**Central Somers Town, London Borough of Camden**

Noise assessment

DECEMBER 2015

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Somers Town Community Investment Programme

Camden

Intended for
**London Borough of Camden**

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# CENTRAL SOMERS TOWN, LONDON BOROUGH OF CAMDEN
# NOISE ASSESSMENT

RAMBOLL ENVIRON

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# NOISE ASSESSMENT

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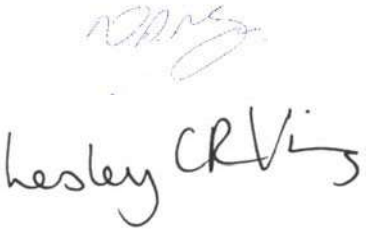

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# EXECUTIVE SUMMARY

Ramboll Environ UK Ltd (Ramboll Environ) has been commissioned to undertake an assessment of noise to accompany a planning application for a mixed use development proposed at a site in Central Somers Town, Camden (the Site).

The Site comprises seven proposed development lots, comprising a mix of residential development, plus community, nursery and educational facilities, in addition to public open space (the Proposed Masterplan Development).

This report summarises the key details of the six separate, detailed assessments covering the individual lots of the Somers Town Masterplan. These reports are presented in full in Appendices 2 to 7.

The individual assessments have concluded that the Site is largely unconstrained by noise and that typical acoustic façade insulation values, associated with traditional thermally insulating construction techniques would be adequate to ensure appropriate internal noise levels for the residential and educational developments across the Proposed Masterplan Development.

The assessments also present data which identifies that the public realm external amenity spaces incorporated within the Proposed Masterplan Development would typically provide daytime noise levels in accordance with the recommendations of the WHO and BS 8233: 2014.

Target noise criteria have been set for all static plant within the Proposed Masterplan Development. Providing that the cumulative rating noise level from the plant items does not exceed the stated noise criteria, whether through the application of noise control techniques or otherwise, the impact of noise from such sources is predicted to have no adverse impact on existing sensitive receptors.

An assessment of vibration has also been carried out for the closest parts of the Proposed Masterplan Development to St Pancras Railway Station, which has indicated that appropriate criteria would be achieved without the need for mitigation measures.

Consequently, the Site is considered suitable for the Proposed Masterplan Development in acoustic terms and noise should not present a constraint to the granting of planning permission for the Proposed Masterplan Development in its current form.

# 1. INTRODUCTION

## 1.1 Background

Ramboll Environ UK Ltd (Ramboll Environ) has been commissioned to undertake an assessment of noise to accompany a planning application for a mixed use development proposed at a site in Central Somers Town, Camden (the Site).

The Site comprises seven proposed development lots, comprising a mix of residential development, plus community, nursery and educational facilities, in addition to public open space (the Proposed Masterplan Development). This report summarises the key details of the six separate, detailed assessments covering the individual lots to provide an overview in relation to noise for the complete Proposed Masterplan Development. These reports are presented in full in Appendices 2 to 7.

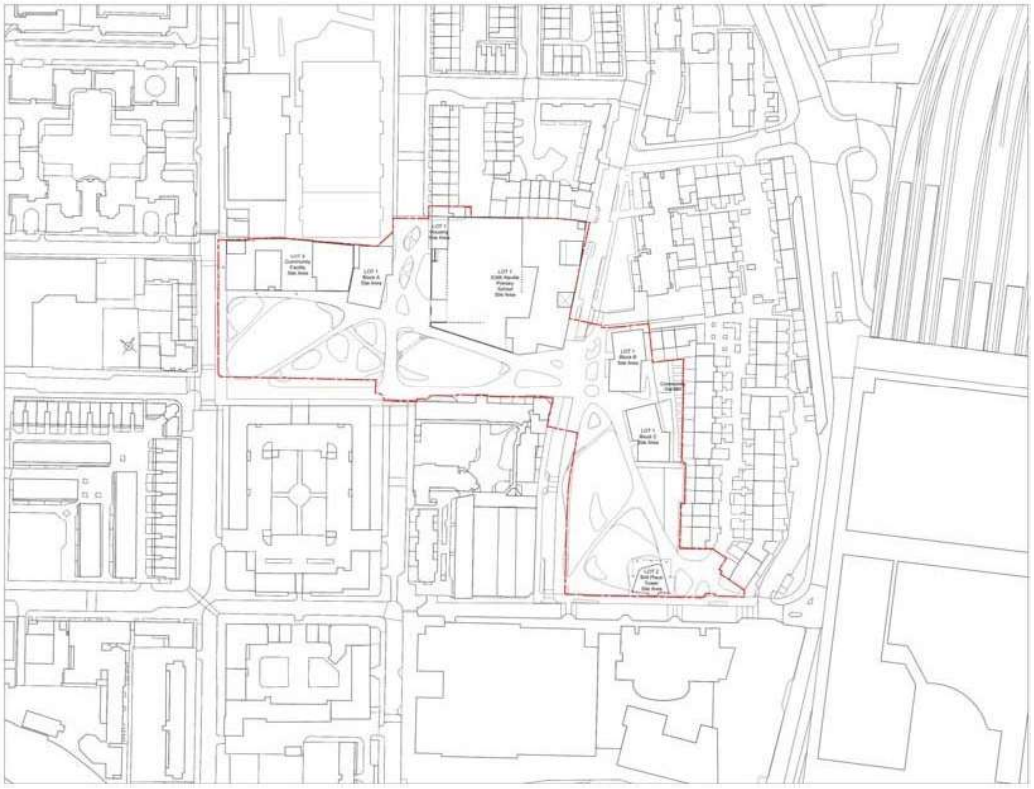
A glossary of technical terms and references is presented in Appendix 1 – Glossary of Terms.

## 1.2 Site Description

The Site is located to the south-west of St Pancras Railway Station, spanning Purchese Street and extending as far south-west as Chalton Street and south-east to Brill Place, as shown in Figure 1.1. The proposals make use of open land and sites/premises requiring redevelopment within the existing residential area of Somers Town, Camden.

The noise climate in the area is dominated primarily by road traffic noise, with contributions arising from rail traffic, towards the north-east of the Site.

**Figure 1.1: Site Location**



## 1.3 Proposed Masterplan Development

The Proposed Masterplan Development comprises the demolition of existing buildings and the provision of approximately 2,180sq.m replacement school (Use Class D1); approximately 1,765sq.m of community facilities (Use Class D1); approximately 207sq.m of flexible Use Class A1/A2/A3/D1 floorspace and 136 residential units (Use Class C3) over 7 buildings ranging from 3 to 25 storeys in height comprising:

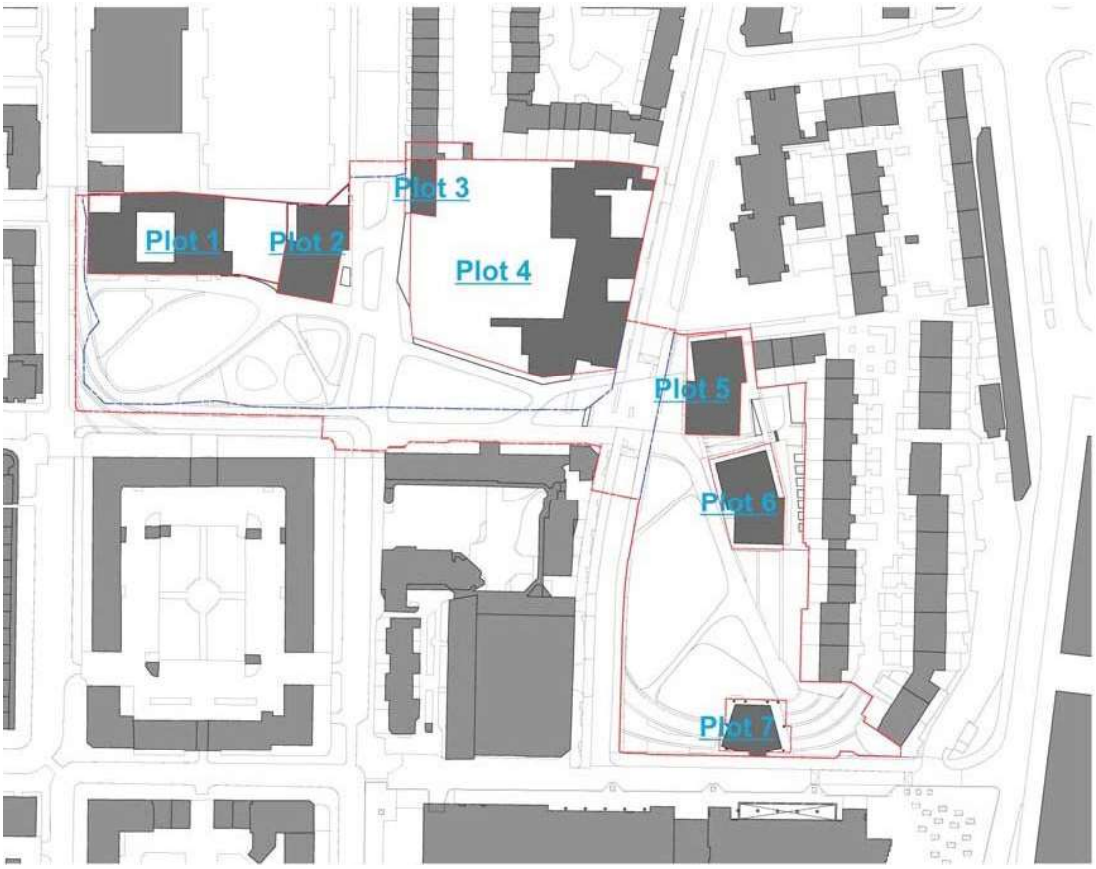
- Plot 1: Community Hub and Housing - Community uses at ground floor (Use Class D1) (approximately 1,554sq.m) to include a children's nursery and community play facility with 10 no. residential units above;
- Plot 2: Charrington Street Apartments - 35 residential units over flexible A1/A2/A3/D1 floorspace at ground level (approximately 137sq.m);
- Plot 3: Charrington Street Terrace Housing - Extension of Grade II listed terrace to provide 3 no. dwellings;
- Plot 4: Edith Neville Primary School and Community Centre - Replacement school (Use Class D1) ;
- Plot 5: Purchese Street Housing North and Community Hall - 20 no. residential units over a replacement community hall (Use Class D1) (approximately 211sq.m);
- Plot 6: Purchese Street Housing South - 14 no. residential units; and
- Plot 7: Brill Place Tower - 54 no. residential units over flexible A1/A2/A3/D1 floorspace at ground level (approximately 70sq.m).

In addition, the Masterplan Development would provide 11,760 sqm of public open space along with associated highways works and landscaping.

The development proposals are shown in **Error! Reference source not found.**, with the plot locations identified on **Error! Reference source not found.**.

## Figure 1.2: Development Proposals

## Figure 1.3: Plot Locations



# 2. POLICY CONTEXT

## 2.1 National Planning Policy Framework

National Planning Policy Framework (NPPF)[1] published on March 27th 2012 sets out the Government's economic, environmental and social planning policies for England. It summarises in a single document all previous national planning policy advice. Taken together, these policies articulate the Government's vision of sustainable development, which should be interpreted and applied locally to meet local aspirations.

The NPPF sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

Under Section 11; Conserving and enhancing the natural environment, the following is stated:

*The planning system should contribute to and enhance the natural and local environment by:*

- *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability.*

The document goes on to state:

*Planning policies and decisions should aim to:*

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

As stated above, this document makes reference to avoiding noise generation from new developments that would adversely impact on health and quality of life.

## 2.2 Planning Practice Guidance – Noise

The National Planning Practice Guidance (NPPG[2]) has been revised and updated to be easily accessible and available online.

The Noise Guidance advises on how planning can manage potential noise impacts in new development. It sets out when noise is relevant to planning and outlines the following Observed Effect Levels to determine the noise impact:

- *Significant observed adverse effect level (SOAEL): This is the level of noise exposure above which significant adverse effects on health and quality of life occur.*
- *Lowest observed adverse effect level (LOAEL): this is the level of noise exposure above which adverse effects on health and quality of life can be detected.*

1 Department for Communities and Local Government, March 2012. National Planning Policy Framework. HMSO.

2 National Planning Practice Guidance, Department for Communities and Local Government (DCLG), March 2014

- *No observed effect level (NOEL): this is the level of noise exposure below which no effect at all on health or quality of life can be detected.*

The document recognises the subjective relationship between noise levels and the impact on those affected, and advises on factors which may influence on whether noise could be a concern.

## 2.3 National Planning Practice Guidance, England

Further guidance in relation to the National Planning Policy Framework and the Noise Policy Statement for England has been published in the National Planning Practice Guidance in England: Noise (NPPG)[3], which summarises the noise exposure hierarchy, based on the likely average response.

This is reproduced in Table 2.1 below.

**Table 2:1: Significance Criteria from NPPG in England: Noise**

| Perception | Examples of Outcomes | Increasing Effect Level | Action |
|---|---|---|---|
| Not noticeable | No Effect | No Observed Effect | No specific measures required |
| Noticeable and not intrusive | Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life. | No Observed Adverse Effect | No specific measures required |
| | | Lowest Observed Adverse Effect Level | |
| Noticeable and intrusive | Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life. | Observed Adverse Effect | Mitigate and reduce to a minimum |
| | | Significant Observed Adverse Effect Level | |
| Noticeable and disruptive | The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awak- | Significant Observed Adverse Effect | Avoid |

[3] Department for Communities and Local Government (DCLG), 2014. National Planning Practice Guidance for England: Noise. DCLG.

| | | | |
|---|---|---|---|
| | ening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area. | | |
| Noticeable and very disruptive | Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory | Unacceptable Adverse Effect | Prevent |

## 2.4 Local Authority Requirements

The site is located within the London Borough of Camden. The Camden Council Local Development Framework (LDF) sets out the planning criteria for noise and vibration used to determine applications for planning permission in the borough. An extract of the sections relevant to this development is provided below.

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**Table A: Noise levels on residential sites adjoining railways and roads at which planning permission will not be granted**

| Noise description and location of measurement | Period | Time | Sites adjoining railways | Sites adjoining roads |
|---|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day | 0700-1900 | 74 dB $L_{Aeq}$ 12h | 72 dB $L_{Aeq}$ 12h |
| Noise at 1 metre external to a sensitive façade | Evening | 1900-2300 | 74 dB $L_{Aeq}$ 4h | 72 dB $L_{Aeq}$ 4h |
| Noise at 1 metre external to a sensitive façade | Night | 2300-0700 | 66 dB $L_{Aeq}$ 8h | 66 dB $L_{Aeq}$ 8h |

**Table B: Noise levels on residential streets adjoining railways and roads at and above which attenuation measures will be required**

| Noise description and location of measurement | Period | Time | Sites adjoining railways | Sites adjoining roads |
|---|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day | 0700-1900 | 65 dB $L_{Aeq}$ 12h | 62 dB $L_{Aeq}$ 12h |
| Noise at 1 metre external to a sensitive façade | Evening | 1900-2300 | 60 dB $L_{Aeq}$ 4h | 57 dB $L_{Aeq}$ 4h |
| Noise at 1 metre external to a sensitive façade | Night | 2300-0700 | 55 dB $L_{Aeq}$ 1h | 52 dB $L_{Aeq}$ 1h |
| Individual noise events several times an hour | Night | 2300-0700 | >82 dB $L_{Amax}$ (S time weighting) | >82 dB $L_{AMAX}$ (S time weighting) |

**Table E: Noise levels from plant and machinery at which planning permission will not be granted**

| Noise description and location of measurement | Period | Time | Noise level |
|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day, evening and night | 0000-2400 | 5dB(A) <LA90 |
| Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade. | Day, evening and night | 0000-2400 | 10dB(A) <LA90 |
| Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade. | Day, evening and night | 0000-2400 | 10dB(A) <LA90 |
| Noise at 1 metre external to sensitive façade where LA90>60dB | Day, evening and night | 0000-2400 | 55dB$L_{Aeq}$ |

Note, for the site under consideration, the Table B limits of 62 dB LAeq,12hr (day), 57 dB LAeq,4hr (evening) and 52 dB LAeq,8hr (night), and no more than 82 dB LASmax (night), represent the noise levels below which standard construction techniques and normal natural ventilation strategies would be expected.

# 3. NOISE ASSESSMENT CRITERIA

## 3.1 Residential Amenity

BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings*[4] draws on the results of research and experience to provide information on achieving internal acoustic environments appropriate to their functions. The guideline values provided are in terms of an average ($L_{Aeq}$) level.

The standard advises that, for steady external noise sources, it is desirable for internal ambient noise levels to not exceed the guidance values, as detailed below in **Error! Reference source not found.**.

**Table 3:1: BS 8233:2014 Ambient Noise Levels**

| Activity | Location | 07:00 to 23:00 | 23:00 to 07:00 |
|---|---|---|---|
| Resting | Living room | 35 dB $L_{Aeq,16hour}$ | - |
| Dining | Dining room | 40 dB $L_{Aeq,16hour}$ | - |
| Sleeping | Bedroom | 35 dB $L_{Aeq,16hour}$ | 30 dB $L_{Aeq,8hour}$ |

BS 8233:2014 goes on to suggest that where development is considered necessary or desirable, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions will still be achieved.

With regard to maximum noise levels, the standard identifies that regular individual noise events (such as passing trains or scheduled aircraft etc) can cause sleep disturbance. The standard does not provide a guideline design target, but simply goes on to suggest that a guideline value may be set in terms of Sound Exposure Level (SEL) or $L_{Amax,F}$, depending upon the character and number of events per night. It goes on to suggest that more sporadic noise events could require separate values.

In respect of external noise levels, the guidance in BS 8233:2014 suggests that *"it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments"*.

BS 8233:2014 provides a much more detailed narrative on noise levels in external amenity areas and acknowledges that it may not always be necessary or feasible to ensure that noise levels remain within these guideline values.

In respect of gardens and patios, BS 8233:2014 states;

*"…it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable."*

BS 8233: 2014 goes on to state, for areas adjoining the strategic transport network:

*" …a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, 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".*

In respect of balconies, roof gardens and terraces, BS 8233:2014 states, *"Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal*

[4] BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* - BSI

*external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses; however, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space".*

It is clear from the narrative of BS 8233:2014, that proposed development within noisy environments should be designed to ensure that the recommended internal design standards are achieved, and that noise levels in external amenity areas are designed to effectively control and reduce noise levels, although it acknowledges that in certain circumstance meeting the external design recommendations may not be feasible, or necessary, especially where the provision of such spaces is desirable for other technical, planning or policy reasons.

## 3.2 Residential Summary

In accordance with the guidance contained within BS 8233:2014 and, in accordance with LBC policy, the following ambient noise level limits have been adopted:

**Table 3:2: Proposed Ambient Noise Level Limits**

| Location | 07:00 to 23:00 | 23:00 to 07:00 |
|---|---|---|
| Bedrooms | 35 dB $L_{Aeq,16hour}$ | 30 dB $L_{Aeq,8hour}$ & 45 dB $L_{Amax,F}$ |
| Kitchen/Dining Rooms | 40 dB $L_{Aeq,16hour}$ | - |
| External Amenity Areas | 50 – 55 dB $L_{Aeq,1hour}$ | - |

## 3.3 Building Regulations

The Building Regulations Approved Document E 2003 (incorporating 2004, 2010, 2013 and 2015 amendments)[5] applies to the residential element of the development. Key requirements of Approved Document E detail the minimum acceptable airborne sound insulation and maximum impact noise performance standards.

It is proposed that a performance uplift of 5 dB with respect to the airborne sound insulation and impact noise performance is targeted for the residential flats in the Plot 1 development.

Note, the 5 dB uplift over Approved Document E standards also aligns with the Mayor's preferred standards set out in the Mayor's Sustainable Design and Construction SPG (2006).

## 3.4 Vibration

The assessment of potential vibration impacts has been carried out in accordance with BS 6472: 2008[6], which provides guidance over the frequency range 0.5 Hz to 80 Hz

BS 6472 describes how to determine the vibration dose value (VDV) from frequency-weighted vibration measurements. The vibration dose value is used to estimate the probability of adverse comment which might be expected from human beings experiencing vibration in buildings. Consideration is given to the time of day and use made of occupied space in buildings, whether residential, office or workshop. BS 6472 states that in homes, adverse comment about building

[5] UK Building Regulations. Approved Document E - Resistance to the passage of sound (2003 Edition incorporating 2004, 2010, 2013 and 2015 amendments)
[6] British Standards Institution, 2008. BS 6472: Guide to evaluation of human exposure to vibration in buildings, Part 1, Vibration sources other than blasting.

vibrations is likely when the vibration levels to which occupants are exposed are only slightly above thresholds of perception.

BS 6472 contains a methodology for assessing the human response to vibration in terms of either the VDV, or in terms of the acceleration or the peak velocity of the vibration, which is also referred to as peak particle velocity (PPV). The advice contained in BS 6472 states that when the vibration is intermittent, as is the case at this Site with the only significant potential source of vibration being the railway to the east of the Site, the VDVs may be used to assess the potential for impacts.

Appropriately-weighted vibration measurements can be aggregated to derive the VDV. The VDV is a single figure descriptor that represents the cumulative dose of transient vibrations, taking into account the frequency spectrum and duration of each event. The VDV is determined over a 16 hour daytime period or 8 hour night-time period, with the guidance in BS 6472 set out in Table 3.3.

### Table 3:3: Vibration Dose Values (ms-1.75) Limits of Adverse Comment from Residential Buildings

| Period | Low Probability of Adverse Comment | Adverse Comment Possible | Adverse Comment Probable |
|---|---|---|---|
| Residential Buildings 16 hour day | 0.2 to 0.4 | 0.4 to 0.8 | 0.8 to 1.6 |
| Residential Buildings 8 hour night | 0.13 | 0.26 | 0.51 |

The above guidance relates to vibration measured at the point of entry into the human body, which is usually taken to mean the ground surface or at a point mid-span of an upper storey floor, rather than the point of entry into the building, for example a foundation element. Where the vibration is measured at another location, BS 6472 states that a transfer function should be applied; however BS6472 does not contain any guidance on suitable transfer functions.

There are two key aspects to the effect that the building structure will have on the measured vibration levels: the first is generally a reduction as the vibration passes into the foundations of a building; there is typically then amplification as the vibration propagates up the building to the upper storeys and across potentially suspended floors. Each of these factors is considered below.

To consider the transfer of vibration through the foundations of the proposed residential dwellings, guidance has been sought from the Handbook of Urban Rail Noise and Vibration Control (HURNVC)[7].

The HURNVC sets out attenuation factors that can be applied to calculate the transfer function between vibrations measured on unloaded ground and vibration at a foundation. It is noted that the multiplication factor for strip foundation is approximately 0.5 and for a piled foundation approximately 0.4 (both based on the 31.5 Hz frequency band).

To extrapolate the measured unloaded ground vibration levels up the building to a suspended upper storey, an amplification factor is required. Based on figures presented in Transmission of Ground-borne Vibration in Buildings[8] an amplification factor of 2.8 is considered appropriate in this case.

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[7] Saurenam, Nelson and Wilson. Handbook of Urban Rail Noise and Vibration. USA. Federal Transit Administration.

[8] Jakobsen, W, 1989. Transmission of Ground-borne Vibration in Buildings. Journal of Low Frequency Noise and Vibration, Vol. 8 No. 3.

On the basis of piled foundations, an overall transfer function, or multiplication factor, of 1.12 (i.e. 2.8 x 0.4) has been assumed to consider the likely impact of vibration at worst case upper suspended storeys in the following assessment.

## 3.5 Educational Facilities

The design of a primary or secondary school falls under requirement E4 of the Building Regulations Approved Document E 2003 (incorporating 2004, 2010, 2013 and 2015 amendments) which states "E4. (1) Each room or other space in a school building shall be designed and constructed in such a way that it has the acoustic conditions and the insulation against disturbance by noise appropriate to its intended use." The Secretary of State's recommended way of satisfying this requirement is by designing the school's acoustics to the guidance in Building Bulletin 93 (BB93)9. A revised BB93 document, Acoustic design of schools: performance standards, was published in December 2014 (most recent version of the document available at time of writing, version V17 February 2015).

A nursery facility is exempt from requirement E4 of the Building Regulations Approved Document E, and thus BB93. However, the performance standards outlined in BB93 (which makes reference to 'nursery school rooms') are potentially useful and appropriate for design purposes, and are requirements under the Hea 05 Acoustic Performance credit of BREEAM New Construction Non-Domestic Buildings 2014.

## 3.6 Commercial Noise

BS 4142[10] sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS 4142 for assessing the effect of sound on residential receptors is to compare the measured or predicted noise level from the source in question, the $L_{Aeq,Tr}$ 'specific noise level', immediately outside the dwelling with the $L_{A90,T}$ background noise level.

Where the noise contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific noise level to obtain the $L_{Ar,Tr}$ 'rating noise level'. A correction to include the consideration of a level of uncertainty in noise measurements, data and calculations can also be applied when necessary.

BS 4142 states: "*The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs*". An estimation of the impact of the specific noise can be obtained by the difference of the rating noise level and the background noise level and considering the following:

- *"Typically, the greater this difference, 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." This would be considered an SOAEL in the context of National Planning Practice Guidance.*
- *"A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context." At or below this level would be considered an LOAEL in the context of National Planning Practice Guidance.*

[9] Building Bulletin 93. Acoustic design of schools: performance standards. February 2015. Department of Education.
[10] BS 4142:2014 *Methods for rating and assessing industrial and commercial sound* - BSI

- *"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." At or below 0dB above the background noise level would be considered an NOEL in the context of National Planning Practice Guidance.*

For the daytime, the assessment is carried out over a reference time period of 1-hour, but at night-time it is carried out over a 15-minute period. The periods associated with day or night, for the purposes of the Standard, are considered to be 07:00 to 23:00 and 23:00 to 07:00, respectively.

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# 4. HEADLINE FINDINGS

The following section summarises the key findings of the individual noise reports produced by Max Fordham and Ramboll Environ for each of the individual development plots making up the masterplan. These reports are included under Appendices 2 to 7 of this report.

## 4.1 Plot 1 - Community Facilities and Chalton St Housing

The external noise environment at the proposed Plot 1 Community Facilities and Chalton St Housing site is characterised by the long term noise survey measurements, which determined representative levels, 56 $L_{Aeq,12hr}$ (day), 46 dB $L_{Aeq,4hr}$ (evening), 46 dB $L_{Aeq,8hr}$ (night) and 66 dB $L_{AFmax}$ (night; 90$^{th}$ percentile $L_{AFmax,15mins}$).

With respect to the proposed residential element, the determined noise levels are below the planning thresholds set in the LBC Local Development Framework (LDF), above which attenuation measures would be required.

Internal residential noise levels are expected to comply with BS 8233:2014.

The nursery facility (Nursery Flexible Space) within the Community Facility buildings would be able to deliver internal noise levels compliant with education best practise, represented by BB93 (2014).

External noise levels at the nursery outdoor play areas are expected to be within BS 8233:2014 and WHO recommended guidelines.

Representative background sound levels have been determined by a long term noise survey. Assuming broadband plant noise emissions, this sets a plant noise emission limit of 37 dBA during the day (07:00-19:00), 33 dBA during the evening (19:00-23:00), and 29 dBA during the night (23:00-07:00) at a point 1 m outside any window of any noise sensitive façade.

## 4.2 Plot 2 - Charrington Street Housing

A noise survey was carried out by Max Fordham LLP between 30 April 2015 and 4 May 2015.

Ambient noise levels measured during the survey suggest that:

- Noise levels at the facades of the proposed development will not be above levels at which attenuation measures would be required by LBC.
- Guideline indoor ambient noise levels set out in BS 8233:2014 can be achieved with standard façade building elements.

Background noise levels measured during the survey suggest that:

- Depending on whether plant noise emissions are broadband or tonal/impulsive, noise emission limits should be set at 32-37 dBA during the day (07:00-19:00), 28-33 dBA during the evening (19:00-23:00), and 24-29 dBA during the night (23:00-07:00)
- Noise emissions for plant equipment associated with the apartments at the nearest noise sensitive receptor are expected to be comfortably within these limits.
- Noise from plant equipment associated with the Commercial Unit will be considered further as the strategy develops and appropriate noise control measures would be included as required.

Activity noise from the Commercial Unit is not expected to pose any noise issues in the area surrounding the Proposed Masterplan Development.

## 4.3 Plot 3 – Charrington Street Terrace Housing

A noise survey was carried out by Max Fordham LLP between 30 April 2015 and 4 May 2015.

Ambient noise levels measured during the survey suggest that:

- Noise levels at the facades of the proposed development will not be above levels at which attenuation measures would be required by LBC;
- Guideline indoor ambient noise levels set out in BS 8233:2014 can be achieved with standard façade building elements.

Background noise levels measured during the survey suggest that:

- Depending on whether plant noise emissions are broadband or tonal/impulsive, noise emission limits should be set at 32-37 dBA during the day (07:00-19:00), 28-33 dBA during the evening (19:00-23:00), and 24-29 dBA during the night (23:00-07:00)

Noise emissions for plant equipment associated with the apartments at the nearest noise sensitive receptor are expected to be comfortably within these limits.

