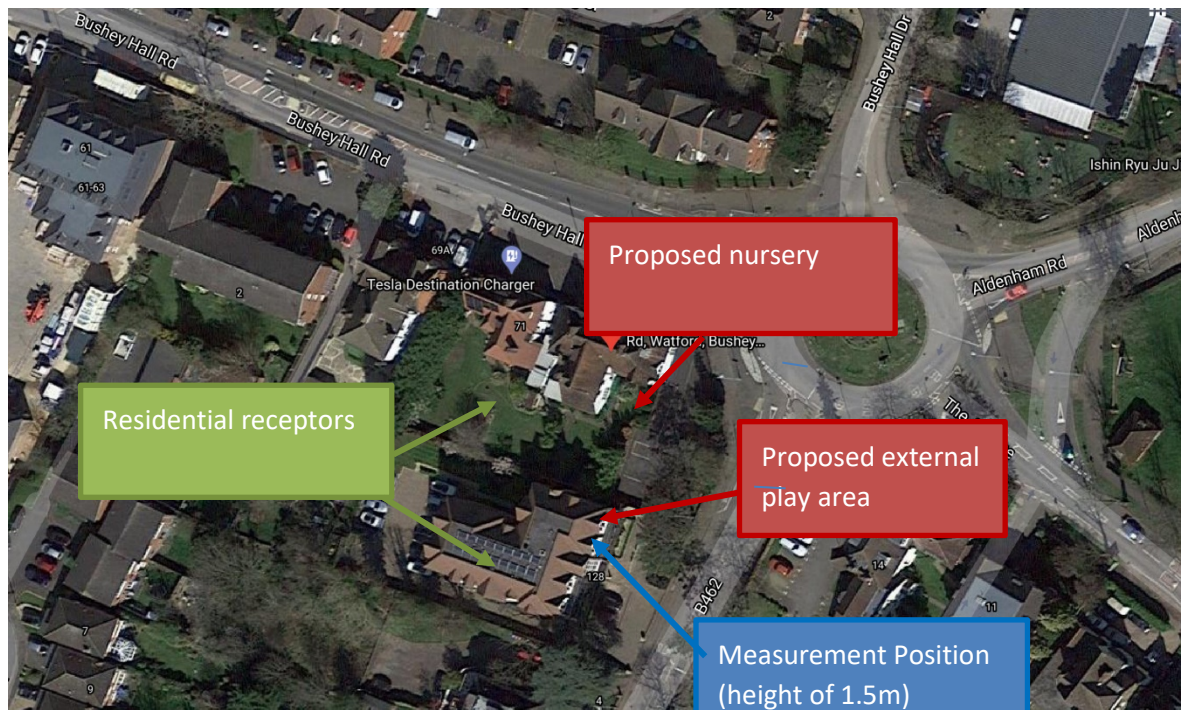


Figure 2: Site Layout (Available at: www.google.com/maps)

There is a 3-storey block of flats immediately bordering the southern curtilage of the site (128 Aldenham Road) and a dwelling immediately to the west. The flats are the most noise-sensitive receptor; however, the degree of sensitivity significantly varies depending on the position of the windows in relation to the external play area. This will be discussed in more detail in Section 5 of this report. The floor plan for 128 Aldenham Road is shown in Figure 3 below and indicates the windows closest to the play area are kitchens i.e., not a room where people typically rest and therefore is not typically considered a noise-sensitive room.

