Noise impact assessment of a proposed nursery

2 Murray Road, London HA6 2YN

Client: The Architects Practice

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0. SUMMARY

0.1. ACA Acoustics Limited has been commissioned to assess the acoustic impact of a proposed nursery at 2 Murray Road, London on existing noise-sensitive properties.

0.2. A sound level survey has been carried out on 19th February 2024 at a position representative of the acoustic soundscape at the most affected noise sensitive residential dwellings. Whilst on site, the author considered the sound climate during the daytime was quite high for a residential area and comprised primarily of high levels of road traffic. Existing ambient sound levels during the daytime were measured at LAeq 62dB.

0.3. A computer model has been set up to calculate sound emissions from use of the proposed outside play garden to nearby existing residential occupants. Calculated noise emissions from the play garden are LAeq 49 - 54dB to the closest residential properties, which are located on Maxwell Road and Murray Road. This equates to a "*Slight*" impact when assessed in accordance with the Institute of Environmental Management and Assessment's *Guidelines for Environmental Noise Impact Assessment* and will be below the Lowest Observed Adverse Effect Level, as defined in the National Planning Policy Framework and Planning Practice Guidance – Noise.

0.4. The assessment only includes benefit of the existing fencing around the site. A comprehensive management plan will be implemented, including limiting the number of children in the garden at any one time and to establish breaks between play sessions throughout the day.

0.5. The development will incorporate new mechanical services equipment. Calculations using manufacturer's sound level data for the new air conditioning condenser unit confirms that the rating level of the new equipment to the most sensitive receptors will be LAr 31dB during the day, when assessed in accordance with BS 4142:2014+A1:2019. This is at least 10dBA below the representative background sound level during the operating periods and complies with the planning requirements of London Borough of Hillingdon Council.

0.6. In accordance with relevant Policies, Standards, and guidance documents, it is the author's opinion that the site is suitable for use as a day nursery.

1. INTRODUCTION

ACA Acoustics Limited has been commissioned to carry out an acoustic assessment of a proposed nursery at 2 Murray Road, London and to recommend acoustic mitigation treatment where necessary.

Assessment of the external play space has been undertaken in order to ensure levels from the play space in use will not be detrimental to the amenity of nearby residential occupants. An acoustic assessment has also been undertaken of the external mechanical services equipment to be installed to ensure that the amenity of nearby noise-sensitive properties is not compromised.

This report presents the results of the assessments.

2. RELEVANT POLICIES, STANDARDS, & GUIDANCE DOCUMENTS

2.1 Noise from Mechanical Services Equipment

The Hillingdon Local Plan: Part 2 - Development Management Policies (2020) states in numerous places that "The development must assess that the impacts of noise levels, air quality and dust emissions, light pollution and vibration on local amenity are acceptable."

The Council does not offer specific criteria to attain, however the British Standard BS 4142:2014+A1:2019 provides guidance on the impact of commercial mechanical equipment on residential amenity and is widely accepted as sound basis for assessment in the Acoustics industry. A discussion of the relevant parts of this Standard are provided below.

The assessment method of BS 4142:2014+A1:2019 corrects the specific noise from the source under investigation to account for operating time periods and any tonal or intermittent features of the noise source to obtain a rating level. This rating level is compared against the prevailing background sound level outside the noise-sensitive property. Section 11 of the Standard provides a commentary of the assessment result and states that:

- *Typically, the greater this difference* [between the rating level and background sound level]*, the greater the magnitude of the impact;*
- *A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;*
- *A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context;*
- *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse*

impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

2.2 Noise from The Proposed External Play Space

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.

2.2.1 National Planning Policy Framework and Noise Policy Statement for England

The National Planning Policy Framework (referred to as 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 180 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 191 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 191 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.

2.2.2 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

2.2.3 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 $L_{Aeq,\ 16\text{-hour}}$ 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 $L_{Aeq,\ 16\text{-hour}}$ 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 $L_{Aeq,\ 16\text{-hour}}$ 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.

2.2.4 IEMA Guidelines for Environmental Noise Impact Assessment

Noise emissions from the external play area will comprise almost exclusively of children's voices. While BS 8233:2014 establishes the upper limit there is no specific formal methodology for undertaking an assessment of noise from voices potentially affecting nearby residential occupiers.

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 "*slight*" corresponds to designing noise to below the LOAEL. ACA Acoustics therefore recommends that where an assessment indicates an impact of "*negligible*" or "*slight*" this is fully acceptable in accordance with the NPPF, NPSE, and PPG-N. Where an assessment indicates a "*moderate*" impact then this would potentially have an adverse impact on nearby residents and would only be acceptable where it can be adequately mitigated and minimised.

