

*Blossom Street*

## **10 Noise and Vibration**

**Replacement Environmental Statement**

Volume I



# 10 Noise and Vibration

## Preface – Update 2015

- This replacement November 2015 Environmental Statement (hereafter referred as the 'November 2015 Replacement ES' or 'this Replacement ES') takes into account the design changes to the Blossom Street project (refer *Chapter 4: Proposed Development*) that have occurred since the submission of the application in December 2014 ES and concludes if any changes to the likely significant effects occur as a result of those changes. This Replacement ES consolidates the environmental assessment of the design changes into a single ES, presenting commentary (under the heading 'Update 2015') for the design changes in the March 2015 ES Addendum (the 'March 2015 ES Addendum') by blue text, and the design changes arising from the current design changes by red text. Where relevant, text removed will be denoted by strike-through, e.g. effect), and updated tables and figures will be denoted by the suffix 'A' (e.g. Table 2.10A).
- This Replacement ES adopts the following terminology to describe the development descriptions and design changes:
  - Proposed Development: description of the development presented in the December 2014 ES;
  - Revised Scheme: description of the scheme incorporating the design changes to the Proposed Development in March 2015 (the design changes referred as the 'March 2015 amendments'), assessed within the March 2015 ES Addendum;
  - Amended Proposed Development: description of the development incorporating the current design changes to the Revised Scheme (the design changes referred as the 'November 2015 amendments'), to be assessed within the November 2015 Replacement ES.
- For clarification, since the preparation of the December 2014 ES, AECOM has merged with URS Infrastructure & Environment UK Limited (URS) to become a single environmental consultancy. Reference within the text to 'URS' in the November 2015 Replacement ES has now been replaced by AECOM Infrastructure and Environment UK Limited (hereafter referred to as 'AECOM').
- Further details in regard to the approach taken in this November 2015 Replacement ES are outlined in *Chapter 2: EIA Methodology*.

## Introduction

- 10.1 This chapter of the Environmental Statement (ES) assesses the likely significant environmental effects of the Proposed Development with respect to noise and vibration.
- 10.2 The chapter describes the baseline conditions currently existing at the Site and in the surrounding area and the methods used to assess the noise and vibration effects associated with the Proposed Development. The chapter also sets out the mitigation measures required to prevent, reduce or offset any significant adverse noise and vibration effects; and the likely residual effects after these measures have been adopted. The likelihood of cumulative noise effects due to other schemes in proximity of the Proposed Development has also been considered.
- 10.3 Effects are considered during the construction phase and on completion and occupation of the Proposed Development. This chapter also provides an assessment of the suitability of the Proposed Development for the proposed use, in terms of existing noise levels, and of the need to provide an adequate internal and external environment regarding noise.
- 10.4 This chapter has been prepared by ~~URS Infrastructure & Environment UK Limited (URS)~~ AECOM and is supported by *ES Volume III: Appendix E*.

## Noise and Vibration Terminology

- 10.5 Throughout this chapter, the following terminology and abbreviations are used:
- Decibel (dB) – The unit of noise measurement that expresses the loudness in terms of decibels (dB);
  - Hertz (Hz) – Hertz (Unit of frequency);
  - $L_{A1}$ ,  $L_{A5}$ ,  $L_{A10}$ ,  $L_{A50}$ ,  $L_{A90}$ ,  $L_{A99}$  – A-weighted sound pressure level exceeded for 1, 5, 10, 50, 90 and 99% of the measured time respectively;
  - $L_{Aeq}$  – Equivalent continuous A-weighted sound pressure level over a given period of time;

- $L_{Amax}$  – The maximum A-weighted sound pressure level over a given period of time;
- PPV – Peak Particle Velocity in millimetres per second (mm/s). The vibration measurement parameter that is usually used to describe vibration in relation to sudden impulse events; and
- $L_w$  – Sound Power Level.

- 10.6 Where a noise indicator (e.g.  $L_{eq}$ ) includes the suffix A (e.g.  $L_{Aeq}$ ), the reported noise level is weighted based on a weighting factor for human sensitivity to sound (A).

## Legislation and Planning Framework

### National Legislation

#### Control of Pollution Act (1974)

- 10.7 The Control of Pollution Act 1974 (CoPA) (Ref. 10-1) requires that 'Best Practicable Means' (as defined in section 72 of CoPA) are adopted to control construction noise on any given site. CoPA makes reference to BS 5228 as best practicable means.
- 10.8 Sections 60 and 61 of the CoPA provide the main legislation regarding noise and vibration from demolition and construction sites. If noise complaints are received, a Section 60 notice may be issued by the Local Authority with instructions to cease work until specific conditions to reduce noise have been adopted.
- 10.9 Section 61 of the CoPA provides a means for applying for prior consent to carry out noise generating activities during construction. Once prior consent has been agreed under Section 61, a Section 60 notice cannot be served provided the agreed conditions are maintained on-site.