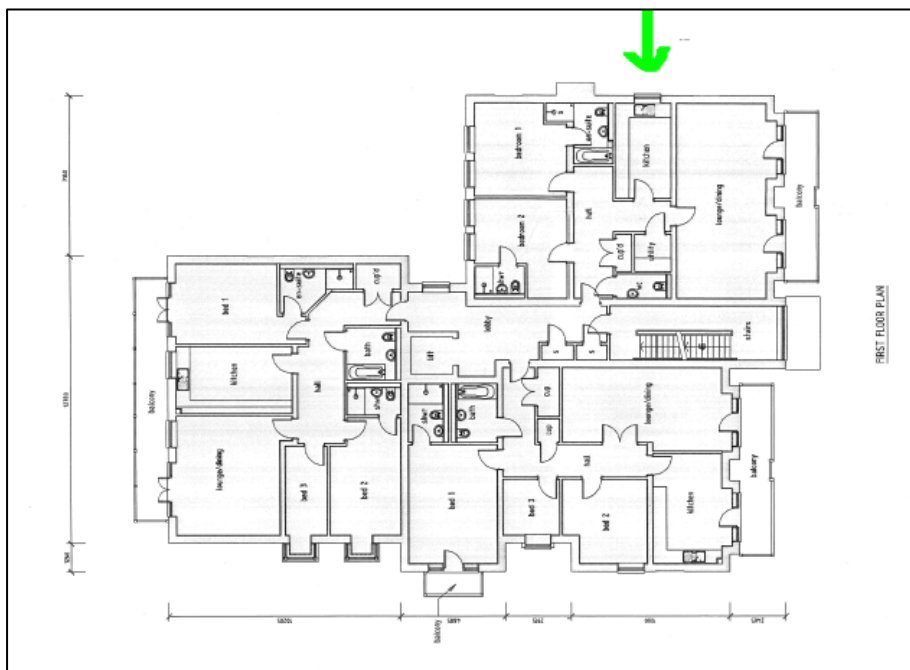


Figure 3: Floor plan for NSR

Proposed operating times of the nursery are understood to be between 07:00 and 19:00 hours, however through the management plan use of the garden will be restricted to between 08:00 and 18:00 hours daily. The external play area will not be used at weekends.

4. BACKGROUND SOUND LEVEL SURVEY

To assess the acoustic impact of the new nursery it is necessary to establish the existing residual and background sound levels in the vicinity. Details of the sound level survey carried out by ACA Acoustics are provided below.

The site was considered secure and therefore an unattended survey was carried out during a nominal 2-day period between Wednesday 24th to Friday 26th February 2021. The measurement position is indicated in Figure 2 above.

Weather conditions at the time of setting up the survey consisted of a temperature of 17°C, 50% cloud with a moderate 2-3ms⁻¹ southerly wind and dry ground conditions. Weather conditions have been reviewed at www.worldweatheronline.com, using the closest available commercial weather station. The extended nature of the survey ensures that a reasonable sample of results have been recorded with appropriate weather conditions and meteorological conditions are not considered to have adversely impacted the outcome of the assessment.

The following equipment was used during the survey; the sound level meter was calibrated before the survey and checked after with no deviation noted.

Equipment	Serial Number	Date of Calibration Expiration
NTi Audio Class 1 sound level meter type XL2-TA	A2A-18128-E0	29/09/2021
Svantek Class 1 calibrator type SV33B.	10436	21/09/2022

Table 3: Equipment used for the sound level survey

Sound level measurements were recorded in terms of 15-minute samples of overall LAeq, LA90, and LAFmax values along with other statistical indices and octave band spectra.

The soundscape was characterised by local road traffic, overhead aircraft and distant children activity.

Results of the survey are shown in graphical form in Figure 3 below.

