AVAL CONSULTING GROUP.
CIVIL, ENVIRONMENT & STRUCTURAL ENGINEERS

Noise Impact Assessment

4-6 Ham Street, Richmond, TW10 SHT

Woodward Nursery School

January 2024

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Project Information

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Disclaimer

1 Table of Contents

1. Introduction

1.1 Overview

Aval Consulting Group Ltd has been commissioned to carry out a noise impact assessment at 4-6 Ham Street, Richmond, TW10 SHT, for the proposal of change of use from a disused pub to a nursery school. This is hereby referred to as the 'purposed development'.

1.2 Objective and Methodology

The local authority requires evidence from a noise impact assessment that the internal noise levels at the proposed site will be suitable for the proposed usage and to also ensure that the noise emission levels arising from activities within the proposed development don't have any adverse impact on the neighbouring receptors.

The BB93 guidance suggests that the upper limit for the indoor ambient noise level in Nursery school rooms should not exceed an $L_{Aeq30min}$ of 35 dB for new builds and $L_{Aeq30min}$ of 40dB for refurbished developments.

The purpose of the noise impact assessment is to ensure that the proposed scheme and its usage are suitable for usage in relation to the prevailing noise in the surrounding area's environment and to ensure that any activities within the development will not have any adverse impact on existing receptors. If needed, an outline of mitigation measures will be provided.

The main source of external noise from the development has been identified as vocal noise and since there are no specific Guidance available for the specific assessment type, a suitable methodology and approach was scoped out with the local authority and is as follows:

- *Baseline Noise Data*: It was considered that the noise levels monitored in the REV A version of this report accurately depict the prevailing ambient and background noise levels in the surrounding areas of the proposed development and have therefore been used in this report.

- *Internal Noise Impact*: BB93 recommends the internal acoustic criteria for Nurseries and their internal classrooms (such as the Upper limit for the indoor ambient noise level). It is proposed that the prevailing ambient noise levels on-site (from traffic and other existing activities) be compared to the BB93 requirements to determine the acoustic performance of all non-glazed and glazed elements within the nursery. This is to ensure that the internal rooms can achieve the recommended/desired acoustic criteria for Nurseries.

- *External Noise Impact:*

  a) *Noise from Nursery Activities*: The nearest sensitive residential receptors (NSRs) around the nursery will be exposed to noise from the nursery as well as from the outdoor play areas. A noise model will be developed based on the exact number of occupants and details of the times at which the outdoor playground will be in use. Assuming that a raised voice will emit 65dB(A) @1m (Leq15min = 60dB(A)) and a shout will emit 82dBA(A)@1m (Association of Australian Acoustical Consultants Guideline for Child Care), it was agreed that the cumulative vocal noise impact levels from the playground can be compared to the prevailing L_{eq} at the NSRs location to determine if any mitigation is required. Similarly, noise levels from shouts (considered as L_{max}) can be compared to the prevailing L_{max} levels at the receptor's location and any mitigation required will be based on the worst-case scenario.

b) Noise From Drop-Offs and Collections: It is understood that drop-off schedules are expected to be from a) 07.00 am to 09.00 am and b) 12.30 pm to 01.30 pm. Collection Schedules are expected to range from a)13.15-14.00 and b) 15.30-18.00. It is considered that there will not be an increase in traffic noise itself (due to low figures from the Transport report), however, it is proposed that the impact of noise from more concerning activities such as slamming of doors and car boots will be considered at the NSRs location.

- *Noise Management Plan*: Based on the findings in the above-mentioned assessments, a noise management plan will be in place and will include measures and guidelines which are inclusive but not limited to

    - The maximum number of occupants in outdoor areas will be determined and not exceeded at all times.
    - Restrictions and noise limits will apply to any noisy activities, such as loud amplified music and other similar activities.
    - Parking activities (if applicable and happening within site boundaries).
    - Noise Respite

1.3 Site Proposal and Location

Figure 1.1 shows the proposed development location. The site is currently a disused 2-storey pub, with residential developments adjacent and opposite the road. There are no nearby railway lines near the property and Grey Court School at around 180m away from the site.

The predominant noise sources on site were observed to be:

- Traffic noise on Ham Street
- Traffic noise on Ham Common
- Noise from Grey Court School

The nearest sensitive receptors (NSRs) were identified and labelled as

- 2 Ham Street (NSR1)
- 27 Ham common/Selby House (NSR2)

Figure 1.1 Site location (Source : Google Maps)

2. Relevant Noise Standards

This section summarises all legislation, policy, statutory and non-statutory guidelines relevant to the proposed development. Furthermore, the latest regional and local planning policy guidance specifically applicable to the proposed development has been reviewed.

2.1 The National Planning Policy Framework (NPPF)

The updated 2023 version of the 'National Planning Policy Framework (NPPF)'[1] contains information and general guidance to Local Authorities in relation to considering and taking into account noise. The National Planning Policy Framework (NPPF) guidance reinforces that noise should be taken into account considering planning policies and decisions. Some of the guidance contained in the 'National Planning Policy Framework (NPPF)' includes the following:

- Paragraph 174e: "…*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 185a,b: "*Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should*:

  (a) *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life…*

  (b) *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;…*"
- Paragraph 187: *Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues, and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.*

In conjunction with the 'National Planning Policy Framework (NPPF)', 'The Noise Policy Statement for England (NPSE)'[2], dated March 2010, states the following regarding a long-term vision of government noise policy:

"Noise Policy Statement for England Aims:

- *The first aim of the NPSE:*

  Avoid significant adverse impacts on health and quality of life from environmental, neighbour, and neighbourhood noise within the context of Government policy on sustainable development.
- *The second aim of the NPSE:*

  Mitigate and minimize adverse impacts on health and quality of life from environmental, neighbour, and neighbourhood noise within the context of Government policy on sustainable development.

[1] The National Planning Policy Framework (2023) https://www.gov.uk/guidance/national-planning-policy-framework
[2] Noise Policy Statement for England (NSPE) https://www.gov.uk/government/publications/noise-policy-statement-for-england

- *The third aim of the NPSE:*

  Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour, and neighbourhood noise within the context of Government policy on sustainable development."

In terms of the NPSE, the impact of noise can be categorised by the following terms:

- NOEL – No Observed Effect Level – The level where no effect can be detected
- LOAEL – Lowest Observed Adverse Effect Level – The level where adverse effects on health and quality of life can be detected
- SOAEL – Significant Observed Adverse Effect Level – The level where significant adverse effects on health and quality of life may occur.

The NPSE further states that:

"It is not possible to have a single objective noise-based measure that defines 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."

No specific guidance is detailed or given in the 'National Planning Policy Framework (NPPF)', or 'The Noise Policy Statement for England (NPSE)' in terms of acceptable acoustic criteria/noise criteria in order to achieve the 'NOEL, LOAEL, or SOAEL'. Therefore, it is considered necessary to refer to alternate national guidance, preferably standardised or regulated such as an appropriate British Standard (BS), or in the absence of this, alternate World Health Organisation (WHO) guidelines, etc.

The British Standard 8233: Sound Insulation and Noise Reduction for Buildings/Code of Practice BS 8233: Sound Insulation and Noise Reduction for Buildings/Code of Practice states that for different spaces, there might be a range of noise levels that are considered acceptable.

2.2 WHO 'Guidelines for Community Noise'

Where noise is assessed against the 'Absolute Level', then this can be split into separate daytime and night-time legislation. The WHO 'Guidelines for Community Noise' state in 4.2.7 "Annoyance Responses" that:

"During the daytime, few people are seriously annoyed by activities with L_{Aeq} levels below 55 dB; or moderately annoyed with L_{Aeq} levels below 50dB. Sound pressure levels during the evening and night should be 5-10 dB lower than during the day…."

The guidance goes on to provide a daytime[3] internal acoustic criteria relative to critical health effect(s) that of 35 dB $L_{Aeq,16\ hour}$, and a night-time[4] level of 30 dB $L_{Aeq,8\ hour}$ / 45 dB L_{AFmax} linked with dwelling indoors. Therefore, assuming a maximum external noise level of 50 dB $L_{Aeq,t}$ during the daytime, (considering a 15 dB reduction in noise via a partially open window) an internal noise level of 35 dB $L_{Aeq,t}$ should be achieved.

During the night-time periods, a further publication; WHO Night Noise Guidelines For Europe' published in 2009 states that:

"Below the level of 30 dB $L_{night,outside}$, no effects on sleep are observed except for a slight increase in the frequency of body movements during sleep due to night noise. There is no sufficient evidence that the biological effects observed at the level below 40 dB $L_{night,outside}$ are harmful to health. However, adverse health effects are observed at the level above 40 dB $L_{night,outside}$, such as self-reported sleep disturbance, environmental insomnia, and increased use of somnifacient drugs and sedatives. Therefore, 40 dB $L_{night,outside}$ is equivalent to the LOAEL for night noise….. The LOAEL of night noise, 40 dB $L_{night,outside}$, can be considered a health-based limit value of the night noise guidelines (NNG) necessary to protect the public,

[3] daytime is typically between 07:00 h and 23:00 h.
[4] night-time is between 23:00 h and 07:00 h.

including most of the vulnerable groups such as children, the chronically ill and the elderly, from the adverse health effects of night noise."