3. REVIEW OF SITE LOCATION & DEVELOPMENT PROPOSALS

The proposed development site is to be located at a former police station at 2 Murray Road, London.

The surrounding area is predominantly residential properties, however to the north-east, there is the start of a parade of shops including a dental surgery.

An aerial photograph of the site and surrounding area, taken from Google Earth, is shown in Figure 2 below. The figure shows the location of the mechanical plant, external play areas (blue rectangles), closest sensitive receptors, and measurement positions.

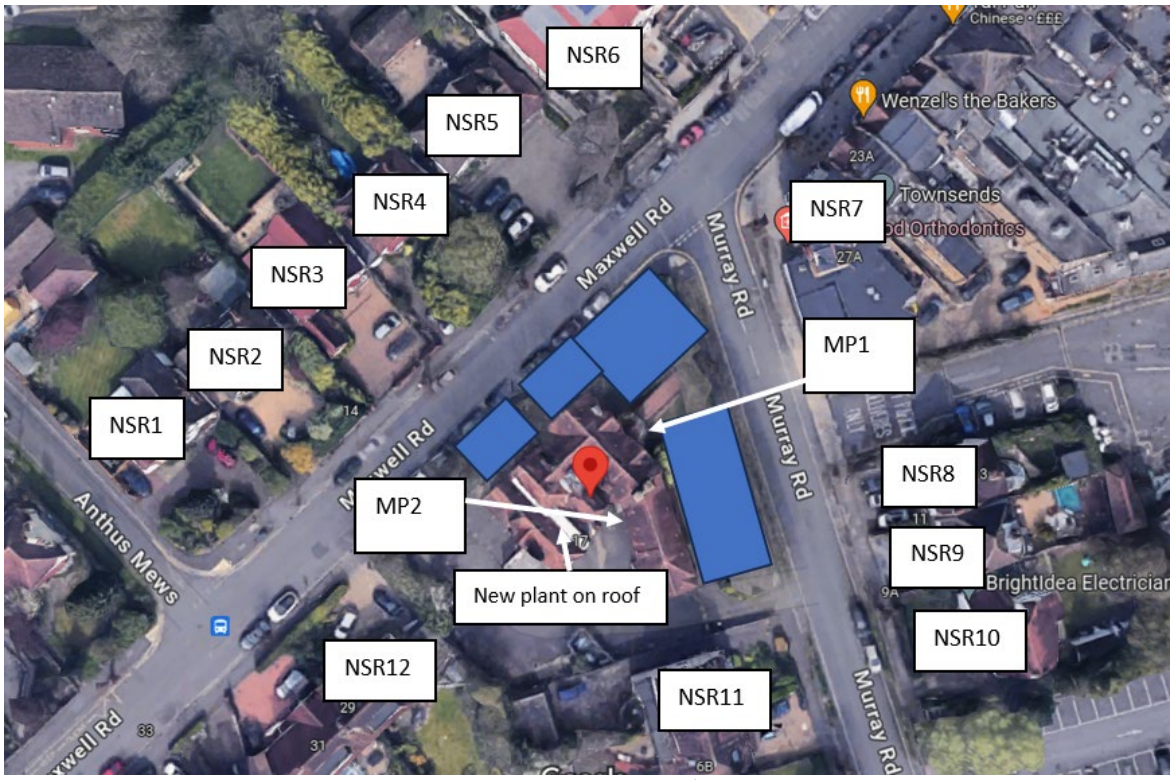

Figure 2: Aerial photograph of the site - Available at www.google.com/maps

Proposed operating times of the nursery are understood to be between 07:00 and 19:00 hours. The mechanical equipment will operate over the same period.

4. BACKGROUND SOUND LEVEL SURVEY

4.1. Playspace 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.

A single measurement position (MP1) was selected to the front of the property to capture the dominant sound source at all of the receptors – namely the road traffic on Murray Road and Maxwell Road.

The site was considered unsecure and therefore an attended survey was carried out on the 19th February 2024 between the hours of 11:00 – 13:00. These times were selected to avoid the noisier rush-hour times in the morning and evening to provide a more robust assessment.

Weather conditions at the time of conducting the survey consisted of a temperature of 5°C, 20% cloud cover, light south easterly winds and dry ground conditions. The meteorological conditions are not considered to have adversely impacted the outcome of the assessment.