## 4.4 Plot 4 - Edith Neville School

A noise survey was carried out by Max Fordham LLP between 30 April 2015 and 4 May 2015. Background noise levels measured during the survey suggest that:

- Depending on whether plant noise emissions are broadband or tonal/impulsive, noise emission limits should be set to 36-41 dBA during the day (07:00-19:00), 36-41 dBA during the evening (19:00-23:00), and 31-36 dBA during the night (23:00-07:00);
- It is expected that acoustic screening will be required around the condenser units on the roof. Elsewhere, duct attenuators will be specified to meet the noise criteria.

Activity noise from the proposed external play area is expected to be similar in overall terms to the current levels, The current levels have not been identified as giving rise to significant noise issues.

## 4.5 Plots 5 and 6 - Purchese Street Housing

A noise survey was carried out by Max Fordham LLP between 30 April 2015 and 4 May 2015.

Ambient noise levels measured during the survey suggest that:

- Noise levels at the facades of the proposed development will not be above levels at which attenuation measures would be required by LBC;
- Guideline indoor ambient noise levels set out in BS 8233:2014 can be achieved with standard façade building elements.

Background noise levels measured during the survey suggest that:

- Depending on whether plant noise emissions are broadband or tonal/impulsive, noise emission limits should be set at 36-41 dBA during the day (07:00-19:00), 36-41 dBA during the evening (19:00-23:00), and 31-36 dBA during the night (23:00-07:00)
- Noise emissions for plant equipment associated with the apartments at the nearest noise sensitive receptor are expected to be comfortably within these limits.

Activity noise from the Community Hall is not expected to be an issue for most general activities. If the scope of hall use is to include any events that could result in higher noise levels, then noise mitigation measures would be implemented in order to minimise the impact on any nearby noise sensitive receptors.

## 4.6 Plot 7 – Brill Place Tower

The prevailing noise and vibration conditions at the location of the Brill Place Tower have been determined by detailed environmental noise and vibration surveys, undertaken on behalf of Ramboll Environ between Wednesday 7 and Friday 9 October 2015. An assessment based on the measured and predicted ambient noise levels suggests that:

- Noise levels at the facades of the proposed development will not be above levels at which attenuation measures would be required by LBC;
- Guideline indoor ambient noise levels set out in BS 8233:2014 can be achieved with standard façade building elements.

Background noise levels measured during the survey suggest that:

- Depending on whether plant noise emissions are broadband or tonal/impulsive, noise emission limits should be set at 49-54 dBA during the day (07:00-19:00), 48-53 dBA during the evening (19:00-23:00), and 39-44 dBA during the night (23:00-07:00)
- Noise emissions for plant equipment associated with the apartments at the nearest noise sensitive receiver are expected to be comfortably within these limits.

Railway-borne vibration levels within a room on the first floor of the closest proposed dwellings to the rail line are predicted to be below the value that would result in a 'low probability of adverse comment' in accordance with the guidance presented in BS 6472. Accordingly, no mitigation measures are considered necessary to control the impact of vibration from the nearby railway.

# 5. PUBLIC REALM / OPEN SPACE

## 5.1 Noise Data

The noise measurement and assessment results presented in the detailed reports presented in Appendices 2 to 7 identify that noise levels throughout the open spaces of the Proposed Masterplan Development, during the daytime, typically range between 54 dBA towards the west, near Chalton Street; through 46 dBA, centrally and around Purchese Street; to ~50 to 55 dB(A) to the north/north-west of the Brill Place Tower.

There will be pockets of variation within the Site, but the spread of the analysis provides a good indication of the typical range of noise exposure across the open areas of the Site.

## 5.2 Analysis

The noise survey and analysis data presented in the detailed assessment reports provides a strong indication that noise levels are and will continue to be at or below the external amenity thresholds recommended by the WHO and represented in BS 8233: 2014.

Consequently, residents of the Proposed Masterplan Development would have immediate access to public realm amenity space, providing appropriate levels of acoustic amenity. Such amenity is considered to be of high value in densely populated urban areas and would be particularly valuable for residents of the more noise-exposed parts of the Brill Place Tower, where some balcony spaces are predicted to exceed the <55 dB(A) upper limit for private external amenity spaces.

# 6. CONCLUSION

The individual assessments have concluded that the Site is largely unconstrained by noise and that typical acoustic façade insulation values, associated with traditional thermally insulating construction techniques would be adequate to ensure appropriate internal noise levels for the residential and educational developments across the Proposed Masterplan Development.

The assessments also present data which identifies that the public realm external amenity spaces incorporated within the Proposed Masterplan Development would typically provide daytime noise levels in accordance with the recommendations of the WHO and BS 8233: 2014.

Target noise criteria have been set for all static plant within the Proposed Masterplan Development. Providing that the cumulative rating noise level from the plant items does not exceed the stated noise criteria, whether through the application of noise control techniques or otherwise, the impact of noise from such sources is predicted to have no adverse impact on existing sensitive receptors.

An assessment of vibration has also been carried out for the closest parts of the Proposed Masterplan Development to St Pancras Railway Station, which has indicated that appropriate criteria would be achieved without the need for mitigation measures.

Consequently, the Site is considered suitable for the Proposed Masterplan Development in acoustic terms and noise should not present a constraint to the granting of planning permission for the Proposed Masterplan Development in its current form.

# APPENDIX 1
# GLOSSARY OF TERMS

## Appendix Table 1: Glossary of Terms 1

| | |
|---|---|
| **Sound Pressure** | Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure. |
| **Sound Pressure Level (Sound Level)** | The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20x10-6 Pascals) on a decibel scale. |
| **Decibel (dB)** | A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 ( s1 / s2 ). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. |
| **A-weighting, dB(A)** | The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies. |
| **Noise Level Indices** | Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to the averaging or statistics are carried out. |
| **$L_{eq,T}$** | A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded. |
| **$L_{max,T}$** | A noise level index defined as the maximum noise level during the period T. $L_{max}$ is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall $L_{eq}$ noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response. |
| **$L_{90,T}$** | A noise level index. The noise level exceeded for 90% of the time over the period T. $L_{90}$ can be considered to be the "average minimum" noise level and is often used to describe the background noise. |
| **$L_{10,T}$** | A noise level index. The noise level exceeded for 10% of the time over the period T. $L_{10}$ can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. |
| **Free-Field** | Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m |
| **Facade** | At a distance of 1m in front of a large sound reflecting object such as a building façade. |
| **Fast Time Weighting** | An averaging time used in sound level meters. Defined in BS 5969. |

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following.

### Table 2: Typical Sound Levels Found In T 1

| Sound Level | Location |
|---|---|
| 0dB(A) | Threshold of hearing |
| 20 to 30dB(A) | Quiet bedroom at night |
| 30 to 40dB(A) | Living room during the day |
| 40 to 50dB(A) | Typical office |
| 50 to 60dB(A) | Inside a car |
| 60 to 70dB(A) | Typical high street |
| 70 to 90dB(A) | Inside factory |
| 100 to 110dB(A) | Burglar alarm at 1m away |
| 110 to 130dB(A) | Jet aircraft on take off |
| 140dB(A) | Threshold of Pain |

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source.

A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that shows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the LA10, the noise level exceeded for 10% of the measurement period. The LA90 is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, LAeq.

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

# APPENDIX 2
# NOISE ASSESSMENT REPORT – PLOT 1

MAX FORDHAM

# Plot 1 - Community Facilities and Chalton Street Housing

# Central Somers Town

# Noise Impact Assessment

## Rev D

November 2015

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## ISSUE HISTORY

| Issue | Date | Description |
|---|---|---|
| * | 21/09/2015 | Draft issue |
| A | 12/10/2015 | Draft issue - Revision A |
| B | 2/11/2015 | Planning submission |
| C | 3/11/2015 | Planning submission – re-issue |
| D | 10/11/2015 | Planning submission – re-issue |

## MAX FORDHAM LLP TEAM CONTRIBUTORS

| Engineer | Role |
|---|---|
| Neil McBride MIOA | Lead Acoustic Engineer |
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| | |
| | |
| | |

**CONTENTS**

## 1.1 INTRODUCTION

Max Fordham LLP (MFLLP) has been appointed to provide advice in relation to acoustic matters at a proposed Central Somers Town Lot 3, Community Facilities and Chalton St Housing development, at Chalton Street, London NW1. The proposed development includes a Nursery (on the Chalton Street façade) and Community Facilities at ground floor level, with 5 storeys of residential flats above the Nursery facilities.

The objectives of this report are to assess:

- The likely impact of the proposed development on nearby noise sensitive premises; and
- The likely impact of the existing noise environment on the development.

The following statement has been prepared on behalf of the London Borough of Camden in support of a planning application for the redevelopment of Central Somers Town.

***Project Background and Masterplan***
*The redevelopment of Central Somers Town is led by the Department for Children, Schools and Families and will be delivered as part of an approved regeneration strategy to deliver significant improvements to the public realm, provide a replacement primary school, nursery, play facilities and community hall. The development will also provide 136 housing units as well as maximising the amount of affordable housing which can be delivered by the scheme. Central to the development is the provision of public open space across the site. This space will be greatly improved as a result of the proposals and there will be no net loss of area following completion of the scheme.*

*The Central Somers Town project is self-funding, with the receipts from the private sale housing used to cross subsidise the delivery of the public realm, Edith Neville Primary School, nursery, community play facilities and community hall, in line with the wider vision for the Central Somers Town area.*

*This development is coming forward as part of the Community Investment Programme (CIP) which is a strategic programme focussed on ensuring the best use of the Council's assets to improve, shape and transform key places and services within Camden, whilst simultaneously addressing a critical capital funding gap. The programme includes a significant number of regeneration schemes across the Borough and involves the disposal of property assets that are surplus to requirements in order to unlock funding that will be reinvested in schools, the Better Homes programme and other supporting community infrastructure.*

*The reduction in government funding, including the money no longer available for schools, means that the Council has to be more innovative in how they make the best use of buildings and land to improve facilities. Working across the Council a borough-wide strategy has been initiated called 'The Community Investment Programme' (CIP) with the purpose of addressing this funding shortfall. The programme is making an important contribution to the delivery of objectives within the Camden Plan, particularly through harnessing the benefits of economic growth, tackling inequality, investing in communities to secure sustainable neighbourhoods and delivering value for money.*

*Under the CIP there are a number of objectives which need to be achieved:*

- *High quality schemes achieving high sustainability standards, including minimum BREEAM 'Excellent' ratings;*
- *Deliver 'fit for purpose' community facilities;*
- *Reduce revenue and capital costs through the efficient use of land and buildings;*
- *Increase revenue and capital value;*
- *Deliver affordable and private homes;*
- *Deliver improved public realm*

***Central Somers Town CIP***

*The Council has a significant property portfolio in the Somers Town area. Primarily this is made up of residential stock but also includes schools, a play project, children's centres and nurseries. These facilities provide an important service to children and their families and form an important part of bringing the wider community together. The area also contains two distinctive areas of public open space, these being Polygon Open Space and Purchese Open Space, which are maintained by the Council and provide a key component in how Somers Town functions as a place to live and work.*

*Central to the CIP is the Edith Neville Primary School and Children's Centre which were constructed as buildings with a short life expectancy. Remedial works have been necessary (both planned and unplanned) to keep it in service but the pressing need for replacement has been widely agreed for a considerable period of time.*

*Central Somers Town area is being addressed strategically as part of the CIP to tackle the significant need for investment. The scheme is intended to be self-funding, with the provision of residential development being utilised to pay for the redevelopment of the primary school and community facilities. It will also be possible to provide wider benefits through the delivery of an element of new affordable housing as well as public realm and public open space improvements.*

## 2.0 THE SITE

The site is located at the junction of Chalton Street and Polygon Road in Somers Town, London NW1. The noise environment is relatively benign, being a largely residential area, with low levels of traffic on Chalton Street. The existing facilities are shown in Figure 2. The locations of the noise surveys are also shown (discussed below). The Plot 1 proposed buildings will have a façade to Chalton Street. See Figure 3 for indicative ground floor and upper floor plans.

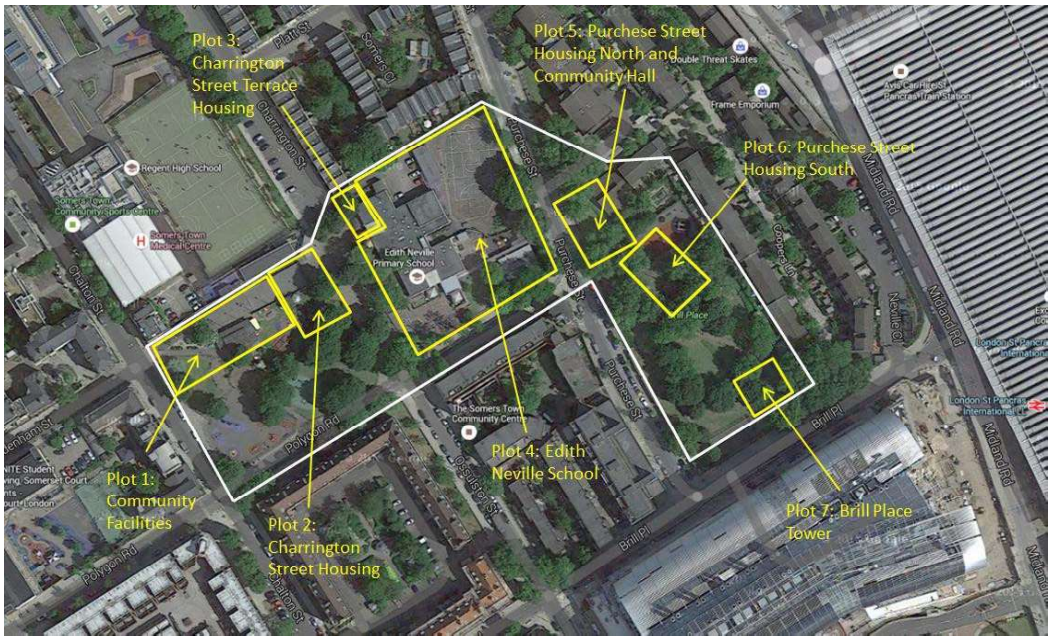



**Figure 1: An aerial image of the existing site of the CIP identifying individual plots**

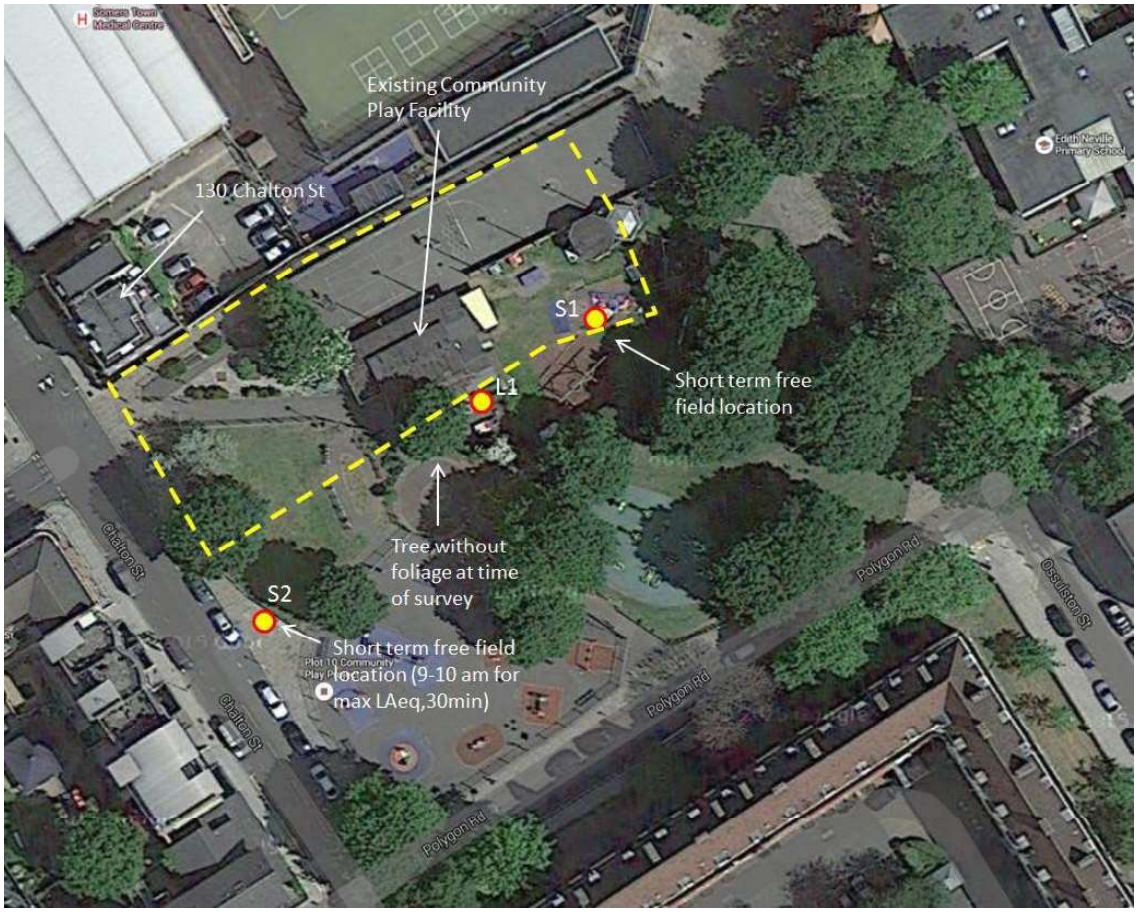



**Figure 2: Aerial image of site (Courtesy Googlemaps) and noise survey locations (see Appendix A for photo of L1 location)**


**Figure 3: Footprint of proposed development. Top: ground floor. Bottom: upper floors showing indicative residential footprint (5 storeys) above Nursery, and MUGA area above Community Facilities. Drawing as submitted for planning, 30/04/2015**

# 3.0 ASSESSMENT CRITERIA

## 3.1 Local Authority Requirements

The site is located within the London Borough of Camden. The Camden Council Local Development Framework (LDF) sets out the planning criteria for noise and vibration used to determine applications for planning permission in the borough. An extract of the sections relevant to this development is provided below.

**Table A: Noise levels on residential sites adjoining railways and roads at which planning permission will not be granted**

| Noise description and location of measurement | Period | Time | Sites adjoining railways | Sites adjoining roads |
|---|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day | 0700-1900 | 74 dB $L_{Aeq}$,12h | 72 dB $L_{Aeq}$,12h |
| Noise at 1 metre external to a sensitive façade | Evening | 1900-2300 | 74 dB $L_{Aeq}$,4h | 72 dB $L_{Aeq}$,4h |
| Noise at 1 metre external to a sensitive façade | Night | 2300-0700 | 66 dB $L_{Aeq}$,8h | 66 dB $L_{Aeq}$,8h |

**Table B: Noise levels on residential streets adjoining railways and roads at and above which attenuation measures will be required**

| Noise description and location of measurement | Period | Time | Sites adjoining railways | Sites adjoining roads |
|---|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day | 0700-1900 | 65 dB $L_{Aeq}$,12h | 62 dB $L_{Aeq}$,12h |
| Noise at 1 metre external to a sensitive façade | Evening | 1900-2300 | 60 dB $L_{Aeq}$,4h | 57 dB $L_{Aeq}$,4h |
| Noise at 1 metre external to a sensitive façade | Night | 2300-0700 | 55 dB $L_{Aeq}$,1h | 52 dB $L_{Aeq}$,1h |
| Individual noise events several times an hour | Night | 2300-0700 | >82 dB $L_{Amax}$ (S time weighting) | >82 dB $L_{AMAX}$ (S time weighting) |

**Table E: Noise levels from plant and machinery at which planning permission will not be granted**

| Noise description and location of measurement | Period | Time | Noise level |
|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day, evening and night | 0000-2400 | 5dB(A) <LA90 |
| Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade. | Day, evening and night | 0000-2400 | 10dB(A) <LA90 |
| Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade. | Day, evening and night | 0000-2400 | 10dB(A) <LA90 |
| Noise at 1 metre external to sensitive façade where LA90>60dB | Day, evening and night | 0000-2400 | 55dB$L_{Aeq}$ |

Note, for the site under consideration, the Table B limits of 62 dB $L_{Aeq,12hr}$ (day), 57 dB $L_{Aeq,4hr}$ (evening) and 52 dB $L_{Aeq,8hr}$ (night), and no more than 82 dB $L_{ASmax}$ (night), represent the noise levels below which standard construction techniques and normal natural ventilation strategies would be expected.

## 3.2 BS 8233:2014

BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings sets out desirable limits for internal ambient noise levels for dwellings from steady external noise sources (see Table 1).

| Activity | Location | 07:00-23:00 | 23:00-07:00 |
|---|---|---|---|
| Resting | Living room | 35 dB $L_{Aeq,16h}$ | – |
| Dining | Dining room / area | 40 dB $L_{Aeq,16hr}$ | – |
| Sleeping | Bedrooms | 35 dB $L_{Aeq,16hr}$ | 30 dB $L_{Aeq,8hr}$ |

**Table 1: Proposed indoor ambient noise limits (from BS 8233:2014 Table 4)**

It is proposed that the levels in BS 8233:2014 are adopted as the basis for assessing the façade sound insulation requirements.

Note, the key noise limit of night time bedroom noise level agrees with the Mayor's preferred standard set out in the Mayor's Sustainable Design and Construction SPG (2006), which aligned with the now superseded BS 8233:1999 'good' standards.

## 3.3 Building Regulations

The Building Regulations Approved Document E 2003 (incorporating 2004, 2010, 2013 and 2015 amendments) applies to the residential element of the Plot 1 development. Key requirements of Approved Document E detail the minimum acceptable airborne sound insulation and maximum impact noise performance standards.

It is proposed that a performance uplift of 5 dB with respect to the airborne sound insulation and impact noise performance is targeted for the residential flats in the Plot 1 development.

Note, the 5 dB uplift over Approved Document E standards also aligns with the Mayor's preferred standards set out in the Mayor's Sustainable Design and Construction SPG (2006).

## 3.4 BB93 (2014)

The design of a primary or secondary school falls under requirement E4 of the Building Regulations Approved Document E 2003 (incorporating 2004, 2010, 2013 and 2015 amendments) which states "*E4. (1) Each room or other space in a school building shall be designed and constructed in such a way that it has the acoustic conditions and the insulation against disturbance by noise appropriate to its intended use.*" The Secretary of State's recommended way of satisfying this requirement is by designing the school's acoustics to the guidance in Building Bulletin 93 (BB93). A revised BB93 document, *Acoustic design of schools: performance standards*, was published in December 2014 (most recent version of the document available at time of writing, version V17 February 2015).

A nursery facility is exempt from requirement E4 of the Building Regulations Approved Document E, and thus BB93. However, the performance standards outlined in BB93 (which does make reference to 'nursery school rooms') are potentially useful and appropriate for design purposes, and are requirements under the Hea 05 *Acoustic Performance* credit of BREEAM New Construction Non-Domestic Buildings 2014.

## 3.5 BS 4142 (2014)

BS 4142:2014 *Methods for rating and assessing industrial and commercial sound*, has now replaced BS 4142:1997. In BS 4142:1997 plant noise ratings were compared with the existing local background noise levels, and if the rating level was more than 10 dB below the measured background noise level then this would be a positive indication that complaints are unlikely.

In BS 4142:2014, a noise rating is still determined and compared with the existing local background sound level (i.e. as before) although several more cumulative acoustic feature corrections to the noise rating are available to apply where appropriate. For example if the noise includes a distinguishable tone, impulse, intermittency or other readily distinguishable sound characteristic, then additional *cumulative* penalties individually ranging from 0 to 9 dB may be applied depending on the type of noise.

BS 4142:2014 seeks to determine a "representative" background sound level, stating that "*…the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*".

The assessment of the impact depends upon the margin by which the rating level of the specific sound source exceeds the background sound level (i.e. as before) but also promotes a consideration of the context in which the sound occurs when making an assessment. BS 4142:2014 states that an initial estimate of the impact of the specific sound is made by subtracting the measured background sound level from the rating level, while considering the following points:

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

Note then, a BS 4142:2014 assessment may deduce a low impact where the specific sound level is approaching the background sound level, and thus may conclude that the specific noise is acceptable.

# 4.0 NOISE SURVEY

## 4.1 Procedure

A long term unattended noise survey (approx. 64 hours) was conducted at the site of the existing Community Facilities building on 23-26 April 2015 by Max Fordham LLP Acoustics Team (survey undertaken by Neil McBride MIOA) in order to determine typical mean ($L_{Aeq}$) and background ($L_{A90}$) sound levels in the vicinity of the proposed buildings.

Additionally, a short term attended survey was also carried out on Chalton St on 11 May 2015 between 9-10 am, at the location of the proposed Chalton Street nursery/residential façade, in order to determine the likely worst case nursery-hours ambient noise incident on the Chalton Street façade, and inform a transfer function between the L1 and S2 locations.

All noise measurements were made with a Norsonic 118 precision sound level analyser with a Norsonic weather protection kit. This equipment complies with BS EN IEC 61672 class 1. The meter uses a Nor 1225 free-field response microphone and NOR 1206 microphone pre-amplifier. The sound level meter was field-calibrated at the beginning and end of measurements with a Nor 1251 sound calibrator, complying with BS EN IEC 60942 class 1. No significant calibration deviation occurred. Details of the equipment are given in Appendix A. The survey procedures were consistent with BS 7445.

Ideally, a microphone position at the location of the proposed Chalton Street façade would have been most appropriate for a direct measurement of the worst case noise environment. However, such a location was considered too exposed for leaving equipment unattended over several days.

Fortunately, the perimeter fencing around the existing Community building is slatted, with 1-3 cm openings, resulting in the fence providing some visual security when viewed from a distance, but being essentially acoustically transparent. Thus the location L1 (see Figure 2 and the photo in Appendix A) was selected as the reasonable location for the long term survey location.

A check was undertaken as to whether the location L1, which was fairly close to the existing single storey building, was representative of a free field measurement. To do this, a second sound level meter was located at S1 (Figure 2) which was far enough from any facades/fences to be considered as a free field location. Comparison of a set of consecutive simultaneous $L_{Aeq,30s}$ measurements showed that the mean sound pressure levels detected at L1 and S1 were the same to the nearest dB. (It is possible that at L1, any slight shielding effect from the nearby building was offset by modest increased reflections.) Thus the L1 data is considered adequate for representing free field conditions for the long term survey, and the location is appropriate for determination of the representative background sound levels for consideration of plant noise limits.

For the duration of the long term survey the weather was generally dry (a rain shower occurred at the very end of the recording period) with light winds. The weather conditions are not considered to have had a significant impact on the noise survey results.

## 4.2 Results

The time history of the results from the long term survey (at location L1) is shown in Figure 4. Derived mean values from the data are presented in Table 2. Mean noise levels of 54 dBA $L_{Aeq,16hr}$ (day) and 46 dBA $L_{Aeq,8hr}$ (night) are derived. The night time 90$^{th}$ percentile $L_{Amax,15mins}$ level is also reported.

The Chalton Street survey (location S2) yielded an ambient noise level of 54 dBA $L_{Aeq,1hr}$ with derived worst case $L_{Aeq,30min}$ value likely being up to 56 dBA (this value being an appropriate level to adopt for the design of the Nursery Flexible Space during school hours).

Representative $L_{A90}$ background sound levels are discussed below in Section 4.4.

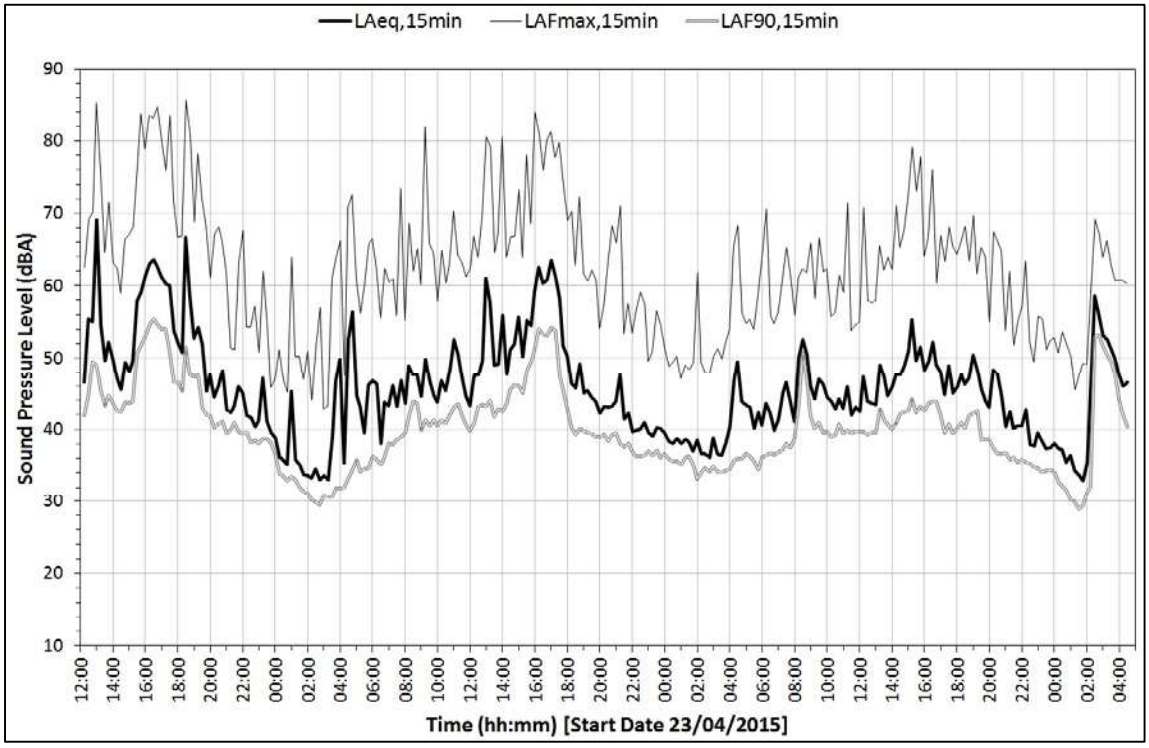



**Figure 4: Long term noise survey (Location L1) results (free-field)**

| Date | Period | $L_{Aeq,T}$ dB (average) | $L_{ASmax,15mins}$ dB ($90^{th}$ percentile) | $L_{AF90,15mins}$ dB ($40^{th}$ percentile) |
|---|---|---|---|---|
| 23-$26^{th}$ April 2015 | Day 16 hours (07:00-23:00) | 54 | N/A | N/A |
| | Day 12 hours (07:00-19:00) | 56 | N/A | 42 |
| | Evening 4 hours (19:00-23:00) | 46 | N/A | 38 |
| | Night 8 hours (23:00-07:00) | 46 | 61 | 34 |

**Table 2: Summary of long term noise survey at location L1 (free-field)**

The approach for determining $L_{AF90,15mins}$ can be found in section 4.4.