Therefore, where absolute levels need to be referenced, a maximum daytime noise limit of 50 dB $L_{Aeq,t}$ can be considered, with the LOAEL for night of 40 dB $L_{night,outside}$ being considered.

2.3 IEMA (Institute of Environmental Management & Assessment)

IEMA also defines the sensitivity of receptors according to the table below

Very Substantial	Greater than 10 dB L_{Aeq} change in sound level perceived at a receptor of great sensitivity to noise
Substantial	Greater than 5 dB L_{Aeq} change in sound level at a noise-sensitive receptor, or a 5 to 9.9 dB L_{Aeq} change in sound level at a receptor of great sensitivity to noise
Moderate	A 3 to 4.9 dB L_{Aeq} change in sound level at a sensitive or highly sensitive noise receptor, or a greater than 5 dB L_{Aeq} change in sound level at a receptor of some sensitivity
Slight	A 3 to 4.9 dB L_{Aeq} change in sound level at a receptor of some sensitivity
None/Not Significant	Less than 2.9 dB L_{Aeq} change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals

Table 2.1 Effect Descriptors (Guidelines For Environmental Noise Assessment, 2014)

2.4 Acoustic design of schools: performance standards – Building bulletin 93 – V17 2015

The Building Regulations require that all spaces should meet the performance standards for indoor ambient noise level, airborne and impact sound insulation, and reverberation time.

These values are for rooms that are finished, furnished for normal use, but unoccupied. Where rooms are to be used without furnishings, the performance standards normally apply in the empty condition. Normal furnishing is not anticipated to have any significant effect on indoor ambient noise levels or sound insulation but may reduce measured reverberation times by providing diffusion and absorption.

The School Premises Regulations and the Independent School Standards also require that consideration be given to operational noise. To comply with the School Premises Regulations and the Independent School Standards open plan spaces should additionally meet the performance standards for speech transmission index.

Guidance on the control of operational noise is provided in 'Acoustic Design of Schools: A Design Guide'. Section 2 describes acoustic tests that can be used to demonstrate compliance with the insitu performance standards in this section. It is strongly recommended that the client should require acoustic testing to be carried out as part of the building contract, because testing of the completed construction is the best practical means of ensuring that it achieves the design intent.

Further guidance is included in 'Acoustic Design of Schools: A Design Guide'. This provides additional information on the acoustic requirements and design of buildings for education purposes, on how to comply with these acoustic standards, and on testing / commissioning procedures. The figures given in the tables for refurbishment should not normally be used for new build unless there are over-riding educational, environmental or health and safety reasons. The refurbishment standards are the minimum acceptable standard for Building Regulations compliance purposes for refurbishments to allow for difficulties of construction and buildings with a short residual life.

However, where possible the target for refurbishment should be at least the new build standard where new elements of the building such as ceilings are installed during

refurbishment. For example, there is considerable educational benefit in achieving the reverberation times for new build in refurbished teaching spaces. There may also be considerable benefit in exceeding the Building Regulations standards for new build, for example music accommodation particularly where required for community use and third-party lettings may need to be of a higher standard than that found in most schools. Overall, the Building Regulations standards should be regarded as minimum standards and there is often considerable benefit in improving on them.

3. Noise Survey

3.1 Overview

This section provides the details of the methodological approach taken to assess the anticipated noise levels produced by the site, as well as the prevailing acoustic environment representative of that where existing noise-sensitive receptors are present. Key noise indicators namely $L_{Aeq,T}$, $L_{A90,T}$, $L_{A10,T}$ and L_{AFmax}, have been used where applicable and are described in Appendix A.

3.2 Noise Monitoring

The 24-hour noise monitoring survey was carried out in the existing site, in locations that were deemed representative of both the prevailing ambient and background noise levels that is experienced on site and at the receptor's locations.

Both noise monitors were installed in restricted spaces hence free-field conditions were not achieved, therefore, a correction factor of 3dB has been applied.

- Location 1 – Facing towards Ham Street (captured prevailing ambient noise levels)
- Location 2 – Facing towards the rear of the development (captured prevailing ambient + background noise levels)

Figure 3.1 Noise monitoring locations

3.3 Noise Survey Periods

Noise monitoring was carried out for 24 hours to determine the prevailing background levels. Details of the survey period have been tabulated below.

Locations	Start Date	Start Time	End Date	End Time
1	3/7/23	10:50	4/7/23	10:50
2	3/7/23	10:50	4/7/23	10:50

Table 3.3 Noise Survey Periods

3.4 Weather Conditions and observations

During the 24-hour survey, it was mostly clear, with some clouds in the early evening. Wind speeds reached a maximum of 5 m/s, the temperature ranged from an overnight low of 6 C to a daytime high of 15º C, and 0 mm precipitation was recorded[5]. The wind direction from the start to the end was south-southeast SSE.

Weather conditions throughout this survey period were deemed suitable for the measurement of environmental noise in accordance with BS7445: Description and Measurement of Environmental Noise.

3.5 Details of Noise Monitoring Equipment

The details of the equipment used for all noise monitoring have been tabulated below. The sound level meter used for this survey was a Class 1 device which has been laboratory calibrated, as well as field calibrated on-site before and after monitoring (no calibration drift was recorded).

Equipment	Serial Number
BSWA 308 Class 1 Sound Level Meter	590145
BSWA 308 Class 1 Sound Level Meter	580276
BSWA CA111 Class 1 Calibrator (UKAS)	550282

Table 3.4 Noise Equipment Details

[5] https://www.weatheronline.co.uk/

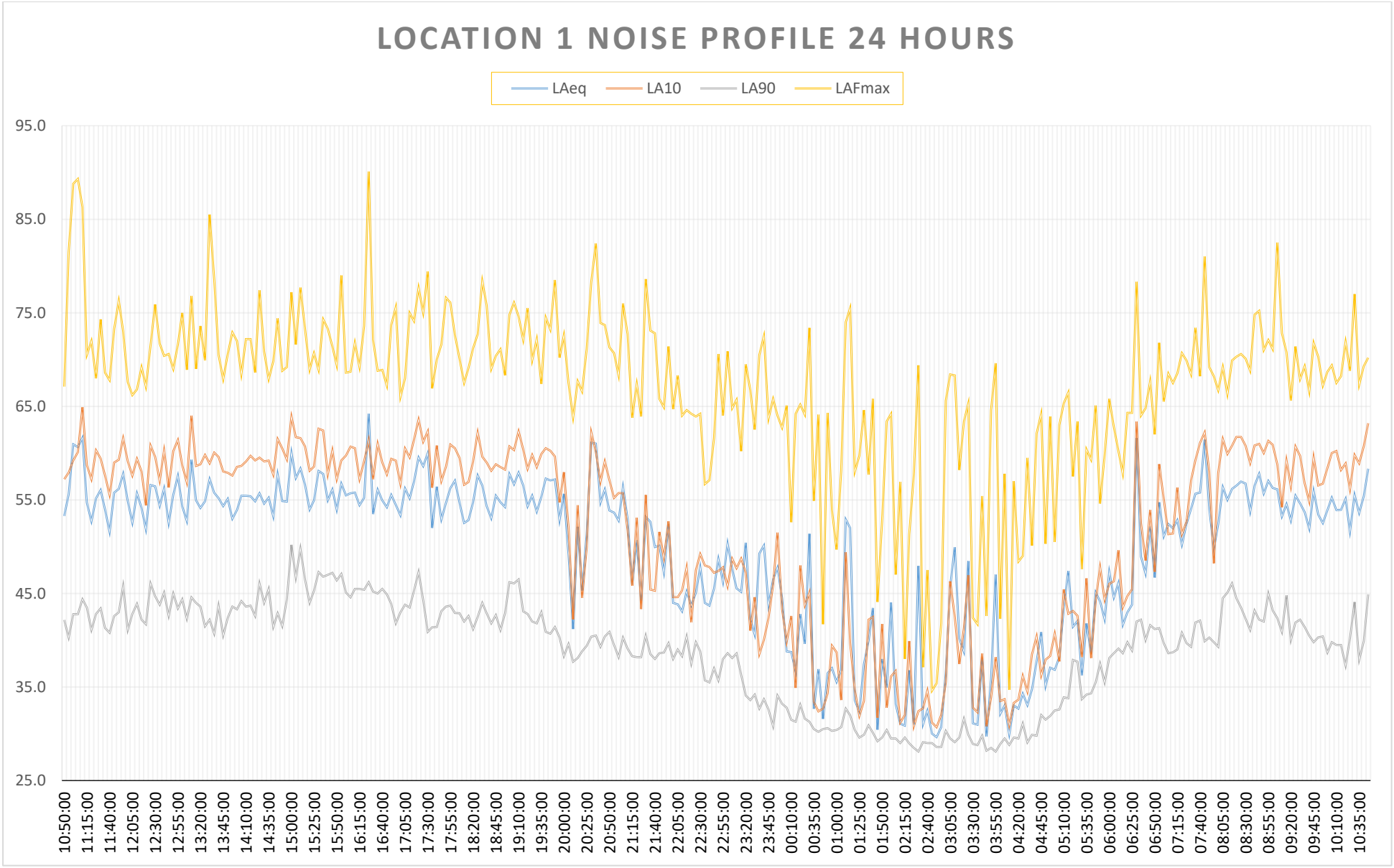
4. Survey Results

4.1 Measured Noise levels (In-Situ)

Measurements were obtained in 1-second intervals and have been summarised below for the daytime and night-time values. A graph is presented in Figure 4.2 for the full 24-hour period (in 5-minute intervals), with a second graph in Figure 4.3 isolating the L_{AFmax} events (1-minute intervals) during the night-time period.