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 survey; the sound level meter was calibrated before the survey and checked after with no deviation noted.

Equipment	Serial Number
Svantek Class 1 sound level meter type SVAN971, complete with MOLES weatherproof and lockable outdoor environmental kit	84045
Svantek calibrator type SV33B. Compliant to IEC 60942-1:2003 (Calibrated to a reference traceable to NIST)	83826

Table 3: Equipment used for the sound level survey

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

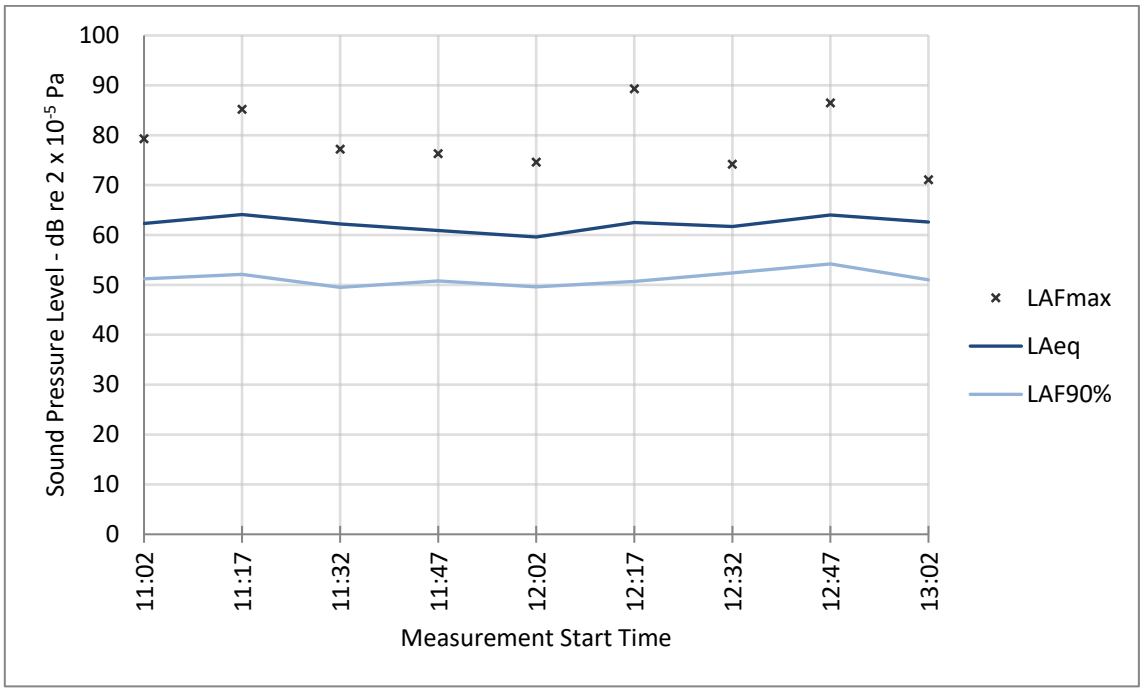

Figure 3: Sound level survey results

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.