### National Policy and Guidance

#### National Planning Policy Framework (2012)

- 10.10 The National Planning Policy Framework (NPPF) (Ref. 10-2) replaces:
- Planning Policy Statement (PPS) 23: Planning and Pollution Control; and
  - Planning Policy Guidance (PPG) 24: Planning and Noise (Ref. 10-3).
- 10.11 The paragraphs from the NPPF relating to noise are set out below:
- Paragraph 109: "*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.....*"
  - Paragraph 123: "*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.*"
  - Paragraph 143: "*In preparing Local Plans, local planning authorities should.....*
    - *Set out environmental criteria, in line with the policies in this Framework, against which planning applications will be assessed so as to ensure that permitted operations do not have unacceptable adverse impacts on the natural and historic environment or human health, including from noise, dust, visual intrusion, traffic, tip- and quarry-slope stability, differential settlement of quarry backfill, mining subsidence, increased flood risk, impacts on the flow and quantity of surface and groundwater and migration of contamination from the site; and take into*

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*account the cumulative effects of multiple impacts from individual sites and/or a number of sites in a locality.”...*

**10.12** Applications for planning permission must be determined in accordance with the Development Plan (which includes any local plan or neighbourhood plans which have been adopted for the area), unless material considerations indicate otherwise. The NPPF must be taken into account in the preparation of local and neighbourhood plans, and is a material consideration in the determination of planning applications. Planning policies and decisions must reflect, and where appropriate, promote relevant EU obligations and statutory requirements.

## *Planning Practice Guidance (2014)*

**10.13** The Planning Practice Guidance (PPG) (Ref. 10-4) “*advises on how planning can manage potential noise impacts in new development*” and provides guidelines that are in line with the NPPF.

**10.14** Following launch of the PPG, a number of previously published planning guidance documents have been cancelled and are detailed within the Written Ministerial Statement titled ‘Making the planning system work more efficiently and effectively’.

**10.15** The PPG states that local planning authorities should take account of the acoustic environment and in doing so consider:

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

## *Planning Policy Guidance Note (PPG) 24 Planning and Noise (withdrawn)*

**10.16** PPG24 (Ref. 10-3) which has been superseded by the NPPF and PPG, provided guidance on planning and noise, and contained the Noise Exposure Categories (NECs) which prior to its withdrawal were widely used in the UK when determining the suitability of sites for development.

**10.17** In addition to NECs, PPG24 outlined the considerations to be taken into account in determining planning applications both for noise sensitive development and for those activities that generate noise, and advised on the use of conditions to minimise the effect

**10.18** The NPPF and PPG make general reference to noise and amenity but does not contain any methodology for the assessment of noise. Therefore, the NPPF and PPG place responsibility on local authorities to produce their local planning policy and make reference to relevant guidance that should be followed.

**10.19** PPG24 remains a valid assessment methodology when referenced in local planning policy for assessing noise effects from new developments. PPG24 is referenced in the current London Borough of Tower Hamlets (LBTH) Managing Development Document and EIA Scoping Guidance (Ref. 10-14).

## *Noise Policy Statement for England (2010)*

**10.20** The Noise Policy Statement for England (NPSE) (Ref. 10-5) seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. The statement applies to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise.

**10.21** The statement sets out the long-term vision of the government’s noise policy, which is to “promote good health and a good quality of life through the effective management of noise within the context of policy on sustainable development”.

**10.22** The NPSE adopts established concepts from toxicology that are currently being applied to noise effects and details noise levels at which the effects of an exposure may be classified into a specific category. The classification categories detailed within NPSE are as follows:

- No Observed Effect Level (NOEL) - the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;
- Lowest Observable Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and

- Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.

**10.23** It is recognised that SOAEL does not have a single objective noise-based level that is applicable to all sources of noise in all situations. The SOAEL is likely to be different for different sources, receptors and at different times of the day.

**10.24** The key aims of the NPSE

- The first aim of the NPSE is to avoid significant adverse effects on health and quality of life, taking into account the guiding principles of sustainable development.
- The second aim considers situations where effects are established between the LOAEL and SOAEL. In such circumstances, all reasonable steps should be taken to mitigate and minimise the effects. However, this does not mean that such adverse effects cannot occur.
- The third aim seeks to improve health and quality of life, where possible, through the pro-active management of noise, whilst also taking account of the guiding principles of sustainable development.

**10.25** The Department for Environment, Food and Rural Affairs (DEFRA) has led a research contract to identify the SOAEL and LOAEL for a limited range of noise sources. However, no guidance from this research has been issued at this time.

## **Regional Policy and Guidance**

### *The London Plan (2011)*

**10.26** With specific reference to noise, the London Plan 2011 (Ref. 10-6) contains the following policy:

- *Policy 7.15: Reducing Noise and Enhancing Soundscapes:*
  - *Development proposals should seek to reduce noise by:*
    - a) *Minimising the existing and potential adverse impacts of noise on, from, within, or in the vicinity of, development proposals;*
    - b) *Separating new noise sensitive development from major noise sources wherever practicable through the use of distance, screening, or internal layout in preference to sole reliance on sound insulation; and*
    - c) *Promoting new technologies and improved practices to reduce noise at source.*

### *Revised Early Minor Alterations (2013)*

**10.27** The Revised Early Minor Alterations to the London Plan (Ref. 10-7) contain the following amended supporting text relating to Policy 7.15 Reducing Noise and Enhancing Soundscapes:

- *Para 7.52:*
  - *Reducing noise pollution and protecting good soundscape quality where it exists, contributes to improving quality of life. The Mayor’s published Ambient Noise Strategy contains policies and proposals on noise related to road and rail traffic, aircraft, water transport and industry. The GLA Act 1999 excludes some sources from the definition of ‘ambient noise’, such as construction and neighbour noise, where powers are held by borough councils. London Plan policies address the spatial implications of the Ambient Noise Strategy. These policies may require further alteration depending on the spatial implications of the Noise Policy Statement for England.*

### *Draft Further Alterations to the London Plan (2014)*

**10.28** The Draft Further Alterations to the London Plan (Ref. 10-8) have updated *Policy 7.15 ‘Reducing and Managing Noise, Improving and Enhancing the Acoustic Environment and Promoting Appropriate Soundscape’*, which contains the following text:

- *Development proposals should seek to manage noise by:*
  - *Avoiding significant adverse noise impacts on health and quality of life as a result of new development;*

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- Mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business;
- Improving and enhancing the acoustic environment and promoting appropriate soundscapes (including identifying and protecting Quiet Areas and spaces of relative tranquillity);
- Separating new noise sensitive development from major noise sources (such as road, rail, air transport and some types of industrial development) through the use of distance, screening or internal layout – in preference to sole reliance on sound insulation;
- Where it is not possible to achieve separation of noise sensitive development and noise sources, without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through the application of good acoustic design principles;
- Having particular regard to the impact of aviation noise on noise sensitive development; and
- Promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.

## City Soundings: The Mayor's London Ambient Noise Strategy (2004)

- 10.29** The London Ambient Noise Strategy (Ref. 10-9) aims to minimise the adverse effects of noise on people living, working in and visiting London by using the best available practices and technologies within a sustainable development framework.
- 10.30** The Strategy aims to work towards more compact city development, while minimising noise. This requires careful consideration of the adverse effect of noise on, from, within or in proximity to a development.

## The Mayor's Supplementary Planning Guidance: Sustainable Design and Construction (2014)

- 10.31** The Sustainable Design and Construction SPG (Ref. 10-10) provides guidance on key noise related areas and makes reference to the following London Plan policies:
- London Plan Policies 3.2, 7.15 – “Areas identified as having positive sound features or as being tranquil should be protected from noise”; and
  - London Plan Policies 3.2, 5.3, 7.6., 7.15 – “Noise should be reduced at source, then designed out of a scheme to reduce the need for mitigation measures”.
- 10.32** The SPG goes on to provide information on the following relating to noise:
- “the sources of noise;
  - ways to mitigate noise emitted by developments;
  - ways to mitigate the impact of noise on developments; and
  - some detailed design considerations.”

## Local Policy and Guidance

### LBTH Core Strategy (2010)

- 10.33** With reference to noise, the LBTH Local Development Framework (LDF) Core Strategy (Ref. 10-11) includes the following policies:
- *Achieving Wider Sustainability (Policy SO3):*
    - “Tower Hamlets will achieve environmental, social and economic development simultaneously; the improvement of one will not be to the detriment of another. Where tradeoffs between competing objectives are unavoidable, these will be transparent and minimised. This will be realised by....:
      - improving air, land and water quality by minimising air, noise, land and water pollution.”....
  - *Creating Healthy and Liveable Neighbourhoods (Policy SP03):*
    - “[Tower Hamlets] will address the impact of noise and air pollution in the borough by:
      - ....minimising and mitigating the impact of noise in identified hot spots, such as along main vehicular routes.”
  - *Creating Distinct and Durable Places (Policy SP10):*

- “....Ensure that buildings and neighbourhoods promote good design principles to create buildings, spaces and places that are high-quality, sustainable, accessible, attractive, durable and well-integrated with their surrounds. This will be achieved through ensuring development uses design and construction techniques to reduce the impact of noise and air pollution.”...

### LBTH Managing Development Document (2013)

- 10.34** With reference to noise, the LBTH Managing Development Document (MDD) (Ref. 10-12) states the following (Policy DM25 Amenity):
- “Development should seek to protect, and where possible improve, the amenity of surrounding existing and future residents and building occupants, as well as the amenity of the surrounding public realm by... not creating unacceptable levels of noise, vibration, artificial light, odour, fume or dust pollution during the construction and life of the development.”
- 10.35** The MDD goes on to provide further information on the assessment methodologies that should be employed for noise sensitive developments and developments that may cause a noise effect on existing receptors:
- Industrial and commercial development:
    - “Acceptability will be based on the need to avoid any increase in ambient noise levels affecting residential or other sensitive uses. British Standard BS 4142/1997 is the Council’s Guideline for determining whether or not development is acceptable.”
  - Construction noise:
    - “See the Council’s policy statement – Construction Code of Practice.”
  - Vibration:
    - “Vibration to which people might normally be exposed to in homes and offices, emitted from external sources, should not exceed vibration levels indicated in BS 6472 “Evaluation of Human Exposure to Vibration in Buildings”. During construction or demolition activities vibration levels should not exceed 1.0 mms ppv in residential properties and 3.00 mms ppv in commercial properties.”
  - Groundborne noise:
    - “Where development is near major roads or railways, the design criteria of 35 dB,  $L_{Amax}$ , fast will be required to be met.”
  - Noise insulation:
    - “Where the development falls within an area of high noise, the ‘good’ standard of BS 8233 should be met, the reasonable standard may only be allowed where other overriding factors have been agreed with environmental health.
    - Acoustic trickle vents may not be acceptable to the local authority, especially if these are within the window frame themselves and high external maximum noise levels prevail.”