	Noise Monitoring Location 1		Noise Monitoring Location 2	
Indicator All values in dB(A) (3dB correction applied)	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
L_{Aeq}	53	43	48	40
L_{A10}	56	41	51	43
L_{A90}	37	27	39	27
L_{Amax}	87	75	78	70

Table 4.1 Background Noise Survey Results


LOCATION 1 NOISE PROFILE 24 HOURS
LAeq
LA10
LA90
LAFmax
95.0
85.0
75.0
65.0
55.0
45.0
35.0
25.0
10:50:00
11:15:00
11:40:00
12:05:00
12:30:00
12:55:00
13:20:00
13:45:00
14:10:00
14:35:00
15:00:00
15:25:00
15:50:00
16:15:00
16:40:00
17:05:00
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10:35:00

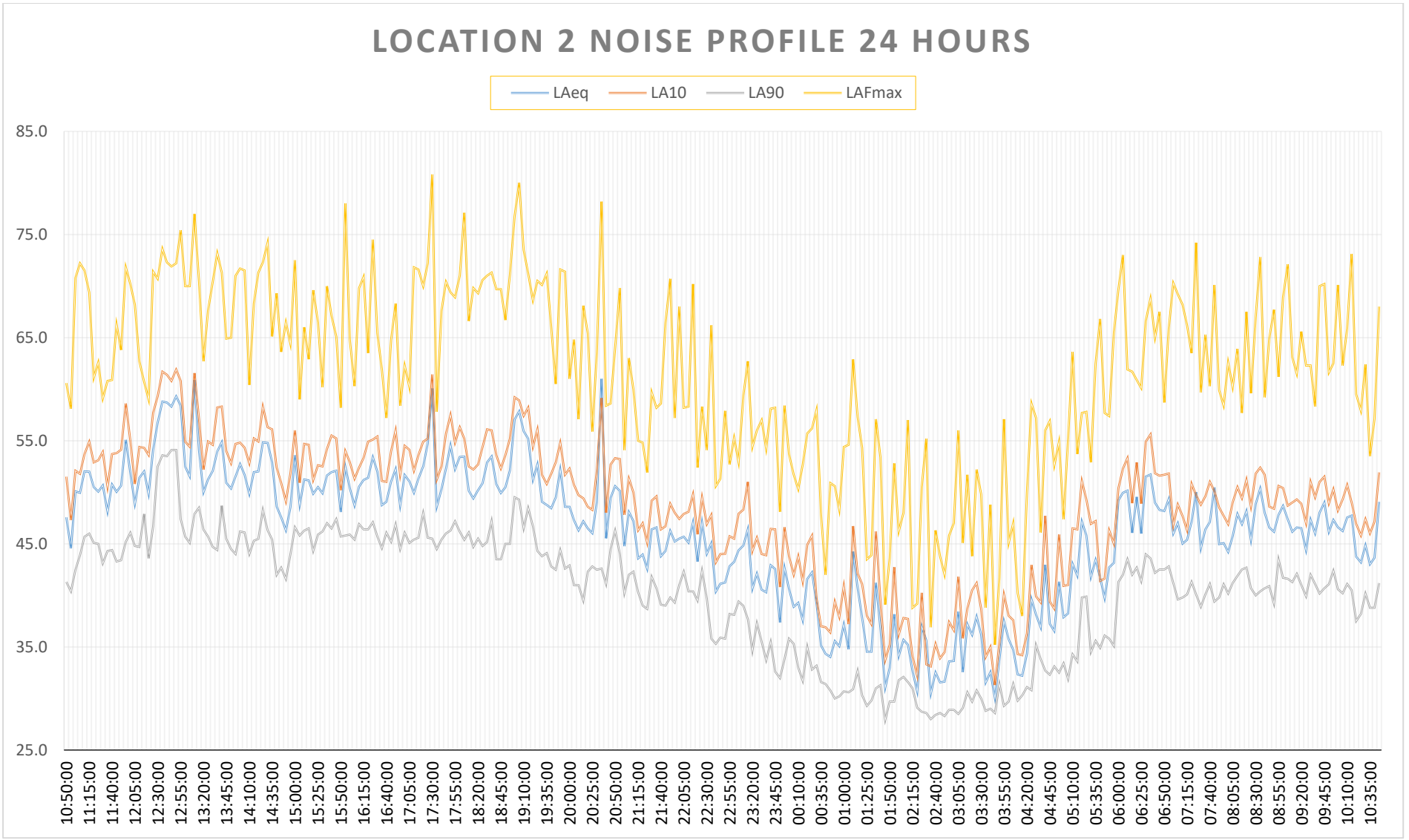
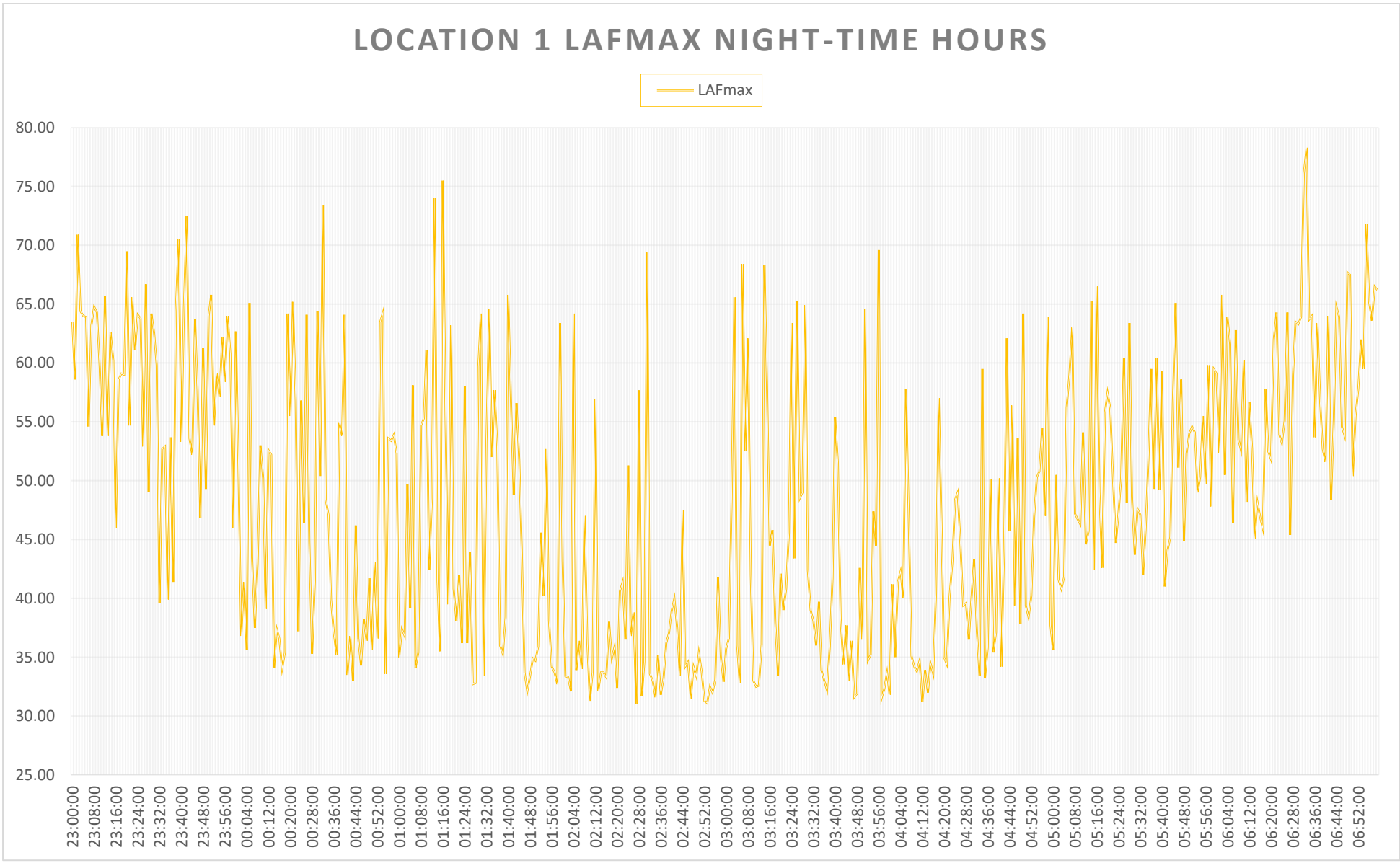