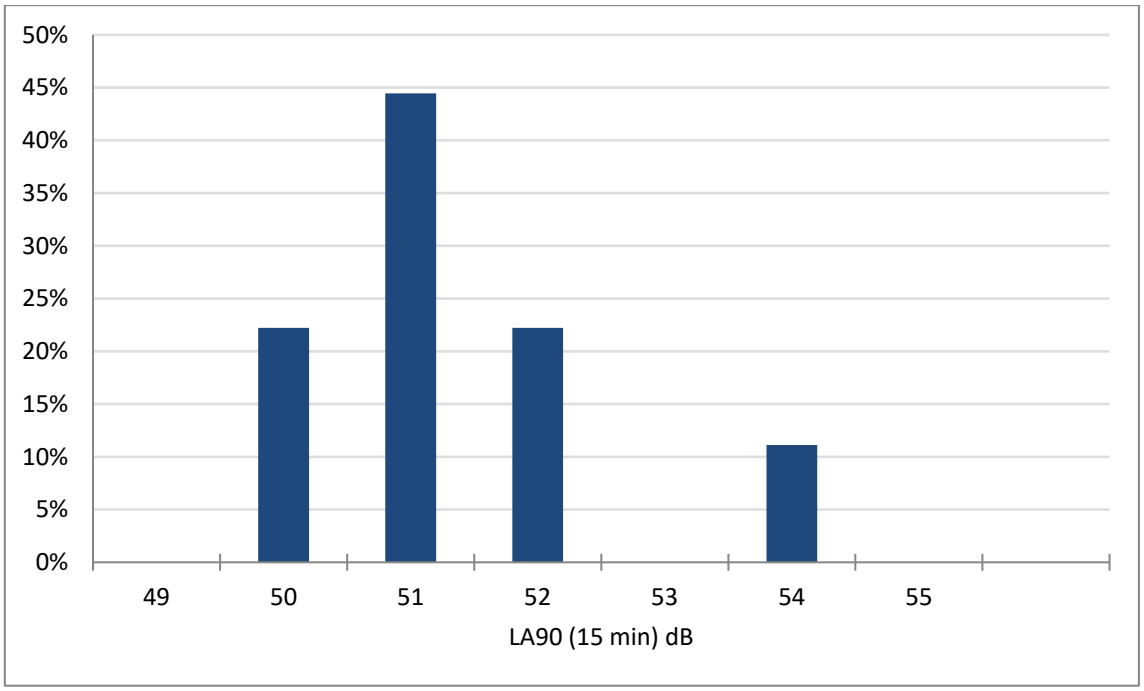

Figure 4: Statistical analysis of measured LA90 sound levels over the daytime measurement period

From results in Figure 4, sound levels taken as being representative of the background are LA90 51dB during the proposed nursery operating period.

Summary results are shown in Table 4 below.

Date	**LAeq, 12-hour 07:00-19:00**	**LA90 07:00-19:00**	**LAfmax 07:00 – 19:00**
Entire measurement period (08th – 11th June 2021)	62dB	51dB	71-89dB

Table 4: Summary sound level survey results

4.2. Mechanical Plant Survey

To assess sound levels from the new mechanical equipment, it is necessary to establish the representative background sound levels in the vicinity during the proposed plant operating times.

The background sound level was measured via an unattended survey at the position indicated in Figure 1 above (MP2). This position is assessed as being representative of the R1 receptor. The survey was conducted between the 11th - 15th January 2024. Notable noise sources included third-party plant, local and distant road traffic, pedestrian activity, delivery yard activity and the occasional overhead aircraft. The current plant associated with the premise was not running.

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**
Svantek Class 1 sound level meter type SVAN971, complete with MOLES weatherproof and lockable outdoor environmental kit	28263
Svantek calibrator type SV33B. Compliant to IEC 60942-1:2003	10436

Table 5: Equipment used

Weather conditions at the time of setting up the survey consisted of a temperature of around 8°C, 50% cloud cover with a 1-2ms^{-1} southerly wind and dry ground conditions. Weather conditions have been reviewed at www.worldweatheronline.com. The extended nature of the survey ensures that a reasonable sample of results have been recorded with appropriate weather conditions.

Results of the survey are shown in Figure 2 below.