### LBTH Code of Construction Practice (2006)

- 10.36** The LBTH Code of Construction Practice (CoCP) (Ref. 10-13) sets out the procedures for managing the environmental impact of construction works, including noise and vibration impacts, and sets out guidance for monitoring regimes, and setting noise and vibration limits.

### LBTH EIA Scoping Guidance (2012)

- 10.37** LBTH has issued Guidance for ES Assessments (Ref. 10-14) which provides guidance for applicants on the scoping stage of Environmental Impact Assessment (EIA) for developments within the LBTH. The document makes reference to British Standards and relevant guidance, including PPG24 in terms of assessing the suitability of a site for residential development, and sets out the methodologies that are required be followed when surveying and assessing a new site in terms of noise and vibration.

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## Other Relevant Policy and Guidance

### World Health Organisation

**10.38** The World Health Organisation's (WHO) 'Community Noise Guidelines' (Ref. 10-24) recommend external daytime and evening environmental noise limits, and internal night-time limits to avoid sleep disturbance.

### British Standard 4142:1997

**10.39** BS 4142 'Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas' (Ref. 10-15) can be used for assessing the effect of noise from mechanical services plant. The method compares the difference between 'rating level' of the new noise, with the 'background level' at the receptor position.

### British Standard 7445-2:1991

**10.40** BS 7445 'Description and Measurement of Environmental Noise' (Ref. 10-16) defines parameters, procedures and instrumentation required for noise measurement and analysis.

### British Standard 8233:2014

**10.41** BS 8233 'Sound Insulation and Noise Reduction for Buildings - Code of Practice' (Ref. 10-17) provides criteria for the assessment of internal noise levels for various uses including dwellings and commercial properties. It is noted that internal noise criteria are defined by a single set of criteria, replacing the 'Good' and 'Reasonable' categories in BS 8233:1997.

### British Standard 5228:2009+A1:2014

**10.42** BS 5228 'Noise and Vibration Control on Construction and Open Sites' (Ref. 10-19) provides a 'best practice' guide for noise and vibration control, and includes Sound Power Level ( $L_w$ ) data for individual plant as well as a calculation method for noise from construction activities. It also provides guidance on the human response to vibration.

### British Standard 6472:2008

**10.43** BS 6472-1 'Guide to Evaluation of Human Exposure to Vibration in Buildings Part 1: Vibration Sources other than Blasting' (Ref. 10-18) presents recommended frequency weighted vibration spectra (for continuous vibration) and vibration dose values (VDV) (for intermittent vibration) above which adverse comment is likely to occur in residential properties.

### British Standard 7385:1993

**10.44** BS 7385 'Evaluation and Measurement for Vibration in Buildings' (Ref. 10-20) presents guide values or limits for transient vibration, above which there is a likelihood of cosmetic damage. The standard establishes the basic principles for carrying out vibration measurements and processing the data, with regard to evaluating vibration effects on buildings.

### Calculation of Road Traffic Noise (1998)

**10.45** Department of Transport/Welsh Office Memorandum 'Calculation of Road Traffic Noise' (CRTN) (Ref. 10-21) describes procedures for traffic noise calculation, and is suitable for environmental assessments of schemes where road traffic noise may have an effect.

### Design Manual for Road and Bridges (2011)

**10.46** The Highways Agency 'Design Manual for Road and Bridges Volume 11 Section 3 Part 7 Traffic Noise and Vibration' (DMRB) (Ref. 10-22) provides guidance on the appropriate level of assessment to be used when assessing the noise and vibration effects arising from all road projects, including new construction, improvements and maintenance.

### British Council for Offices (BCO)

**10.47** The British Council for Offices (BCO) (Ref. 10-23) guide recommends internal noise level limits for office facilities.

## Legislation and Planning Framework - Update 2015

### March 2015 ES Addendum

**10.48** Since the submission of the December 2014 ES, no changes to noise and vibration legislation or planning policy have been made that affect the assessment in the December 2014 ES.

### November 2015 Amendments

#### The London Plan (2015)

**10.49** The adoption of the FALP in March 2015 resulted in the consolidation of changes to the London Plan (2011) to become the 'London Plan (2015)' (Ref. 10-26). The London Plan (2015) also incorporates the REMA, which were published in October 2013.

**10.50** No changes were made to the policy affecting the assessment as part of the adoption of the London Plan 2015 and does not alter the overarching content of the policy review undertaken as part of the December 2014 ES.