Due to the consistency of the time profile across the measured days, it is considered appropriate to report average noise levels.

## 4.3 Residential Noise Exposure

As the Chalton Street survey at location S2 ($L_{Aeq,1hr}$ ambient noise level of 54 dBA) suggests that the transfer function between S2 and L1 is not significant, the L1 long term data can be used to indicate expected noise levels at the proposed flats' facades.

While there is some uncertainty (possibly up to 3 dB, estimated), it is clear that the 56 $L_{Aeq,12hr}$ (day), 46 dB $L_{Aeq,4hr}$ (evening), 46 dB $L_{Aeq,8hr}$ (night) and 66 dB $L_{AFmax}$ (night; $90^{th}$ percentile $L_{AFmax,15mins}$) determined at L1, indicates that the residential facades will be below the noise limits set out in Section 3.1, i.e. noise levels to be no more than 62 dB $L_{Aeq,12hr}$ (day), 57 dB $L_{Aeq,4hr}$ (evening) and 52 dB $L_{Aeq,8hr}$ (night), and no more than 82 dB $L_{ASmax}$ (night). Thus no specific noise mitigation to the residential facades is required, other than normal building solutions.

## 4.4 Background Sound Level Assessment

BS 4142:2014 seeks to determine a "representative" background sound level, stating that "…*the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*". A definitive method of selecting a representative background sound level is not prescribed in BS 4142:2014, although an example is presented where the modal value is selected from a statistical analysis.

In our experience, a reasonable approach is to adopt the repeatable method of selecting the $40^{th}$ percentile value of the $L_{AF90}$ data periods. This generally accounts for potentially unrepresentative high values and untypical events, while usually representing values near the median of the remaining 'valid' distribution.

The day, evening and night period analyses are shown in Figures 5-7 and the summary is presented in Table 3. These values are used to consider plant noise limits (see below).

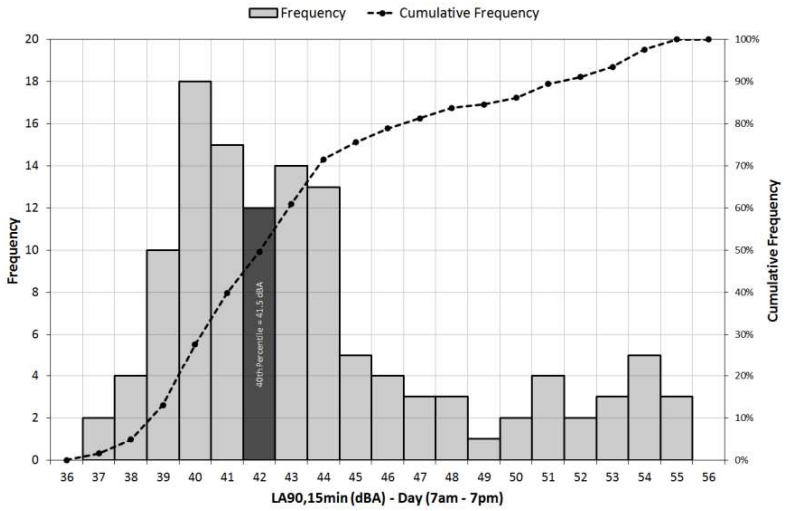



**Figure 5: Histogram showing the frequency of occurrence distribution of LAF90,15min data for the day time periods of the long term noise survey (i.e. approx. 31 hours of day time data accumulated).**

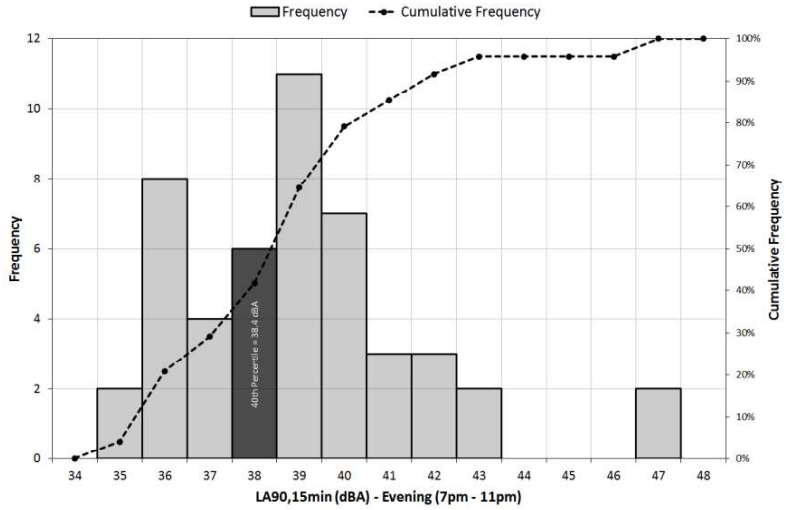



**Figure 6: Histogram showing the frequency of occurrence distribution of LAF90,15min data for the evening periods of the long term noise survey (i.e. 12 hours of night time data accumulated).**

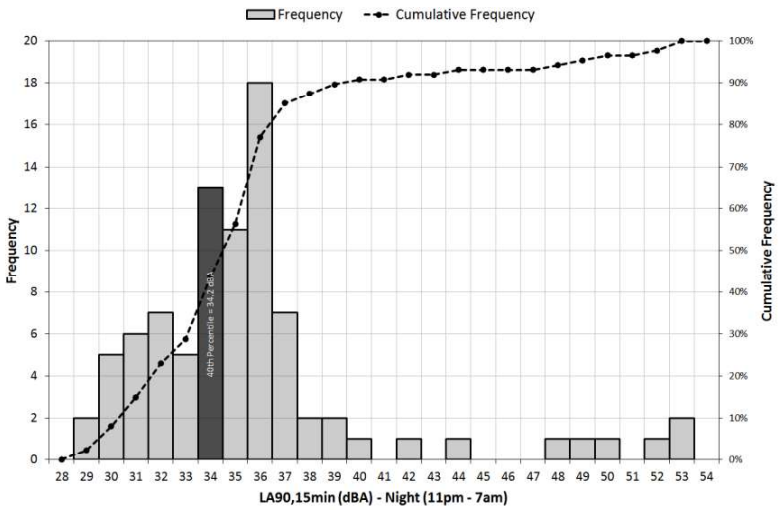



**Figure 7: Histogram showing the frequency of occurrence distribution of LAF90,15min data for the night periods of the long term noise survey (i.e. approx. 21 hours of night time data accumulated).**

# 5.0 FAÇADE SOUND INSULATION

## 5.1 Residential Façade Sound Insulation Requirements

**Overall Requirements**
Considering the external noise results, it is recommended that the residential façade constructions should provide an overall sound level difference of at least 24 dB outside to inside in order to meet all of the internal noise criteria given above, including a 3 dB safety margin.

This requirement is based on a typical façade construction with no specific acoustic attenuation measures – a light-weight wall construction and standard double or triple glazing. With this type of construction, internal noise levels are well within the guideline indoor ambient noise level limits in BS 8233:2014.

**Ventilation**
Background ventilation to the flats will be provided with whole house MVHR systems (supply and extract), and thus there is no requirement for window trickle vents. Windows will be openable for purge and over-heating ventilation. The sound transmission from outside to inside through MVHR systems is negligible and will not compromise the acoustic performance of the facades.

## 5.2 Nursery Façade Sound Insulation Requirements

**Overall Requirements**
Considering the expected worst case $L_{Aeq,30min}$ value of 56 dBA at the Flexible Nursery Space, it is recommended that the nursery façade construction should provide an overall sound level difference of at least 24 dB outside to inside in order to meet target ambient noise levels, including a 3 dB safety margin.

This requirement is based on a typical façade construction with no specific acoustic attenuation measures – a light-weight wall construction and standard double or triple glazing. With this type of construction, internal noise levels are well within the guideline indoor ambient noise level limits in BB93:2014.

**Ventilation**
The Nursery Flexible Space will be naturally ventilated by openable vents. It is proposed that at least two vents are provided with built-in 150 mm deep acoustic louvres, such that when the vents are partly open to provide normal cross ventilation, the internal noise limits will be achieved. Additional non-attenuated vents will be provided for purge and over-heating control conditions.

# 6.0 EXTERNAL PLANT NOISE EMISSIONS

## 6.1 Noise Emission Limits

The Camden Council policy (Section 3.1) requires that plant noise does not exceed a level that is 5 dB below the external background noise or 10dB below if the noise has a 'distinguishable, discrete, continuous note' or 'distinct impulses'.

The representative background sound levels determined by a methodology consistent with BS 4142 (2014) were presented in Table 2, and these levels are adopted as the baseline "background noise" levels.

Plant noise emission limits at a point 1 m outside any window of any noise sensitive façade are as set out in Table 3.

| Period | Plant noise emission limit – broadband noise ($L_{Aeq,T}$) | Plant noise emission limit – tonal / impulsive noise ($L_{Aeq,T}$) |
|---|---|---|
| Day 12 hours (07:00-19:00) | 37 | 32 |
| Evening 4 hours (19:00-23:00) | 33 | 28 |
| Night 8 hours (23:00-07:00) | 29 | 24 |

Table 3: Plant noise emission limits for broadband and tonal/impulsive noise

## 6.2 Proposed Fixed Plant

The residential element is expected to employ continuously running MVHR units to provide ventilation and heat recovery.

In the Community Facilities building, MVHR units will be provided to the Nursery WCs, with intermittent day time use only. Some WCs and/or showers are expected to use domestic sized through wall extract fans, i.e. typically no more than 30 l/s extract, with intermittent day time use only.

Small scale, domestic-sized externally venting kitchen extract fans may be fitted in both the residential and Community Facilities elements.

The noise levels emitted externally by these units would normally be comfortably within the limits set out in the previous section at the nearest noise sensitive receiver. Once ventilation strategy has advanced further, additional consideration will be given to any requirements for attenuation e.g. duct attenuators. However it is not anticipated at this stage that these will be necessary.

It is understood that noise emitted by all other plant equipment is negligible.

# 7.0 OTHER CONSIDERATIONS

## 7.1 Community Facilities Outdoor Play Areas

In assessing acceptable noise levels for external areas used for amenity space, two documents frequently referred to are the World Health Organisation's (WHO) *Guidelines for Community Noise* (1999) and BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* (replacing BS 8233:1999). The WHO document advises that noise for outdoor school playgrounds during the day should not normally exceed 55 dB ($L_{Aeq,T}$). For comparison, BS 8233:2014 gives an upper guideline value for external areas such as gardens and patios of 55 dB ($L_{Aeq,T}$) also, although recognizes that the guideline values are not achievable in all circumstances where development might be desirable.

Considering the noise survey data described above, the external play areas in the development are likely to be within the guideline 55 dB $L_{Aeq,T}$ noise value.

## 7.2 The MUGA Facility

The proposed development will include a MUGA on the roof of the Community Play Facility. This is to replace a MUGA at the existing facility, which is used by both children and adults to play football, up till around 9.30pm. The proposed MUGA is therefore expected to result in similar levels of activity noise to those currently experienced on site.

The MUGA will be closely managed to ensure that its use will not cause undue nuisance to neighbouring dwellings and appropriate hours of operation will be secured in order to minimise potential amenity impacts.

For information, noise levels of adults, robustly playing 5-a-side football could give rise to a mean noise level of approximately 55 dB(A) at 20 m.

## 8.0 SUMMARY

The external noise environment at the proposed Lot 3 Community Facilities and Chalton St Housing site is characterised by the long term noise survey measurements, which determined representative levels of56 $L_{Aeq,12hr}$ (day), 46 dB $L_{Aeq,4hr}$ (evening), 46 dB $L_{Aeq,8hr}$ (night) and 66 dB $L_{AFmax}$ (night; $90^{th}$ percentile $L_{AFmax,15mins}$).

With respect to the proposed residential element, the determined noise levels are below the planning thresholds set in the Camden Council Local Development Framework (LDF), above which attenuation measures would be required.

Internal residential noise levels are expected to comply with BS 8233:2014.

The nursery facility (Nursery Flexible Space) within the Community Facility buildings will be able to deliver internal noise levels compliant with education best practise, represented by BB93 (2014).

External noise levels at the nursery outdoor play areas are likely to within BS 8233:2014and WHO recommended guidelines.

Representative background sound levels have been determined by the long term noise survey. Assuming broadband plant noise emissions, this sets a plant noise emission limit of 32-37 dBA during the day (07:00-19:00), 28-33 dBA during the evening (19:00-23:00), and 24-29 dBA during the night (23:00-07:00) at a point 1 m outside any window of any noise sensitive façade.

Activity levels at a MUGA on the roof of the proposed Community Play Facility are expected to be similar to a MUGA at the existing site. The noise levels are therefore also expected to be similar. In addition, the new MUGA will be closely managed and its hours of operation secured so as to minimise any impact on neighbouring dwellings.

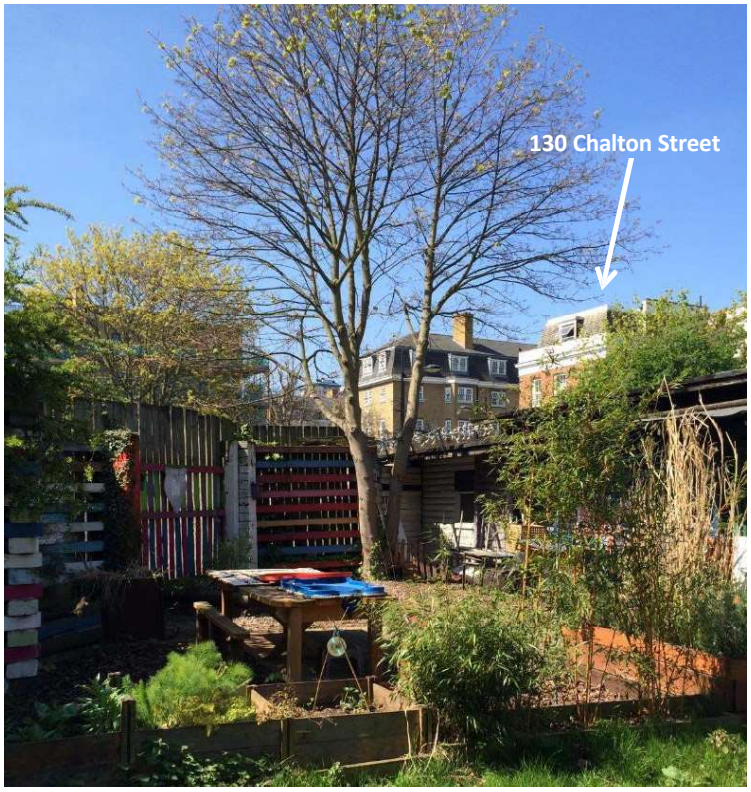
## 9.0 APPENDIX A – NOISE MONITORING EQUIPMENT DETAILS

The measurements were made with a Norsonic 118 precision sound level analyser. This equipment complies with BS EN IEC 61672 class 1. The meter uses a Nor 1225 free field response microphone and NOR 1206 microphone pre-amplifier.

This equipment, summarised in the table below, has been calibrated by a UKAS accredited laboratory in accordance with the laboratory requirements of the United Kingdom Accreditation Service (UKAS) on the dates indicated.

| Item | Make | Type | Serial no. | Calibration Intervals | Last Calibrated | Next Due Calibration | Calibration Certificate Number |
|---|---|---|---|---|---|---|---|
| Class 1 sound level meter | Norsonic | 118 | 31419 | 2 years | 14/07/14 | 14/07/16 | U16587 |
| Microphone | Norsonic | 1225 | 51319 | 2 years | 14/07/14 | 14/07/16 | 16586 |
| Microphone preamplifier | Norsonic | 1206 | 30457 | 2 years | 14/07/14 | 14/07/16 | U16589 |
| Calibrator | Norsonic | 1251 | 30895 | 1 year | 07/11/14 | 07/11/15 | U14606 |

Due to equipment security, the survey equipment was located in garden area of the existing Community Facilities, where a slatted fence meant that the fencing was essentially acoustically transparent. Photo taken looking towards Chalton Street direction, with 130 Chalton Street marked:



# APPENDIX 3
# NOISE ASSESSMENT REPORT – PLOT 2

MAX FORDHAM

# Plot 2 – Charrington Street Housing

# Central Somers Town

# Noise Impact Assessment

# Rev B

November 2015

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## ISSUE HISTORY

| Issue | Date | Description |
|---|---|---|
| * | 12/10/2015 | Draft issue |
| A | 2/11/2015 | Planning submission |
| B | 10/11/2015 | Planning submission - revised |
| | | |
| | | |

## MAX FORDHAM LLP TEAM CONTRIBUTORS

| Engineer | Role |
|---|---|
| Arthur Lewis-Nunes | Lead Acoustic Engineer |
| Lewis Crabtree | Acoustic Engineer |
| | |
| | |
| | |

**CONTENTS**

# 1. INTRODUCTION

Max Fordham LLP ("MFLLP") has been appointed to provide advice in relation to acoustic matters for the Central Somers Town Community Investment Project ("CIP"). Proposed developments for the project include the following:

- new buildings for Edith Neville School and St Aloysius Nursery
- redesign and rebuilding of Plot 10 play project (Community Facilities)
- improving the parks and open spaces
- residential developments at Charrington Street, Purchese Street and Brill Place.

This report covers Plot 2 of the development – Charrington Street Housing ("Plot 2").

Although principally residential, Plot 2 also includes a Commercial Unit on the ground floor (see Figure 3).

The objectives of this report are to assess:

- The likely impact of Plot 2 of the proposed development, including plant equipment on nearby noise sensitive premises; and
- The likely impact of the existing noise environment on Plot 2 of the development.

The following statement has been prepared on behalf of the London Borough of Camden in support of a planning application for the redevelopment of Central Somers Town.

***Project Background and Masterplan***
*The redevelopment of Central Somers Town is led by the Department for Children, Schools and Families and will be delivered as part of an approved regeneration strategy to deliver significant improvements to the public realm, provide a replacement primary school, nursery, play facilities and community hall. The development will also provide 136 housing units as well as maximising the amount of affordable housing which can be delivered by the scheme. Central to the development is the provision of public open space across the site. This space will be greatly improved as a result of the proposals and there will be no net loss of area following completion of the scheme.*

*The Central Somers Town project is self-funding, with the receipts from the private sale housing used to cross subsidise the delivery of the public realm, Edith Neville Primary School, nursery, community play facilities and community hall, in line with the wider vision for the Central Somers Town area.*

*This development is coming forward as part of the Community Investment Programme (CIP) which is a strategic programme focussed on ensuring the best use of the Council's assets to improve, shape and transform key places and services within Camden, whilst simultaneously addressing a critical capital funding gap. The programme includes a significant number of regeneration schemes across the Borough and involves the disposal of property assets that are surplus to requirements in order to unlock funding that will be reinvested in schools, the Better Homes programme and other supporting community infrastructure.*

*The reduction in government funding, including the money no longer available for schools, means that the Council has to be more innovative in how they make the best use of buildings and land to improve facilities. Working across the Council a borough-wide strategy has been initiated called 'The Community Investment Programme' (CIP) with the purpose of addressing this funding shortfall. The programme is making an important contribution to the delivery of objectives within the Camden Plan, particularly through harnessing the benefits of economic growth, tackling inequality, investing in communities to secure sustainable neighbourhoods and delivering value for money.*

*Under the CIP there are a number of objectives which need to be achieved:*

- *High quality schemes achieving high sustainability standards, including minimum BREEAM 'Excellent' ratings;*
- *Deliver 'fit for purpose' community facilities;*
- *Reduce revenue and capital costs through the efficient use of land and buildings;*
- *Increase revenue and capital value;*
- *Deliver affordable and private homes;*
- *Deliver improved public realm*

***Central Somers Town CIP***

*The Council has a significant property portfolio in the Somers Town area. Primarily this is made up of residential stock but also includes schools, a play project, children's centres and nurseries. These facilities provide an important service to children and their families and form an important part of bringing the wider community together. The area also contains two distinctive areas of public open space, these being Polygon Open Space and Purchese Open Space, which are maintained by the Council and provide a key component in how Somers Town functions as a place to live and work.*

*Central to the CIP is the Edith Neville Primary School and Children's Centre which were constructed as buildings with a short life expectancy. Remedial works have been necessary (both planned and unplanned) to keep it in service but the pressing need for replacement has been widely agreed for a considerable period of time.*

*Central Somers Town area is being addressed strategically as part of the CIP to tackle the significant need for investment. The scheme is intended to be self-funding, with the provision of residential development being utilised to pay for the redevelopment of the primary school and community facilities. It will also be possible to provide wider benefits through the delivery of an element of new affordable housing as well as public realm and public open space improvements.*

## 2. THE SITE

Plot 2 is located at the southern end of Charrington Street, London NW1. An aerial image identifying the location of Plot 2 and each of the other plots relative to the existing site is shown in Figure 1.

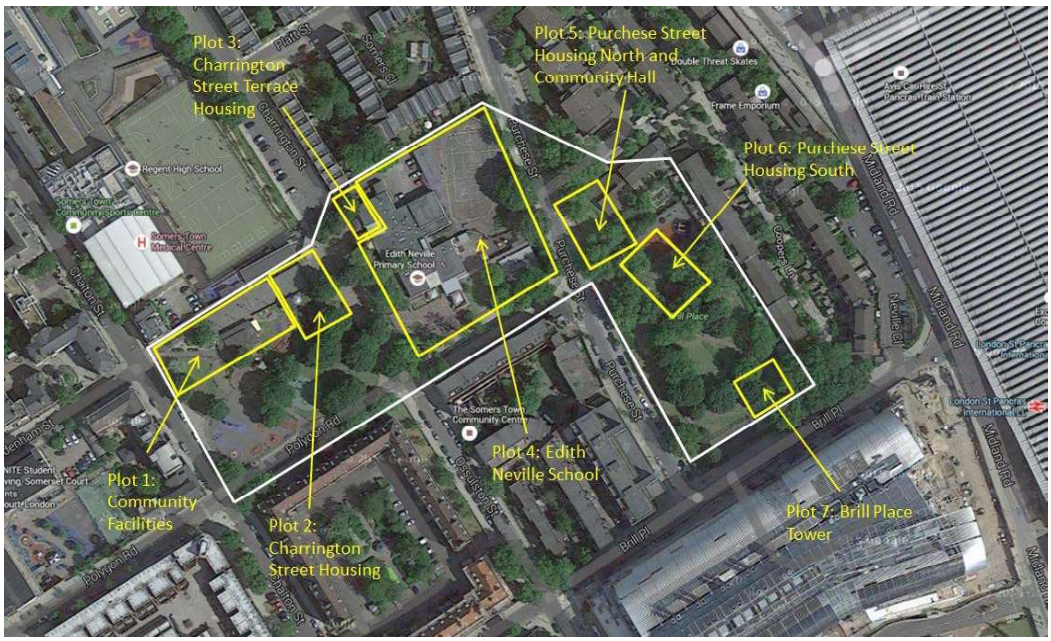


**Figure 1: An aerial image of the existing site of the CIP identifying individual plots**

Figure 2 identifies locations relevant to the noise survey for this plot, including long term and short term measurement locations ("L1", "S1", "S2"). The nearest noise sensitive receiver was identified to be a residential property at the end of Charrington Street, adjacent to the existing Edith Neville Primary School site.

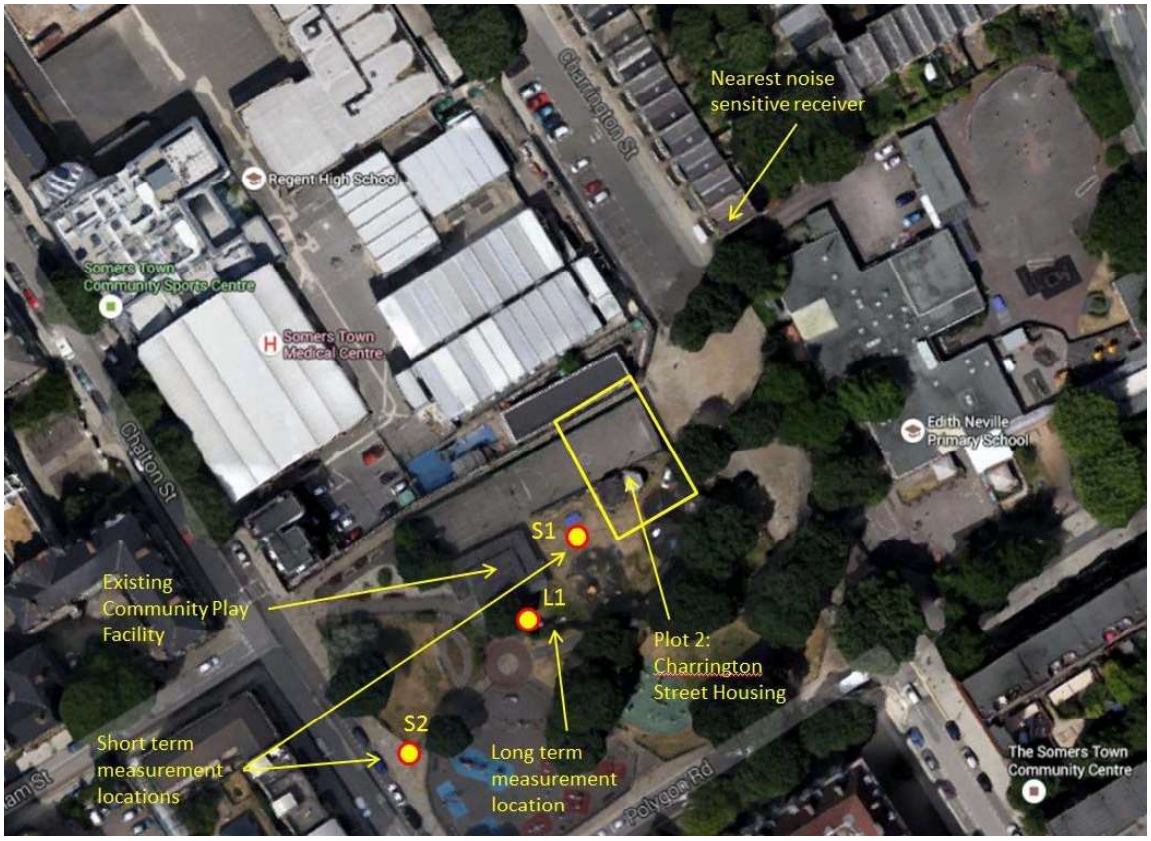


**Figure 2: Aerial image of site and noise survey locations**

A subjective assessment from a site visit indicates that the local noise environment is relatively benign. The roads surrounding the site are principally residential. Traffic volume was observed to be low on Chalton Street.


**Figure 3: Ground floor plan of proposed Plot 2 development, including Commercial Unit. Drawing correct as at 29/09/2015 – Coordination issue.**

# 3. ASSESSMENT CRITERIA

## Local Authority Requirements

The site is located within the London Borough of Camden. The Camden Council Local Development Framework (LDF) sets out the planning criteria for noise and vibration used to determine applications for planning permission in the borough. An extract of the sections relevant to this development is provided in Figure 4.

Should noise levels on adjoining roads in the vicinity of Plot 2 reach the levels in Table B, attenuation measures would be required. Should the noise levels exceed those levels in Table A, planning permission would not be granted. Plant and machinery noise should not exceed 5 dB below background noise as set out in Table E (with additional restrictions placed on tonal or impulsive noise).