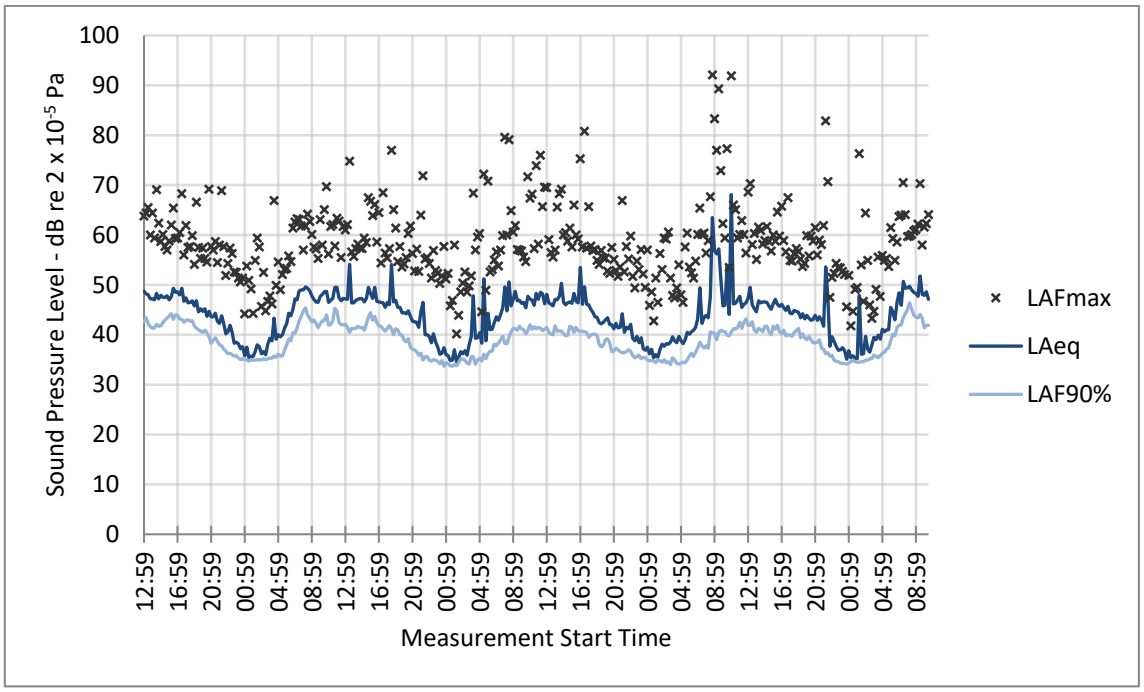

Figure 5: Sound level survey results at Position MP2 11th – 15th January 2024

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. Distribution of the measured LA90 sound levels during the more sensitive times of the opening times is shown in Figure 3 below.

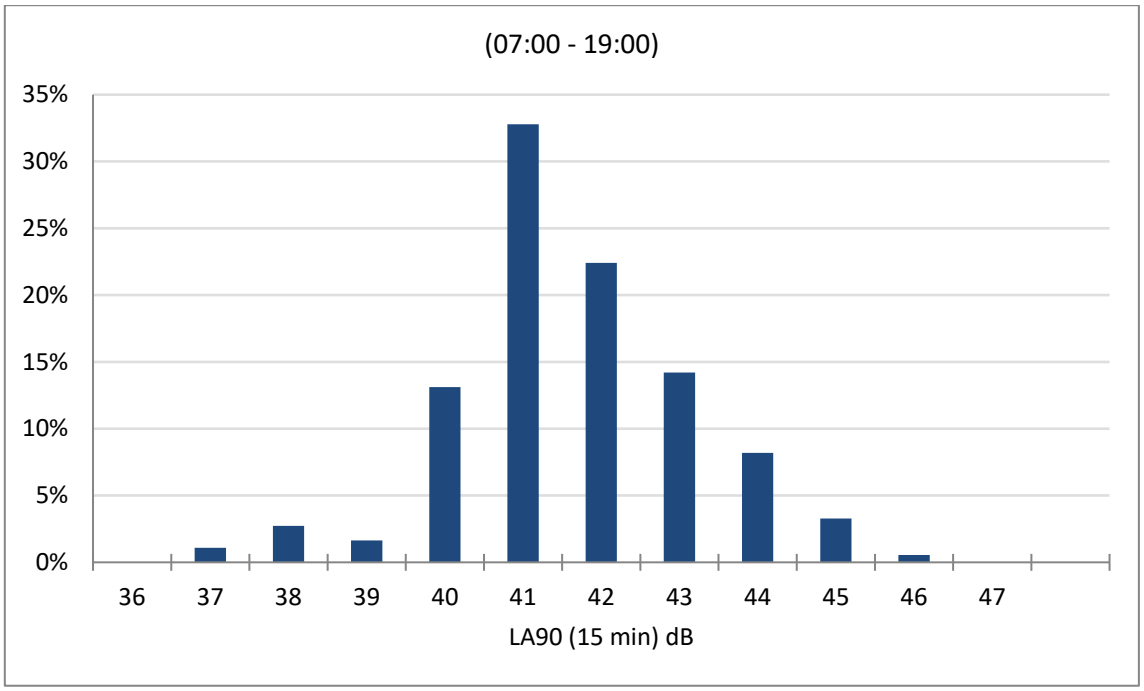

Figure 6: Statistical analysis of measured LA90 sound levels during evening hours

The pertinent results of the survey are summarised in Table 6 below.

Receptor	Period	Typical Background Sound Level During Operating Period LA90	Criteria LAr
NSR11/12	07:00 – 19:00	41dB	41dB

Table 6: Summary sound level survey results

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.

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 outside play space is of a similar size to the proposals, being slightly smaller, but with no limitation on the number of children that can use the space. 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 7: Photograph of play space at N Family Club - West Hampstead (available at www.google.com/maps)

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 an extended period. The survey was conducted from Tuesday 22nd September to Friday 25th September 2020.

Weather conditions have been reviewed from the closest available commercial station 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 survey and checked after with no deviation noted.