#### Minor Alterations to the London Plan (2015)

**10.51** On 11<sup>th</sup> May 2015 the Mayor of London published for six weeks public consultation (11<sup>th</sup> May to 22<sup>nd</sup> June) two sets of Minor Alterations to the London Plan – on Housing Standards and on Parking Standards (Ref. 10-27). Both sets of minor alterations were to be considered at a public examination, commencing on 21<sup>st</sup> October 2015.

**10.52** These minor alterations have been prepared to bring the London Plan in line with new national housing standards and car parking policy.

**10.53** No changes were made to the policy affecting the assessment as part of the Minor Alterations so does not alter the overarching content of the policy review undertaken as part of the December 2014 ES.

## Assessment Methodology and Significance Criteria

**10.54** This section presents the methodology used to assess the baseline conditions and each type of noise and vibration effect in view of relevant standards and guidance (as detailed above), the data collected and assessment undertaken, and the derivation of the significance or compliance criteria used in the assessments.

### Consultation

**10.55** LBTH has been consulted throughout the evolution of the Proposed Development. The scope of the noise and vibration assessment for the EIA was set out in the EIA Scoping Report submitted to LBTH in July 2014. The EIA Scoping Opinion identified a list of the information to be accounted for within the assessment. These have been addressed within this Chapter (refer below) or where topics have not been addressed, reasons are provided.

**10.56** Matters addressed include:

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**Table 10.1 Matters raised within Scoping Opinion**

Topic	Reference in Chapter/Application Documentation
<b>London Borough of Tower Hamlets</b>	
The following possible noise sources that will impact on the scheme/ any sensitive facades: <ul style="list-style-type: none"> <li>- rail noise;</li> <li>- road traffic noise;</li> <li>- ground-borne noise;</li> <li>- plant noise; and</li> <li>- construction noise</li> </ul>	All possible noise sources identified have been accounted for within the following sections: <ul style="list-style-type: none"> <li>- Assessment of the Suitability of the Site for the Proposed Uses</li> <li>- Potential Effects and Mitigation Measures</li> </ul>
LBTH will require further long-term vibration monitoring at Elder Street and Folgate Street This is to take into account the listed Huguenot Buildings in Elder Street and Folgate Street, also the Dennis Severs House Museum in Folgate Street	Refer 'Further Consultation' section (para 10.51)
LBTH will require further long-term noise monitoring at Folgate St. This is to take into account the listed Huguenot Buildings in Elder Street and Folgate Street, also the Dennis Severs House Museum in Folgate Street	Refer to 'Further Consultation' section (para 10.51)
The scope of Assessment should take into account: a) MDD (LBTH) with calculations b) BS 8233:2014 with glazing specification c) BS 6472 :2008 with actual data d) BS 5228: with construction noise calcs e) BS 4142: with Plant noise calculations f) Ground-borne noise to meet Lmax 35dB(A) g) Cumulative impacts at the most sensitive residential facades should be considered.	Matters identified to be accounted for within the scope of the assessment have been addressed within the following sections: <ul style="list-style-type: none"> <li>- Baseline Conditions;</li> <li>- Assessment of the Suitability of the Site for the Proposed Uses;</li> <li>- Potential Effects and Mitigation Measures</li> </ul>
The high-rise development will be subjected to high number of aircraft overflying the development both now and increasingly in future years - this needs to be taken fully into consideration in the EIA	Refer to 'Limitations and Assumptions' section (para 10.102)
The EIA will need to assess the effects of the adjacent rail lines, and how the development can be designed to ensure appropriate mitigation for residents and the school, including outside space	Refer to 'Assessment Methodology' section (para 10.59)
BS 5228 allows the prediction of construction impacts, although it cannot predict the vibration impact due to demolition and construction, so any piling methodologies must be agreed up front	Refer to 'Further Consultation' section (para 10.52)
The requirement for any Control of Pollution Act Section 61 applications should be referred to in the ES	Refer to 'Summary of Mitigation Measures' section (para 10.168)

## Further Consultation

- 10.57** It is considered that existing ambient and background noise levels at Folgate Street are sufficiently represented by noise data obtained at the monitoring locations described in the Baseline Conditions section below.
- 10.58** The Proposed Development (office and residential uses) will not result in the generation of vibration during operation. There is the potential for vibration to arise during the demolition / construction phases but such impacts are assessed on absolute vibration levels. Consequently, long-term monitoring of ambient vibration levels at sensitive receptors would provide little or no benefit in evaluating vibration effects. However, short term and long term vibration monitoring of rail traffic movements has been undertaken at two locations within the Site (as shown on Figure 10.1) as part of the site suitability assessment.

- 10.59** Consultation with LBTH Environmental Health Officer has been undertaken to discuss the comments and reasoning within the scoping opinion. Following further discussion regarding the monitoring methodology and approach to assessment (phone discussion, 12<sup>th</sup> November 2014), it was agreed that no additional noise and vibration monitoring would be required (see *ES Volume III: Appendix E* for copy of correspondence relating).