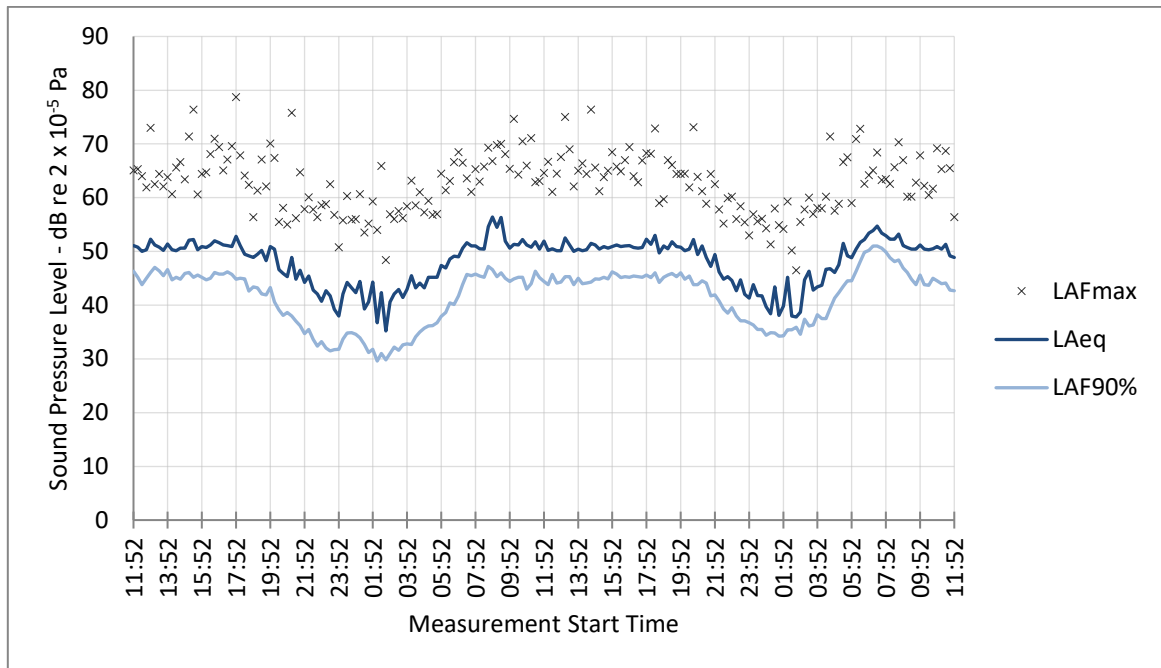


Figure 4: Sound level survey results

For the assessment of noise from mechanical services plant it is necessary to determine the background sound level. In accordance with BS 4142:2014+A1:2019, the prevailing background sound level is not necessarily taken to be the lowest recorded values, but rather the level that best represents the typical background sound level in the area over a defined period. A statistical analysis of the measured background sound levels has been carried out, generally following suggested guidance contained in Section 8 of the Standard. A histogram of measured sound levels is shown below for use within the assessment of noise from mechanical equipment serving the nursery between 07:00 – 19:00 hours.

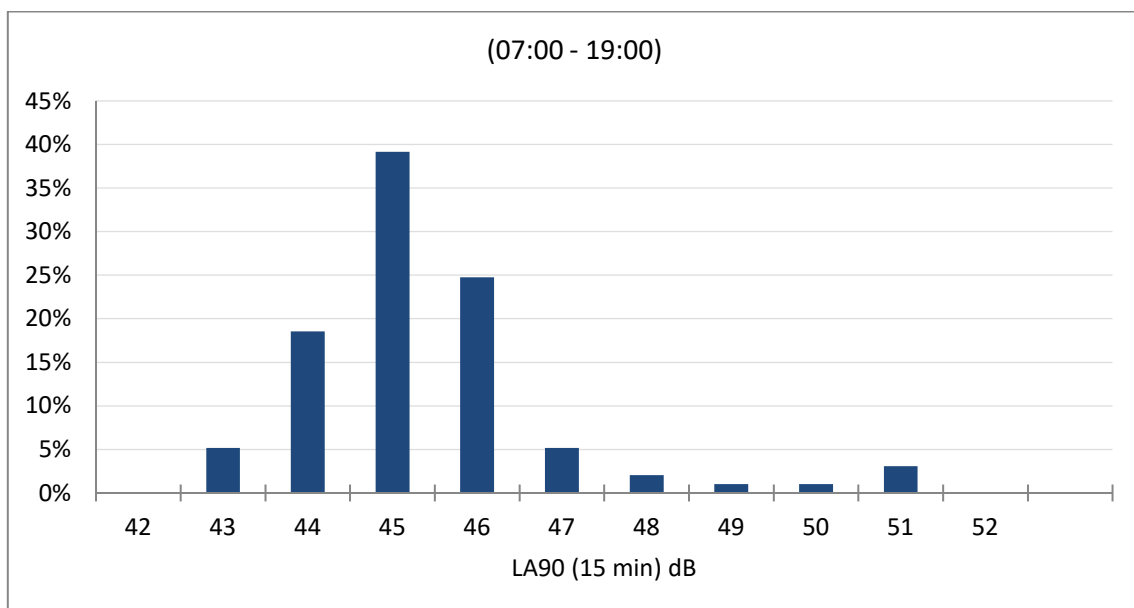


Figure 5: Statistical analysis of measured LA90 sound levels over the daytime measurement period

From results in Figure 4, sound levels taken as being representative of the background are LA90 45dB during the proposed nursery operating period. Summary results are shown in Table 4 below. As the nursery is only operating between the hours of 07:00 – 19:00, the values shown below are for these time periods.