Equipment	**Serial Number**
Rion Class 1 sound level meter type NL-52, complete with weatherproof outdoor environmental kit	00564867
Svantek calibrator type SV33B. Compliant to IEC 60942-1:2003 (Calibrated to a reference traceable to NIST)	57595

Table 7: Equipment used for the sound level survey

Results of the survey are shown in graphical form below.

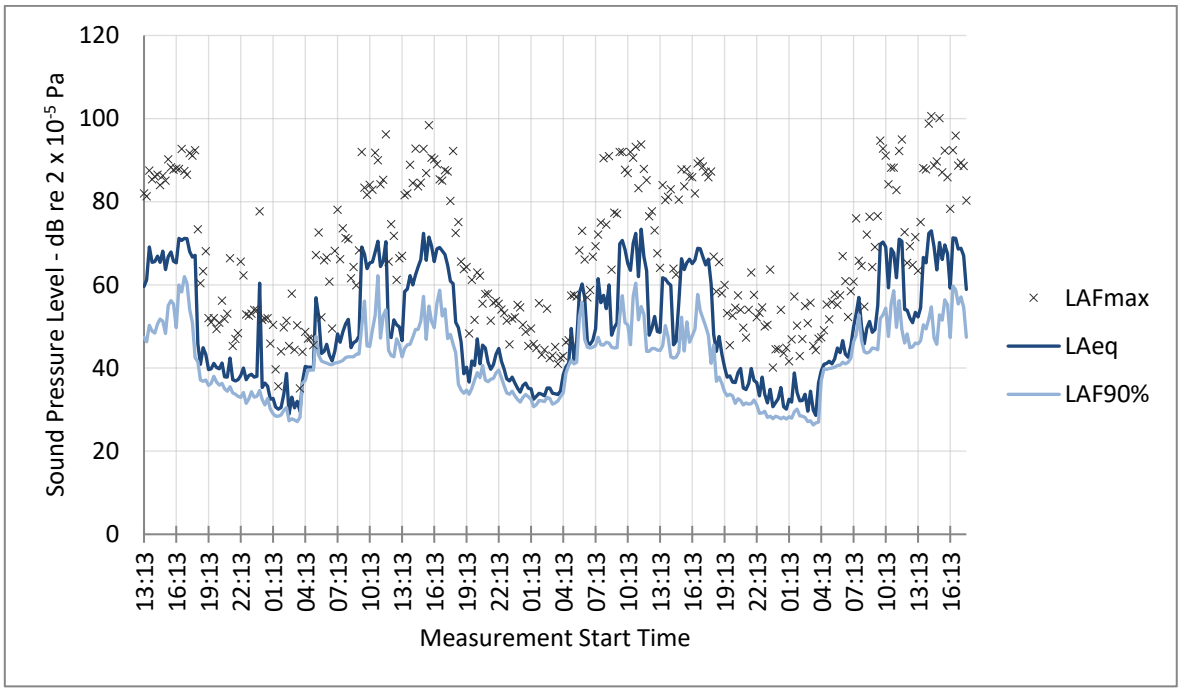

Figure 8: Sound level survey results in existing nursery play garden - Tuesday 22nd-Friday 25th September 2020

Summary results are shown in Table 6 below.

Date	**LAeq, 10-hour 08:00-18:00**	**Highest LAeq, 1-hour**	**LAfmax[1]**
Tuesday 22nd September	67dB	70dB	88dB
Wednesday 23rd September	65dB	70dB	90dB
Thursday 24th September	65dB	71dB	89dB
Friday 25th September	67dB	70dB	92dB
Average over 4-day period	**66dB**	**70dB**	**90dB**

Table 8: 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 Tuesday 22nd are shorter than the full 10-hour period. Values for this day 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 days the highest measured one-hour levels were very consistent at LAeq 70dB.

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/breaktimes was LAeq 70dB at all three 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 sound level survey along with the previous surveys and published report provides a high degree of confidence in the computer model. Noise emissions from the play space will not normally exceed a level of $LAeq_{,\ 1\text{-hour}}$ 70dB.

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

This ensures a robust assessment. Calculated sound levels will be a worst-case one-hour value and actual sound levels at neighbouring residents will be lower for much of the time.

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 90dB 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 computer model uses a source sound level of $LAeq_{,\ 1\text{-hour}}$ 70dB as described above.

The model only incorporates the acoustic screening provided by the existing fences at the site boundaries. The assessment is therefore based on the assumption these will remain in situ.

Printouts from the computer calculation model are provided in Appendix A.