## Significance Criteria

### Effect Significance Terminology Overview

- 10.60** The assessment of effect significance outlined within the below sections is consistent with the terminology and criteria outlined within **Chapter 2: EIA Methodology** of this ES and accords with the relevant British Standards and guidance. The terminology used to describe the sensitivity of resources / receptors and magnitude of the impact will be as follows:
- High (note: for the purposes of this assessment, very high is also assigned in relation to receptor sensitivity);
  - Medium;
  - Low; and
  - Very Low.
- 10.61** The key terminology to be used to describe the classification of effects is as follows and is further described in the 'Significance of Environmental Effects section of this chapter:
- Major;
  - Moderate;
  - Minor; and
  - Negligible.
- 10.62** The nature of the effects may be either adverse (negative) or beneficial (positive).
- 10.63** A generic classification of effects matrix is provided within Table 10.2 below as an example of the criteria to be used to assess the significance of effects. The basis for determining effect significance will take into account the sensitivity of resource / receptor and magnitude of impact.

**Table 10.2 Classification of Effects Significance Framework**

Receptor Sensitivity	Magnitude of Change			
	High	Medium	Low	Very Low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very Low	Minor	Negligible	Negligible	Negligible

- 10.64** Following the classification of an effect using this methodology, a clear statement is then made as to whether the effect is significant or not significant. As a general rule, the following criteria is applied:
- 'Moderate' or 'major' are deemed to be **'significant'**.
  - 'Minor' are considered to be **'not significant'**, although they may be a matter of local concern; and
  - 'Negligible' effects are considered to be **'not significant'** and not a matter of local concern.

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## Assessment Methodology

### Methodology for Determining Baseline Conditions and Sensitive Receptors

#### Baseline Noise Monitoring Methodology

- 10.65** Baseline noise surveys were undertaken to establish the noise environment around the Site. The baseline noise surveys were undertaken in accordance with best practice as specified in BS 7445: Part 2 (Ref. 10-16).
- 10.66** Unattended long-term noise measurements were undertaken at the Site at four monitoring positions between the period 28 March to 10 April 2014 (see Figure 10.1), using Rion NL-52 and Norsonic 140 Type 1 sound level meters with a B&K 4230 Type 1 field calibrator.
- 10.67** The calibration levels were checked before and after measurements and no significant calibration drift was detected. The sound level meters log environmental noise measurement parameters including average ambient ( $L_{Aeq}$ ), maximum ( $L_{Amax}$ ) and background ( $L_{A90}$ ) noise levels.

#### Baseline Vibration Monitoring Methodology

- 10.68** Monitoring positions were selected at locations on the Site that were considered to experience the highest on-site levels of vibration due to train movements on the overground railway line to the north of the Site and the Central Line London Underground Line (LUL) which runs underneath part of the Site.
- 10.69** Unattended long term vibration monitoring was carried out at the Site at two locations between 28 March 2014 and 14 April 2014 (see Figure 10.1) using a Svantek 958 vibration level meter and a Rion VE10 vibration calibrator.
- 10.70** Attended short term vibration measurements were also undertaken around the Site at two locations on 3 June 2014 (also shown on Figure 10.1) using a Svantek 958 vibration level meter and a Rion VE10 vibration calibrator. Additional short term measurements were taken on 27 June 2014.

#### Methodology for Determining Sensitive Receptors

- 10.71** Sensitive receptors in proximity to the Site have been considered when assessing the effects associated with noise and vibration levels from the demolition/construction and operational phases of the Proposed Development.
- 10.72** Receptor locations have been selected which are considered to be representative of the nearest existing noise and vibration sensitive receptors to the Proposed Development. It is considered that, if noise and vibration levels are suitably controlled at the key receptors identified, then noise and vibration levels will be suitably controlled at all sensitive receptors in the surrounding area.

#### Methodology for Determining the Suitability of the Site for Development

##### PPG24: Planning and Noise

- 10.73** The effect of existing noise levels at the Site has been assessed using the ambient noise levels measured during the baseline survey in order to determine site suitability in terms of internal and external noise levels for the various uses within the Proposed Development.
- 10.74** The now deleted PPG24 defined Noise Exposure Categories (NECs) for day and night-time external noise. The categories related to different noise bands depending on the source of noise (i.e. road, rail, air or mixed noise sources). Table 10.3 details the classification of NECs covering daytime and night-time periods for different noise sources. The values refer to the average ( $L_{Aeq}$ ) noise level throughout the day or night-time periods respectively.

**Table 10.3 Noise Exposure Categories for New Dwellings,  $L_{Aeq, T}$  (dB)**

Noise Source	Noise Exposure Category			
	A	B	C	D
Road Traffic 07:00 – 23:00 23:00 – 07:00	<55 <45	55 – 63 45 – 57	63 – 72 57 – 66	>72 >66
Rail Traffic 07:00 – 23:00 23:00 – 07:00	<55 <45	55 – 66 45 – 59	66 – 74 59 – 66	>74 >66
Air Traffic 07:00 – 23:00 23:00 – 07:00	<57 <47	57 – 66 47 – 59	66 – 72 59 – 68	>72 >68
Mixed Sources 07:00 – 23:00 23:00 – 07:00	<55 <45	55 – 63 45 – 57	63 – 72 57 – 66	>72 >66

- 10.75** PPG24 advised that where individual night-time noise events regularly exceed 82 dB  $L_{ASmax}$  a site should be treated as NEC C, unless already in NEC D.
- 10.76** Table 10.4 details the planning guidance associated with each NEC classification.