Figure 4.2 Background survey 24-hour noise profile graphs


LOCATION 1 LAFMAX NIGHT-TIME HOURS
LAFmax
80.00
75.00
70.00
65.00
60.00
55.00
50.00
45.00
40.00
35.00
30.00
25.00
23:00:00
23:08:00
23:16:00
23:24:00
23:32:00
23:40:00
23:48:00
23:56:00
00:04:00
00:12:00
00:20:00
00:28:00
00:36:00
00:44:00
00:52:00
01:00:00
01:08:00
01:16:00
01:24:00
01:32:00
01:40:00
01:48:00
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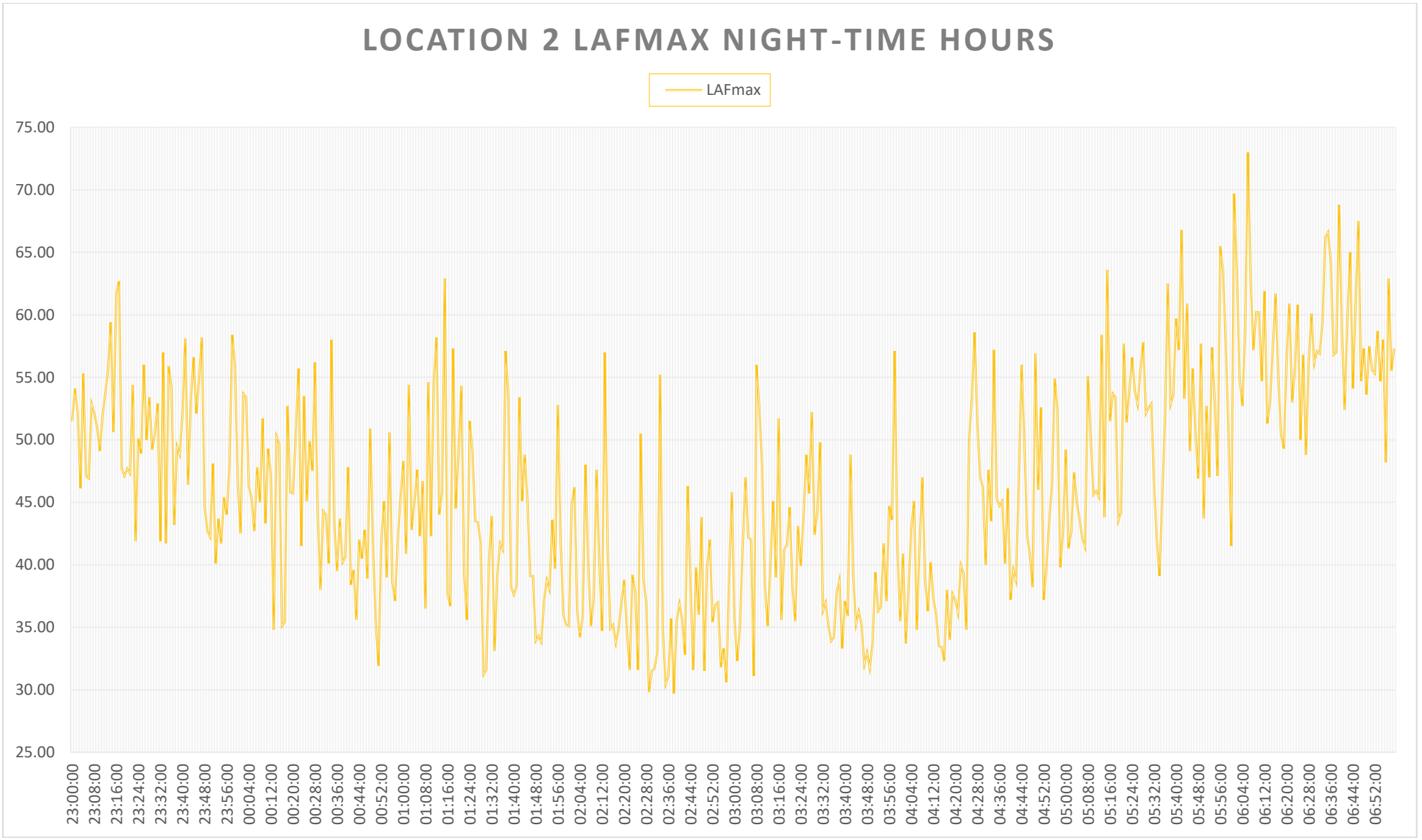


Figure 4.3 Background survey LAFmax night-time noise graphs

5. Noise Impact Assessment

The measured external noise levels have been compared with the BB93 target internal noise levels (see Section 2 of this Report) to derive the required noise reduction of façade/windows. As the proposed development is considered a change of use, indoor ambient noise levels for refurbishments have been used to assess the noise impact. Night-time levels have not been considered for this assessment as the purposed development is not operating during the night-time.

The internal target levels for Nursery School Rooms are based on guidelines laid out by BB93:

- Upper limit for the indoor ambient noise levels for new builds: 35 dB(A)
- Upper limit for the indoor ambient noise levels for refurbishments: 40 dB(A)

The nursery will also include potential noisy activities within the outdoor play areas and the noise impact levels at the NSRs have also been assessed and compared to the prevailing ambient noise levels to determine if any mitigation is required.

Based on the information received from the School Travel Plan REV B (issued by Aval Consulting Group on 02.01.24), it is understood that the development will be car-free and as such, there is no on-site car park, and no parking allocations are being provided for the drop-offs and pick-ups from the Nursery. Therefore, any possible noise from slamming doors in parked cars etc will form part of the existing noise in the surrounding public areas (not on-site) and has therefore been scoped out. Even though the traffic count figures are low, the potential increase in noise levels due to an increased traffic flow related to the Nursery operations has been assessed based on CRTN to determine the magnitude of impact.

Although NPSE from the National Planning Policy Framework have presented NOEL, SOEL, etc, there are no distinctive numerical criteria provided for adverse noise levels, hence it was considered appropriate to use the criteria provided in the IEMA table (refer to Section 2.1 of this report).

5.1 Noise Impact on Nursery Rooms (From External Noise).

Referring to Section 4 of this Report and considering the nature of the noise from the external surroundings, the prevailing levels of noise recorded in the surrounding area were compared to the internal BB93 criteria for Nursery school rooms.

5.1.1 Front Façade (facing Ham Street)

For the front façade of the Nursery, it was found that a minimum attenuation level of 53 – 40 = **13 dB** is required during daytime.

5.1.2 Rear Façade

Referring to Section 4 of this Report and considering the nature of the noise from the external surroundings, the prevailing levels of noise recorded were compared to the BB93 criteria mentioned in the above paragraph.

It was found that a minimum attenuation level of 48 – 40 = **8 dB** is required during daytime.

Therefore, based on the worst-case scenario, it has been deduced that a noise reduction of at least 13 **dB(A)** is recommended for all facades to ensure that the internal BB93 noise criteria for Nursery rooms are met.

5.2 Noise Impact on Nursery Offices (From External Noise).

It was noted that the offices within the nursery only operate during the daytime, and typically within the hours of 8 am – 6 pm. Therefore, only daytime readings have been considered. Based on the BB93 internal noise levels recommended for Offices (35 dB), it was found that a minimum attenuation level of 53 – 35 = **18 dB** is required during daytime.

5.3 Noise Impact From Exterior Play Areas

The proposed development will include 2 outdoor play areas and are labelled as "exterior play area 13.7m^2" and "Play Ground Area" In the proposed designs (refer to Appendix B). Based on the daily schedule of activities within the nursery, a noise model has been developed where the noise emission levels during the operational times of the Exterior Play Areas have been assessed for their impact at the NSRs and the findings have been presented in the oncoming sections of this report.

5.3.1 Noise Impact on Nearest Sensitive Receptors (NSR1)

It should be noted that, out of the 3 existing NSRs, 2 Ham Street (NSR1) is the closest one to both play areas; notably adjoins the "Play Ground Area" and is approximately 7m from the "exterior play area 13.7m^2". Due to its close proximity, the noise impact levels from the "Play Ground Area" have not been distance corrected as this area adjoins the receptor, however a distance correction (*using* $Lp_{@receptor} = Lp_{@source} - 20log(7/1)$) has been implemented for noise from the "exterior play area 13.7m^2" as it is approximately 7m from the NSR1.

The cumulative/resulting noise levels at NSR1 have been compared to the prevailing ambient noise levels (L_{eq}) to determine if any adverse impact could occur. Detailed results have been presented in Appendix D and in summary, it was found that the noise impact level at the site boundary of the nearest sensitive receptor would exceed the prevailing L_{eq} by **30dB** in the event of a worst-case scenario, which occurs when Classroom 3 (with the highest number of children) occupies the play areas. This is termed as very substantial based on IEMA criteria and mitigation is required. *(It should be noted that these calculations do not reflect the attenuation from the existing separating wall of the receptor, which has been considered in Section 6 of this report).*

Based on the methodology depicted in section 1.2 of this report, the predicted L_{max} levels from the play areas (82 dB) have also been considered and compared to the prevailing L_{max} levels measured on-site (87dB). It was found that the noise impact at the NSR would be **5dB** below the prevailing L_{max} noise levels.

5.3.2 Noise Impact on Nearest Sensitive Receptors (NSR2)

NSR2 lies at approximately 13m from the "exterior play area 13.7m^2" and at around 10m from "Play Ground Area". Based on the calculations in Appendix D, it was found that in the event of a worst-case scenario, the cumulative noise impact levels at NSR2 would exceed the prevailing ambient noise levels by **11dB**, which is very substantial based on IEMA criteria.

When comparing the L_{max} noise levels, it was found that the noise impact would be 62dB from the "Play Ground Area" and 60dB from the "exterior play area 13.7m^2". When compared to the prevailing L_{max} levels measured on-site (87dB), it can be concluded that the noise impact from L_{max} levels will be insignificant.