Date	LAeq, 12-hour 07:00-19:00	LA90 07:00-19:00	LAfmax¹ 07:00 – 19:00
24 th -26 th February 2021	52dB	45dB	71dB

Table 4: Summary sound level survey results

¹: The 10th highest measured LAfmax values over the daytime period between 07:00 and 19:00 have been reported as being representative of a typical ‘high’ LAfmax value.

Due to government lockdown restrictions measured sound levels are likely to be lower than would normally be expected. This is mostly due to a reduction in pedestrian activity and local road traffic in the immediate vicinity along with other more distant larger roads. Criteria used in the assessment are relative to the measured residual and background sound levels and therefore if sound levels during ‘normal’ conditions are likely to be higher this ensures a robust assessment and provides a further degree of safety into the assessment outcome.

5. SOUND LEVEL SURVEY AT EXISTING NURSERY PLAY GARDEN

ACA Acoustics have previously undertaken a sound level survey in the outdoor play space at an existing nursery run by the proposed operator of the new nursery.

The nursery chosen for the survey was N Family Club, 13 Woodchurch Road, London, NW6 3PL. The site is on a quiet residential street and with adjoining residential neighbours. The nursery and play space are open and in use at this site from 07:00 to 19:00 daily.

A photograph of the play space is included below.



Figure 6: Photograph of play space at N Family Club - West Hampstead (available at www.google.com/maps)

The survey was unattended, and it is not possible to accurately quantify the number of children using the play space at any one time. However, the operator of the nursery confirmed that at times at least 50 children would have been using the play space during the survey.

ACA Acoustics fixed sound monitoring equipment at the boundary of the play space nominally at the centre of the longer side to record sound levels over a typical week.

An initial survey was conducted between Monday 14th September and Friday 18th September 2020. However, a mouse or other rodent chewed through the microphone cable overnight in the early hours of Tuesday 15th September and no measurement results were obtained after this time. The survey was repeated from Tuesday 22nd September to Friday 25th September 2020 to complete a weeks' monitoring.

Weather conditions at the closest available commercial station have been reviewed at worldweatheronline.com. It is understood there was light rain at times on Wednesday 23rd September and wind speeds slightly above ideal conditions on Friday 25th. Weather over the remainder of the survey included dry and calm conditions.

Sound level measurements were recorded in terms of 15-minute samples of overall LAeq, LA90, and LAFmax values along with other statistical indices and octave band spectra.

The following equipment was used during the surveys; a calibration check was conducted on the sound level meters before the surveys and repeated after with no deviation noted.

Equipment	Serial Number	Date of Calibration Expiration
Svantek Class 1 sound level meter type SVAN971, complete with MOLES outdoor environmental kit	84045	26/08/2021
Rion Class 1 sound level meter type NL-52, complete with outdoor environmental kit	00564867	22/10/2022
Svantek Class 1 calibrator type SV33B	83826	29/05/2021
Svantek Class 1 calibrator type SV33B	57595	30/06/2021

Table 5: Equipment used for the sound level survey

Results of the surveys are shown in graphical form below.