Calculated sound emissions from the play garden to 1m outside the closest noise sensitive residential properties is shown in Table 7 below. For houses only the ground floor windows have been assessed, as it is assumed that bedrooms are not sensitive during daytime hours. For flats, all of the floors have been assessed.

Receptor Location	Sound Level from Play Garden	Existing Residual Sound Level	Cumulative Change in Sound Level
NSR1 - GF	LAeq 50dB	LAeq 62dB	0dBA
NSR2 - GF	LAeq 52dB	LAeq 62dB	0dBA
NSR3 - GF	LAeq 54dB	LAeq 62dB	1dBA
NSR4 - GF	LAeq 54dB	LAeq 62dB	1dBA
NSR5 - GF	LAeq 54dB	LAeq 62dB	1dBA
NSR6 - GF	LAeq 52dB	LAeq 62dB	0dBA
NSR6 – 1F	LAeq 52dB	LAeq 62dB	0dBA
NSR6 – 2F	LAeq 52dB	LAeq 62dB	0dBA
NSR7 – 1F	LAeq 56dB	LAeq 62dB	1dBA
NSR7 – 2F	LAeq 56dB	LAeq 62dB	1dBA
NSR8 - GF	LAeq 54dB	LAeq 62dB	1dBA
NSR9 - GF	LAeq 53dB	LAeq 62dB	1dBA
NSR10 - GF	LAeq 51dB	LAeq 62dB	0dBA
NSR11 - GF	LAeq 49dB	LAeq 62dB	0dBA
NSR12 - GF	LAeq 45dB	LAeq 62dB	0dBA

Table 9: Summary noise emissions from play garden to adjacent noise-sensitive properties

Table 9 confirms that the highest 1-hour noise emissions from the proposed play garden when the play garden is at its busiest will cause a cumulative increase to the existing residual sound level of around 1dBA. When assessed in accordance with the IEMA Guidelines, as shown in Table 1 this gives an initial impact of "*none/not significant*".

Correcting the computer model pro rata, average noise emissions over the day will be around 4dBA lower, resulting in an even lower impact.

In accordance with the IEMA Guidelines the calculated initial impact should be corrected, taking into account the context of the development. Relevant factors which should be considered are shown in Table 7-2 of the Guidelines and have been used as headings to guide the assessment in the table below.

Factor	Issue	Discussion
Averaging period	Is the averaging time so long that it might mask a greater impact at certain times, or does the noise change occur for such a small proportion of the time that it therefore can be considered of little consequence?	The play garden will be open for a reasonable proportion of the day, with breaks between play sessions. As discussed above, taking into account these break periods the cumulative impact on all neighbouring properties falls to 0dBA and would equate to a negligible impact. However, considering the impact over the full day may mask short term impacts and therefore the selected period of 1-hour is considered the most appropriate.
Time of day/night/week	Is the change occurring at a time that might increase or reduce its effect from that implied by the basic noise change?	The play garden will only be open between 07:00 and 19:00 hours. These daytime hours reduce the impact.
Nature of the noise source	Is there a change in the nature of the noise source which might alter the effect?	There is no existing similar noise source in the vicinity, therefore there may be an adverse impact associated with this.
Frequency of occurrence	How does the frequency of the occurrence of the noise source affect the effect?	The nursery will be open daily. This regularity may have a slight increase in the potential for adverse impact.
Spectral characteristics	Is there a change in the spectral characteristics which might affect the effect?	As discussed above, the nature of the source might have an impact on the spectral characteristics compared to the existing acoustic environment at the receptor. This will increase the impact.
Noise indicator	Has the indicator(s) which best correlate with the specific effect been correctly identified? (i.e. does the change in level as described by the indicator used adequately reflect the change that would be experienced by those exposed to it and could be affected by it?)	The play garden will be in use over a reasonable portion of the day and therefore the LAeq – equivalent energy averaged sound level – has been used. The alternative indicator would be to consider the LAfmax sound levels; the short-term peak sound level from individual high-noise events such as a child shouting or laughing during play. The LAfmax levels from the playspace are 74dB at the receptors. This is within the existing measured range and is does not increase the potential for any adverse impact.