5.3.3 Noise Impact on Nursery Classrooms

Based on the daily schedule of activities, it was observed that all the classrooms would not be in the play areas at the same time. Therefore, it has been anticipated that the facades and glazed elements of the classrooms would require adequate attenuation so that the internal BB93 noise criteria for classrooms can be achieved whilst the playgrounds are occupied. With reference to the noise model in Appendix D, the highest noise emission levels from the playgrounds have been recorded as 78dB (A). To achieve the BB93 criteria of 40dB for refurbished classrooms, a noise reduction of **38dB (A)** is required.

5.4 Noise Impact from Pick-Ups and Drop-Offs

It is understood that the development would be car-free and the only parking provision provided on-site would be for cycle parking. Therefore, it is anticipated that there will not be any cars accessing the site and any potential noise from car door slams will form part of the existing noise in the surrounding public areas (not on-site) and has therefore been scoped out as all the occupants would likely come in by walking or cycling. However, certain advisory measures have been provided in the noise management plan (refer to Section 6 of this report).

5.5 Noise Impact from Nursery Traffic.

The School Travel Plan REV B (issued by Aval Consulting Group on 02.01.24) anticipates a total traffic flow of 35 vehicles over the course of the operational day (07.00 – 19.00).

Using the CRTN formula, $L_{A10(1hour)} = 42.2 + 10 \log (q)$, the predicted noise level due to the nursery traffic flow only, was determined as $L_{A10(1hour)} = 48dB$ (rounded to nearest figure). When compared to the prevailing L_{A10} noise level of 59dB (in the absence of the proposed development), it was found that cumulatively, there will not be any significant increase in noise levels due to traffic flow from the proposed development.

6. Outline Mitigation Measures

Mitigation measures need to be in place to minimise the potential negative impacts in order to ensure that the internal noise limits are achieved, we would recommend the following scheme of mitigation measures as outlined below.

6.1 Non-Glazed Elements

The non-glazed building façade elements are being retained in the refurbishment of the proposed development and consist of masonry and concrete. Based on the external noise levels recorded, all external walls for the Office area must achieve an acoustic performance of at least **18 dB**(A) to prevent any noise ingress from the surroundings. However, the non-glazed elements of classrooms 1, 2 and 3 would require an acoustic performance of at least **38 dB** (A).

6.2 Glazed Elements

Based on the results obtained in Section 5 of this report, it is proposed that glazing with an acoustic performance of > **18 dB** should be implemented in the Office area to prevent any external noise ingress. For classrooms 1, 2 and 3, the acoustic performance should be a minimum of **38dB** (A).

6.3 Mitigation for "Play Ground Area"

6.3.1 Mitigation at NSR1 (2 Ham Street)

Based on the findings in Section 5 of this report, the noise impact at the nearest sensitive receptor would exceed the prevailing ambient noise levels by 30 dB. However, it should be noted that these calculations were carried out without the consideration of existing topography and barriers. NSR 1 adjoins the "Play Ground Area" and a separating façade lies between the play area and the premises (as seen in Figure 6.1 below). From the site visit and based on the pictures below, it was deduced that the separating façade consists of 215mm brickwork, as can be seen in Figure 6.2.

Figure 6.1 "Play Ground Area" and separating façade of NSR1 ***(Sourced from Google Maps)***

Figure 6.2 215mm Brickwork Separating Façade of NSR1 *(Sourced from Google Maps)*

Based on INSUL Simulations found in Appendix E, it was found that the façade of NSR1 is likely to provide an attenuation of at least R_w (C, C_{tr}) = 55 (-2,-5) dB. Therefore, the internal noise impact from the play area would be 78 – 53 = 25 dB, which is less than the internal recommendation of 35dB for sensitive residential areas such as bedrooms etc. It can be concluded that the noise will not be heard at all within the premises and is considered insignificant. No further mitigation is recommended for NSR1.

6.3.2 Mitigation at NSR2 (27 Ham Common/Selby House)

Based on the findings in Section 5 of this report, the predicted noise impact levels at NSR2 would exceed the prevailing ambient levels by 11dB and would therefore require adequate noise reduction. In conjunction with the simulations in Appendix D, it was found that a 2.5m barrier would reduce the noise impact level to 0dB above the prevailing ambient noise levels, following which the significance of impact can be classed as having an insignificant (as per IEMA).

It is understood that a concrete wall is already in place on the site boundary. It is thereby proposed that the height of the wall will be verified and if required, additional acoustic fencing will be fitted so that an overall height of at least 2.5m is reached. The location of the proposed barrier mitigation has been highlighted in Figure 6.3 below (in red).

Figure 6.3 Proposed Barrier Location highlighted in red *(Sourced from Google Maps)*

6.4 Separating Floors and Walls

For nurseries where school rooms share a wall, staircase, corridor, or floor, it is necessary that separating elements are designed in accordance with the BB93.

For refurbishment nursery school rooms that have a medium noise tolerance in the receiving room require an average airborne acoustic performance of $D_{nT,w}$ > **40 dB,** and an impact $L_{nT,w}$ < **65 dB**.

The maximum mid-frequency performance reverberation time requirement for nursery school rooms for refurbishments is T_{mf} seconds **≤ 0.8 s**.

6.5 Ventilation Noise Requirements

Based on the findings in Sections 4 and 5 of this report, the noise from building services under normal conditions should meet their limits for indoor ambient noise levels from BB93. The table below shows the operating condition, ventilation system and noise level limits of each variation.

Condition	Ventilation System	Noise Level Limits dB
Normal - ventilation for normal teaching and learning activities	Mechanical	40
	Natural	45
	Hybrid	Mechanical noise value: 40
		Total noise value: 45
Summertime - ventilation under local control of teacher to prevent overheating – allowable during the hottest 200 hrs of the year	Mechanical	45
	Natural or Hybrid	≤55
Intermittent boost – ventilation under local control of teacher for dilution of fumes during practical activities as in practical spaces for science, art, food technology and design and technology	Mechanical	45
	Natural or Hybrid	≤55

Table 6.1 Ventilation system noise level limits.

6.6 Noise Management Plan

The development of a full management plan is outside the scope of Aval Consulting Group and would be established by the operator of the premises, taking into consideration their own preferred working practices. However, it is proposed that the following can be part of the Noise Management plan to ensure that there is no adverse impact during the operational periods of the proposed development.

- No loud music and other similar activities should be carried out within the premises. Should such activities be required on-site, an additional noise survey will be required to set the noise limits based on octave band frequency analysis.
- It is suggested that the nearby receptors (residential premises) should be informed about the development in question and the daily schedule shared to explain how consideration has been made and what mitigation measures are in place to minimize the noise impact the development could have. (Please also refer to the noise respite section).
- It is proposed that parents and staff coming in and out of the premises during the early morning hours be briefed and made aware of potential adverse noise impacts and noise management issues so they can restrict the emission of loud noises such as shouts etc.
- Staff should be mindful of residential neighbours and use calm, gentle voices when interacting with children and others.
- It is proposed that the daily schedule of activities should be kept in place and not changed (especially the occupation of the play areas)
- This noise survey is based on the maximum number of occupants for the play areas, which is 10 occupants from classroom 1, 25 occupants from classroom 2 and 18 occupants from classroom 3. It should be noted that the results in this report could be void if the occupants exceed these numbers at any point in time. Therefore, it is proposed that the number of occupants for the play area should stay in place (as per the current schedule) or a new noise survey carried out if they are to be increased.
- Noise Respite: The "*Respite Working Group 2014-16*" define noise respite as a scheduled relief from noise for a period of time. In context to the proposed development, both the occupants and the receptors within the area will be exposed to the highest levels of noise during the operational hours of the playground areas. It has been noted that the daily schedule of nursery activities includes noise respite at particular hours of the day. Noise respite would occur on a daily basis as per the schedules below.
    - Mondays and Thursdays- Noise respite occurring from 12.00 – 15.30
    - Tuesdays and Fridays – Noise respite occurring from 11.00 – 15.30
    - Wednesdays – Noise respite occurring from 11.30 – 14.30

  It was also observed that the 2 play areas are not occupied at the same time on different days, which also creates noise respite on a rotational basis. For example, the "external play area", is not used at all on Tuesdays and Fridays and the timeslots that it is used on the remaining days differ. It is thereby proposed that the daily schedule should be maintained as it is and advice should be sought before any changes are to be made.
- An appropriate procedure should be in place to enable prompt investigation should any complaints or concerns be raised by nearby residents.

7. Conclusions

An environmental noise survey has been undertaken for the proposed development at 4-6 Ham Street, Richmond, TW10 SHT, allowing the assessment of daytime likely to be experienced by the proposed development.

Predicted noise levels allowed a robust noise insulation proposal to be made to comply with a minimum value for required attenuation, which would, in turn, provide internal noise levels for all nursery school rooms and commercial office environments of the development commensurate to the relevant design standard, BB93.

Mitigation measures have been provided to prevent any adverse noise impacts on existing receptors and a noise management plan has been proposed to ensure no adverse impact occurs during the operational phase.

It can, therefore, be concluded that the proposed development is not considered to conflict with any national, regional, or local noise planning policy.

Appendix A: Noise Indicators

Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of 10^{13} units, that only a logarithmic scale is the sensible solution for displaying such a range.

Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Reference Time Interval, T

The specified time interval over which an equivalent continuous A-weighted sound pressure level is determined.

$L_{Aeq,T}$

The A-weighted equivalent continuous sound level. This is the sound level of a notionally steady sound having the same energy as the fluctuating sound over a specified measurement period, T.