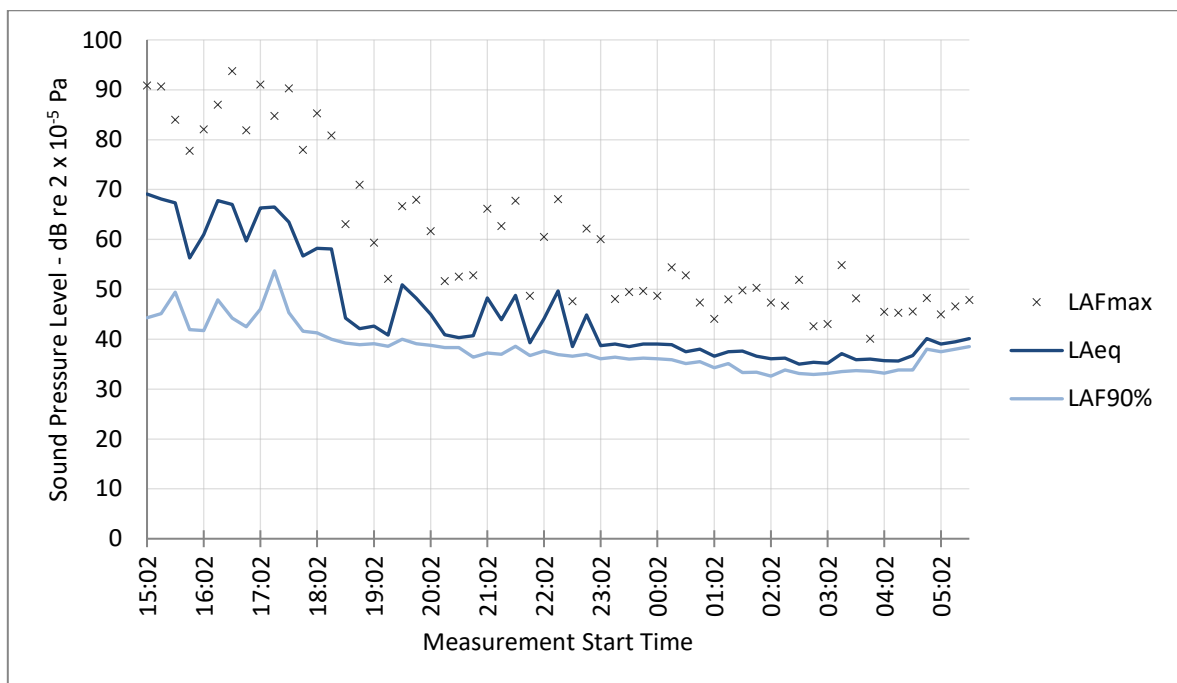


Figure 7: Sound level survey results in existing nursery play garden - Monday 14th September 2020