Factor	Issue	Discussion
Absolute level (benchmark)	How does the change relate to any applicable published guidance?	BS 8233:2014 recommends that to provide a reasonable standard of amenity, sound levels outside a residential property should ideally achieve a level of $LAeq_{,16\text{-hour}}$ 55dB. The calculated sound level over the 10-hour period the play garden will be in use is $LAeq_{,10\text{-hour}}$ 54dB. Sound levels later into the evening, once the play garden has closed, will be lower further reducing the 16-hour average level. This ensures use of the play garden will not cause the average level to exceed the BS 8233 guideline limits and there is no increase to the potential for adverse impact.
Impact and assessment of effects	Taking the relevant factors into account, as discussed above, the author considers that because there will be a change in character, the proposed development will have a slightly greater for potential adverse impact than the initial numerical assessment. When considering guidance in Figure 1 and Table 1, the use of the play space will increase to an impact of "slight". The proposed nursery play garden may be heard at times but would not result in any change in behaviour or attitude of adjoining occupants.	

Table 10: IEMA Assessment factors and assessment outcome

As discussed in Table 10, in accordance with relevant Standards, guidance documents, and government planning policy it is the author's opinion that the noise impact of the proposed play garden should not be detrimental to the amenity of nearby residential occupants and the site is suitable for the proposed development.

7. EXTERNAL PLAY SPACE NOISE MITIGATION SCHEME

Whilst noise emissions from use of the play space will be low, to protect the amenity of nearby residents further it is recommended that an appropriate management plan is put in place. Whilst 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 garden:

- Outdoor areas should only be used between the hours of 07:00 and 19:00. Areas should not be constantly used, and the play garden 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.

8. NOISE FROM MECHANICAL SERVICES PLANT AND EQUIPMENT

The development includes the installation of new ASHP condenser units on the roof of the main building. Confirmation of the equipment model used in the assessment is provided in Table 9 below.

Description	Equipment Model	Quantity
ASHP Units	Daikin Altherma 3 - EBLA16D3W1	2

Table 11: Proposed new mechanical equipment used in the assessment

Sound emissions from the mechanical equipment can be determined from manufacturer's published data.

A computer model has been used to calculate the noise contribution from the proposed plant to outside nearest noise-sensitive windows. Environmental corrections are calculated using the assessment method of ISO 9613-2:1996.

The calculated specific sound level from the condenser to outside the closest sensitive residential windows is shown in Table 10. Summary print outs from the calculation model is included in Appendix B.

Receptor Location	Calculated Equipment Sound Level
NSR11/12	31dBA

Table 12: Calculated cumulative equipment sound levels at 1m outside noise-sensitive windows

Assessment of the calculated rating level at the most affected property (NSR11/12) in accordance with BS 4142:2014+A1:2019 is provided in Table 11.

Description	Receptor at 28 A Leighton Road	Relevant Clause	Commentary
Calculated specific sound level to receptor	LAeq 31dB	7.1 7.3.6	New plant operating. Refer calculation sheets in Appendix B
Background sound level	LA90 41dB	8.1.3 8.3	Representative background sound level during operating period (07:00 – 19:00).
Acoustic feature correction	+0dB	9.2	The calculated specific sound levels do not indicate any tonal component, the equipment will be ≥10dBA below the background sound level therefore it is unlikely any acoustic characteristics will be audible.
Rating level	LAr 31dB	9.2	
Excess of rating level over background sound level	**-10dB**	**11**	**Assessment indicates negligible likelihood of adverse impact**

Table 13: BS 4142:2014+A1:2019 Assessment

Table 11 shows the rating level of the proposed new equipment will be at least 10dBA below the representative background LA90 sound level to outside the closest noise-sensitive properties.

BS 4142:2014+A1:2019 requires an assessment to consider the context of the development, rather than simply adhering to numerical values. Considering the calculated numerical value of the specific sound, allowing a reduction through partially open windows of 15dBA, as recommended in BS 8233:2014, sound levels inside the neighbouring dwellings due to the proposed new equipment will be approximately 15dBA. This is significantly below guideline levels for resting during the daytime LAeq 35dB, set out in BS 8233:2014 and is further confirmation that sound levels from the new mechanical equipment should not be detrimental to the amenity of any noise-sensitive receptors in the vicinity.

The author considers that the context of the assessment does not alter the initial estimate of the impact, and that sound levels from the new mechanical equipment should not be detrimental to the amenity of any residential occupiers in the vicinity.

9. CONCLUSION

The client is preparing a planning application for a proposed nursery at 2 Murray Road, London.

It is the author's opinion that the acoustic impact of the proposed external play space to the closest sensitive residential dwellings will be low.

In addition, the calculated Rating Level from new external mechanical plant will not be detrimental to the amenity of nearby occupants.

The site is suitable for the proposed development with no further noise mitigation measures necessary.

Appendix A

Computer Noise Map Print-Out of External Play Garden

Appendix B

Calculation Sheets for Mechanical Services.

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