$L_{A10,T}$

The A-weighted sound level exceeded for 10% of the specified measurement period, T.

L_{Amax}

The highest short duration A-weighted sound level recorded during a noise event.

L_{A90}

The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 % of a given time interval, T.

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible

6	Clearly noticeable
10	About twice as loud

Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

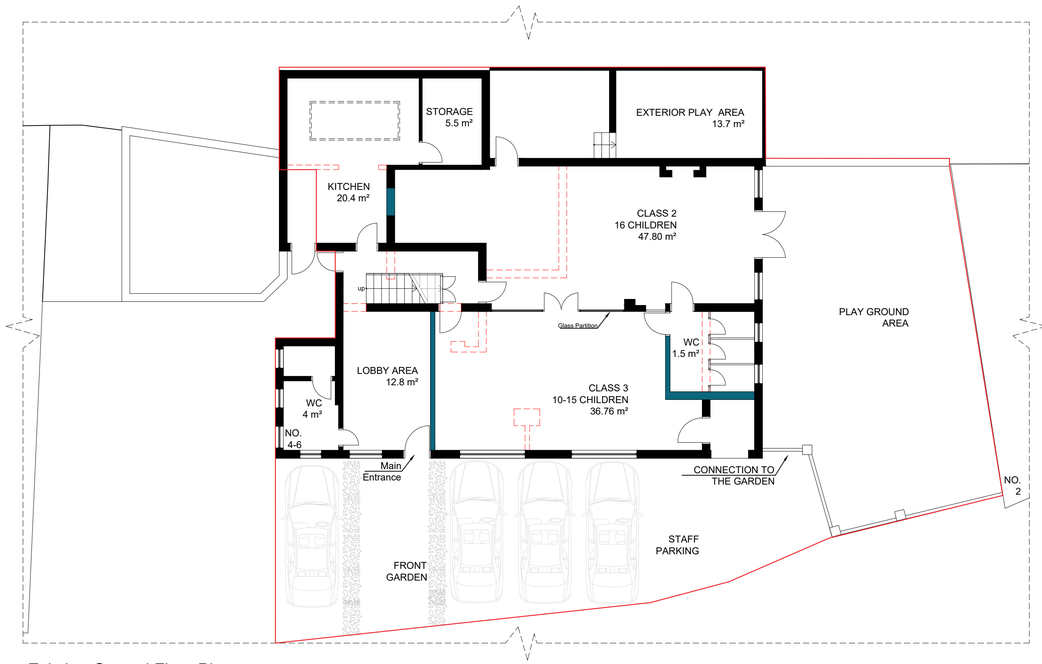
Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

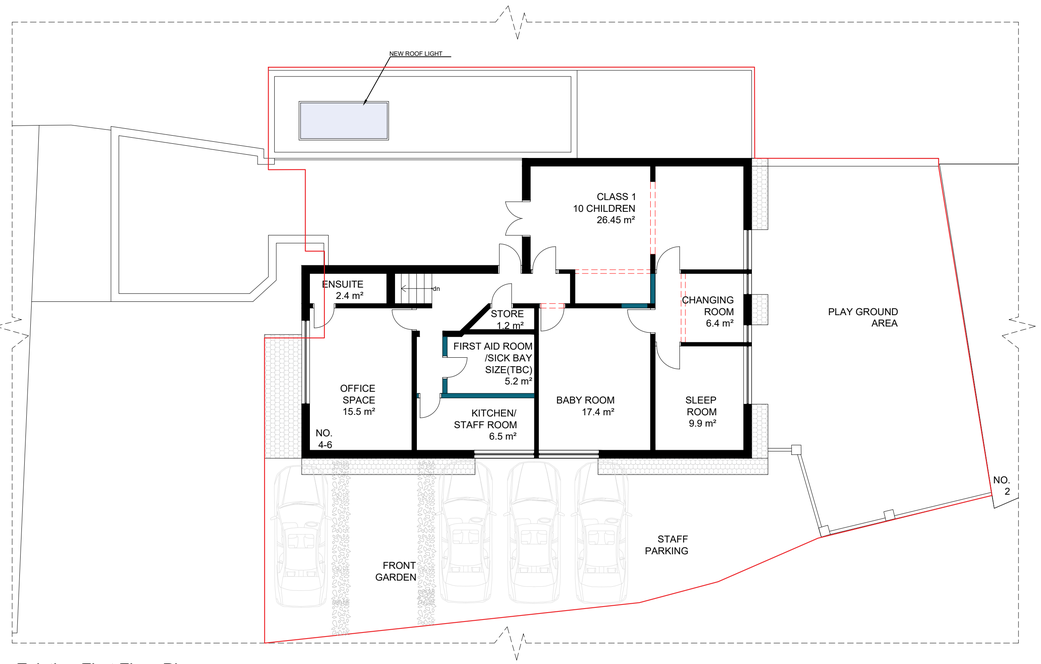
Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.

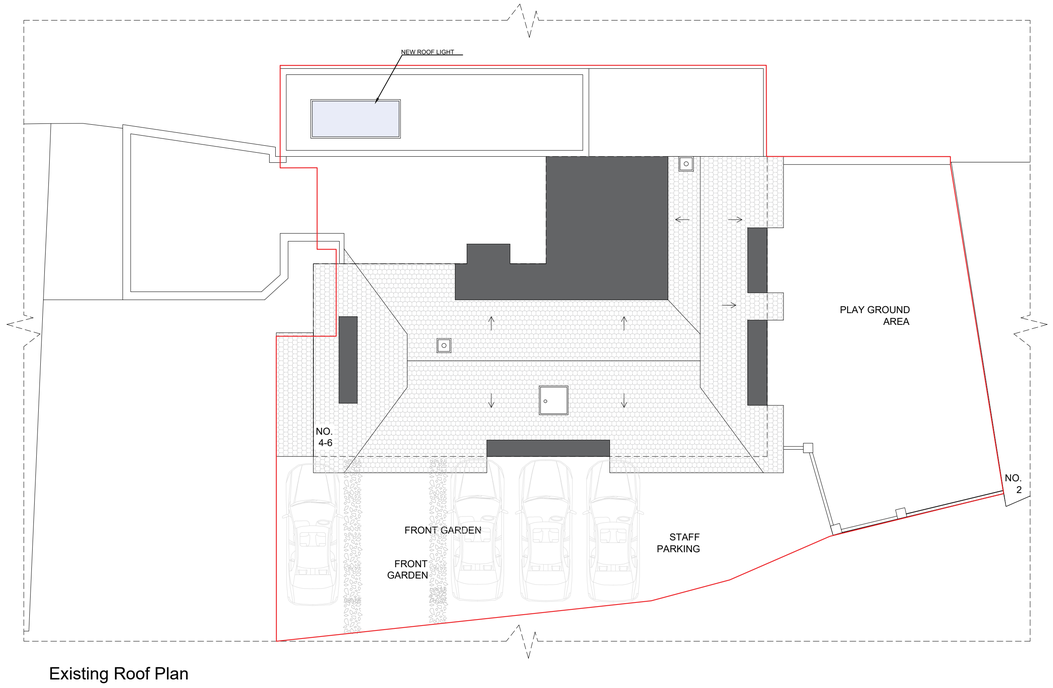
Appendix B: Proposed Site Plans, Activities and Location of NSRs



Existing Ground Floor Plan



Existing First Floor Plan



Existing Roof Plan

Any dimensions shown should be checked on site and discrepancies reported to the Architect prior to construction. Designs are not coordinated with engineer projects. Do not scale for construction purposes.

Existing

Proposed

0 1 2 3 4

Scale Bar 1:100 M

Drawing Name
Proposed Plans

Project Adress
4-6 Ham Street, Richmond
TW10 7HT

Scale
1/100 at A1

Date
03.05.2023

Designer
DG

Revision
V2

Drawing No.
4-6HamStreet_
ProposedPlans_V2

PLANNING BY DESIGN
HOMEOWNER'S EXEMPTION

Planning By Design Ltd
www.planning-by-design.co.uk
hello@planning-by-design.co.uk

Daily Schedule_ Early Years

All children will be in allocated classroom 1,2,3 or babies, as per prescribed ratios recommended by the DFE, for all of their activities, with the exception of PE (Gross Motor Development) and OUTDOOR PLAY.

Outdoor play time will be spent in Playground Area, however no more than one classroom at a time will be accomodate, it will be by rotation during the prescribed playtime.

Classroom 1 = 10; Classroom 2 = 18; Classroom 3 =15, Babies = 5.