**Table A: Noise levels on residential sites adjoining railways and roads at which planning permission will not be granted**

| Noise description and location of measurement | Period | Time | Sites adjoining railways | Sites adjoining roads |
|---|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day | 0700-1900 | 74 dB $L_{Aeq}$,12h | 72 dB $L_{Aeq}$,12h |
| Noise at 1 metre external to a sensitive façade | Evening | 1900-2300 | 74 dB $L_{Aeq}$,4h | 72 dB $L_{Aeq}$,4h |
| Noise at 1 metre external to a sensitive façade | Night | 2300-0700 | 66 dB $L_{Aeq}$,8h | 66 dB $L_{Aeq}$,8h |

**Table B: Noise levels on residential streets adjoining railways and roads at and above which attenuation measures will be required**

| Noise description and location of measurement | Period | Time | Sites adjoining railways | Sites adjoining roads |
|---|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day | 0700-1900 | 65 dB $L_{Aeq}$,12h | 62 dB $L_{Aeq}$,12h |
| Noise at 1 metre external to a sensitive façade | Evening | 1900-2300 | 60 dB $L_{Aeq}$,4h | 57 dB $L_{Aeq}$,4h |
| Noise at 1 metre external to a sensitive façade | Night | 2300-0700 | 55 dB $L_{Aeq}$,1h | 52 dB $L_{Aeq}$,1h |
| Individual noise events several times an hour | Night | 2300-0700 | >82 dB $L_{Amax}$ (S time weighting) | >82 dB $L_{AMAX}$ (S time weighting) |

**Table E: Noise levels from plant and machinery at which planning permission will not be granted**

| Noise description and location of measurement | Period | Time | Noise level |
|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day, evening and night | 0000-2400 | 5dB(A) <LA90 |
| Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade. | Day, evening and night | 0000-2400 | 10dB(A) <LA90 |
| Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade. | Day, evening and night | 0000-2400 | 10dB(A) <LA90 |
| Noise at 1 metre external to sensitive façade where LA90>60dB | Day, evening and night | 0000-2400 | 55dB$L_{Aeq}$, |

**Figure 4: Extract from Camden Council Local Development Framework - planning criteria for noise and vibration**

## BS 8233:2014

BS 8233:2014 *Guidance on Sound Insulation and Noise Reduction for Buildings* sets out desirable limits for indoor ambient noise levels for dwellings from steady external noise sources (see Table 1).

| Activity | Location | 07:00-23:00 | 23:00-07:00 |
|---|---|---|---|
| Resting | Living room | 35 dB $L_{Aeq,16h}$ | – |
| Dining | Dining room / area | 40 dB $L_{Aeq,16hr}$ | – |
| Sleeping | Bedrooms | 35 dB $L_{Aeq,16hr}$ | 30 dB $L_{Aeq,8hr}$ |

**Table 1: Proposed indoor ambient noise limits (from BS 8233:2014 Table 4)**

It is proposed that the levels in BS 8233:2014 are adopted as the basis for assessing the façade sound insulation requirements.

BS 8233 advises that these noise limits should apply in background ventilation conditions i.e. with trickle vents open (if applicable).

In circumstances where noise levels are above the proposed indoor ambient noise limits, BS 8233 advises that a relaxation of up to 5 dB may be applied if the development is considered necessary or desirable. This would still achieve reasonable internal conditions.

## Building Regulations

The Building Regulations Approved Document E 2003 (incorporating 2004, 2010, 2013 and 2015 amendments) applies to this development. Key requirements of Approved Document E detail the minimum acceptable airborne sound insulation and maximum impact noise performance standards.

It is proposed that a performance uplift of 5 dB with respect to the airborne sound insulation and impact noise performance is targeted for Plot 2.

Note, the 5 dB uplift over Approved Document E standards also aligns with the Mayor's preferred standards set out in the Mayor's Sustainable Design and Construction SPG (2006).

## BS 4142 (2014)

BS 4142:2014 *Methods for Rating and Assessing Industrial and Commercial Sound*, has now replaced BS 4142:1997. In BS 4142:1997 plant noise ratings were compared with the existing local background noise levels, and if the rating level was more than 10 dB below the measured background noise level then this would be a positive indication that complaints are unlikely.

In BS 4142:2014, a noise rating is still determined and compared with the existing local background sound level (i.e. as before) although several more cumulative acoustic feature corrections to the noise rating are available to apply where appropriate. For example if the noise includes a distinguishable tone, impulse, intermittency or other readily distinguishable sound characteristic, then additional *cumulative* penalties individually ranging from 0 to 9 dB may be applied depending on the type of noise.

BS 4142:2014 seeks to determine a "representative" background sound level, stating that "…*the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*".

The assessment of the impact depends upon the margin by which the rating level of the specific sound source exceeds the background sound level (i.e. as before) but also promotes a consideration of the context in which the sound occurs when making an assessment. BS 4142:2014 states that an initial estimate of the impact of the specific sound is made by subtracting the measured background sound level from the rating level, while considering the following points:

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

Note then, a BS 4142:2014 assessment may deduce a low impact where the specific sound level is approaching the background sound level, and thus may conclude that the specific noise is acceptable.

# 4. NOISE SURVEY

An unattended noise survey was undertaken between 23-26th April 2015 to establish existing environmental noise conditions at the site.

In addition, short term attended measurements were carried out on 11 May 2015 on Chalton Street.

## Procedure

A long term unattended noise survey (approx. 64 hours) was conducted at the site of the existing Somers Town Community Facilities building on 23-26 April 2015 by MFLLP in order to determine typical mean ($L_{Aeq}$), maximum ($L_{Amax}$) and background ($L_{A90}$) sound levels in the vicinity of the proposed buildings. The survey location is identified in Figure 2 ("L1").

The microphone of the sound level meter was mounted on a tripod and positioned adjacent to the Community Facilities building. The sound level meter was set up to make consecutive 15-minute measurements and left unattended to capture noise data for duration of the survey period starting at 12:15pm on Thursday 23th April 2015.

Additionally, a short term attended survey was also carried out on Chalton St on 11 May 2015 between 9-10 am on the site boundary, also identified in Figure 2 ("S2").

All noise measurements were made with a Norsonic 118 precision sound level analyser with a Norsonic weather protection kit. This equipment complies with BS EN IEC 61672 class 1. The meter uses a Nor 1225 free-field response microphone and NOR 1206 microphone pre-amplifier. The calibration of the sound level meter was checked at the beginning and end of measurements with a Nor 1251 sound calibrator, complying with BS EN IEC 60942 class 1. No significant calibration deviation occurred. Details of the equipment are given in Appendix A. The survey procedures were consistent with BS 7445.

For the duration of the long term survey the weather was generally dry (a rain shower occurred at the very end of the recording period) with light winds. The weather conditions are not considered to have had a significant impact on the noise survey results.

## Results

The time history of the results from the long term survey (at location L1) is shown in Figure 5. Derived values from the data are presented in Table 2.

The short-term Chalton Street survey (location S2) yielded an ambient noise level of 54 dBA $L_{Aeq,1hr}$.

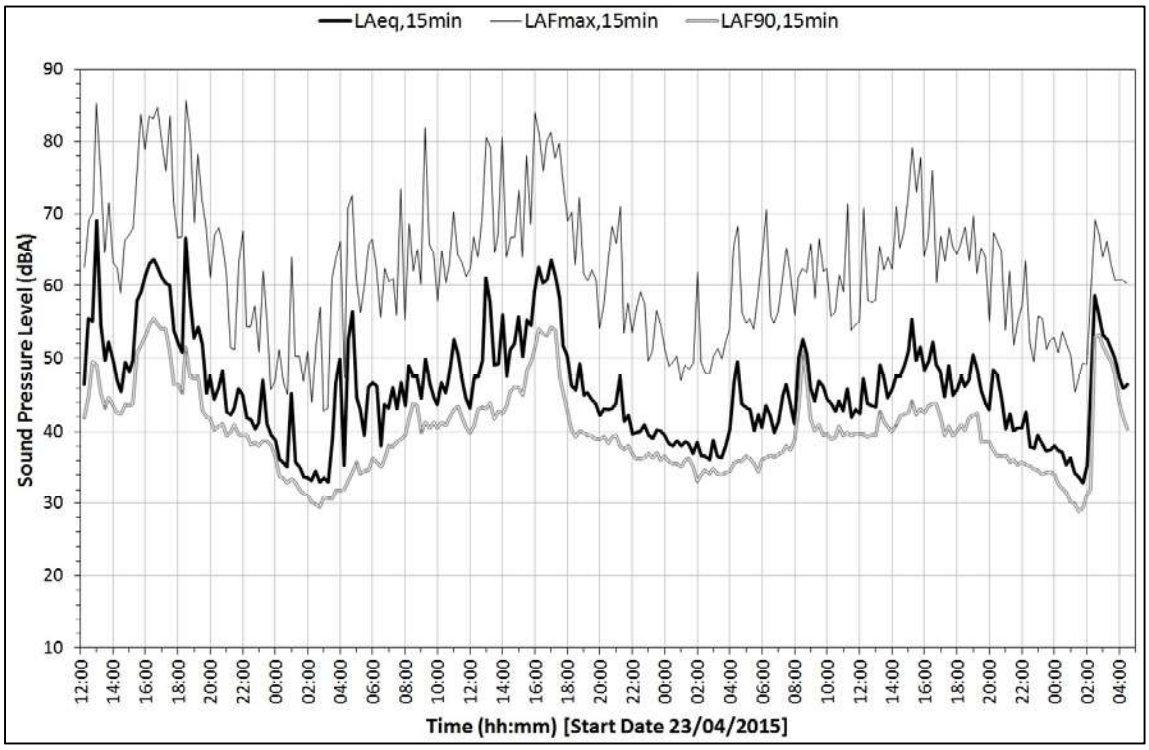


**Figure 5: Long term noise survey (Location L1) results (free-field)**

| Date | Period | $L_{Aeq,T}$ dB (average) | $L_{ASmax,15mins}$ dB ($90^{th}$ percentile) | $L_{AF90,15mins}$ dB ($40^{th}$ percentile) |
|---|---|---|---|---|
| 23-$26^{th}$ April 2015 | Day 16 hours (07:00-23:00) | 54 | N/A | N/A |
| | Day 12 hours (07:00-19:00) | 56 | N/A | 42 |
| | Evening 4 hours (19:00-23:00) | 46 | N/A | 38 |
| | Night 8 hours (23:00-07:00) | 46 | 61 | 34 |

**Table 2: Summary of long term noise survey at location L1 (free-field)**

These noise level measurements are considered representative of noise levels at the façade of the proposed Plot 2 development. Due to the consistency of the time profile across the measured days, it is considered appropriate to report average noise levels.

**Background Sound Level Assessment Methodology**

BS 4142:2014 seeks to determine a "representative" background sound level, stating that "…*the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*". A definitive method of selecting a representative background sound level is not prescribed in BS 4142:2014, although an example is presented where the modal value is selected from a statistical analysis.

In our experience, a reasonable approach is to adopt the repeatable method of selecting the $40^{th}$ percentile value of the $L_{AF90}$ data periods. This generally accounts for potentially unrepresentative high values and untypical events, while usually representing values near the median of the remaining 'valid' distribution.

# 5. NOISE EXPOSURE ASSESSMENT

## Local Authority Requirements

The long term data in Table 2 is used to derive expected noise levels at the proposed facades. Table 3 sets out these noise levels in comparison to the levels above which attenuation measures would be required by Camden Council in the Local Development Framework Table B (see Figure 4).

| Period | Expected Façade Exposure $L_{Aeq}$ dB | Noise levels above which attenuation measures will be required (Camden Council LDF Table B) $L_{Aeq}$ dB |
|---|---|---|
| Day 12 hours (07:00-19:00) | 56 | 62 |
| Evening 4 hours (19:00-23:00) | 46 | 57 |
| Night 8 hours (23:00-07:00) | 46 | 52 |
| Individual noise events (Night) | 67 $L_{ASmax}$ | 82 $L_{ASmax}$ |

**Table 3: Expected Façade Exposure and Camden Council LDF limits**

Measured results suggest that the average and maximum noise levels determined at L1 are below noise levels above which attenuation measures will be required by Camden Council.

## BS 8233:2014 Assessment

Expected internal noise levels have been calculated based on the measured external noise levels and sound insulation of an indicative building façade.

| Location | Expected Façade Exposure $L_{Aeq}$ dB | Indicative Façade Sound Reduction dB | Calculated Indoor Ambient Noise Level LAeq dB | BS 8233:2014 desirable limit LAeq dB |
|---|---|---|---|---|
| Living room (07:00-23:00) | 54 | 24 | 30 | 35 |
| Dining room/area (07:00-23:00) | 54 | | 30 | 40 |
| Bedroom (07:00-23:00) | 54 | | 30 | 35 |
| Bedroom (23:00-07:00) | 46 | | 22 | 30 |

**Table 4: Calculated Indoor Ambient Noise Level and BS 8233:2014 guidlines**

The indicative façade performance is based on typical façade construction with no specific acoustic attenuation measures – a light-weight wall construction, standard glazing and standard trickle vents with no acoustic treatment. With this type of construction, internal noise levels are well within the guideline indoor ambient noise level limits in BS 8233:2014 as set out in Table 4.

# 6. EXTERNAL PLANT NOISE EMISSIONS

## Noise Emission Limits

The Camden Council policy (Section 3) requires that plant noise does not exceed a level that is 5 dB below the external background noise or 10dB below if the noise has a 'distinguishable, discrete, continuous note' or 'distinct impulses'.

The representative background sound levels determined by a methodology consistent with BS 4142 (2014) were presented in Table 2. These levels are adopted as the baseline "background noise" levels.

Plant noise emission limits at a point 1 m outside any window of any noise sensitive façade are as set out in Table 5.

| Period | Plant noise emission limit – broadband noise ($L_{Aeq,T}$) | Plant noise emission limit – tonal / impulsive noise ($L_{Aeq,T}$) |
|---|---|---|
| Day 12 hours (07:00-19:00) | 37 | 32 |
| Evening 4 hours (19:00-23:00) | 33 | 28 |
| Night 8 hours (23:00-07:00) | 29 | 24 |

**Table 5: Plant noise emission limits for broadband and tonal/impulsive noise**

## Proposed Fixed Plant Equipment

Charrington Street Housing is expected to employ continuously running MVHR units to provide ventilation and heat recovery. These will draw air in and out through the facades of each flat.

There may also be externally venting residential kitchen extract fans.

The noise levels emitted externally by these small, domestic units would normally be comfortably within the limits set out in the previous section at the nearest noise sensitive receiver.

Once ventilation strategy has advanced further, additional consideration will be given to any requirements for attenuation e.g. duct attenuators. However it is not anticipated at this stage that these will be necessary.

Certain items of plant may be required for the Commercial Unit on the ground floor of, for example, a kitchen extract fan. An attenuation strategy will be developed if it emerges that plant for this element of the development would generate noise levels at the noise sensitive receiver above levels defined in the previous section.

It is understood that noise emitted by all other plant equipment is negligible.

# 7. COMMERCIAL UNIT

A Commercial Unit (believed to be a café) is to be included on the ground floor of the development at Plot 2.

Plant noise from this unit is covered in section 6.

Typical activity noise expected from this unit is not anticipated to result in any significant increase in daytime ambient noise levels in the vicinity of plot 2.

## 8. SUMMARY

A noise survey was carried out by Max Fordham LLP between 23 April 2015 and 26 April 2015.

Ambient noise levels measured during the survey suggest that:

- Noise levels at the facades of the proposed development will not be above levels at which attenuation measures would be required by Camden Council
- Guideline indoor ambient noise levels set out in BS 8233:2014 can be achieved with standard façade building elements.

Background noise levels measured during the survey suggest that:

- Depending on whether plant noise emissions are broadband or tonal/impulsive, noise emission limits should be set to 32-37 dBA during the day (07:00-19:00), 28-33 dBA during the evening (19:00-23:00), and 24-29 dBA during the night (23:00-07:00)
- Noise emissions for plant equipment associated with the apartments at the nearest noise sensitive receiver are expected to be comfortably within these limits.
- Noise from plant equipment associated with the Commercial Unit will be considered further as the strategy develops and appropriate noise control measures included as required.

Activity noise from the Commercial Unit is not expected to pose any noise issues in the area surrounding the site.

## APPENDIX A – NOISE MONITORING EQUIPMENT DETAILS

The measurements were made with a Norsonic 118 precision sound level analyser. This equipment complies with BS EN IEC 61672 class 1. The meter uses a Nor 1225 free field response microphone and NOR 1206 microphone pre-amplifier.

This equipment, summarised in the table below, has been calibrated by a UKAS accredited laboratory in accordance with the laboratory requirements of the United Kingdom Accreditation Service (UKAS) on the dates indicated.

| Item | Make | Type | Serial no. | Calibration Intervals | Last Calibrated | Next Due Calibration | Calibration Certificate Number |
|---|---|---|---|---|---|---|---|
| Class 1 sound level meter | Norsonic | 118 | 31419 | 2 years | 14/07/14 | 14/07/16 | U16587 |
| Microphone | Norsonic | 1225 | 51319 | 2 years | 14/07/14 | 14/07/16 | 16586 |
| Microphone preamplifier | Norsonic | 1206 | 30457 | 2 years | 14/07/14 | 14/07/16 | U16589 |
| Calibrator | Norsonic | 1251 | 30895 | 1 year | 07/11/14 | 07/11/15 | U14606 |

# APPENDIX 4
# NOISE ASSESSMENT REPORT – PLOT 3

MAX FORDHAM

# Plot 3 – Charrington Street Terrace Housing

# Central Somers Town

# Noise Impact Assessment

## Rev B

November 2015

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## ISSUE HISTORY

| Issue | Date | Description |
|---|---|---|
| * | 12/10/2015 | Draft issue |
| A | 2/11/2015 | Planning submission |
| B | 10/11/2015 | Planning submission - revised |
| | | |
| | | |

## MAX FORDHAM LLP TEAM CONTRIBUTORS

| Engineer | Role |
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| Lewis Crabtree | Acoustic Engineer |
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**CONTENTS**

# 1. INTRODUCTION

Max Fordham LLP ("MFLLP") has been appointed to provide advice in relation to acoustic matters for the Central Somers Town Community Investment Project ("CIP"). Proposed developments for the project include the following:

- new buildings for Edith Neville School and St Aloysius Nursery
- redesign and rebuilding of Plot 10 play project (Community Facilities)
- improving the parks and open spaces
- residential developments at Charrington Street, Purchese Street and Brill Place.

This report covers Plot 3 of the development – Charrington Street Terrace Housing ("Plot 3").

The objectives of this report are to assess:

- The likely impact of Plot 3 of the proposed development, including plant equipment on nearby noise sensitive premises; and
- The likely impact of the existing noise environment on Plot 3 of the development.

The following statement has been prepared on behalf of the London Borough of Camden in support of a planning application for the redevelopment of Central Somers Town.

***Project Background and Masterplan***
*The redevelopment of Central Somers Town is led by the Department for Children, Schools and Families and will be delivered as part of an approved regeneration strategy to deliver significant improvements to the public realm, provide a replacement primary school, nursery, play facilities and community hall. The development will also provide 136 housing units as well as maximising the amount of affordable housing which can be delivered by the scheme. Central to the development is the provision of public open space across the site. This space will be greatly improved as a result of the proposals and there will be no net loss of area following completion of the scheme.*

*The Central Somers Town project is self-funding, with the receipts from the private sale housing used to cross subsidise the delivery of the public realm, Edith Neville Primary School, nursery, community play facilities and community hall, in line with the wider vision for the Central Somers Town area.*

*This development is coming forward as part of the Community Investment Programme (CIP) which is a strategic programme focussed on ensuring the best use of the Council's assets to improve, shape and transform key places and services within Camden, whilst simultaneously addressing a critical capital funding gap. The programme includes a significant number of regeneration schemes across the Borough and involves the disposal of property assets that are surplus to requirements in order to unlock funding that will be reinvested in schools, the Better Homes programme and other supporting community infrastructure.*

*The reduction in government funding, including the money no longer available for schools, means that the Council has to be more innovative in how they make the best use of buildings and land to improve facilities. Working across the Council a borough-wide strategy has been initiated called 'The Community Investment Programme' (CIP) with the purpose of addressing this funding shortfall. The programme is making an important contribution to the delivery of objectives within the Camden Plan, particularly through harnessing the benefits of economic growth, tackling inequality, investing in communities to secure sustainable neighbourhoods and delivering value for money.*

*Under the CIP there are a number of objectives which need to be achieved:*

- *High quality schemes achieving high sustainability standards, including minimum BREEAM 'Excellent' ratings;*

- *Deliver 'fit for purpose' community facilities;*
- *Reduce revenue and capital costs through the efficient use of land and buildings;*
- *Increase revenue and capital value;*
- *Deliver affordable and private homes;*
- *Deliver improved public realm*

***Central Somers Town CIP***

*The Council has a significant property portfolio in the Somers Town area. Primarily this is made up of residential stock but also includes schools, a play project, children's centres and nurseries. These facilities provide an important service to children and their families and form an important part of bringing the wider community together. The area also contains two distinctive areas of public open space, these being Polygon Open Space and Purchese Open Space, which are maintained by the Council and provide a key component in how Somers Town functions as a place to live and work.*

*Central to the CIP is the Edith Neville Primary School and Children's Centre which were constructed as buildings with a short life expectancy. Remedial works have been necessary (both planned and unplanned) to keep it in service but the pressing need for replacement has been widely agreed for a considerable period of time.*

*Central Somers Town area is being addressed strategically as part of the CIP to tackle the significant need for investment. The scheme is intended to be self-funding, with the provision of residential development being utilised to pay for the redevelopment of the primary school and community facilities. It will also be possible to provide wider benefits through the delivery of an element of new affordable housing as well as public realm and public open space improvements.*

## 2. THE SITE

Plot 3 is located at the southern end of Charrington Street, London NW1. An aerial image identifying the location of Plot 3 and each of the other plots relative to the existing site is shown in Figure 1.

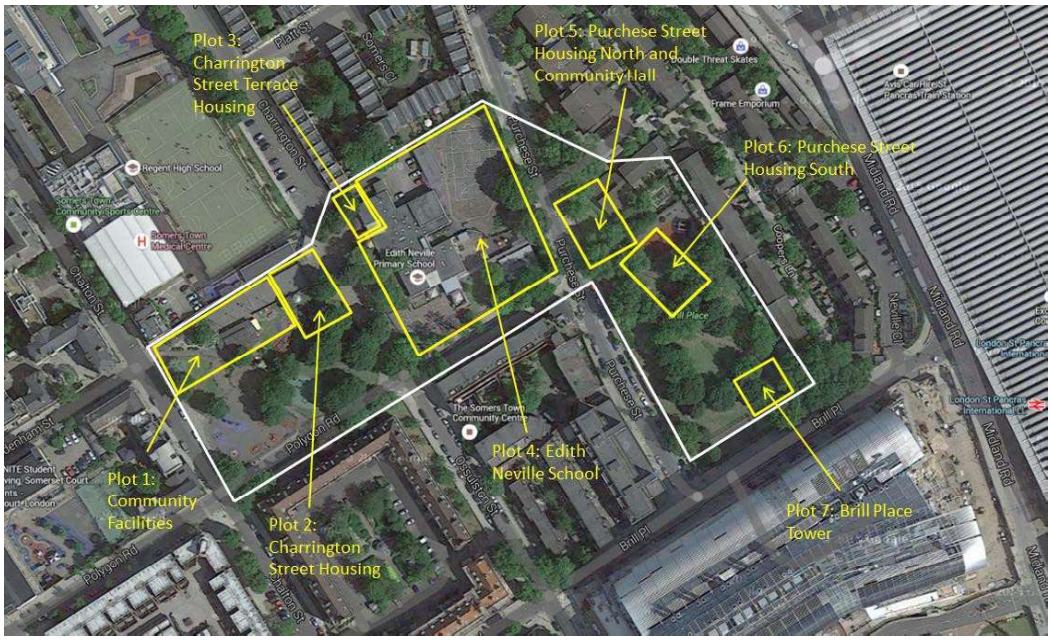


**Figure 1: An aerial image of the existing site of the CIP identifying individual plots**

Figure 2 identifies locations relevant to the noise survey for this plot, including long term and short term measurement locations ("L1", "S1", "S2"). The existing nearest noise sensitive receiver was identified to be a residential property at the end of Charrington Street, adjacent to Plot 3.

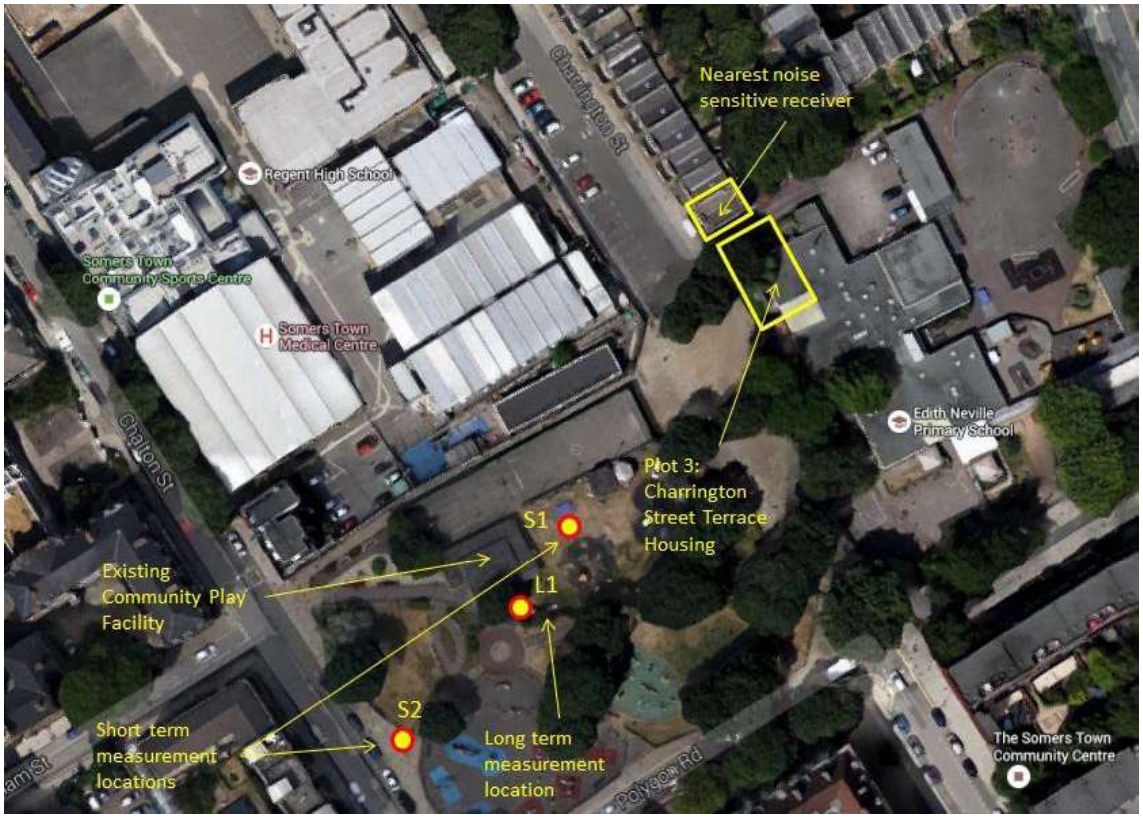


**Figure 2: Aerial image of site and noise survey locations**

A subjective assessment from a site visit indicates that the local noise environment is relatively benign. The roads surrounding the site are principally residential. Traffic volume was observed to be low on Chalton Street.

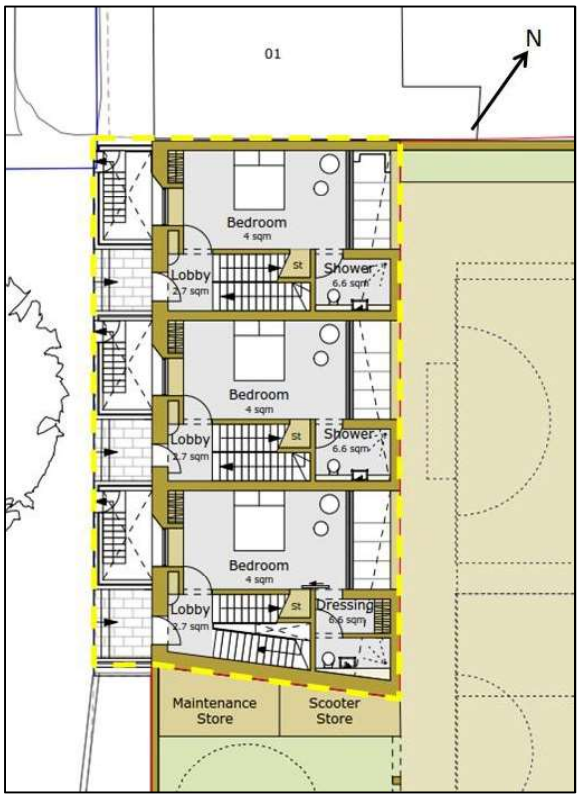


**Figure 3: Ground floor plan of proposed Plot 3 development. Drawing correct as at 28/10/2015 – coordination issue**

# 3. ASSESSMENT CRITERIA

## Local Authority Requirements

The site is located within the London Borough of Camden. The Camden Council Local Development Framework (LDF) sets out the planning criteria for noise and vibration used to determine applications for planning permission in the borough. An extract of the sections relevant to this development is provided in Figure 4.

Should noise levels on adjoining roads in the vicinity of Plot 3 reach the levels in Table B, attenuation measures would be required. Should the noise levels exceed those levels in Table A, planning permission would not be granted. Plant and machinery noise should not exceed 5 dB below background noise as set out in Table E (with additional restrictions placed on tonal or impulsive noise).