**Table 10.4 Descriptive Guidance in Relation to Noise Exposure Categories (re PPG24 Guidance)**

NEC	PPG 24 Guidance
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.
C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter Sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

#### Internal Noise Levels within Buildings and Outdoor Amenity Space

- 10.77** External façades of the Proposed Development will be designed to ensure provision of suitable working and living internal noise conditions in accordance with BS 8233. BS 8233 provides recommended criteria for internal ambient noise levels when rooms are unoccupied, dependent on their intended use. Table 10.5 presents the desirable internal noise levels that should not be exceeded in new developments.

**Table 10.5 Indoor Ambient Noise Levels Criteria**

Activity	Location	Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)
<b>Residential Units</b>			
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16h}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$
<b>Office Units</b>			



# 10 Noise and Vibration

Activity	Location	Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)
Acoustic privacy in shared spaces	Open plan office	45 – 50 dB $L_{Aeq,T}$	-
Study and work requiring concentration	Executive office	35 – 40 dB $L_{Aeq}$	-
<b>Retail Units</b>			
Speech or telephone communications	Department store, Cafeteria, canteen, kitchen	50 – 55 dB $L_{Aeq,T}$	-

- 10.78** Regular individual noise events at night have the potential to disturb the sleep of inhabitants in dwellings. BS 8233 states that: “A guideline value may be set in terms of SEL or  $L_{Amax,F}$ , depending on the character and number of events per night”.
- 10.79** The WHO Guidelines for Community Noise provide guidance on noise levels of single noise events that may cause sleep disturbance by stating: “To avoid sleep disturbance, indoor guideline values for bedrooms are ... 45dB  $L_{Amax}$  for single sound events”. Consequently, for the purposes of this assessment a noise level of 45dB  $L_{Amax,F}$  has been adopted as a suitable internal noise level for impulse noise events that should not normally be exceeded at night.
- 10.80** BS 8233 provides guidance on suitable noise levels for external spaces that are used for amenity areas (e.g. gardens and patios). An upper guideline value of 55dB  $L_{Aeq,T}$  is considered to be acceptable for outdoor amenity areas.
- 10.81** BS 8233 acknowledges that this guideline value may not be achievable in higher noise areas such as city centres or urban areas adjoining the strategic transport network. These conditions are relevant to the Proposed Development and in accordance with BS 8233 the design will aim to achieve the lowest practicable noise levels in outdoor amenity areas within the Proposed Development.

## Ambient Vibration Impact on Humans in Buildings

- 10.82** An assessment of vibration affecting humans in existing and proposed buildings due to train movements has been undertaken in accordance with BS 6472-1:2008 by considering the Vibration Dose Value (VDV) in  $ms^{-1.75}$ . The VDV levels take into account the level and duration of vibration events, allowing both continuous and intermittent vibration events to be assessed using the same assessment metric.
- 10.83** The significance of existing vibration levels at the Site has been derived from BS 6472-1:2008, which rates vibration in terms of varying degrees of adverse comment, ranging from ‘adverse comment not expected’ to ‘adverse comment very likely’. This range of varying degrees of adverse comment has been translated into the significance criteria as presented in Table 10.6.

**Table 10.6 Criteria for Assessing Human Response to Vibration in Buildings**

Period	Low Probability of Adverse Comment ( $ms^{-1.75}$ )	Adverse Comment Possible ( $ms^{-1.75}$ )	Adverse Comment Probable ( $ms^{-1.75}$ )
Residential 16 Hour Daytime	0.2 - 0.4	0.4 – 0.8	0.8 – 1.6
Residential 8 Hour Night-time	0.1 – 0.2	0.2 – 0.4	0.4 – 0.8

- 10.84** The values shown in Table 10.6 relate to residential properties and can also be applied to hotels and places of worship. However, for vibration levels in offices and workshops, BS 6472-1:2008 states that “For offices and workshops, multiplying factors of 2 and 4 respectively should be applied to the above vibration dose value ranges for a 16 h day”. This allows for a relaxed threshold in terms of vibration limits than is required for residential units.

## Ground-borne Noise within Buildings

- 10.85** Reference is made to available URS experience in constructing new underground railways, e.g. the Crossrail, Jubilee Line Extension, Thameslink and High Speed 1 (Channel Tunnel Rail Link) in order to assess ground-borne noise within buildings. All of these projects adopted a significance criterion for ground-borne noise inside residential properties of 40 dB  $L_{ASmax}$ . However, this ground-borne noise limit is for assessing the effects of a new railway on existing residential premises.
- 10.86** London Underground Limited has issued Guidance Document G1323 Noise and Vibration Asset Design Guidance (2012) (Ref. 10-25) for new railway infrastructure, which contains a significance criterion for noise inside residential premises of 40 dB  $L_{AFmax}$ . It also states that “reasonable endeavours” should be used to design to an internal noise level of 35 dB  $L_{AFmax}$  for residential properties. This accords with the requirement from LBTH as set out in the LBTH MDD (Ref. 10-12).
- 10.87** Therefore, a design target of 40 dB  $L_{AFmax}$  has been applied for the Proposed Development to avoid significant levels of ground-borne noise within the new dwellings. Where practicable, mitigation measures should be applied to building designs to achieve a lower threshold of 35 dB  $L_{AFmax}$ .
- 10.88** No guideline values are given within G1323 for uses other than residential, but BS 8233:1999 generally recommends noise levels for office accommodation which are 5 dB greater than those for residential. As such, a significance criterion for office accommodation of 45 dB  $L_{AFmax}$ , is considered appropriate for the Proposed Development. This accords with the BCO guidance (Ref. 10-23), which recommends 45 dB  $L_{ASmax}$  as a design criterion for ground-borne noise from trains inside offices.