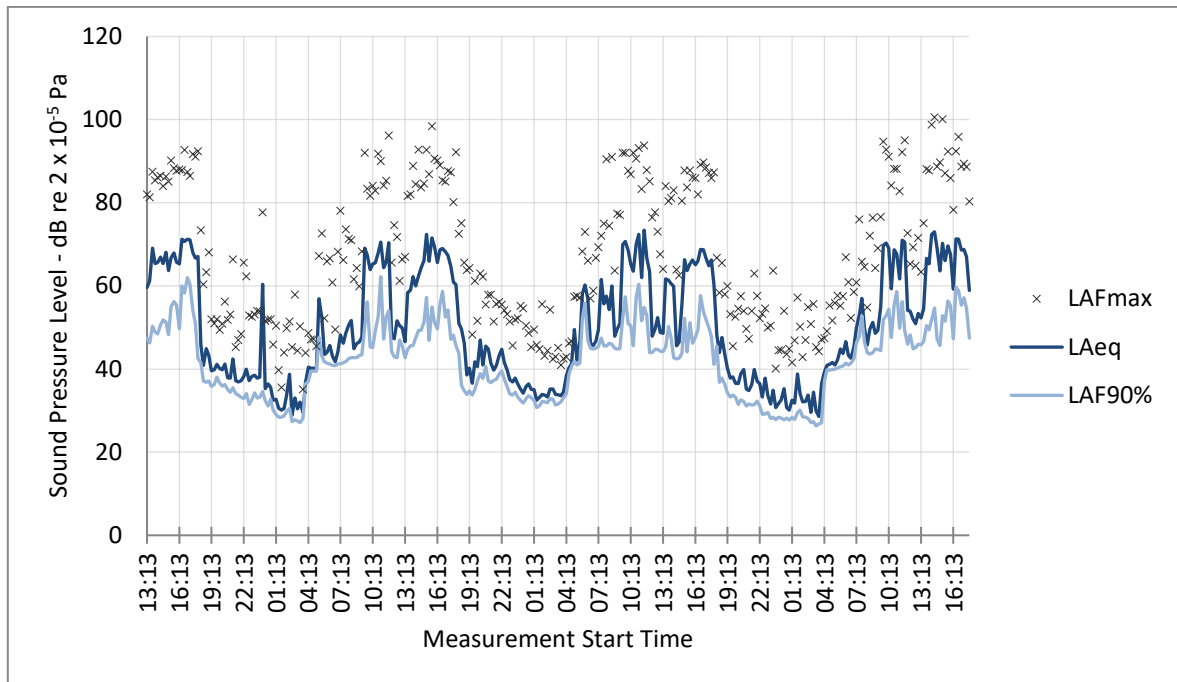


Figure 8: Sound level survey results in existing nursery play garden - Tuesday 22nd-Friday 25th September 2020

Summary results are shown in Table 6 below.

Date	LAeq, 10-hour 08:00-18:00	Highest LAeq, 1-hour	LAfmax ¹
Monday 14 th September	65dB	67dB	82dB
Tuesday 22 nd September	67dB	70dB	88dB
Wednesday 23 rd September	65dB	70dB	90dB
Thursday 24 th September	65dB	71dB	89dB
Friday 25 th September	67dB	70dB	92dB
Average over 5-day period	66dB	70dB	92dB

Table 6: Summary sound level survey results

¹: The 10th highest measured LAfmax values over the daytime period between 08:00 and 18:00 have been reported as being representative of a typical 'high' LAfmax value.

²: Measurement times on Monday 14th and Tuesday 22nd are shorter than the full 10-hour period. Values for these days have been reported as measured.

Table 6 confirms that the average sound level from the play space over the operating period is LAeq 66dB daily. The highest measured level over any one-hour period throughout the survey was LAeq 71dB between 11:00 and 12:00 hours on Thursday 24th September. Over the rest of the entire week the highest measured levels were very consistent at LAeq 70dB or below.

These levels correlate exactly with data previously recorded by ACA Acoustics at several schools and nurseries, including long-term monitoring of children playing on playgrounds at Ark Paddington Green Primary Academy and Wilberforce Primary School, as well as at an N Nursery & Family Club site at Defoe Road, London. Measured sound levels at the edge of the playground at lunchtimes/play times was LAeq 70dB at all three other sites. This also correlates with published data included in the *Development of Noise Assessment Method for School Playground Noise* (Weixiong Wu, Inter-Noise, 2006), which predicts a worst-case sound level of LAeq 71dB at the boundary of a playground.

Results of this latest sound level survey along with the previous surveys and published report provides a high degree of confidence in the source data used within the computer model. Noise emissions from the play space will not normally exceed a level of LAeq, 1-hour 70dB.

The sound level over the full operating period of the play space is around 4dBA lower than the highest one-hour value used in the computer model.

Furthermore, it can be seen on days when measurements were conducted over the full operating time of the outdoor play space (Wednesday to Friday) that there are extended periods throughout the day when the play space was not in use and only background sound levels were recorded. Sound levels drop by more than 10dBA for periods of up to an hour on each day. This confirms that, as described in the operator's noise management plan, use of the play space will not be continuous throughout the day and there are periods of inactivity.

LAfmax sound levels do not regularly exceed a level of 90-92dB from the play space. This correlates with levels previously measured by ACA Acoustics and provides further confidence in the results obtained.

6. NOISE IMPACT ASSESSMENT OF PLAY GARDEN

To calculate noise emissions from the proposed play garden to noise-sensitive properties in the vicinity a computer calculation model has been set up using iNoise proprietary noise mapping software, based on the calculation procedures of ISO 9613-1/2 standards and the associated ISO 17534 quality standard.

The following data and assumptions have been included within the computer model:

- The model uses an area source over the full extents of the proposed play space at a height of 0.75m.

- The source sound power level has been corrected to achieve a sound pressure level of LAeq, 1-hour 70dB at the perimeter of the play space, correlating with the measurement survey described in Section 5.
- The receptor heights are 2, 4, and 7m to represent the 3 storeys of flats.
- The existing fence along the southern boundary of the site has been included and configured to a height of 1.8m.
- The closest children are configured to be 3m from the closest window.
- Slight downwind propagation (from source to receiver).