**Table A: Noise levels on residential sites adjoining railways and roads at which planning permission will not be granted**

| Noise description and location of measurement | Period | Time | Sites adjoining railways | Sites adjoining roads |
|---|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day | 0700-1900 | 74 dB $L_{Aeq}$,12h | 72 dB $L_{Aeq}$,12h |
| Noise at 1 metre external to a sensitive façade | Evening | 1900-2300 | 74 dB $L_{Aeq}$,4h | 72 dB $L_{Aeq}$,4h |
| Noise at 1 metre external to a sensitive façade | Night | 2300-0700 | 66 dB $L_{Aeq}$,8h | 66 dB $L_{Aeq}$,8h |

**Table B: Noise levels on residential streets adjoining railways and roads at and above which attenuation measures will be required**

| Noise description and location of measurement | Period | Time | Sites adjoining railways | Sites adjoining roads |
|---|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day | 0700-1900 | 65 dB $L_{Aeq}$,12h | 62 dB $L_{Aeq}$,12h |
| Noise at 1 metre external to a sensitive façade | Evening | 1900-2300 | 60 dB $L_{Aeq}$,4h | 57 dB $L_{Aeq}$,4h |
| Noise at 1 metre external to a sensitive façade | Night | 2300-0700 | 55 dB $L_{Aeq}$,1h | 52 dB $L_{Aeq}$,1h |
| Individual noise events several times an hour | Night | 2300-0700 | >82 dB $L_{Amax}$ (S time weighting) | >82 dB $L_{AMAX}$ (S time weighting) |

**Table E: Noise levels from plant and machinery at which planning permission will not be granted**

| Noise description and location of measurement | Period | Time | Noise level |
|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day, evening and night | 0000-2400 | 5dB(A) <LA90 |
| Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade. | Day, evening and night | 0000-2400 | 10dB(A) <LA90 |
| Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade. | Day, evening and night | 0000-2400 | 10dB(A) <LA90 |
| Noise at 1 metre external to sensitive façade where LA90>60dB | Day, evening and night | 0000-2400 | 55dB$L_{Aeq}$ |

**Figure 4: Extract from Camden Council Local Development Framework - planning criteria for noise and vibration**

## BS 8233:2014

BS 8233:2014 *Guidance on Sound Insulation and Noise Reduction for Buildings* sets out desirable limits for indoor ambient noise levels for dwellings from steady external noise sources (see Table 1).

| Activity | Location | 07:00-23:00 | 23:00-07:00 |
|---|---|---|---|
| Resting | Living room | 35 dB $L_{Aeq,16h}$ | – |
| Dining | Dining room / area | 40 dB $L_{Aeq,16hr}$ | – |
| Sleeping | Bedrooms | 35 dB $L_{Aeq,16hr}$ | 30 dB $L_{Aeq,8hr}$ |

**Table 1: Proposed indoor ambient noise limits (from BS 8233:2014 Table 4)**

It is proposed that the levels in BS 8233:2014 are adopted as the basis for assessing the façade sound insulation requirements.

BS 8233 advises that these noise limits should apply in background ventilation conditions i.e. with trickle vents open (if applicable).

In circumstances where noise levels are above the proposed indoor ambient noise limits, BS 8233 advises that a relaxation of up to 5 dB may be applied if the development is considered necessary or desirable. This would still achieve reasonable internal conditions.

## Building Regulations

The Building Regulations Approved Document E 2003 (incorporating 2004, 2010, 2013 and 2015 amendments) applies to this development. Key requirements of Approved Document E detail the minimum acceptable airborne sound insulation and maximum impact noise performance standards.

It is proposed that a performance uplift of 5 dB with respect to the airborne sound insulation and impact noise performance is targeted for Plot 3.

Note, the 5 dB uplift over Approved Document E standards also aligns with the Mayor's preferred standards set out in the Mayor's Sustainable Design and Construction SPG (2006).

## BS 4142 (2014)

BS 4142:2014 *Methods for Rating and Assessing Industrial and Commercial Sound*, has now replaced BS 4142:1997. In BS 4142:1997 plant noise ratings were compared with the existing local background noise levels, and if the rating level was more than 10 dB below the measured background noise level then this would be a positive indication that complaints are unlikely.

In BS 4142:2014, a noise rating is still determined and compared with the existing local background sound level (i.e. as before) although several more cumulative acoustic feature corrections to the noise rating are available to apply where appropriate. For example if the noise includes a distinguishable tone, impulse, intermittency or other readily distinguishable sound characteristic, then additional *cumulative* penalties individually ranging from 0 to 9 dB may be applied depending on the type of noise.

BS 4142:2014 seeks to determine a "representative" background sound level, stating that "…*the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*".

The assessment of the impact depends upon the margin by which the rating level of the specific sound source exceeds the background sound level (i.e. as before) but also promotes a consideration of the context in which the sound occurs when making an assessment. BS 4142:2014 states that an initial estimate of the impact of the specific sound is made by subtracting the measured background sound level from the rating level, while considering the following points:

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

Note then, a BS 4142:2014 assessment may deduce a low impact where the specific sound level is approaching the background sound level, and thus may conclude that the specific noise is acceptable.

# 4. NOISE SURVEY

An unattended noise survey was undertaken between 23-26th April 2015 to establish existing environmental noise conditions at the site.

In addition, short term attended measurements were carried out on 11 May 2015 on Chalton Street.

## Procedure

A long term unattended noise survey (approx. 64 hours) was conducted at the site of the existing Community Facilities building on 23-26 April 2015 by MFLLP in order to determine typical mean (LAeq), maximum (LAmax) and background (LA90) sound levels in the vicinity of the proposed buildings. The survey location is identified in Figure 2 ("L1").

The microphone of the sound level meter was mounted on a tripod and positioned adjacent to the Community Facilities building. The sound level meter was set up to make consecutive 15-minute measurements and left unattended to capture noise data for duration of the survey period starting at 12:15pm on Thursday 23th April 2015.

Additionally, a short term attended survey was also carried out on Chalton St on 11 May 2015 between 9-10 am on the site boundary, also identified in Figure 2 ("S2").

All noise measurements were made with a Norsonic 118 precision sound level analyser with a Norsonic weather protection kit. This equipment complies with BS EN IEC 61672 class 1. The meter uses a Nor 1225 free-field response microphone and NOR 1206 microphone pre-amplifier. The calibration of the sound level meter was checked at the beginning and end of measurements with a Nor 1251 sound calibrator, complying with BS EN IEC 60942 class 1. No significant calibration deviation occurred. Details of the equipment are given in Appendix A. The survey procedures were consistent with BS 7445.

For the duration of the long term survey the weather was generally dry (a rain shower occurred at the very end of the recording period) with light winds. The weather conditions are not considered to have had a significant impact on the noise survey results.

## Results

The time history of the results from the long term survey (at location L1) is shown in Figure 5. Derived values from the data are presented in Table 2.

The short-term Chalton Street survey (location S2) yielded an ambient noise level of 54 dBA $L_{Aeq,1hr}$.

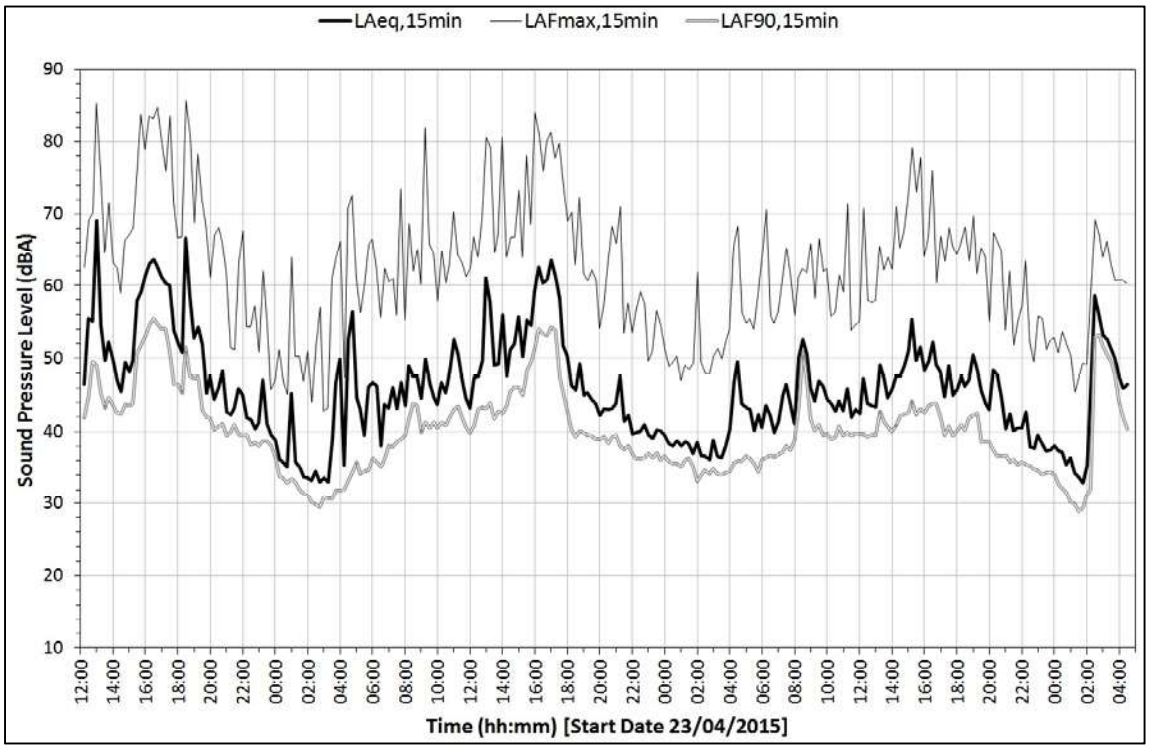


**Figure 5: Long term noise survey (Location L1) results (free-field)**

| Date | Period | $L_{Aeq,T}$ dB (average) | $L_{ASmax,15mins}$ dB ($90^{th}$ percentile) | $L_{AF90,15mins}$ dB ($40^{th}$ percentile) |
|---|---|---|---|---|
| 23-$26^{th}$ April 2015 | Day 16 hours (07:00-23:00) | 54 | N/A | N/A |
| | Day 12 hours (07:00-19:00) | 56 | N/A | 42 |
| | Evening 4 hours (19:00-23:00) | 46 | N/A | 38 |
| | Night 8 hours (23:00-07:00) | 46 | 61 | 34 |

**Table 2: Summary of long term noise survey at location L1 (free-field)**

These noise level measurements are considered representative of noise levels at the façade of the proposed Plot 3 development. Due to the consistency of the time profile across the measured days, it is considered appropriate to report average noise levels.

**Background Sound Level Assessment Methodology**

BS 4142:2014 seeks to determine a "representative" background sound level, stating that "…*the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*". A definitive method of selecting a representative background sound level is not prescribed in BS 4142:2014, although an example is presented where the modal value is selected from a statistical analysis.

In our experience, a reasonable approach is to adopt the repeatable method of selecting the $40^{th}$ percentile value of the $L_{AF90}$ data periods. This generally accounts for potentially unrepresentative high values and untypical events, while usually representing values near the median of the remaining 'valid' distribution.

# 5. NOISE EXPOSURE ASSESSMENT

## Local Authority Requirements

The long term data in Table 2 is used to derive expected noise levels at the proposed facades. Table 3 sets out these noise levels in comparison to the levels above which attenuation measures would be required by Camden Council in the Local Development Framework Table B (see Figure 4).

| Period | Expected Façade Exposure $L_{Aeq}$ dB | Noise levels above which attenuation measures will be required (Camden Council LDF Table B) $L_{Aeq}$ dB |
|---|---|---|
| Day 12 hours (07:00-19:00) | 56 | 62 |
| Evening 4 hours (19:00-23:00) | 46 | 57 |
| Night 8 hours (23:00-07:00) | 46 | 52 |
| Individual noise events (Night) | 67 $L_{ASmax}$ | 82 $L_{ASmax}$ |

**Table 3: Expected Façade Exposure and Camden Council LDF limits**

Measured results suggest that the average and maximum noise levels determined at L1 are below noise levels above which attenuation measures will be required by Camden Council.

## BS 8233:2014 Assessment

Expected internal noise levels have been calculated based on the measured external noise levels and sound insulation of an indicative building façade.

| Location | Expected Façade Exposure $L_{Aeq}$ dB | Indicative Façade Sound Reduction dB | Calculated Indoor Ambient Noise Level LAeq dB | BS 8233:2014 desirable limit LAeq dB |
|---|---|---|---|---|
| Living room (07:00-23:00) | 54 | 24 | 30 | 35 |
| Dining room/area (07:00-23:00) | 54 | | 30 | 40 |
| Bedroom (07:00-23:00) | 54 | | 30 | 35 |
| Bedroom (23:00-07:00) | 46 | | 22 | 30 |

**Table 4: Calculated Indoor Ambient Noise Level and BS 8233:2014 guidlines**

The indicative façade performance is based on typical façade construction with no specific acoustic attenuation measures – a light-weight wall construction, standard glazing and standard trickle vents with no acoustic treatment. With this type of construction, internal noise levels are well within the guideline indoor ambient noise level limits in BS 8233:2014 as set out in Table 4.

## Activity Noise from Edith Neville School

Charrington Street Terrace Housing is located adjacent to the site of Edith Neville School, which is being redeveloped as part of the Central Somers Town Masterplan. Noise levels experienced at the rear façade of the proposed Plot 3 development are expected to be comparable to those experienced at existing dwellings surrounding the school. The internal layout of the houses is such that ventilation can be provided in all habitable rooms by opening windows on the west façade. The occupants can therefore keep the east (rear) façade openings which overlook the external play area closed. This allows them to control activity noise intrusion when the external play area is in use.

# 6. EXTERNAL PLANT NOISE EMISSIONS

## Noise Emission Limits

The Camden Council policy (Section 3.1) requires that plant noise does not exceed a level that is 5 dB below the external background noise or 10dB below if the noise has a 'distinguishable, discrete, continuous note' or 'distinct impulses'.

The representative background sound levels determined by a methodology consistent with BS 4142 (2014) were presented in Table 2. These levels are adopted as the baseline "background noise" levels.

Plant noise emission limits at a point 1 m outside any window of any noise sensitive façade are as set out in Table 5.

| Period | Plant noise emission limit – broadband noise ($L_{Aeq,T}$) | Plant noise emission limit – tonal / impulsive noise ($L_{Aeq,T}$) |
|---|---|---|
| Day 12 hours (07:00-19:00) | 37 | 32 |
| Evening 4 hours (19:00-23:00) | 33 | 28 |
| Night 8 hours (23:00-07:00) | 29 | 24 |

**Table 5: Plant noise emission limits for broadband and tonal/impulsive noise**

## Proposed Fixed Plant Equipment

Charrington Street Terrace Housing is expected to employ continuously running MVHR units to provide ventilation and heat recovery. These are expected to be located at the front of the house at ground floor level.

There may also be externally venting residential kitchen extract fans.

The noise levels emitted externally by the proposed types of plant equipment would normally be comfortably within the limits set out in the previous section at the nearest noise sensitive receiver. Once ventilation strategy has advanced further, additional consideration will be given to any requirements for attenuation e.g. duct attenuators. However it is not anticipated at this stage that these will be necessary.

It is understood that noise emitted by all other plant equipment is negligible.

## 7. SUMMARY

A noise survey was carried out by Max Fordham LLP between 23 April 2015 and 26 April 2015.

Ambient noise levels measured during the survey suggest that:

- Noise levels at the facades of the proposed development will not be above levels at which attenuation measures would be required by Camden Council
- Guideline indoor ambient noise levels set out in BS 8233:2014 can be achieved with standard façade building elements.

Background noise levels measured during the survey suggest that:

- Depending on whether plant noise emissions are broadband or tonal/impulsive, noise emission limits should be set to 32-37 dBA during the day (07:00-19:00), 28-33 dBA during the evening (19:00-23:00), and 24-29 dBA during the night (23:00-07:00)
- Noise emissions for plant equipment associated with the apartments at the nearest noise sensitive receiver are expected to be comfortably within these limits.

## APPENDIX A – NOISE MONITORING EQUIPMENT DETAILS

The measurements were made with a Norsonic 118 precision sound level analyser. This equipment complies with BS EN IEC 61672 class 1. The meter uses a Nor 1225 free field response microphone and NOR 1206 microphone pre-amplifier.

This equipment, summarised in the table below, has been calibrated by a UKAS accredited laboratory in accordance with the laboratory requirements of the United Kingdom Accreditation Service (UKAS) on the dates indicated.

| Item | Make | Type | Serial no. | Calibration Intervals | Last Calibrated | Next Due Calibration | Calibration Certificate Number |
|---|---|---|---|---|---|---|---|
| Class 1 sound level meter | Norsonic | 118 | 31419 | 2 years | 14/07/14 | 14/07/16 | U16587 |
| Microphone | Norsonic | 1225 | 51319 | 2 years | 14/07/14 | 14/07/16 | 16586 |
| Microphone preamplifier | Norsonic | 1206 | 30457 | 2 years | 14/07/14 | 14/07/16 | U16589 |
| Calibrator | Norsonic | 1251 | 30895 | 1 year | 07/11/14 | 07/11/15 | U14606 |

# APPENDIX 5
# NOISE ASSESSMENT REPORT – PLOT 4

MAX FORDHAM

# Plot 4 – Edith Neville School

# Central Somers Town

# Noise Impact Assessment

# Rev B

November 2015

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## ISSUE HISTORY

| Issue | Date | Description |
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| * | 12/10/2015 | Draft issue |
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| B | 10/11/2015 | Planning submission - revised |
| | | |
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**CONTENTS**

# 1. INTRODUCTION

Max Fordham LLP ("MFLLP") has been appointed to provide advice in relation to acoustic matters for the Central Somers Town Community Investment Project ("CIP"). Proposed developments for the project include the following:

- new buildings for Edith Neville School and St Aloysius Nursery
- redesign and rebuilding of Plot 10 play project (Community Facilities)
- improving the parks and open spaces
- residential developments at Charrington Street, Purchese Street and Brill Place.

This report covers Plot 4 of the development – Edith Neville School ("Plot 4").

The objective of this report is to assess the likely impact of Plot 4 of the proposed development, including plant equipment on nearby noise sensitive premises.

The following statement has been prepared on behalf of the London Borough of Camden in support of a planning application for the redevelopment of Central Somers Town.

***Project Background and Masterplan***
*The redevelopment of Central Somers Town is led by the Department for Children, Schools and Families and will be delivered as part of an approved regeneration strategy to deliver significant improvements to the public realm, provide a replacement primary school, nursery, play facilities and community hall. The development will also provide 136 housing units as well as maximising the amount of affordable housing which can be delivered by the scheme. Central to the development is the provision of public open space across the site. This space will be greatly improved as a result of the proposals and there will be no net loss of area following completion of the scheme.*

*The Central Somers Town project is self-funding, with the receipts from the private sale housing used to cross subsidise the delivery of the public realm, Edith Neville Primary School, nursery, community play facilities and community hall, in line with the wider vision for the Central Somers Town area.*

*This development is coming forward as part of the Community Investment Programme (CIP) which is a strategic programme focussed on ensuring the best use of the Council's assets to improve, shape and transform key places and services within Camden, whilst simultaneously addressing a critical capital funding gap. The programme includes a significant number of regeneration schemes across the Borough and involves the disposal of property assets that are surplus to requirements in order to unlock funding that will be reinvested in schools, the Better Homes programme and other supporting community infrastructure.*

*The reduction in government funding, including the money no longer available for schools, means that the Council has to be more innovative in how they make the best use of buildings and land to improve facilities. Working across the Council a borough-wide strategy has been initiated called 'The Community Investment Programme' (CIP) with the purpose of addressing this funding shortfall. The programme is making an important contribution to the delivery of objectives within the Camden Plan, particularly through harnessing the benefits of economic growth, tackling inequality, investing in communities to secure sustainable neighbourhoods and delivering value for money.*

*Under the CIP there are a number of objectives which need to be achieved:*

- *High quality schemes achieving high sustainability standards, including minimum BREEAM 'Excellent' ratings;*
- *Deliver 'fit for purpose' community facilities;*
- *Reduce revenue and capital costs through the efficient use of land and buildings;*
- *Increase revenue and capital value;*

- *Deliver affordable and private homes;*
- *Deliver improved public realm*

***Central Somers Town CIP***

*The Council has a significant property portfolio in the Somers Town area. Primarily this is made up of residential stock but also includes schools, a play project, children's centres and nurseries. These facilities provide an important service to children and their families and form an important part of bringing the wider community together. The area also contains two distinctive areas of public open space, these being Polygon Open Space and Purchese Open Space, which are maintained by the Council and provide a key component in how Somers Town functions as a place to live and work.*

*Central to the CIP is the Edith Neville Primary School and Children's Centre which were constructed as buildings with a short life expectancy. Remedial works have been necessary (both planned and unplanned) to keep it in service but the pressing need for replacement has been widely agreed for a considerable period of time.*

*Central Somers Town area is being addressed strategically as part of the CIP to tackle the significant need for investment. The scheme is intended to be self-funding, with the provision of residential development being utilised to pay for the redevelopment of the primary school and community facilities. It will also be possible to provide wider benefits through the delivery of an element of new affordable housing as well as public realm and public open space improvements.*

## 2. THE SITE

Plot 4 is located between Ossulston Street, Charington Street and Purchese Street, London NW1. An aerial image identifying the location of Plot 4 and each of the other plots relative to the existing site is shown in Figure 1.

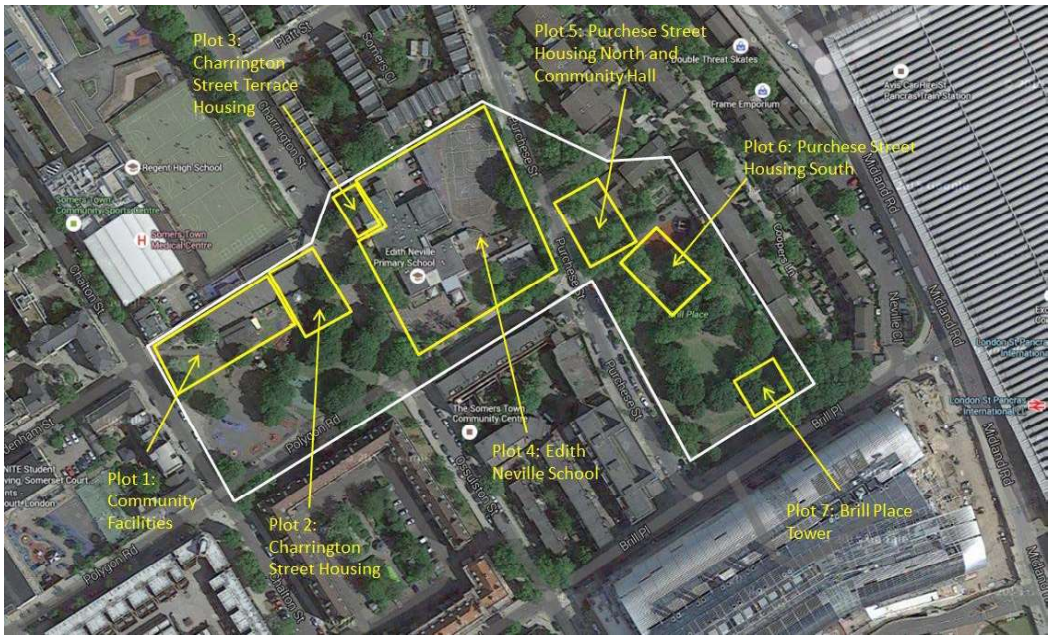


**Figure 1: An aerial image of the existing site of the CIP identifying individual plots**

Figure 2 identifies locations relevant to the noise survey for this plot, including long term and short term measurement locations ("L1" and "S1"). Whilst there are several properties surrounding the site that could be affected by proposed development including the housing on Polygon Road, the nearest noise sensitive receivers were identified to be the properties on the south of Somers Close, adjacent to Plot 4.


**Figure 2: Aerial image of site and noise survey locations**

A subjective assessment from a site visit indicates that the local noise environment is relatively benign and is well shielded from traffic noise from the nearby main roads such as Midland Road next to London St. Pancras station. The roads surrounding the site are principally residential. Traffic volume was observed to be low on Purchese Street.


**Figure 3: Ground floor plan of proposed Plot 4 development. Drawing correct as at 28/10/2015 – coordination issue**

# 3. ASSESSMENT CRITERIA

## Local Authority Requirements

The site is located within the London Borough of Camden. The Camden Council Local Development Framework (LDF) sets out the planning criteria for noise and vibration used to determine applications for planning permission in the borough. An extract of the sections relevant to this development is provided in Figure 4.

Plant and machinery noise should not exceed 5 dB below background noise as set out in Table E (with additional restrictions placed on tonal or impulsive noise).

**Table E: Noise levels from plant and machinery at which planning permission will not be granted**

| Noise description and location of measurement | Period | Time | Noise level |
|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day, evening and night | 0000-2400 | 5dB(A) <LA90 |
| Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade. | Day, evening and night | 0000-2400 | 10dB(A) <LA90 |
| Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade. | Day, evening and night | 0000-2400 | 10dB(A) <LA90 |
| Noise at 1 metre external to sensitive façade where LA90>60dB | Day, evening and night | 0000-2400 | 55dB$L_{Aeq}$ |

**Figure 4: Extract from Camden Council Local Development Framework - planning criteria for noise and vibration**

## BB93 (2015)

Whilst not an explicit planning requirement, the design of a primary school falls under requirement E4 of the Building Regulations Approved Document E 2003 (incorporating 2004, 2010, 2013 and 2015 amendments) which states "*E4. (1) Each room or other space in a school building shall be designed and constructed in such a way that it has the acoustic conditions and the insulation against disturbance by noise appropriate to its intended use.*" The Secretary of State's recommended way of satisfying this requirement is by designing the school's acoustics to the guidance in Building Bulletin 93 (BB93). This development will be designed in accordance with BB93 (2015).

## BS 4142 (2014)

BS 4142:2014 *Methods for Rating and Assessing Industrial and Commercial Sound*, has now replaced BS 4142:1997. In BS 4142:1997 plant noise ratings were compared with the existing local background noise levels, and if the rating level was more than 10 dB below the measured background noise level then this would be a positive indication that complaints are unlikely.

In BS 4142:2014, a noise rating is still determined and compared with the existing local background sound level (i.e. as before) although several more cumulative acoustic feature corrections to the noise rating are available to apply where appropriate. For example if the noise includes a distinguishable tone, impulse, intermittency or other readily distinguishable sound characteristic, then additional *cumulative* penalties individually ranging from 0 to 9 dB may be applied depending on the type of noise.

BS 4142:2014 seeks to determine a "representative" background sound level, stating that "…*the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*".

The assessment of the impact depends upon the margin by which the rating level of the specific sound source exceeds the background sound level (i.e. as before) but also promotes a consideration of the context in which the sound occurs when making an assessment. BS 4142:2014 states that an initial estimate of the impact of the specific sound is made by subtracting the measured background sound level from the rating level, while considering the following points:

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

Note then, a BS 4142:2014 assessment may deduce a low impact where the specific sound level is approaching the background sound level, and thus may conclude that the specific noise is acceptable.

# 4. NOISE SURVEY

An unattended noise survey was undertaken between the 30th April and 5nd May 2015 to establish existing environmental noise conditions at the site.

In addition, short term attended measurements were carried out on 23rd October 2014.

## Procedure

A long term unattended noise survey (approx. 113 hours) was conducted at the site of the existing Edith Neville School on 30 April - 5 May 2015 by MFLLP, in order to determine typical background ($L_{A90}$) sound levels in the vicinity of the proposed building. The survey location is identified in Figure 2 ("L1").

Additionally, a short term attended survey was carried out on Purchese Street on 23rd October 2014 between 10-11.30 am on the site boundary, also identified in Figure 2 ("S1").

All noise measurements were made with a Norsonic 140 precision sound level analyser with a Norsonic weather protection kit. This equipment complies with BS EN IEC 61672 class 1. The meter uses a Nor 1225 free-field response microphone and NOR 1209 microphone pre-amplifier. The calibration of the sound level meter was checked at the beginning and end of measurements with a Nor 1251 sound calibrator, complying with BS EN IEC 60942 class 1. No significant calibration deviation occurred. Details of the equipment are given in Appendix A.

The microphone of the sound level meter was mounted on a tripod and positioned adjacent to the boundary fence between Edith Neville School and Purchese Street. The sound level meter was set up to make consecutive 15-minute measurements and left unattended to capture noise data for duration of the survey period starting at 15:45 on Thursday 30th April 2015.

For the duration of the survey the weather was dry and clear with light winds. The weather conditions are not considered to have had a significant impact on the noise survey results.

## Results

The time history of the results from the long term survey (at location L1) is shown in 5. Derived values from the data of $L_{AF90,15mins}$ are presented in Table 1.

**Background Sound Level Assessment Methodology**
BS 4142:2014 seeks to determine a "representative" background sound level, stating that "*…the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*". A definitive method of selecting a representative background sound level is not prescribed in BS 4142:2014, although an example is presented where the modal value is selected from a statistical analysis.

In our experience, a reasonable approach is to adopt the repeatable method of selecting the 40th percentile value of the $L_{AF90}$ data periods. This generally accounts for potentially unrepresentative high values and untypical events, while usually representing values near the median of the remaining 'valid' distribution.