Children in Classroom 1 + Baby Class Schedule

Morning Session	Monday	Tuesday	Wednesday	Thursday	Friday
07:00	Arrive at school and proceed with class register				
07:30					
08:00					
08:30	Breakfast followed by class register and circle time				
09:00	Social	Language	PE	MUSIC	STEM
09:30	PLAYGROUND AREA/ OUTDOOR PLAY				
10:00	Morning Snack				
10:30	PE	STEM	Social	PE	Social
11:00	Language	Art & Craft	Enrichment Learning	Art & Craft	Enrichment Learning
11:30	STEM				
12:00	Lunch				
Afternoon Sessio	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
13:00	Arrive at school and proceed with class register				
13:30					
14:00					
14:30	Breakfast followed by class register and circle time				
15:00	Social	Language	PE	MUSIC	STEM
15:30	PLAYGROUND AREA/ OUTDOOR PLAY				
16:00	Morning Snack				
16:30	PE	STEM	Social	PE	Social
17:00	Language	Art & Craft	Enrichment Learning	Art & Craft	Enrichment Learning
17:30	STEM				
18:00	Story Time/ Home time				

Children in Classroom 2 Class Schedule

Morning Sessio	Monday	Tuesday	Wednesday	Thursday	Friday
07:00	Arrive at school and proceed with class register				
07:30					
08:00					
08:30	Breakfast followed by class register and circle time				
09:00	Social	Language	Enrichment Learning	Art & Craft	STEM
09:30	Language	STEM			Social
10:00	PLAYGROUND AREA/ OUTDOOR PLAY				
10:30	Morning Snack				
11:00	PE	Art & Craft	PE	PE	Enrichment Learning
11:30	STEM		Social	Music	
12:00	Lunch				
Afternoon Sessi	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
13:00	Arrive at school and proceed with class register				
13:30					
14:00					
14:30	Breakfast followed by class register and circle time				
15:00	Social	Language	Enrichment Learning	Art & Craft	STEM
15:30	Language	STEM			Social
16:00	PLAYGROUND AREA/ OUTDOOR PLAY				
16:30	Morning Snack				
17:00	PE	Art & Craft	PE	PE	Enrichment Learning
17:30	STEM		Social	Music	
18:00	Lunch				

Children in Classroom 3 Class Schedule

Morning Sessio	Monday	Tuesday	Wednesday	Thursday	Friday
07:00	Arrive at school and proceed with class register				
07:30					
08:00					
08:30	Breakfast followed by class register and circle time				
09:00	Social	Language	Social	Art & Craft	STEM
09:30	Language	STEM	PE		Social
10:00	Morning Snack				
10:30	PLAYGROUND AREA/ OUTDOOR PLAY				
11:00	STEM	Art & Craft	Enrichment Learning	Music	Enrichment Learning
11:30	PE			PE	
12:00	Lunch				
Afternoon Sessi	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
13:00	Arrive at school and proceed with class register				
13:30					
14:00					
14:30	Breakfast followed by class register and circle time				
15:00	Social	Language	Social	Art & Craft	STEM
15:30	Language	STEM	PE		Social
16:00	Morning Snack				
16:30	PLAYGROUND AREA/ OUTDOOR PLAY				
17:00	STEM	Art & Craft	Enrichment Learning	Music	Enrichment Learning
17:30	PE			PE	
18:00	Lunch				

Notes:

Outdoor time

7. Children will spend all activities times in classroom 1, 2 and 3 except - Gross motor in Exterior Play area (PE - Green) on Ground floor and Free Play in Outdoor PlayGround (red).
8. Outdoor play time will be spent in Playground Area, however no more than one classroom at a time will be accomodate, it will be by rotation during the prescribed playtime.

Morning Session/ Playground Area: 0-24 months (9:30 - 10:00), 24- 36 months (10:00 - 10:30), 38-48 months (10:30 - 11:00).

Afternoon Session/Playground Area: 0-24 months (14:30 - 15:00), 24- 36 months (15:00 - 15:30), 36-60 months (15:30 - 16:00).

Sessions

1. Arts and crafts (A&C) include art appreciation and conversations about the theme and art
2. MA - Stands for music appreciation, whereby a proper music lesson needs to be given to the children
3. S&E includes things like role play, puppet show, fantasy or imaginary play
4. STEM includes mathematics
5. With the exception of A&C sessions must be at least 30 minutes (Allow 5 minutes for movement and 5 minutes for tidy up time)
6. A&C is to be 1 hour long (If class finishes early - complete the lesson with mindfulness activity for the lat 10 minutes)

Drop-off Schedule (7:00 am - 9:00 am):

Time	Activity
6:30 am	Staff Arrival and Set-Up
7:00 am	Early Drop-off Begins (Arrival Window of 1 hour and 30 minutes is open) (The front entrance and side playground entrance are open) Expect at least 19 children
8:30 am	Morning Activities/Classes Begin (Arrival window still open for 30 minutes) Expect at least 13 children
9:00 am	Morning Drop-off Ends

Drop-off Schedule (12:30 pm - 1:30 pm):

Time	Activity
12:30 pm	Staff Arrival and Set-Up
12:45 pm	Afternoon Drop-off Begins (Arrival Window of 1 hour is open) (The front entrance only is open) Expect at least 17 children
1:30 pm	Afternoon Activities/Classes Begin

Collection Schedule (13:15 - 14:00):

Time	Activity
13:00	Staff Arrival and Set-Up
13:15	Early Collection Begins (Morning Session) (Arrival Window of 30 minutes is open) (The side playground entrance is open) Expect at least 10 leaving children
14:00	Collection period closed

Collection Schedule (15:30 - 18:00):

Time	Activity
15:30 - 16:00	Early Collection Begins (Afternoon Session) (Arrival Window of 1 hour and 30 minutes is open) (The front entrance is open) Expect at least 8 leaving children
16:00 - 17:30	Evening collection period (Afternoon Session) (Arrival Window of 1 hour and 30 minutes is open) (The front entrance is open) Expect at least 12 leaving children
17:30 - 18:00	Collection Peak (Afternoon Session) (Arrival Window of 30 minutes is open) (The front entrance and side playground entrance are open) Expect at least 19 leaving children

*(Approximate collection time is 3 minutes per person, who may arrive at the same time)

*Please refer to the school travel plan for arrival methods

Distance from Play Ground Area (Boundary) to

- NSR 1 = 0m
- NSR 2 = 10m

Distance from Exterior Play Area 13.7m^2 (Boundary) to

- NSR 1 = 7m
- NSR 2 = 13m

Appendix C: Glazing Example mitigation.

Sound insulation data for Pilkington **Optiphon™**

Glass	Sound reduction index (dB)									
	Octaveband Centre Frequency (Hz)						R_w (C; C_{tr})	R_w	R_w+C	R_w+C_{tr}
	125	250	500	1000	2000	4000				
Single glazing										
6.8 mm Pilkington **Optiphon™**	22	26	31	37	40	40	36 (-1; -4)	36	35	32
8.8 mm Pilkington **Optiphon™**	27	29	34	38	40	43	37 (0; -2)	37	37	35
10.8 mm Pilkington **Optiphon™**	26	30	35	39	40	46	38 (-1; -3)	38	37	35
12.8 mm Pilkington **Optiphon™**	29	32	36	41	42	51	40 (-1; -3)	40	39	37
16.8 mm Pilkington **Optiphon™**	31	33	38	41	43	54	41 (-1; -3)	41	40	38
Insulating glass units										
6 mm / 16 mm argon / 6.8 mm Pilkington **Optiphon™**	21	28	37	48	48	54	40 (-2; -6)	40	38	34
6 mm / 16 mm argon / 8.8 mm Pilkington **Optiphon™**	25	27	38	48	47	55	41 (-2; -6)	41	39	35
8 mm / 16 mm argon / 8.8 mm Pilkington **Optiphon™**	21	30	39	47	50	55	42 (-3; -8)	42	39	34
10 mm / 16 mm argon / 8.8 mm Pilkington **Optiphon™**	28	31	42	45	50	58	44 (-2; -6)	44	42	38
10 mm / 20 mm argon / 8.8 mm Pilkington **Optiphon™**	28	36	43	47	49	58	46 (-2; -6)	46	44	40
8.8 mm Pilkington **Optiphon™** / 16 mm argon / 12.8 mm Pilkington **Optiphon™**	28	36	45	53	56	64	48 (-2; -7)	48	46	41
10.8 mm Pilkington **Optiphon™** / 24 mm argon / 16.8 mm Pilkington **Optiphon™**	35	41	48	53	55	65	52 (-2; -6)	52	50	46
12.8 mm Pilkington **Optiphon™** / 20 mm argon / 16.8 mm Pilkington **Optiphon™**	35	45	49	50	54	65	51 (-1; -4)	51	50	47

Measurements undertaken in accordance with BS EN ISO 10140 and Rw (C; C_{tr}) determined in accordance with BS EN ISO 717-1.
For insulating glass units, there is little difference in the sound insulation for cavity widths in the range 6 to 16 mm.
To calculate performance data for Pilkington products, please use our Spectrum online calculator at https://spectrum.pilkington.com/
For glass combinations to achieve an R_w value higher than 52 dB, please contact us for more details.