Figure 8 below, shows the noise mapping carried out to assess the noise emissions from the play area at the various nearby noise-sensitive receptors.

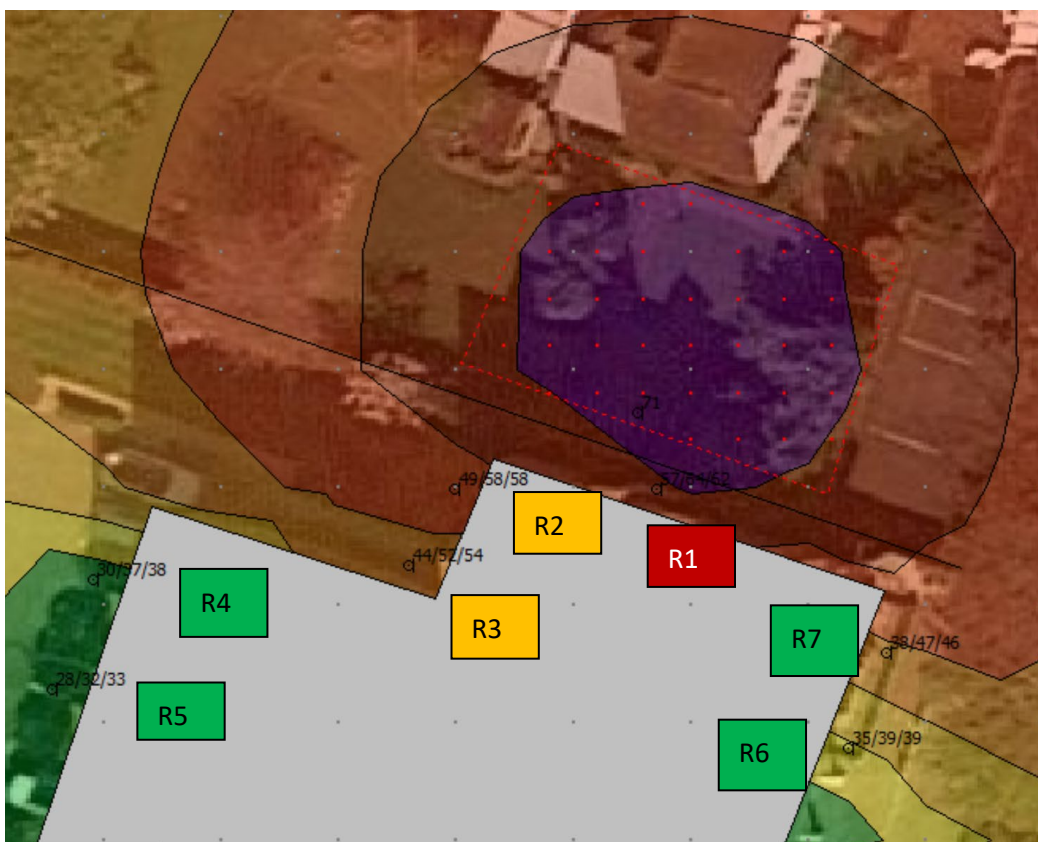


Figure 9: Noise Propagation Model from play area to adjacent flats

Calculated sound emissions from the play garden to 1m outside the various noise sensitive residential windows is shown in Table 7 below. The values used below are the floor with the highest sound levels, which is either the 2nd or 3rd floor, depending on the receptor.