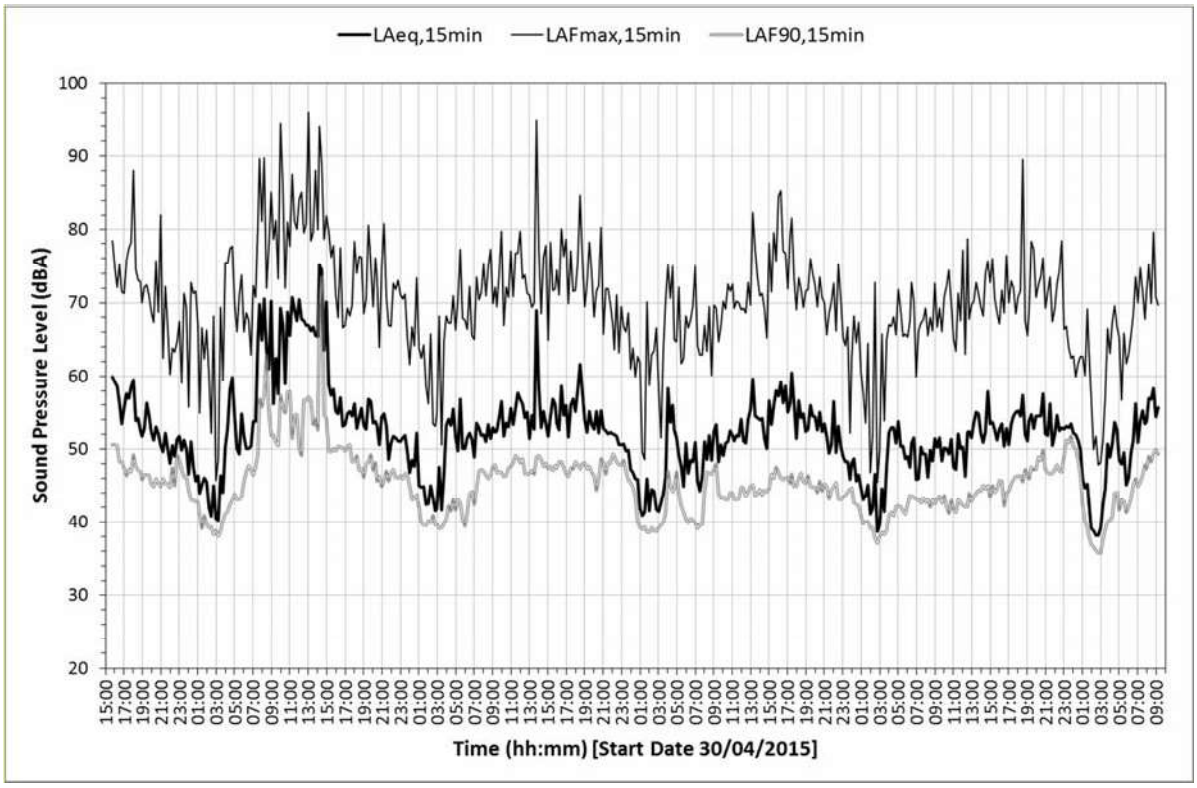


**Figure 5: Long term noise survey (Location L1) results (free-field)**

| Date | Period | $L_{AF90,15mins}$ dB ($40^{th}$ percentile) |
|---|---|---|
| Friday 1st May | Day 12 hours (07:00-19:00) | 51 |
| | Evening 4 hours (19:00-23:00) | 46 |
| | Night 8 hours (23:00-07:00) | 42 |
| Saturday 2nd May | Day 12 hours (07:00-19:00) | 47 |
| | Evening 4 hours (19:00-23:00) | 48 |
| | Night 8 hours (23:00-07:00) | 41 |
| Sunday 3rd May | Day 12 hours (07:00-19:00) | 44 |
| | Evening 4 hours (19:00-23:00) | 45 |
| | Night 8 hours (23:00-07:00) | 40 |
| Monday 4th May | Day 12 hours (07:00-19:00) | 43 |
| | Evening 4 hours (19:00-23:00) | 47 |
| | Night 8 hours (23:00-07:00) | 41 |

**Table 1: Summary of long term noise survey at location L1 (free-field)**

# 5.0 EXTERNAL PLANT NOISE EMISSIONS

## 5.1 Noise Emission Limits

The Camden Council policy (Section 3.1) requires that plant noise does not exceed a level that is 5 dB below the external background noise or 10dB below if the noise has a 'distinguishable, discrete, continuous note' or 'distinct impulses'.

The representative background sound levels determined by a methodology consistent with BS 4142 (2014) were presented in Table 1.

It is considered that data taken from Saturday 2nd May is most representative of background noise levels at the façade of the proposed Plot 5 development. Data taken on Friday 1st May is considered to have been affected by activity noise from the school due to the proximity of the measurement location to the playground. These levels are adopted as the baseline "background noise" levels.

Plant noise emission limits at a point 1 m outside any window of any noise sensitive façade are as set out in Table 2.

| Period | Plant noise emission limit – broadband noise ($L_{Aeq,T}$) | Plant noise emission limit – tonal / impulsive noise ($L_{Aeq,T}$) |
|---|---|---|
| Day 12 hours (07:00-19:00) | 42 | 37 |
| Evening 4 hours (19:00-23:00) | 43 | 38 |
| Night 8 hours (23:00-07:00) | 36 | 31 |

**Table 2: Plant noise emission limits for broadband and tonal/impulsive noise**

## 5.2 Proposed Fixed Plant Equipment

Approximately 2-3 condenser units will be situated on the roof of the school to provide cooling. Depending on their location and specification, an acoustic screen may be required around these units in order to control their operational noise to be within the limits given in Table 2. Typically this would need to be 300mm greater than the height of the units.

Kitchen and WC ventilation will be provided by supply and extract fans. The kitchen AHU is to be located internally in a plant room.

There will be several MVHR units located internally in certain rooms. These units will be occupant controlled, and are expected to only be used intermittently throughout the day.

Adequate noise control can be achieved using attenuators in the atmosphere side ductwork of the ventilation plant equipment.

Noise from any other plant equipment planned for the development is considered to be negligible.

## 5.3 Plant Noise Control Measures

In order to ensure that the impact of plant equipment at nearby noise sensitive receivers is kept within the limits given in Table 2, the following measures will be implemented:

- The kitchen AHU is to be located internally in a plant room, and will be provided with an attenuator on the exhaust,
- An acoustic screen around roof condenser units will be constructed if necessary,
- The MVHR unit will be provided with duct attenuators on the intake and exhaust.

## 6.0 EXTERNAL PLAY AREAS

Noise generated by school activities in the external play area is expected to be similar in overall terms to the current site. The orientation of the proposed development is different to the current school site, however, therefore the noise exposure of local noise sensitive receivers may vary from existing conditions. A comparison of existing site orientation and proposed site orientation can be found in Figure 6.


**Figure 6: Comparison of existing site and proposed development identifying proposed school building and external play areas in relation to potential noise sensitive receivers**

The change in orientation of the external play area is likely to result in a reduced noise level for the majority of houses on Somers Close, but a slightly increased noise level at the houses at the south end of Charrington Street. The noise levels at this location are not expected to exceed those currently experienced at other residential properties adjacent to the site and we are not aware of them giving rise to significant noise issues.

## 7.1 SUMMARY

A noise survey was carried out by Max Fordham LLP between 30 April 2015 and 4 May 2015.

Background noise levels measured during the survey suggest that:

- Depending on whether plant noise emissions are broadband or tonal/impulsive, noise emission limits should be set to 37-42 dBA during the day (07:00-19:00), 38-43 dBA during the evening (19:00-23:00), and 31-36 dBA during the night (23:00-07:00);
- It is expected that acoustic screening will be required around the condenser units on the roof. Elsewhere, duct attenuators will be specified to meet the noise criteria.

Activity noise from the proposed external play area is expected to be similar in overall terms to the current levels, and we are not aware of current levels giving rise to significant noise issues.

## APPENDIX A – NOISE MONITORING EQUIPMENT DETAILS

The measurements were made with a Norsonic 140 precision sound level analyser. This equipment complies with BS EN IEC 61672 class 1. The meter uses a Nor 1225 free field response microphone and NOR 1209 microphone pre-amplifier.

This equipment, summarised in the table below, has been calibrated by a UKAS accredited laboratory in accordance with the laboratory requirements of the United Kingdom Accreditation Service (UKAS) on the dates indicated.

| Item | Make | Type | Serial no. | Calibration Intervals | Last Calibrated | Next Due Calibration | Calibration Certificate Number |
|---|---|---|---|---|---|---|---|
| Class 1 sound level meter | Norsonic | 140 | 1405942 | 2 years | 20/03/2014 | 20/03/2016 | 473706412 |
| Microphone | Norsonic | 1225 | 208215 | 2 years | 20/03/2014 | 20/03/2016 | No number – see chart |
| Microphone preamplifier | Norsonic | 1209 | 15804 | 2 years | 20/03/2014 | 20/03/2016 | 473706412 |
| Calibrator | Norsonic | 1251 | 34059 | 1 year | 14/04/2015 | 14/04/2016 | U18539 |

# APPENDIX 6
# NOISE ASSESSMENT REPORT – PLOTS 5 & 6

MAX FORDHAM

# Plot 5 – Purchese Street Housing North and Community Hall and Plot 6 – Purchese Street Housing South

# Central Somers Town

# Noise Impact Assessment

## Rev B

November 2015

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## ISSUE HISTORY

| Issue | Date | Description |
|---|---|---|
| * | 12/10/2015 | Draft issue |
| A | 2/11/2015 | Planning submission |
| B | 10/11/2015 | Planning submission - revised |
| | | |
| | | |

## MAX FORDHAM LLP TEAM CONTRIBUTORS

| Engineer | Role |
|---|---|
| Arthur Lewis-Nunes | Lead Acoustic Engineer |
| Lewis Crabtree | Acoustic Engineer |
| | |
| | |
| | |

**CONTENTS**

# 1. INTRODUCTION

Max Fordham LLP ("MFLLP") has been appointed to provide advice in relation to acoustic matters for the Central Somers Town Community Investment Project ("CIP"). Proposed developments for the project include the following:

- new buildings for Edith Neville School and St Aloysius Nursery
- redesign and rebuilding of Plot 10 play project (Community Facilities)
- improving the parks and open spaces
- residential developments at Charrington Street, Purchese Street and Brill Place.

This report covers Plots 5 and 6 of the development – Purchese Street Housing North and Community Hall ("Plot 5") and Purchese Street Housing South ("Plot 6"). These plots consist of two residential housing blocks – blocks B and C. Block A is also on the Central Somers Town site, at Plot 2 (Charrington Street Housing).

The objectives of this report are to assess:

- The likely impact of Plots 5 and 6 of the proposed development, including plant equipment on nearby noise sensitive premises; and
- The likely impact of the existing noise environment on Plots 5 and 6 of the development.

The following statement has been prepared on behalf of the London Borough of Camden in support of a planning application for the redevelopment of Central Somers Town.

***Project Background and Masterplan***
*The redevelopment of Central Somers Town is led by the Department for Children, Schools and Families and will be delivered as part of an approved regeneration strategy to deliver significant improvements to the public realm, provide a replacement primary school, nursery, play facilities and community hall. The development will also provide 136 housing units as well as maximising the amount of affordable housing which can be delivered by the scheme. Central to the development is the provision of public open space across the site. This space will be greatly improved as a result of the proposals and there will be no net loss of area following completion of the scheme.*

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- *Increase revenue and capital value;*
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***Central Somers Town CIP***

*The Council has a significant property portfolio in the Somers Town area. Primarily this is made up of residential stock but also includes schools, a play project, children's centres and nurseries. These facilities provide an important service to children and their families and form an important part of bringing the wider community together. The area also contains two distinctive areas of public open space, these being Polygon Open Space and Purchese Open Space, which are maintained by the Council and provide a key component in how Somers Town functions as a place to live and work.*

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*Central Somers Town area is being addressed strategically as part of the CIP to tackle the significant need for investment. The scheme is intended to be self-funding, with the provision of residential development being utilised to pay for the redevelopment of the primary school and community facilities. It will also be possible to provide wider benefits through the delivery of an element of new affordable housing as well as public realm and public open space improvements.*

## 2. THE SITE

Plots 5 and 6 are located at the corner of Purchese Street and Hampden Close, London NW1. An aerial image identifying the location of the plots and each of the other plots relative to the existing site is shown in Figure 1.

The plots each consist of a residential housing block – blocks B and C. Block A is also on the Central Somers Town site, at Plot 2 (Charrington Street Housing).

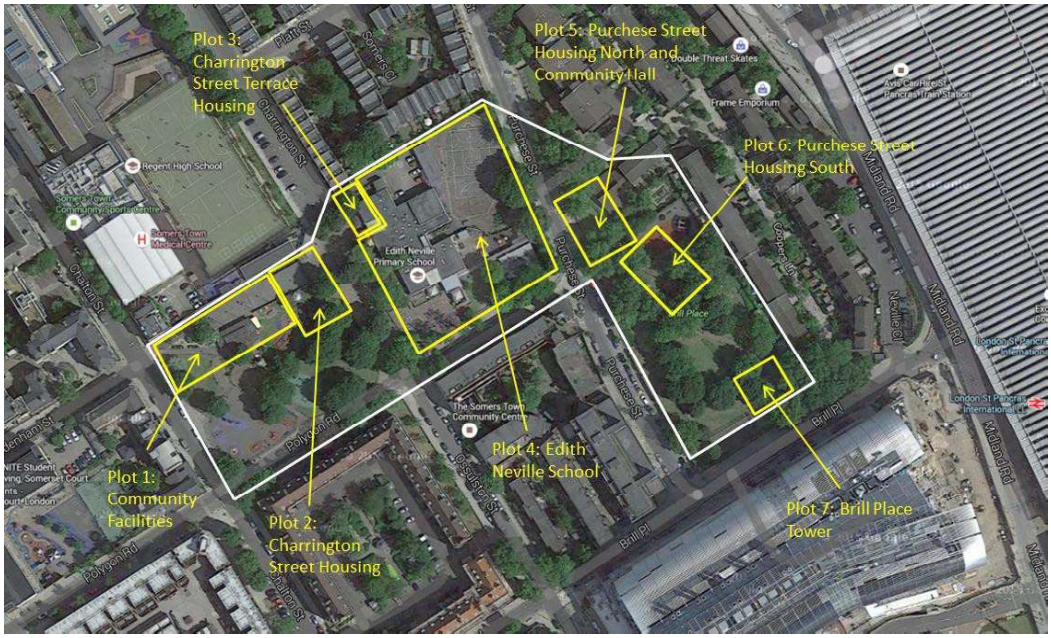


**Figure 1: An aerial image of the existing site of the CIP identifying individual plots**

Figure 2 identifies locations relevant to the noise survey for these plots, including long term and short term measurement locations ("L1" and "S1"). The nearest noise sensitive receiver was identified to be a residential property on Hampden Close, adjacent to plot 5.

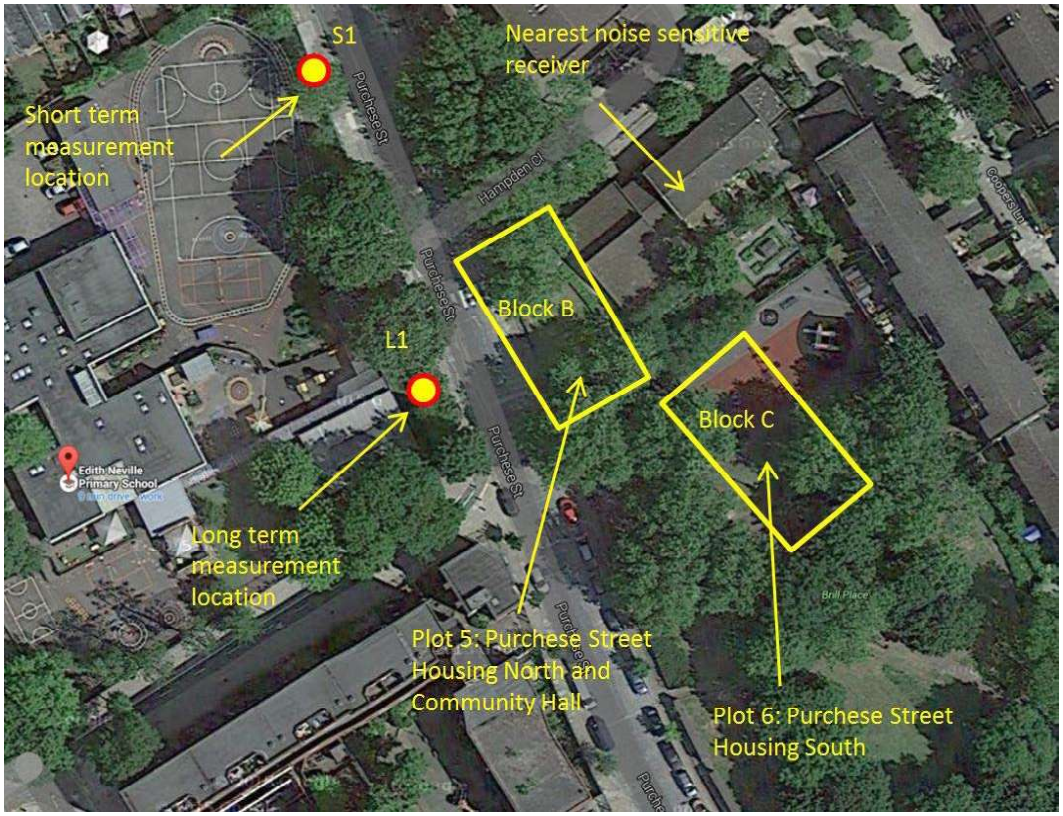


**Figure 2: Aerial image of site and noise survey locations**

A subjective assessment from a site visit indicates that the local noise environment is relatively benign and is well shielded from traffic noise from the nearby main roads such as Midland Road next to London St. Pancras station. The roads surrounding the site are principally residential. Traffic volume was observed to be low on Purchese Street.

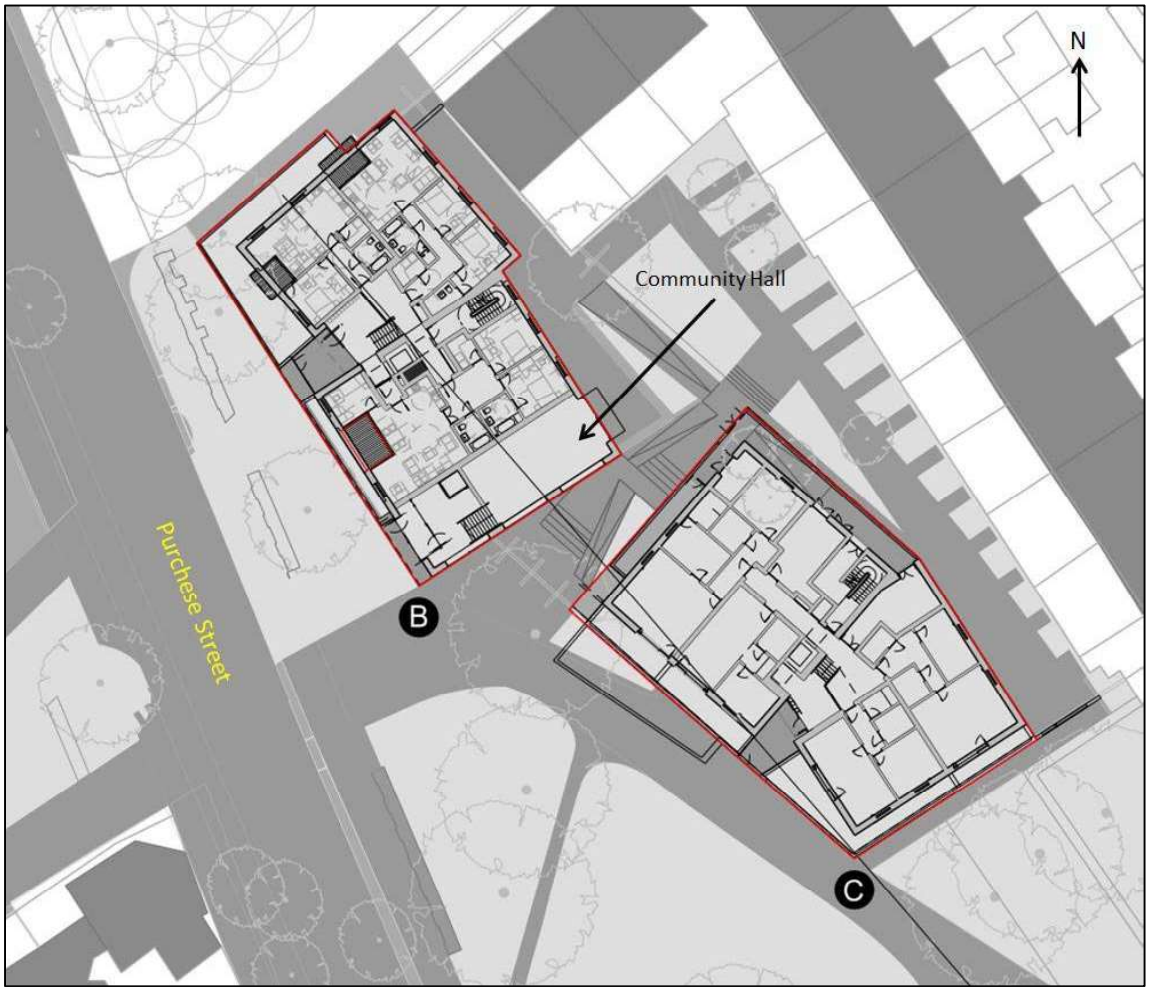


**Figure 3: Ground floor plan of proposed Plots 5 and 6 including Community Hall. Drawing correct as at 26/09/2015 – coordination issue.**

# 3. ASSESSMENT CRITERIA

## Local Authority Requirements

The site is located within the London Borough of Camden. The Camden Council Local Development Framework (LDF) sets out the planning criteria for noise and vibration used to determine applications for planning permission in the borough. An extract of the sections relevant to this development is provided in Figure 4.

Should noise levels on adjoining roads in the vicinity of Plots 5 and 6 reach the levels in Table B, attenuation measures would be required. Should the noise levels exceed those levels in Table A, planning permission would not be granted. Plant and machinery noise should not exceed 5 dB below background noise as set out in Table E (with additional restrictions placed on tonal or impulsive noise).

**Table A: Noise levels on residential sites adjoining railways and roads at which planning permission will not be granted**

| Noise description and location of measurement | Period | Time | Sites adjoining railways | Sites adjoining roads |
|---|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day | 0700-1900 | 74 dB $L_{Aeq}$ 12h | 72 dB $L_{Aeq}$ 12h |
| Noise at 1 metre external to a sensitive façade | Evening | 1900-2300 | 74 dB $L_{Aeq}$ 4h | 72 dB $L_{Aeq}$ 4h |
| Noise at 1 metre external to a sensitive façade | Night | 2300-0700 | 66 dB $L_{Aeq}$ 8h | 66 dB $L_{Aeq}$ 8h |

**Table B: Noise levels on residential streets adjoining railways and roads at and above which attenuation measures will be required**

| Noise description and location of measurement | Period | Time | Sites adjoining railways | Sites adjoining roads |
|---|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day | 0700-1900 | 65 dB $L_{Aeq}$ 12h | 62 dB $L_{Aeq}$ 12h |
| Noise at 1 metre external to a sensitive façade | Evening | 1900-2300 | 60 dB $L_{Aeq}$ 4h | 57 dB $L_{Aeq}$ 4h |
| Noise at 1 metre external to a sensitive façade | Night | 2300-0700 | 55 dB $L_{Aeq}$ 1h | 52 dB $L_{Aeq}$ 1h |
| Individual noise events several times an hour | Night | 2300-0700 | >82 dB $L_{Amax}$ (S time weighting) | >82 dB $L_{AMAX}$ (S time weighting) |

**Table E: Noise levels from plant and machinery at which planning permission will not be granted**

| Noise description and location of measurement | Period | Time | Noise level |
|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day, evening and night | 0000-2400 | 5dB(A) <LA90 |
| Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade. | Day, evening and night | 0000-2400 | 10dB(A) <LA90 |
| Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade. | Day, evening and night | 0000-2400 | 10dB(A) <LA90 |
| Noise at 1 metre external to sensitive façade where LA90>60dB | Day, evening and night | 0000-2400 | 55dB $L_{Aeq}$ |

**Figure 4: Extract from Camden Council Local Development Framework - planning criteria for noise and vibration**

## BS 8233:2014

BS 8233:2014 *Guidance on Sound Insulation and Noise Reduction for Buildings* sets out desirable limits for indoor ambient noise levels for dwellings from steady external noise sources (see Table 1).

| Activity | Location | 07:00-23:00 | 23:00-07:00 |
|---|---|---|---|
| Resting | Living room | 35 dB $L_{Aeq,16h}$ | – |
| Dining | Dining room / area | 40 dB $L_{Aeq,16hr}$ | – |
| Sleeping | Bedrooms | 35 dB $L_{Aeq,16hr}$ | 30 dB $L_{Aeq,8hr}$ |

**Table 1: Proposed indoor ambient noise limits (from BS 8233:2014 Table 4)**

It is proposed that the levels in BS 8233:2014 are adopted as the basis for assessing the façade sound insulation requirements.

BS 8233 advises that these noise limits should apply in background ventilation conditions i.e. with trickle vents open (if applicable).

In circumstances where noise levels are above the proposed indoor ambient noise limits, BS 8233 advises that a relaxation of up to 5 dB may be applied if the development is considered necessary or desirable. This would still achieve reasonable internal conditions.

## Building Regulations

The Building Regulations Approved Document E 2003 (incorporating 2004, 2010, 2013 and 2015 amendments) applies to this development. Key requirements of Approved Document E detail the minimum acceptable airborne sound insulation and maximum impact noise performance standards.

It is proposed that a performance uplift of 5 dB with respect to the airborne sound insulation and impact noise performance is targeted for Plots 5 and 6.

Note, the 5 dB uplift over Approved Document E standards also aligns with the Mayor's preferred standards set out in the Mayor's Sustainable Design and Construction SPG (2006).

## BS 4142 (2014)

BS 4142:2014 *Methods for Rating and Assessing Industrial and Commercial Sound*, has now replaced BS 4142:1997. In BS 4142:1997 plant noise ratings were compared with the existing local background noise levels, and if the rating level was more than 10 dB below the measured background noise level then this would be a positive indication that complaints are unlikely.

In BS 4142:2014, a noise rating is still determined and compared with the existing local background sound level (i.e. as before) although several more cumulative acoustic feature corrections to the noise rating are available to apply where appropriate. For example if the noise includes a distinguishable tone, impulse, intermittency or other readily distinguishable sound characteristic, then additional *cumulative* penalties individually ranging from 0 to 9 dB may be applied depending on the type of noise.

BS 4142:2014 seeks to determine a "representative" background sound level, stating that "…*the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*".

The assessment of the impact depends upon the margin by which the rating level of the specific sound source exceeds the background sound level (i.e. as before) but also promotes a consideration of the context in which the sound occurs when making an assessment. BS 4142:2014 states that an initial estimate of the impact of the specific sound is made by subtracting the measured background sound level from the rating level, while considering the following points:

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

Note then, a BS 4142:2014 assessment may deduce a low impact where the specific sound level is approaching the background sound level, and thus may conclude that the specific noise is acceptable.

# 4. NOISE SURVEY

An unattended noise survey was undertaken between the 30th April and 5nd May 2015 to establish existing environmental noise conditions at the site.

In addition, short term attended measurements were carried out on 23rd October 2014.

## Procedure

A long term unattended noise survey (approx. 113 hours) was conducted on the site of the existing Edith Neville School on 30 April - 5 May 2015 by MFLLP, in order to determine typical mean ($L_{Aeq}$), maximum ($L_{Amax}$) and background ($L_{A90}$) sound levels in the vicinity of the proposed developments. The survey location is identified in Figure 2 ("L1").

Additionally, a short term attended survey was carried out on Purchese Street on 23rd October 2014 between 10-11.30 am on the site boundary, also identified in Figure 2 ("S1").

All noise measurements were made with a Norsonic 140 precision sound level analyser with a Norsonic weather protection kit. This equipment complies with BS EN IEC 61672 class 1. The meter uses a Nor 1225 free-field response microphone and NOR 1209 microphone pre-amplifier. The calibration of the sound level meter was checked at the beginning and end of measurements with a Nor 1251 sound calibrator, complying with BS EN IEC 60942 class 1. No significant calibration deviation occurred. Details of the equipment are given in Appendix A.

The microphone of the sound level meter was mounted on a tripod and positioned adjacent to the boundary fence between Edith Neville School and Purchese Street. The sound level meter was set up to make consecutive 15-minute measurements and left unattended to capture noise data for duration of the survey period starting at 15:45 on Thursday 30th April 2015.

For the duration of the survey the weather was dry and clear with light winds. The weather conditions are not considered to have had a significant impact on the noise survey results.

## Results

The time history of the results from the long term survey (at location L1) is shown in Figure 5. Derived values from the data are presented in Table 2 .

The short-term Purchese Street survey (location S1) yielded a range of ambient noise levels of 56-60 dB(A) $L_{Aeq,5\ mins}$ with an average of 58 dB(A).