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Appendix D: Noise Impact Calculations and Acoustic Barrier Simulation

Noise Impact at NSR1 *(Exterior play area in Green and Play Ground Area in red)*

Day	Time	Number of Occupants Ext Play Area	Noise emission levels	Noise Impact at closest NSR	Number of occupants Outdoor Play Area	Noise emission levels	Noise Impact at closest NSR	Cumulative Noise	Excess over prevailing Leq
Mondays & Thursdays	09.00-09.30								
	09.30-10.00				10	75	75	75	27
	10.00 - 10.30				18	78	78	78	30
	10.30- 11.00	10	75	58	15	77	77	77	29
	11.00 - 11.30	18	78	61				61	13
	11.30 -12.00	15	77	60				60	12
	15.00 - 15.30								
	15.30 - 16.00				10	75	75	75	27
	16.00 -16.30				18	78	78	78	30
	16.30 - 17.00	10	75	58	15	77	77	77	29
	17.00 - 17.30	18	78	61				61	13
	17.30 - 18.00	15	77	60				60	12
Day	Time	Number of Occupants Ext Play Area	Noise emission levels	Noise Impact at closest NSR	Number of occupants Outdoor Play Area	Noise emission levels	Noise Impact at closest NSR	Cumulative Noise	Excess over prevailing Leq
Tuesday & Fridays	09.00-09.30								
	09.30-10.00				10	75	75	75	27
	10.00 - 10.30				18	78	78	78	30
	10.30- 11.00				15	77	77	77	29
	11.00 - 11.30								
	11.30 -12.00								
	15.00 - 15.30								
	15.30 - 16.00				10	75	75	75	27
	16.00 -16.30				18	78	78	78	30
	16.30 - 17.00				15	77	77	77	29
	17.00 - 17.30								
	17.30 - 18.00								
Day	Time	Number of Occupants Ext Play Area	Noise emission levels	Noise Impact at closest NSR	Number of occupants Outdoor Play Area	Noise emission levels	Noise Impact at closest NSR	Cumulative Noise	Excess over prevailing Leq
Wednesday	09.00-09.30	10	75	58				58	10
	09.30-10.00	18	78	61	10	75	75	75	27
	10.00 - 10.30				15	77	77	77	29
	10.30- 11.00				18	78	78	78	30
	11.00 - 11.30	15	77	60				60	12
	11.30 -12.00								
	14.30 - 15.00	10	75	58				58	10
	15.00 - 15.30								
	15.30 - 16.00	18	78	61	10	75	75	75	27
	16.00 -16.30				15	77	77	77	29
	16.30 - 17.00				18	78	78	78	30
	17.00 - 17.30	15	77	60				60	12
	17.30 - 18.00								

Noise Impact at NSR2 *(Exterior play area in Green and Play Ground Area in red)*

Day	Time	Number of Occupants Ext Play Area	Noise emission levels	Noise Impact at closest NSR	Number of occupants Outdoor Play Area	Noise emission levels	Noise Impact at closest NSR	Cumulative Noise	Excess over prevailing Leq
Mondays & Thursdays	09.00-09.30								
	09.30-10.00				10	75	55	55	7
	10.00 - 10.30				18	78	58	58	10
	10.30- 11.00	10	75	53	15	77	57	59	11
	11.00 - 11.30	18	78	55				55	7
	11.30 -12.00	15	77	54				54	6
	15.00 - 15.30							0	
	15.30 - 16.00				10	75	55	55	7
	16.00 -16.30				18	78	58	58	10
	16.30 - 17.00	10	75	53	15	77	57	57	9
	17.00 - 17.30	18	78	55				55	7
	17.30 - 18.00	15	77	54				54	6

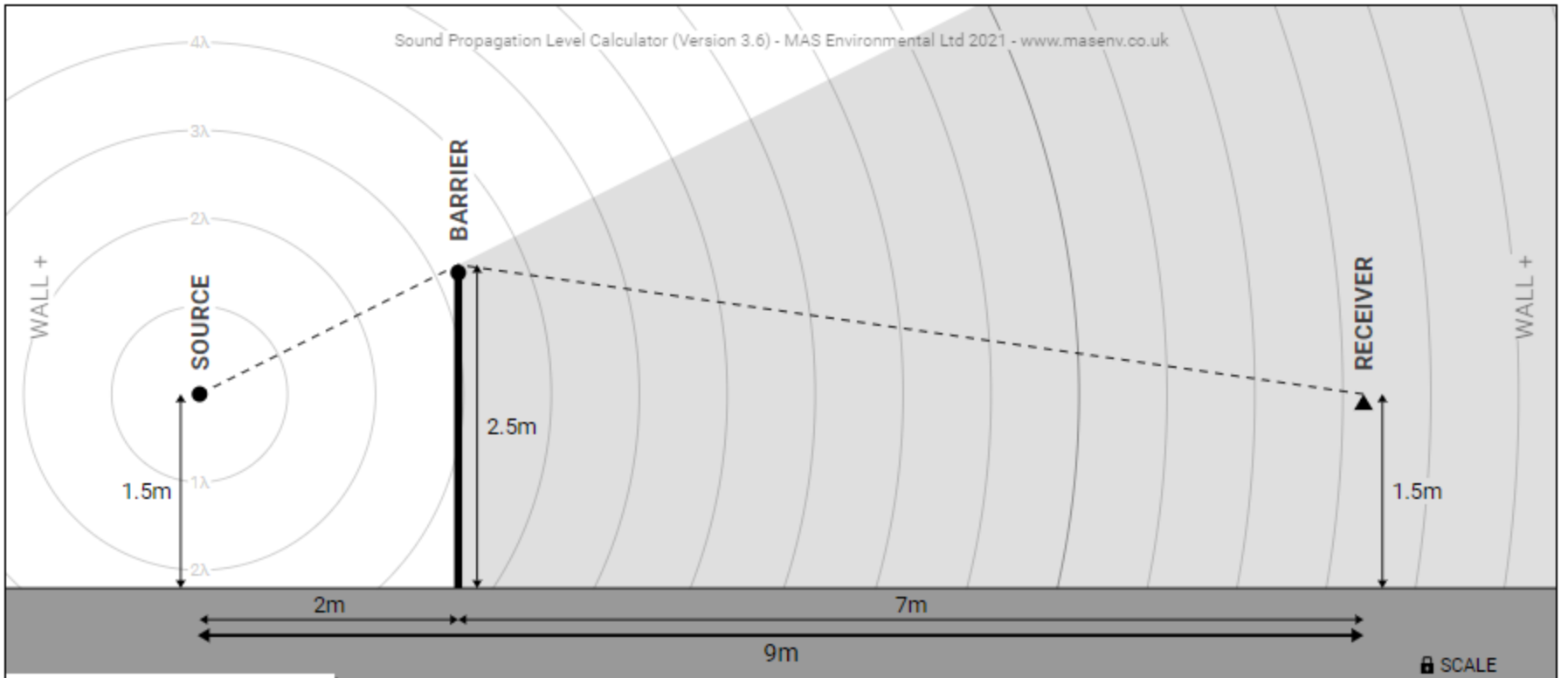
Day	Time	Number of Occupants Ext Play Area	Noise emission levels	Noise Impact at closest NSR	Number of occupants Outdoor Play Area	Noise emission levels	Noise Impact at closest NSR	Cumulative Noise	Excess over prevailing Leq
Tuesday & Fridays	09.00-09.30								
	09.30-10.00				10	75	55	55	55
	10.00 - 10.30				18	78	58	58	58
	10.30- 11.00				15	77	57	57	57
	11.00 - 11.30								
	11.30 -12.00								
	15.00 - 15.30								
	15.30 - 16.00				10	75	55	55	55
	16.00 -16.30				18	78	58	58	58
	16.30 - 17.00				15	77	57	57	57
	17.00 - 17.30								
	17.30 - 18.00								

Day	Time	Number of Occupants Ext Play Area	Noise emission levels	Noise Impact at closest NSR	Number of occupants Outdoor Play Area	Noise emission levels	Noise Impact at closest NSR	Cumulative Noise	Excess over prevailing Leq
Wednesday	09.00-09.30	10	75	53					0
	09.30-10.00	18	78	55	10	75	55	58	10
	10.00 - 10.30				15	77	57	57	9
	10.30- 11.00				18	78	58	58	10
	11.00 - 11.30	15	77	54				54	6
	11.30 -12.00								
	14.30 - 15.00	10	75	53				53	5
	15.00 - 15.30								
	15.30 - 16.00	18	78	55	10	75	55	58	10
	16.00 -16.30				15	77	57	57	9
	16.30 - 17.00				18	78	58	58	10
	17.00 - 17.30	15	77	54				54	6
	17.30 - 18.00								

Please note that barrier calculations involve closest NSR and is a worst case scenario

Sound Propagation Level Calculator

Interactive noise source-to-receiver diagram with barrier calculations



Single Frequency | Multi Spectrum

Source

Frequency: 500 Hz

Sound Power Level: 89 dB

Receiver

Show calculation breakdown

Distance from Source: 9 m

Resulting Sound Pressure Level: 48.1 dB

Barriers

Apply ISO limit

- No barriers
- Single barrier
- Double barrier
- Building

Display

- Off
- Grid (m)
- Distance (m)
- Wavelength (λ)

Environmental Parameters

20 °C Temperature

70 % Humidity

1 Ground Factor (G)

Hard | Soft | Original IS

Options

- Reset all values
- Link to this calculation
- Copy results to clipboard
- Save results as an image

Appendix E: INSUL Simulations

Sound Insulation Prediction (v9.0.24)

Margin of error is generally within Rw ±3 dB
- Key No. 5595
Job Name:
Job No.: 92609 Initials:Aval_Model
Date:24/01/2024
File Name:insul

Notes:

Rw 55 dB
C -2 dB
Ctr -5 dB

Panel Size = 2.7 m x 4.0 m

Partition surface mass = 344 kg/m²

System description

Panel 1 : 1 x 215 mm Brick

freq.(Hz)	R(dB)	R(dB)
50	41	
63	41	41
80	41	
100	41	
125	38	39
160	39	
200	41	
250	44	43
315	46	
400	49	
500	51	51
630	54	
800	56	
1000	58	58
1250	60	
1600	61	
2000	63	63
2500	65	
3150	66	
4000	68	68
5000	69