Receptor	Model Condition	Sound Level from Play Garden	Existing Residual Sound Level	Cumulative Resultant Sound Level	Cumulative Change in Sound Level	IEMA Outcome
R1 (Kitchen)	Highest 1-hour sound level	LAeq 64dB	LAeq 52dB	LAeq 64dB	12dBA	Substantial
	Average sound level over the day	LAeq 60dB	LAeq 52dB	LAeq 61dB	9dBA	Moderate
R2	Highest 1-hour sound level	LAeq 58dB	LAeq 52dB	LAeq 59dB	7dBA	Moderate
	Average sound level over the day	LAeq 54dB	LAeq 52dB	LAeq 55dB	3dBA	Slight
R3	Highest 1-hour sound level	LAeq 54dB	LAeq 52dB	LAeq 56dB	4dBA	Slight
	Average sound level over the day	LAeq 50dB	LAeq 52dB	LAeq 54dB	2dBA	None
R4	Highest 1-hour sound level	LAeq 38dB	LAeq 52dB	LAeq 52dB	0dBA	None
	Average sound level over the day	LAeq 34dB	LAeq 52dB	LAeq 52dB	0dBA	None
R5	Highest 1-hour sound level	LAeq 33dB	LAeq 52dB	LAeq 52dB	0dBA	None
	Average sound level over the day	LAeq 29dB	LAeq 52dB	LAeq 52dB	0dBA	None
R6	Highest 1-hour sound level	LAeq 47dB	LAeq 52dB	LAeq 53dB	1dBA	None
	Average sound level over the day	LAeq 43dB	LAeq 52dB	LAeq 53dB	1dBA	None
R7	Highest 1-hour sound level	LAeq 39dB	LAeq 52dB	LAeq 58dB	0dBA	None
	Average sound level over the day	LAeq 35dB	LAeq 52dB	LAeq 56dB	0dBA	None

Table 7: Summary noise emissions from play garden to adjacent noise-sensitive properties

Table 7 shows that although the closest windows (which are for kitchens) will experience a ‘substantial’ to ‘moderate’ impact, this diminishes to ‘slight’ and ‘none’ at the other windows across the remaining flats within the block.

Day nurseries are often considered vital parts of the early years education provision for the local area and could be regarded as a significant benefit to the wider community. Relevant guidance

such as IEMA and NPPF stipulate that the impact from such local infrastructure developments should be assessed at a macroscopic level rather than in isolation.

Other contextual factors should also be considered such as the fact that play area will only be used during the hours of 08:00 and 18:00 and during weekdays only. If the site were continued to be used as a hotel or changed to a restaurant or bar, the external amenity area would likely be used for longer periods and during more unsocial hours. Additionally, schools, nurseries and children's play areas are often located in housing areas and operate without causing noise nuisance on neighbouring residents. There is also a primary school and nurse's office a short distance to the north, demonstrating the site proposals are in keeping with the local area.

It is recommended that an appropriate noise management plan should be implemented to help control noise to nearby residents. Development of a full management plan is outside the scope of ACA Acoustics and would be established by the operator of the premises, taking into consideration their own preferred working practices. It is anticipated a suitable plan is likely to incorporate the following elements relating to the external play space:

- Outdoor areas should only be used between the hours of 08:00 and 18:00. Areas should not be constantly used, and the play space will contain periods of inactivity during the day.
- Staff should be mindful of residential neighbours and use calm, gentle voices when interacting with children and others.
- Upset children who cannot be calmed should be taken back inside after a reasonable period (e.g. 5 to 10 minutes).
- Incorporate awareness of noise-management issues into regular staff training.
- An appropriate procedure should be put in place to enable the prompt investigation should any complaints or concerns be raised by nearby residents.

7. NOISE FROM MECHANICAL SERVICES PLANT AND EQUIPMENT

The local planning portal shows similar sites have been granted permission by ensuring the Rating Level from plant achieves a 'low impact' assessed in accordance with BS4142:2014+A1:2019.

Mechanical services plant has not yet been selected, however any future plant items should be selected and/or appropriately mitigated so as to achieve a cumulative level of 40dBA at 1m outside the most noise-sensitive receptor.

This is 5dB below the representative LA90 levels and will result in a 'low impact' as assessed in accordance with BS4142:2014. Also, by allowing a 10dB reduction for open window attenuation, internal levels will be 30dBA, ensuring appropriate internal levels in accordance with BS8233:2014.

8. CONCLUSION

The client is preparing a planning application for a proposed day nursery at 73 Bushey Hall Road, Bushey.

In accordance with relevant policies, Standards, and guidance documents, it is the author's assessment that the levels from the play space in use will not be disproportionately detrimental to the amenity of nearby residential occupants.

In addition, any new mechanical plant will be selected/mitigated to ensure compliance with the local authority requirements.