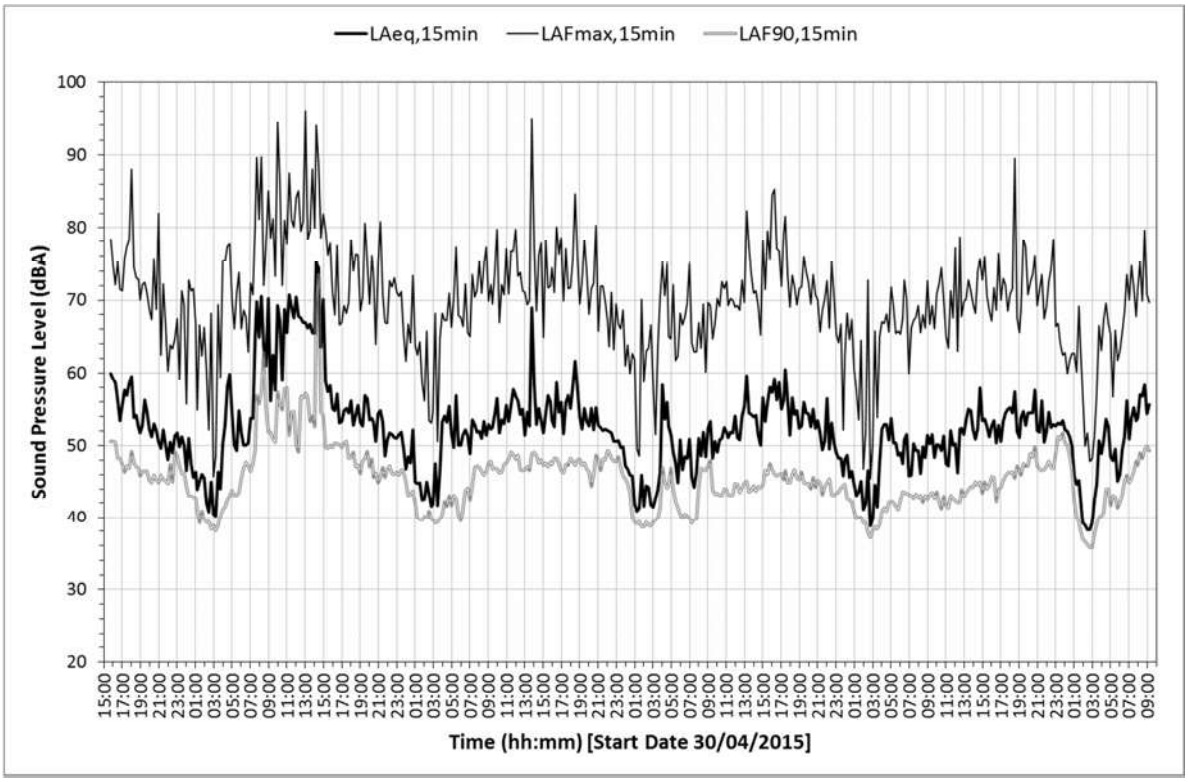


**Figure 5: Long term noise survey (Location L1) results (free-field)**

| Date | Period | $L_{Aeq,15mins}$ dB (average) | $L_{ASmax,15mins}$ dB (90th percentile) | $L_{AF90,15mins}$ dB (40th percentile) |
|---|---|---|---|---|
| Friday 1st May | Day 16 hours (07:00-23:00) | 66 | N/A | N/A |
| | Day 12 hours (07:00-19:00) | 67 | | 51 |
| | Evening 4 hours (19:00-23:00) | 53 | | 46 |
| | Night 8 hours (23:00-07:00) | 51 | 82 | 42 |
| Saturday 2nd May | Day 16 hours (07:00-23:00) | 56 | N/A | N/A |
| | Day 12 hours (07:00-19:00) | 57 | | 47 |
| | Evening 4 hours (19:00-23:00) | 53 | | 48 |
| | Night 8 hours (23:00-07:00) | 50 | 74 | 41 |
| Sunday 3rd May | Day 16 hours (07:00-23:00) | 54 | N/A | N/A |
| | Day 12 hours (07:00-19:00) | 54 | | 44 |
| | Evening 4 hours (19:00-23:00) | 53 | | 45 |
| | Night 8 hours (23:00-07:00) | 49 | 72 | 40 |
| Monday 4th May | Day 16 hours (07:00-23:00) | 53 | N/A | N/A |
| | Day 12 hours (07:00-19:00) | 52 | | 43 |
| | Evening 4 hours (19:00-23:00) | 54 | | 47 |
| | Night 8 hours (23:00-07:00) | 50 | 70 | 41 |

**Table 2: Summary of long term noise survey at location L1 (free-field)**

**Background Sound Level Assessment Methodology**

BS 4142:2014 seeks to determine a "representative" background sound level, stating that "…*the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*". A definitive method of selecting a representative background sound level is not prescribed in BS 4142:2014, although an example is presented where the modal value is selected from a statistical analysis.

In our experience, a reasonable approach is to adopt the repeatable method of selecting the 40$^{th}$ percentile value of the $L_{AF90}$ data periods. This generally accounts for potentially unrepresentative high values and untypical events, while usually representing values near the median of the remaining 'valid' distribution.

# 5. NOISE EXPOSURE

The long term data in Table 2 is used to derive expected noise levels at the proposed facades. It is considered that data taken from Saturday 2nd May is most representative of external ambient noise levels at the façade of the proposed Plot 5 and 6 development. Data taken on Friday 1st May is considered to have been affected by activity noise from the school due to the proximity of the measurement location to the playground. Site observations and results from the short term survey on Purchese Street on Thursday 23rd October 2014 corroborate this.

## Local Authority Requirements

Table 3 sets out these noise levels in comparison to the levels above which attenuation measures would be required by Camden Council in the Local Development Framework Table B (see Figure 4).

| Period | Expected Façade Exposure $L_{Aeq}$ dB | Noise levels above which attenuation measures will be required (Camden Council LDF Table B) $L_{Aeq}$ dB |
|---|---|---|
| Day 12 hours (07:00-19:00) | 57 | 62 |
| Evening 4 hours (19:00-23:00) | 53 | 57 |
| Night 8 hours (23:00-07:00) | 50 | 52 |
| Individual noise events (Night) | 74 $L_{ASmax}$ | 82 $L_{ASmax}$ |

**Table 3: Expected Façade Exposure and Camden Council LDF limits**

Measured results suggest that the average and maximum noise levels determined at L1 are below noise levels above which attenuation measures will be required by Camden Council.

## BS 8233:2014 Assessment

Expected internal noise levels have been calculated based on the measured external noise levels and sound insulation of an indicative building façade.

| Location | Expected Façade Exposure $L_{Aeq}$ dB | Indicative Façade Sound Reduction dB | Calculated Indoor Ambient Noise Level LAeq dB | BS 8233:2014 desirable limit LAeq dB |
|---|---|---|---|---|
| Living room (07:00-23:00) | 56 | 24 | 32 | 35 |
| Dining room/area (07:00-23:00) | 56 | | 32 | 40 |
| Bedroom (07:00-23:00) | 56 | | 32 | 35 |
| Bedroom (23:00-07:00) | 50 | | 26 | 30 |

**Table 4: Calculated Indoor Ambient Noise Level and BS 8233:2014 guidlines**

The indicative façade performance is based on typical façade construction with no specific acoustic attenuation measures – a light-weight wall construction, standard glazing and standard trickle vents with no acoustic treatment. With this type of construction, internal noise levels are well within the guideline indoor ambient noise level limits in BS 8233:2014 as set out in Table 4.

# 6. EXTERNAL PLANT NOISE EMISSIONS

## Noise Emission Limits

The Camden Council policy (Section 3.1) requires that plant noise does not exceed a level that is 5 dB below the external background noise or 10dB below if the noise has a 'distinguishable, discrete, continuous note' or 'distinct impulses'.

The representative background sound levels determined by a methodology consistent with BS 4142 (2014) were presented in Table 2. It is considered that data taken from Saturday 2nd May is most representative of background noise levels at the façade of the proposed Plot 5 and 6 development. Data taken on Friday 1st May is considered to have been affected by activity noise from the school due to the proximity of the measurement location to the playground. These levels are adopted as the baseline "background noise" levels.

Plant noise emission limits at a point 1 m outside any window of any noise sensitive façade are as set out in Table 5.

| Period | Plant noise emission limit – broadband noise ($L_{Aeq,T}$) | Plant noise emission limit – tonal / impulsive noise ($L_{Aeq,T}$) |
|---|---|---|
| Day 12 hours (07:00-19:00) | 42 | 37 |
| Evening 4 hours (19:00-23:00) | 43 | 38 |
| Night 8 hours (23:00-07:00) | 36 | 31 |

**Table 5: Plant noise emission limits for broadband and tonal/impulsive noise**

## Proposed Fixed Plant Equipment

The Purchese Street Housing blocks are expected to employ continuously running MVHR units to provide ventilation and heat recovery. These will draw air in and out through the facades of each flat.

There may also be externally venting residential kitchen extract fans.

The noise levels emitted externally by these units would normally be comfortably within the limits set out in the previous section at the nearest noise sensitive receiver. Once ventilation strategy has advanced further, additional consideration will be given to any requirements for attenuation e.g. duct attenuators. However it is not anticipated at this stage that these will be necessary.

It is understood that noise emitted by all other plant equipment is negligible.

## 7. COMMUNITY HALL

A Community Hall is to be included on the ground floor of Block B, at the southern end of the building. The hall is intended to be used by a range of users including community groups, educational clubs, youth groups, and dance / fitness classes.

Due to the potentially high noise levels associated with some of these uses, the building envelope design will be developed to ensure that noise breakout is kept within the existing ambient noise levels at nearby housing in order to minimise any impact. If the building is to be naturally ventilated, the ventilation openings will be appropriately acoustically attenuated. Glazing and external wall constructions will also be specified to achieve a high level of sound insulation. The floor construction separating the Community Hall from the apartments above (and associated flanking details) will be developed to ensure noise transmission is minimised.

## 8. SUMMARY

A noise survey was carried out by Max Fordham LLP between 30 April 2015 and 4 May 2015.

Ambient noise levels measured during the survey suggest that:

- Noise levels at the facades of the proposed development will not be above levels at which attenuation measures would be required by Camden Council
- Guideline indoor ambient noise levels set out in BS 8233:2014 can be achieved with standard façade building elements.

Background noise levels measured during the survey suggest that:

- Depending on whether plant noise emissions are broadband or tonal/impulsive, noise emission limits should be set to 37-42 dBA during the day (07:00-19:00), 38-43 dBA during the evening (19:00-23:00), and 31-36 dBA during the night (23:00-07:00)
- Noise emissions for plant equipment associated with the apartments at the nearest noise sensitive receiver are expected to be comfortably within these limits.

A Community Hall is to be included on the ground floor of Block B. The building envelope design will be developed to ensure that noise breakout is kept within the existing ambient noise levels at nearby housing in order to minimise any impact.

## APPENDIX A – NOISE MONITORING EQUIPMENT DETAILS

The measurements were made with a Norsonic 140 precision sound level analyser. This equipment complies with BS EN IEC 61672 class 1. The meter uses a Nor 1225 free field response microphone and NOR 1209 microphone pre-amplifier.

This equipment, summarised in the table below, has been calibrated by a UKAS accredited laboratory in accordance with the laboratory requirements of the United Kingdom Accreditation Service (UKAS) on the dates indicated.

| Item | Make | Type | Serial no. | Calibration Intervals | Last Calibrated | Next Due Calibration | Calibration Certificate Number |
|---|---|---|---|---|---|---|---|
| Class 1 sound level meter | Norsonic | 140 | 1405942 | 2 years | 20/03/2014 | 20/03/2016 | 473706412 |
| Microphone | Norsonic | 1225 | 208215 | 2 years | 20/03/2014 | 20/03/2016 | No number – see chart |
| Microphone preamplifier | Norsonic | 1209 | 15804 | 2 years | 20/03/2014 | 20/03/2016 | 473706412 |
| Calibrator | Norsonic | 1251 | 34059 | 1 year | 14/04/2015 | 14/04/2016 | U18539 |

# APPENDIX 7
# NOISE ASSESSMENT REPORT – PLOT 7

Intended for
**London Borough of Camden**

Date
**December, 2015**

Project Number
**UK11-22137**

# NOISE ASSESSMENT
# PLOT 7: BRILL PLACE TOWER

RAMBOLL ENVIRON

| | |
|---|---|
| Project No. | **UK1122137** |
| Issue No. | **1** |
| Date | **02/12/2015** |
| Made by | **Pau Santamaria** |
| Checked by | **Neil Morgan** |
| Approved by | **Lesley Vining** |

Made by:

Checked/Approved by:



**Version Control Log**

| Revision | Date | Made by | Checked by | Approved by | Description |
|---|---|---|---|---|---|
| 1 | 08/12/2015 | PS | NM | LV | Final Draft |
| | | | | | |

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## APPENDICES

# EXECUTIVE SUMMARY

Ramboll Environ UK Ltd (Ramboll Environ) has been commissioned to undertake an assessment of noise to accompany a planning application for a mixed use development proposed at Central Somers Town, Camden (the Site).

The Site comprises seven development lots, comprising a mix of residential development, plus community, nursery and educational facilities, in addition to public open space.

This report relates to Plot 7, which comprises a 21 storey residential tower referred to as Brill Place Tower or the Proposed Development, located on Brill Place, in the London Borough of Camden, NW1.

The exercise has identified that the site is not significantly affected by noise, as a result it is considered that the acoustic façade performance typical of that achieved with traditional thermally insulating construction techniques would be adequate to achieve internal noise levels compliant with those set out in BS8233: 2014.

The Proposed Development incorporates external amenity spaces, such as balconies. Some of these areas have been predicted to exceed the <55 dB(A) external amenity criterion recommended by the WHO and echoed within BS 8233: 2014. However, BS 8233: 2014 acknowledges that blanket compliance within urban areas is likely to be unfeasible. Furthermore, as the wider Central Somers Town Development incorporates substantial areas of public external amenity space, which is predicted to comply with the amenity criterion, it is considered that residents would be able to access these spaces, should a quieter environment be desired.

Target noise criteria have been set for all static plant within the Proposed Development. Providing that the cumulative rating noise level from the plant items does not exceed the stated noise criteria, whether through the application of noise control techniques or otherwise, the impact of noise from such sources is predicted to have no adverse impact on existing or proposed sensitive receptors.

The assessment of vibration has also been carried out, which has indicated that appropriate criteria would be achieved without the need for any mitigation measures.

In the light of the above, which demonstrates that the Proposed Development would be expected to comply with the relevant British Standards, it is considered that noise would not present a constraint to the granting of planning permission for the Proposed Development in its currently proposed form.

# 1. INTRODUCTION

## 1.1 Background

Ramboll Environ UK Ltd (Ramboll Environ) has been commissioned to undertake an assessment of noise to accompany a planning application for a mixed use development proposed at Central Somers Town, Camden (the Site).

The Site comprises seven development lots, comprising a mix of residential development, plus community, nursery and educational facilities, in addition to public open space.

This report relates to Plot 7, which comprises a 21 storey residential tower referred to as Brill Place Tower or the Proposed Development, located on Brill Place, in the Borough of Camden, NW1.

A glossary of technical terms and references is presented in Appendix 1 – Glossary of Terms.

## 1.2 Site Description

The location and extent of the Proposed Development is identified in Figure 1.1.

The proposed site is located within a park area bound between Brill Place, Purchese Street and Midland Road. Further to this, the existing Francis Crick Institute sits on the southern boundary of the site (beyond Brill Place). Existing residential dwellings are located to the eastand north ends of the Proposed Development (Coopers Lane, Neville Close), as well as to the west (Purchese Street).

**Figure 1.1: Site and Proposed Development**


The noise climate in the area is primarily dominated by road traffic noise generated by the busy Midland Road, which is a single carriageway road with 2 lanes (1 for cars and the other one for taxis/buses), and two additional lateral lanes; one is a taxi queuing area (left hand side of the street) and another one is for delivery trucks to St Pancras Station (loading bay on the right hand side of the street). Noise from trains idling in the station and from vehicles on the taxi rank that

runs between St Pancras Station and Midland Road were also audible at the site, especially during traffic lulls at Midland Road.

# 2. ASSESSMENT CRITERIA

## 2.1 National Planning Policy Framework

National Planning Policy Framework (NPPF)[1] published on March 27 2012 sets out the Government's economic, environmental and social planning policies for England. It summarises in a single document all previous national planning policy advice. Taken together, these policies articulate the Government's vision of sustainable development, which should be interpreted and applied locally to meet local aspirations.

The NPPF sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

Under Section 11; Conserving and enhancing the natural environment, the following is stated:

*The planning system should contribute to and enhance the natural and local environment by:*

- *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability.*

The document goes on to state:

*Planning policies and decisions should aim to:*

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

As stated above, this document makes reference to avoiding noise generation from new developments that would adversely impact on health and quality of life.

## 2.2 Planning Practice Guidance – Noise

The National Planning Practice Guidance (NPPG[2]) has been revised and updated to be easily accessible and available online.

The Noise Guidance advises on how planning can manage potential noise impacts in new development. It sets out when noise is relevant to planning and outlines the following Observed Effect Levels to determine the noise impact:

- *Significant observed adverse effect level (SOAEL): This is the level of noise exposure above which significant adverse effects on health and quality of life occur.*
- *Lowest observed adverse effect level (LOAEL): this is the level of noise exposure above which adverse effects on health and quality of life can be detected.*

[1] Department for Communities and Local Government, March 2012. National Planning Policy Framework. HMSO.
[2] National Planning Practice Guidance, Department for Communities and Local Government (DCLG), March 2014

- *No observed effect level (NOEL): this is the level of noise exposure below which no effect at all on health or quality of life can be detected.*

The document recognises the subjective relationship between noise levels and the impact on those affected, and advises on factors which may influence on whether noise could be a concern.

## 2.3 National Planning Practice Guidance, England

Further guidance in relation to the National Planning Policy Framework and the Noise Policy Statement for England has been published in the National Planning Practice Guidance in England: Noise (NPPG)[3], which summarises the noise exposure hierarchy, based on the likely average response.

This is reproduced in Table 2.1 below.

**Table 2.1: Significance Criteria from NPPG in England: Noise**

| Perception | Examples of Outcomes | Increasing Effect Level | Action |
|---|---|---|---|
| Not noticeable | No Effect | No Observed Effect | No specific measures required |
| Noticeable and not intrusive | Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life. | No Observed Adverse Effect | No specific measures required |
| | | Lowest Observed Adverse Effect Level | |
| Noticeable and intrusive | Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life. | Observed Adverse Effect | Mitigate and reduce to a minimum |
| | | Significant Observed Adverse Effect Level | |
| Noticeable and disruptive | The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. | Significant Observed Adverse Effect | Avoid |

[3] Department for Communities and Local Government (DCLG), 2014. National Planning Practice Guidance for England: Noise. DCLG.

| | | | |
|---|---|---|---|
| | 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. | | |
| Noticeable and very disruptive | Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory | Unacceptable Adverse Effect | Prevent |

## 2.4 Local Authority Requirements

The site is located within the London Borough of Camden. The Camden Council Local Development Framework (LDF) sets out the planning criteria for noise and vibration used to determine applications for planning permission in the borough. An extract of the sections relevant to the Proposed Development is provided below.

**Table A: Noise levels on residential sites adjoining railways and roads at which planning permission will not be granted**

| Noise description and location of measurement | Period | Time | Sites adjoining railways | Sites adjoining roads |
|---|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day | 0700-1900 | 74 dB $L_{Aeq}$,12h | 72 dB $L_{Aeq}$,12h |
| Noise at 1 metre external to a sensitive façade | Evening | 1900-2300 | 74 dB $L_{Aeq}$,4h | 72 dB $L_{Aeq}$,4h |
| Noise at 1 metre external to a sensitive façade | Night | 2300-0700 | 66 dB $L_{Aeq}$,8h | 66 dB $L_{Aeq}$,8h |

**Table B: Noise levels on residential streets adjoining railways and roads at and above which attenuation measures will be required**

| Noise description and location of measurement | Period | Time | Sites adjoining railways | Sites adjoining roads |
|---|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day | 0700-1900 | 65 dB $L_{Aeq}$,12h | 62 dB $L_{Aeq}$,12h |
| Noise at 1 metre external to a sensitive façade | Evening | 1900-2300 | 60 dB $L_{Aeq}$,4h | 57 dB $L_{Aeq}$,4h |
| Noise at 1 metre external to a sensitive façade | Night | 2300-0700 | 55 dB $L_{Aeq}$,1h | 52 dB $L_{Aeq}$,1h |
| Individual noise events several times an hour | Night | 2300-0700 | >82 dB $L_{Amax}$ (S time weighting) | >82 dB $L_{AMAX}$ (S time weighting) |

**Table E: Noise levels from plant and machinery at which planning permission will not be granted**

| Noise description and location of measurement | Period | Time | Noise level |
|---|---|---|---|
| Noise at 1 metre external to a sensitive façade | Day, evening and night | 0000-2400 | 5dB(A) <LA90 |
| Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade. | Day, evening and night | 0000-2400 | 10dB(A) <LA90 |
| Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade. | Day, evening and night | 0000-2400 | 10dB(A) <LA90 |
| Noise at 1 metre external to sensitive façade where LA90>60dB | Day, evening and night | 0000-2400 | 55dB$L_{Aeq}$ |

Note, for the Proposed Development, the Table B limits of 62 dB LAeq,12hr (day), 57 dB LAeq,4hr (evening) and 52 dB LAeq,8hr (night), and no more than 82 dB LASmax (night), represent the noise levels below which standard construction techniques and normal natural ventilation strategies would be expected.

# 3. PREDICTION METHODOLOGY

## 3.1 Residential Amenity

BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings*[4] draws on the results of research and experience to provide information on achieving internal acoustic environments appropriate to their functions. The guideline values provided are in terms of an average ($L_{Aeq}$) level.

The standard advises that, for steady external noise sources, it is desirable for internal ambient noise levels to not exceed the guidance values, as detailed below in Table 3.1.

**Table 3.1: BS 8233:2014 Ambient Noise Levels**

| Activity | Location | 07:00 to 23:00 | 23:00 to 07:00 |
|---|---|---|---|
| Resting | Living room | 35 dB $L_{Aeq,16hour}$ | - |
| Dining | Dining room | 40 dB $L_{Aeq,16hour}$ | - |
| Sleeping | Bedroom | 35 dB $L_{Aeq,16hour}$ | 30 dB $L_{Aeq,8hour}$ |

BS 8233:2014 goes on to suggest that where development is considered necessary or desirable, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions will still be achieved.

With regard to maximum noise levels, the standard identifies that regular individual noise events (such as passing trains or scheduled aircraft etc) can cause sleep disturbance. The standard does not provide a guideline design target, but simply goes on to suggest that a guideline value may be set in terms of Sound Exposure Level (SEL) or $L_{Amax,F}$, depending upon the character and number of events per night. It goes on to suggest that more sporadic noise events could require separate values.

In respect of external noise levels, the guidance in BS 8233:2014 suggests that "*it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments*".

BS 8233:2014 provides a much more detailed narrative on noise levels in external amenity areas and acknowledges that it may not always be necessary or feasible to ensure that noise levels remain within these guideline values.

In respect of gardens and patios, BS 8233:2014 states;

"*…it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable.*"

BS 8233: 2014 goes on to state, for areas adjoining the strategic transport network:

" *…a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, 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".*

In respect of balconies, roof gardens and terraces, BS 8233:2014 states, "*Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be*

[4] BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* - BSI

*necessary for these uses; however, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space"*.

It is clear from the narrative of BS 8233:2014, that proposed development within noisy environments should be designed to ensure that the recommended internal design standards are achieved, and that external amenity areas are designed to effectively control and reduce noise levels, although it acknowledges that in certain circumstance meeting the external design recommendations may not be feasible, or necessary, especially where the provision of such spaces is desirable for other technical, planning or policy reasons.

## 3.2 Commercial Noise

BS 4142[5] sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS 4142 for assessing the effect of sound on residential receptors is to compare the measured or predicted noise level from the source in question, the $L_{Aeq,Tr}$ 'specific noise level', immediately outside the dwelling with the $L_{A90,T}$ background noise level.

Where the noise contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific noise level to obtain the $L_{Ar,Tr}$ 'rating noise level'. A correction to include the consideration of a level of uncertainty in noise measurements, data and calculations can also be applied when necessary.

BS 4142 states: "*The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs*". An estimation of the impact of the specific noise can be obtained by the difference of the rating noise level and the background noise level and considering the following:

- *"Typically, the greater this difference, 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."* This would be considered an SOAEL in the context of National Planning Practice Guidance.
- *"A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context."* At or below this level would be considered an LOAEL in the context of National Planning Practice Guidance.
- *"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."* At or below 0dB above the background noise level would be considered an NOEL in the context of National Planning Practice Guidance.

[5] BS 4142:2014 *Methods for rating and assessing industrial and commercial sound* - BSI

The periods associated with day or night, for the purposes of the Standard, are considered to be 07.00 to 23.00 and 23.00 to 07.00, respectively.

## 3.3 Summary

In accordance with the guidance contained within BS 8233:2014 and, in accordance with LBC policy, the following ambient noise level limits have been adopted:

### Table 3.2: Proposed Ambient Noise Level Limits

| Location | 07:00 to 23:00 | 23:00 to 07:00 |
|---|---|---|
| Bedrooms | 35 dB $L_{Aeq,16hour}$ | 30 dB $L_{Aeq,8hour}$ & 45 dB $L_{Amax,F}$ |
| Kitchen/Dining Rooms | 40 dB $L_{Aeq,16hour}$ | - |
| External Amenity Areas | 50 – 55 dB $L_{Aeq,1hour}$ | - |

## 3.4 Vibration

The assessment of potential vibration impacts has been carried out in accordance with BS 6472: 2008[6], which provides guidance over the frequency range 0.5 Hz to 80 Hz

BS 6472 describes how to determine the vibration dose value (VDV) from frequency-weighted vibration measurements. The vibration dose value is used to estimate the probability of adverse comment which might be expected from human beings experiencing vibration in buildings. Consideration is given to the time of day and use made of occupied space in buildings, whether residential, office or workshop. BS 6472 states that in homes, adverse comment about building vibrations is likely when the vibration levels to which occupants are exposed are only slightly above thresholds of perception.

BS 6472 contains a methodology for assessing the human response to vibration in terms of either the VDV, or in terms of the acceleration or the peak velocity of the vibration, which is also referred to as peak particle velocity (PPV). The advice contained in BS 6472 states that when the vibration is intermittent, as is the case at this Site with the only significant potential source of vibration being the railway to the east of the Site, the VDVs may be used to assess the potential for impacts.

Appropriately-weighted vibration measurements can be aggregated to derive the VDV. The VDV is a single figure descriptor that represents the cumulative dose of transient vibrations, taking into account the frequency spectrum and duration of each event. The VDV is determined over a 16 hour daytime period or 8 hour night-time period, with the guidance in BS 6472 set out in Table 3.3.

### Table 3.3: Vibration Dose Values (ms-1.75) Limits of Adverse Comment from Residential Buildings

| Period | Low Probability of Adverse Comment | Adverse Comment Possible | Adverse Comment Probable |
|---|---|---|---|
| Residential Buildings 16 hour day | 0.2 to 0.4 | 0.4 to 0.8 | 0.8 to 1.6 |
| Residential Buildings 8 hour night | 0.13 | 0.26 | 0.51 |

The above guidance relates to vibration measured at the point of entry into the human body, which is usually taken to mean the ground surface or at a point mid-span of an upper storey floor, rather than the point of entry into the building, for example a foundation element. Where the vibration is

[6] British Standards Institution, 2008. BS 6472: Guide to evaluation of human exposure to vibration in buildings, Part 1, Vibration sources other than blasting.

measured at another location, BS 6472 states that a transfer function should be applied; however BS6472 does not contain any guidance on suitable transfer functions.

There are two key aspects to the effect that the building structure will have on the measured vibration levels: the first is generally a reduction as the vibration passes into the foundations of a building; there is typically then amplification as the vibration propagates up the building to the upper storeys and across potentially suspended floors. Each of these factors is considered below.

To consider the transfer of vibration through the foundations of the proposed residential dwellings, guidance has been sought from the Handbook of Urban Rail Noise and Vibration Control (HURNVC)[7].

The HURNVC sets out attenuation factors that can be applied to calculate the transfer function between vibrations measured on unloaded ground and vibration at a foundation. It is noted that the multiplication factor for strip foundation is approximately 0.5 and for a piled foundation approximately 0.4 (both based on the 31.5 Hz frequency band).

To extrapolate the measured unloaded ground vibration levels up the building to a suspended upper storey, an amplification factor is required. Based on figures presented in Transmission of Ground-borne Vibration in Buildings[8] an amplification factor of 2.8 is considered appropriate in this case.

On the basis of piled foundations, an overall transfer function, or multiplication factor, of 1.12 (i.e. 2.8 x 0.4) has been assumed to consider the likely impact of vibration at worst case upper suspended storeys in the following assessment.

[7] Saurenam, Nelson and Wilson. Handbook of Urban Rail Noise and Vibration. USA. Federal Transit Administration.

[8] Jakobsen, W, 1989. Transmission of Ground-borne Vibration in Buildings. Journal of Low Frequency Noise and Vibration, Vol. 8 No. 3.

# 4. MEASUREMENTS

The prevailing noise and vibration conditions at the location of the Proposed Development were determined by detailed environmental noise and vibration surveys, undertaken between Wednesday 7 and Friday 9 October 2015.

An additional set of attended short-form environmental noise measurements were also undertaken on Thursday 8 (night-time) and Friday 9 (daytime) October 2015, in order to populate and validate the noise model upon which the assessment has been based.

## 4.1 Baseline Noise and Vibration Surveys

Noise monitoring was undertaken over sequential 15 minute periods at each measurement position for the duration of the survey.

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of BS 7445[9].

All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672[10].[11]. A full inventory of this equipment is shown in Table 4.1.

**Table 4.1: Inventory of Acoustic Measurement Equipment**

| Item | Make & Model | Serial Number |
|---|---|---|
| A - Sound Level Meter | 01dB Solo | 61280 |
| A - Preamplifier | 01dB Pre 21 | 14175 |
| A - Microphone | Gras | 167948 |
| B - Sound Level Meter | B&K 2250 | 3006737 |
| B - Preamplifier | B&K ZC 0032 | 16531 |
| B - Microphone | B&K 4189 | 2556374 |
| C - Sound Level Meter | 01dB Duo | 10965 |
| C - Preamplifier | 01dB Pre 23 | 10449 |
| C - Microphone | Gras 40CD | 161799 |
| Calibrator | Rion NC-74 | 34315165 |
| Vibration Meter | Vibrock V901 | 747 |

The noise measurement equipment used during the survey was calibrated at the start and end of the measurement. The calibrator used had itself been calibrated by a UKAS accredited calibration laboratory within the twelve months preceding the measurements. No significant drift in calibration was found to have occurred on any sound level meter.

The microphones were fitted with protective windshields for the measurements, which are described in greater detail below.

As a result of the non-secure nature of the site, it was not possible to undertake unattended continuous 24-hour noise monitoring at all necessary measurement positions. Therefore, a short-form survey was undertaken over a continuous three hour period during the daytime and the night-

[9] British Standard 7445: 2003: *Description and measurement of environmental noise*. BSI
[10] British Standard 61672: 2003: *Electroacoustics. Sound level meters*. Part 1 *Specifications.* BSI.
[11] British Standard 61672: 2003: Electroacoustics. Sound level meters. Part 1 Specifications. BSI.

time periods, at two measurement positions (MP1 – MP2). An additional 2-hour-period daytime noise measurement was undertaken at a third location (MP3), in order to characterise the noise emissions from the trains' engines idling at St Pancras Station, which were found to be the dominating component of the background noise level on site.

Measurements were undertaken as follows:

- Night-time – 23:00 – 02:00 hours on 8 October 2015
- Daytime – 12:00 – 15:00 hours on 9 October 2015

The results of the night-time measurements can be considered to represent a worst case noise climate, therefore allowing for the assessment of the worst-case maximum and period averaged noise levels encountered over this critical period. The night-time periods were chosen to represent the typical worst-case (i.e. noisiest) noise levels that the Brill Place Tower Site is likely to be exposed to during the night-time period.

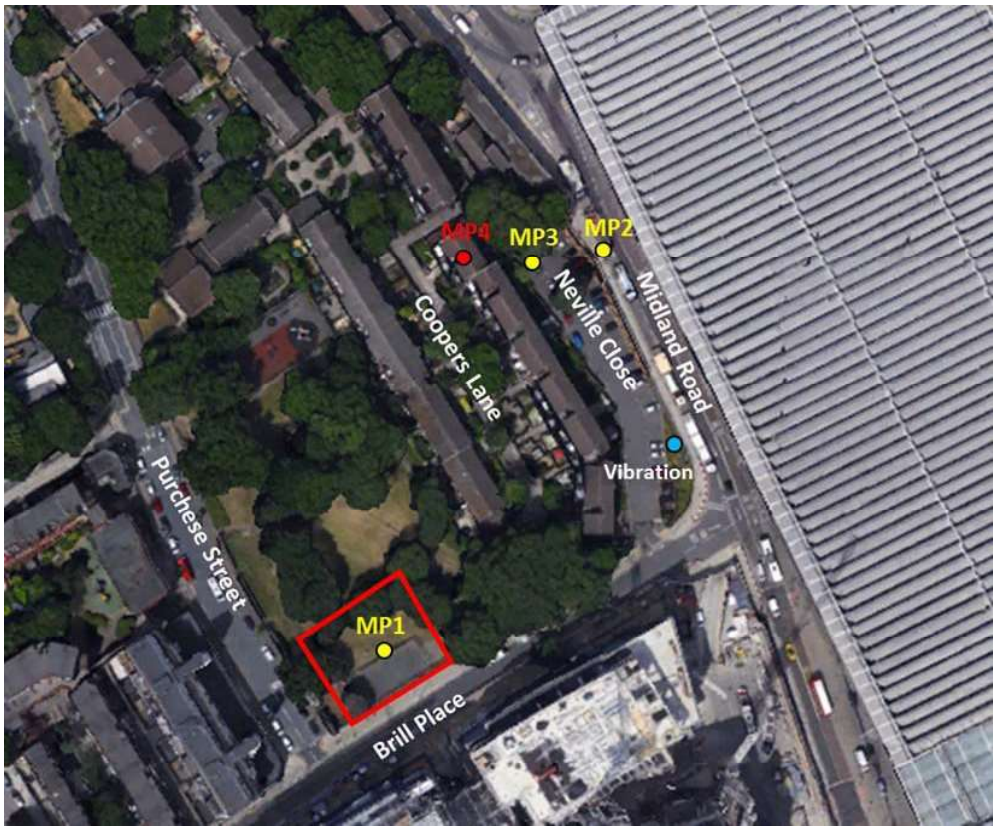
Daytime and night-time noise monitoring were undertaken over 15-minute periods at each measurement position during each specified hour. The levels measured are assumed to be representative of the noise climate over the hourly period in each case.

In conjunction with the attended measurements, a continuous 45-hour midweek measurement was also undertaken at one measurement position (MP4), as described in greater detail below. At this position, continuous daytime and night-time logged noise monitoring was undertaken for the duration of the survey.

Measurements were undertaken at the locations described below and shown in Figure 4.1:

- Position 1 – A microphone was attached to a fence surrounding the basketball pitch, at a height of 1.5m above ground level, approximately 13 metres from the Brill Place kerb. Measurements undertaken at this position were free-field and were noted to have been dominated by road traffic movements along Midland Road, continuous noise from the idling trains at St Pancras Station, and intermittent construction noise from the Francis Crick Institute site (daytime only).
- Position 2 – A sound level meter was positioned on the pavement of Midland Road, at a height of 1.5 metres above ground level and at 3.5 metres from the existing rear wall of Neville Close. In order to inform the modelling process, this position was chosen to allow derivation of source noise levels for road traffic using Midland Road. Measurements undertaken at this position were free-field and were noted to have been dominated by road traffic movements along Midland Road, as well as noise from trains idling in the station, and vehicles on the taxi rank that runs between St Pancras Station and Midland Road.
- Position 3 – A sound level meter was positioned on the Neville Close car park, at a height of 1.5 metres above ground level, 8 metres from the nearest façade to the south and 10 metres behind the 3.5-metre wall separating Midland Road and the car park. This position has been used to characterise the noise emissions from the trains idling within St Pancras Station, since the existing wall is providing significant acoustic screening from the road traffic noise generated by Midland Road, resulting in the train engine noise dominating the noise climate and allowing the corresponding measurements to be taken into account within the modelling exercise.
- Position 4 – A sound level meter was positioned on the roof of the apartments in the Coopers Lane housing development, facing St Pancras Station. The microphone was attached to the top of a 4.5 metre pole. Measurements undertaken at this position were free-field and were noted to have been dominated by mixed road traffic movements along Midland Road and Pancras Road, continuous noise from the idling trains at St Pancras Station, and intermittent construction noise from the Francis Crick Institute site (daytime only).

## Figure 4.1: Measurement Locations



# 5. SURVEY RESULTS

## 5.1 NOISE

### 5.1.1 Attended Measurements

The measured free-field noise levels at measurement positions 1 and 2 over the 3-hour daytime period are detailed in Table 5.1, below. The long-term monitoring results are presented in full in Annex 2.

**Table 5.1: Summary of DAYTIME noise measurements**

| Position | Period | Noise Level, dB | | | |
|---|---|---|---|---|---|
| | | $L_{Aeq,T}$ | $L_{A90}$ | $L_{A10}$ | $L_{AFmax}$ |
| 1* | 12:00 - 13:00 | - | - | - | - |
| | 13:00 – 14:00 | - | - | - | - |
| | 14:00 – 15:00 | - | - | - | - |
| 2 | 12:00 - 13:00 | 71.6 | 64.4 | 74.5 | 87.5 |
| | 13:00 – 14:00 | 71.4 | 64.7 | 75.0 | 87.3 |
| | 14:00 – 15:00 | - | - | - | - |

(*): Measurements were partially impacted by construction site activity on the Francis Crick Institute site. The site activity was not continuous throughout the 3-hour attended measurement period, but it did not allow continuous representative noise monitoring.

The measured free-field noise levels at measurement positions 1 and 2 over the 3-hour night-time period are detailed in Table 5.2, below.

**Table 5.2: Summary of NIGHT-TIME noise measurements**

| Position | Period | Noise Level, dB | | | |
|---|---|---|---|---|---|
| | | LAeq,T | LA90 | LA10 | LAFmax |
| 1 | 23:00 – 00:00 | 51.9 | 49.5 | 53.2 | 65.2 |
| | 00:00 – 01:00 | 51.6 | 49.1 | 52.3 | 74.2 |
| | 01:00 – 02:00 | 48.0 | 42.1 | 49.8 | 65.0 |
| 2 | 23:00 – 00:00* | - | - | - | - |
| | 00:00 – 01:00 | 72.0 | 63.6 | 75.6 | 94.9 |
| | 01:00 – 02:00 | 69.0 | 52.7 | 73.8 | 85.4 |

(*): Measurements started after 23:32h.

*Unattended Measurements*

The measured average noise levels ($L_{Aeq}$) and typical maximum noise levels ($L_{Amax}$) at Measurement Position 4 over the daytime and night-time periods are detailed in Table 5.3 below:

**Table 5.3: Daytime & Night-Time Laeq And Lamax Noise Levels – Position 4 (Free-Field)**

| Period | Daytime (07:00 – 23:00 Hours) | | | Night-time (23:00 – 07:00 Hours) | | |
|---|---|---|---|---|---|---|
| | $L_{Aeq}$ | $L_{A90}$ | $L_{Amax}$ | $L_{Aeq}$ | $L_{A90}$ | $L_{Amax}$ |
| Wednesday 07/10/15* | 60.9 | 57.7 | 70.4 | 57.8 | 50.9 | 69.9 |
| Thursday 08/10/15 | 61.1 | 58.1 | 70.7 | 58.0 | 49.5 | 70.2 |
| Friday 09/10/15** | 61.3 | 58.2 | 70.4 | - | - | - |

(*): Measurements started after 14:51h.
(**): Measurements finished at 14:31h.

In order to take into account both the "typical" LAFmax values as well as the contribution of individual events for each position, which may exceed the "typical" LAFmax values, a statistical analysis of the measured LAFmax (23:00 – 07:00) over the measurement periods has been undertaken. For the purpose of this exercise, the 90th percentile of the LAFmax noise levels measured at each measurement position has been derived. (The 90th percentile of the Lmax of all measured data is the Lmax noise level that will not be exceeded for 90% of the time).

## 5.2 VIBRATION

### 5.2.1 Vibration Monitoring

All vibration measurements were undertaken by a consultant competent in vibration monitoring in accordance with the principles of BS 6472.

A full inventory of this equipment is shown in Table 5.4.

**Table 5.4: Inventory of Vibration Measurement Equipment**

| Item | Make and Model | Serial Number |
|---|---|---|
| Vibrock Meter | Vibrock V901 | 747 |

The vibration meter was a self-calibrating meter and had been laboratory calibrated in accordance with the appropriate requirements.

Vibration measurements were carried out at a point on the Neville Close residential area, since it was the only secure location to leave the vibration meter unattended, as described above and identified on Figure 2. The transducers were mounted on hard ground and covered with compacted sand to ensure a good connection with the surrounding area.

The measured 16-hour day and 8-hour night measured vibration levels are summarised in Table 5.5. Full tabulated results are presented in Appendix 3.

## Table 5.5: Summary of Vibration Measurement Results, EVDV MS-1.75

| Position | Period | Axis | | |
|---|---|---|---|---|
| | | X | Y | Z |
| V | Wednesday 07/10/2015 – Night-time | 0.018 | 0.018 | 0.028 |
| | Thursday 08/10/2015 – Daytime | 0.021 | 0.021 | 0.033 |
| | Thursday 08/10/2015 – Night-time | 0.018 | 0.018 | 0.028 |

# 6. NOISE MODELLING

The baseline noise measurement results presented above have been used to predict noise levels across the site and, to consider the effects of any acoustic screening provided by the as-built structures of the proposed development.

The predictions have been carried out using the noise-modelling suite Cadna/A v4.5.

The measurement results detailed in Section 5 have been processed to determine appropriate noise emission rates for the Site's adjacent roads, as well as for the noise emanating from the idling train engines within St Pancras Station.

In addition to the source noise levels used in the predictions, the model also considers the effects of the topographical conditions throughout the area, ground absorption, atmospheric absorption, acoustic reflections, acoustic screening, as well as applying a light downwind propagation correction to represent a worst-case.

The model has been used to determine daytime LAeq,16hour (07:00 - 23:00) and night- time LAeq,8hour (23:00 to 07:00) noise levels across the Brill Place Tower Site and surrounding area. The results of those predictions are shown in the following section.

Further to the above, the adjacent UK Centre for Medical Research and Innovation (UKCMRI), known as the Francis Crick Institute, is currently being constructed and is near completion. The Institute will provide a biomedical research centre including laboratory and research space, lecturing and teaching space, exhibition space and a community facility; landscaped public open spaces; a new pedestrian route between Midland Road and Ossulston Street; a service entrance off Brill Place and a relocated vehicular access from Midland Road to serve the British Library.

Once in operation, the UKCMRI will have several external plant items that have the potential to influence the acoustic environment of the highest floors of the proposed Brill Place Tower.

Consequently, the noise data for the proposed plant to be included at the Francis Crick Institute has been obtained, in order to inform the noise modelling exercise. The ES Chapter containing this data was obtained from the LBC planning portal12, including plant noise emissions, locations and operational profiles. The proposed external plant has therefore been included into the noise model and a cumulative scenario predicted, comprising the road sources, the railway source and the proposed plant from the UKCMRI.

[12]Planning application number 2010/4721/P.
http://camdocs.camden.gov.uk/webdrawer/webdrawer.dll/webdrawer/search/rec&sm_ncontents=2010/4721/P&template=reclistplanning&rows=1000

# 7. NOISE ASSESSMENT

## 7.1 Internal Noise Levels

In order to achieve the internal ambient noise level limits required for the residential units within the Proposed Development a level of façade mitigation will be required in order to achieve internal noise levels of <35 dB(A) in habitable rooms during the day and <30 dB(A) during the night.

The glazing and ventilation elements are typically the weakest acoustic link in the construction of a building facade. Therefore, in order to assess the acoustic performance of the proposed dwellings, it is appropriate in the first instance to explore the level of protection that will be afforded by the performance of the glazing and ventilation elements.

Windows do not reduce noise equally across the entire frequency spectrum, so the frequency content of the sound will influence the overall sound reduction performance of a given window and by extension, the resulting noise levels within the receiving room.

Many glazing manufacturers test their products under laboratory conditions using a typical road traffic noise frequency spectrum source. The resultant measured noise attenuation, in dB, gives a very useful guide to in-situ sound reduction performance of the window for situations where road traffic noise dominates. This performance index is known as the $R_{TRA}$.

Table 1 in Annex 6 of the now superseded PPG 24[13] provides examples of typical noise reductions for a dwelling façade with windows set in a brick/block wall. The table shows various levels of noise reduction provided by different glazing configurations and for different noise sources. The values shown are the level difference (in dBA) between the outside and the inside of a typical dwelling.

For a road traffic noise spectrum ($R_{TRA}$), PPG 24 states that standard thermal double glazing will provide a façade sound insulation performance of 33 dB(A), which for free-field noise levels as predicted in this case would be 30 dB(A). As an example of a glazing unit that could achieve the above performance, the glazing manufacturer Saint-Gobain states that its 4/12/4 double glazed window unit has an $R_{TRA}$ of 30dB. The 4/12/4 notation refers to a glazing unit comprising two 4mm panes of glass, separated by a 12mm air gap.

The Building Regulations require that habitable rooms within dwellings are provided with background ventilation. Internal noise levels should be considered in the context of room ventilation requirements. In this instance, the target internal noise levels will only be achieved in the majority of dwellings when windows are closed and, as such, providing background ventilation via opening windows is likely to result in excessive internal noise levels in habitable rooms. It follows that an alternative means of ventilation will, therefore, be required to comply with the requirements of the Building Regulations Approved Document F. It is understood that each residential unit within the Proposed Development would be provided with ventilation in the form of a mechanical ventilation system with heat recovery (MVHR) and as such, in this instance it has been assumed that the relative contribution through any background ventilation elements is negligible.

In order to achieve the target daytime and night-time internal noise levels, it is necessary to determine the minimum acoustic performance requirements of façade.

The predicted $L_{Aeq,16}$ hour daytime and $L_{Aeq,8}$ hour and typical worst-case $L_{Amax}$ night-time noise levels have been assumed to exist at the various locations of the proposed building façades.

Accordingly, the required composite $R_{TRA}$ sound reduction performances for the building facades, during both daytime and night-time periods are identified in Table 7.1 below.

[13] Planning Policy Guidance 24 (1994), Planning and noise, Department of the Environment

### Table 7.1: Worst-Case Sound Reduction Performance Requirements

| Location | Period | Worst-case Free-field Noise Level, dB | | Target Internal Noise Level, dB | | Maximum Composite Sound Reduction Performance Requirement, $R_{TRA}$ dB |
|---|---|---|---|---|---|---|
| | | $L_{Aeq,T}$ | $L_{Amax}$ | $L_{Aeq,T}$ | $L_{Amax}$ | |
| Tower's Ground Floor | Day – 07:00-23:00 | 58.4 | - | 35 | - | 23.4 |
| | Night – 23:00-07:00 | 55.3 | 74.2 | 30 | 45 | 29.2 |
| Lower Tower (Western Block) | Day – 07:00-23:00 | 60.5 | - | 35 | - | 25.5 |
| | Night – 23:00-07:00 | 57.5 | 68.5 | 30 | 45 | 27.5 |
| Lower Tower (Western Block) - Slated Roof Building | Day – 07:00-23:00 | 60.5 | - | 35 | - | 25.5 |
| | Night – 23:00-07:00 | 57.5 | 68.3 | 30 | 45 | 27.5 |
| Higher Tower (Eastern Block) | Day – 07:00-23:00 | 60.8 | - | 35 | - | 25.8 |
| | Night – 23:00-07:00 | 57.8 | 68.8 | 30 | 45 | 27.8 |
| Slated Roof Building - Higher Tower (Eastern Block) | Day – 07:00-23:00 | 58.5 | - | 35 | - | 23.5 |
| | Night – 23:00-07:00 | 55.5 | 67.1 | 30 | 45 | 25.5 |

Table 7.1 identifies that the sound reduction performance requirements for the proposed development are mainly driven by meeting the adopted target night-time $L_{Aeq}$ internal noise level of 30 dB $L_{Aeq}$.

It should be noted that the sound reduction performances detailed in Table 7.1 apply to habitable rooms, such as living rooms, dining rooms and bedrooms only. For non-habitable rooms such as kitchens, bathrooms, stairways, halls, landings etc., lower acoustic performance glazing configurations would be permissible.

The above mitigation measures demonstrate that appropriate internal noise levels are entirely achievable through the use of suitable façade treatments.

The detailed design of the residential units within the Proposed Development will affect both the required sound reduction performance and the appropriate selection of glazing and ventilator units. The aspects of the detailed design that are important are the room dimensions, room finishes, window dimensions and the sound reduction performance of non-glazed elements.

The cumulative scenario modelling exercise, considering the proposed external plant noise emissions from the adjacent Francis Crick Institute and the existing road and railway sources, has produced the worst-case façade incident noise analysis provided in Table 7.2.

**Table 7.2: Worst-Case Sound Reduction Performance Requirements**

| Location | Period | Worst-case Free-field Noise Level, dB | | Target Internal Noise Level, dB | | Maximum Composite Sound Reduction Performance Requirement, $R_{TRA}$ dB |
|---|---|---|---|---|---|---|
| | | $L_{Aeq,T}$ | $L_{Amax}$ | $L_{Aeq,T}$ | $L_{Amax}$ | |
| Tower's Ground Floor | Day – 07:00-23:00 | 60.1 (+1.7dB) | - | 35 | - | 25.1 (+1.7 dB) |
| | Night – 23:00-07:00 | 57.0 (+1.7 dB) | 74.2 | 30 | 45 | 29.2 |
| Lower Tower (Western Block) | Day – 07:00-23:00 | 61.9 (+1.4dB) | - | 35 | - | 26.9 (+1.4 dB) |
| | Night – 23:00-07:00 | 58.7 (+1.2dB) | 68.5 | 30 | 45 | 28.7 (+1.2 dB) |
| Lower Tower (Western Block) - Slated Roof Building | Day – 07:00-23:00 | 61.7 (+1.2dB) | - | 35 | - | 26.7 (+1.2dB) |
| | Night – 23:00-07:00 | 58.6 (+1.1dB) | 68.3 | 30 | 45 | 28.6 (+1.1dB) |
| Higher Tower (Eastern Block) | Day – 07:00-23:00 | 62.1 (+1.3 dB) | - | 35 | - | 27.1 (+1.3dB) |
| | Night – 23:00-07:00 | 59.0 (+1.2 dB) | 68.8 | 30 | 45 | 29.0 (+1.2 dB) |
| Slated Roof Building - Higher Tower (Eastern Block) | Day – 07:00-23:00 | 59.2 (+0.7dB) | - | 35 | - | 24.2 (+0.7dB) |
| | Night – 23:00-07:00 | 56.2 (+0.7dB) | 67.1 | 30 | 45 | 26.2 (+0.7dB) |

The results set out in Table 7.2 constitute the minimum façade insulation performances for the Proposed Development and are considered to be comfortably within the performances of typical façade treatments.

## 7.2 External Noise Levels in Amenity Areas

Current architectural proposals indicate external amenity areas associated with the Proposed Development are to include private balconies and a number of terrace areas located at all levels within the tower building on the northern, eastern and western facade.

The results of the noise surveys identify some of the proposed external balcony areas would experience noise levels above the BS8233:2014 recommended limiting level criterion of 55 dB(A) during daytime periods, especially those facing Midland Road and St Pancras Station (North-eastern façade of the tower). However, BS8233 concedes that the limiting level is for gardens/patios and that the limit, whilst desirable for balconies, is not always achievable in urban areas.

The balconies overlooking the internal park area and Purchese Street (North-western and South-western façades respectively), will be exposed to lower levels, due to significant levels of acoustic screening afforded by the built-form of the development.

Furthermore, the wider Central Somers Town Development incorporates substantial areas of external amenity space that will be compliant with the recommended daytime criterion, so residents

of those apartments with balconies experiencing daytime noise levels of >55 dB(A) would have access to quieter spaces.

This "offsetting" approach is typical of urban developments, where blanket compliance with the <55 dB(A) external daytime criterion is simply not feasible.

# 8. VIBRATION ASSESSMENT

The below-ground structure of a building or hard surface will affect the levels of vibration present due to a remote source. Different types of foundation will affect the amount of vibration that is transferred from the ground to either the building or the hard surface.

The below-ground structure of the surface upon which the vibration measurements were taken is not known. Similarly, the type of foundations of the Proposed Development are not known, but given the scale and location of the development, have been assumed to be piled.

As discussed in Section 3 of this report, it is necessary to use a transfer function that would represent the likely effect that a foundation would have on the transfer of vibration from the ground into the proposed residential units. As it is assumed that piled foundations are likely in this case, a transfer function of 0.4 is appropriate.

The vibration is likely to be amplified as it propagates up the structure and amplified again as it propagates across a suspended floor, as might be found in the upper storeys of residential properties, although the Proposed Development would likely incorporate a steel and concrete floor system, offering a higher degree of rigidity and lower likelihood of amplification. Nevertheless, to represent a worst case prediction, to extrapolate the measured vibration levels up the building to a suspended upper storey, an amplification factor of 2.8 has been used.

The other factor that may affect the final vibration level within the proposed units, relative to the amount of vibration that has been measured on-site, is the separation distance between the Proposed Development and the railway line. In this instance, the measurements were taken on the wider Central Somers Town Site boundary, which represents the closest build-line to the railway.

Table 8.1 shows the likely vibration level within a room located on the first floor of the Proposed Development. The figures presented in Table 8.1 equate to the maximum measured values amplified by a transfer function of 1.12 (0.4 x 2.8).

### Table 8.1 Estimated Vibration Dose Values (eVDV) at Uppermost Storey, ms-1.75

| Period | Maximum Measured VDV | Transfer Function | Resultant eVDV |
|---|---|---|---|
| Day – 0700-2300 | 0.033 | 1.12 | 0.037 |
| Night – 2300-0700 | 0.028 | 1.12 | 0.031 |

It can be seen from Table 8.1 that the calculated VDV within a room on the first floor of the closest proposed dwellings to the rail line are predicted to be below the value that would result in a 'low probability of adverse comment' in accordance with the guidance presented in BS 6472. Accordingly, no mitigation measures are considered necessary to control the impact of vibration from the nearby railway.

# 9. OPERATIONAL NOISE FROM STATIC PLANT

The commercial and building services elements of the Proposed Development are likely to incorporate static plant and processes. Best practice dictates that items of static services plant associated with all new developments should be designed to give a cumulative noise rating level ($L_{Ar,Tr}$) of no greater than the current prevailing background noise level ($L_{A90}$) at a distance of 1 m from the nearest residential façades.

The LBC policy (Table E, Section 2.4) requires that plant noise does not exceed a level that is 5 dB below the minimum external background noise or 10dB below if the noise has a 'distinguishable, discrete, continuous note' or 'distinct impulses'.

In order to meet these requirements, the noise criteria set out in Table 9.1 are proposed, based on the lowest measured existing background daytime and night-time noise levels in the area where the environmental noise survey was undertaken.

As a result of the non-secure nature of the site, it was not possible to undertake unattended continuous 24-hour noise monitoring at the nearest noise-sensitive receptor to the Proposed Development, which was located within the park area close to the Proposed Brill Place Tower. Therefore, the proposed plant noise emissions criteria have been obtained from the long-term noise measurement undertaken on the roof of the apartments in the Coopers Lane housing development (MP4).

In line with BS4142:2014, the typical background noise levels $L_{AF90,T}$ for each assessed period (daytime, evening and night-time) have been used to derive the corresponding plant noise emissions criteria. Typical background noise levels $L_{A90,T}$ over each assessment period have been derived from a statistical analysis of the values measured on site. The purpose of this analysis is to select values representative of the existing levels experienced at the Site during the monitoring exercise. The most frequently occurring value measured during each period assessed has been used.

### Table 9.1: Proposed Noise Emissions Criteria

| **Position** | **Noise Level, dBA** | | |
|---|---|---|---|
| | **Daytime (07:00 – 19:00 Hours)** | **Evening (19:00 – 23:00 Hours)** | **Night-time (23:00 – 07:00 Hours)** |
| Typical $L_{A90,T}$ (MP4) | 59 | 58 | 49 |
| Plant noise emissions criteria $L_{AR,TR}$ (Noise at 1 metre external to a sensitive façade) | 54 | 53 | 44 |
| Plant noise emissions criteria $L_{AR,TR}$ (Noise that has a distinguishable discrite continuous note, i.e. whine, hiss screech, hum) at 1 metre external to a sensitive façade | 49 | 48 | 39 |

The above limits apply to the total noise emission level from all static plant and processes. Individual plant items may need to be designed to a lower limit such that the overall total achieves the stated criteria above. It should be noted that the above limits should be applied to both existing and

proposed residential façades in order to ensure plant associated with the development does not affect the amenity of existing and future occupants.

Compliance with the above limiting noise levels would ensure that all static plant and process noise associated with the Proposed Development would give rise to a negligible impact at both existing and proposed receptors.

# 10. CONCLUSION

A noise measurement and detailed noise modelling exercise has been undertaken in order to determine the acoustic façade insulation requirements of the Brill Place Tower Development, taking account all significant sources of noise. The sources considered comprise the existing road and rail noise sources in the vicinity, plus the proposed plant associated with the adjacent Francis Crick Institute.

The exercise has identified that the site is not significantly affected by noise, as a result it is considered that the acoustic façade performance typical of that achieved with traditional thermally insulating construction techniques would be adequate to achieve internal noise levels compliant with those set out in BS8233: 2014.

The Proposed Development incorporates external amenity spaces, such as balconies. Some of these areas have been predicted to exceed the <55 dB(A) external amenity criterion recommended by the WHO and echoed within BS 8233: 2014. However, BS 8233: 2014 acknowledges that blanket compliance within urban areas is likely to be unfeasible. Furthermore, as the wider Central Somers Town Development incorporates substantial areas of public external amenity space, which is predicted to comply with the amenity criterion, it is considered that residents would be able to access these spaces, should a quieter environment be desired.

Target noise criteria have been set for all static plant within the Proposed Development. Providing that the cumulative rating noise level from the plant items does not exceed the stated noise criteria, whether through the application of noise control techniques or otherwise, the impact of noise from such sources is predicted to have no adverse impact on existing or proposed sensitive receptors.

The assessment of vibration has also been carried out, which has indicated that appropriate criteria would be achieved without the need for any mitigation measures.

In the light of the above, which demonstrates that the Proposed Development would be expected to comply with the relevant British Standards, it is considered that noise would not present a constraint to the granting of planning permission for the Proposed Development in its currently proposed form.