## Methodology for Determining Demolition and Construction Effects

### Demolition and Construction Works Noise

- 10.89** BS 5228 provides practical information on construction noise and vibration reduction measures, and promotes a ‘Best Practicable Means’ approach to control noise and vibration. The calculation method provided in BS 5228 is based on the number and types of equipment operating, their associated Sound Power Level ( $L_w$ ), and the distance to receptors, together with the effects of any screening.
- 10.90** There are no current national standards or guidelines that give noise limits for construction sites. BS5228 provides some guidance on acceptable levels of construction noise. Additionally, BS 5228 provides example criteria for the assessment of the significance of construction noise impacts.
- 10.91** Specific details of the construction works associated with the Proposed Development will not be available until after a contractor has been appointed. Therefore, representative construction activities and worst case assumptions, including the likely types and numbers of construction plant, have been assumed based on the information provided in **Chapter 5: Demolition and Construction** of this ES, AECOM’s experience of similar projects, and the Applicant’s commitment to employing best practice in the industry through the Applicant’s own sustainability policies and community engagement.
- 10.92** For the purposes of assessing noise from construction activities  $L_w$  values for equipment to be used during the construction phase have been sourced from BS 5228 (Part 1). The source data which have been input into the calculation spread sheets are provided in **ES Volume III: Appendix E**.
- 10.93** To assess potential noise effects due to demolition and construction activities, certain periods have been selected from the demolition and construction phasing plan (see **Chapter 5: Demolition and Construction**) that are considered representative of periods of high noise generating activities. The periods chosen for assessment and corresponding site activities are presented in Table 10.7. It should be noted that, whenever more than one activity was scheduled for a certain time period, predictions were undertaken assuming the noisier activity was occurring to provide a worst case scenario.

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**Table 10.7 Demolition and Construction Assessment Periods**

Month	Site Activities
6	<ul style="list-style-type: none"> <li>S1 Substructure (including S1a, b, c)</li> <li>S2 Demolition</li> <li>S3 Demolition</li> </ul>
11	<ul style="list-style-type: none"> <li>S1 Substructure (including S1a, b, c)</li> <li>S2 Substructure</li> <li>S3 Substructure</li> </ul>
16	<ul style="list-style-type: none"> <li>S1a Frame, Envelope</li> <li>S1b Frame</li> <li>S1c Frame, Envelope</li> </ul>
21	<ul style="list-style-type: none"> <li>S1a Fit out</li> <li>S1b Envelope, Fit out</li> <li>S1c Fit out</li> <li>S2 Frame, Envelope</li> <li>S3 Frame, Envelope</li> </ul>

**10.94** Construction noise limits stated in LBTH's CoCP (Ref. 10-13) are presented in Table 10.8.

**Table 10.8 LBTH Construction Noise Limits**

Period	Hours	Residential / Commercial Premises dB L <sub>Aeq,T</sub>
Monday to Friday	0800 - 1800	75 dB(A)
Saturday	0800 - 1300	75 dB(A)

**10.95** Significance criteria to assess effects relating to construction noise have been derived from the LBTH's CoCP. A scale for the description of construction noise impacts as measured at the façade for daytime working outside dwellings and offices is shown in Table 10.9.

**Table 10.9 Scale for Description of Construction Noise Impacts**

Description	Impact Category
Daytime noise levels less than measured ambient noise level	Very Low
Daytime noise levels exceeding ambient noise level, but not exceeding LBTH criteria	Low
Daytime noise levels exceeding LBTH criteria, but not exceeding 5 dB above LBTH criteria	Medium
Daytime noise levels exceeding 5 dB above LBTH criteria	High

### Construction Vibration – Human Receptors

**10.96** BS 5228 Part 2 provides further guidance on the perception of vibration within occupied buildings. This provides a simple method of determining annoyance alongside evaluation of cosmetic damage associated with vibration.

**10.97** Table 10.10 details the PPV levels and effect on humans, and presents a scale for describing changes in vibration levels arising from construction activities and the subsequent effect on human receptors which is based on guidance vibration limits in BS 5228: Part 2 and LBTH MDD.

**Table 10.10 Guidance on Human Effects of Vibration Levels (PPV)**

Vibration Level	Magnitude of Impact
0.14 mm/s	Very Low
0.3 mm/s	Low
1.0 mm/s	Medium
3.0 mm/s	High

### Construction Vibration – Buildings

**10.98** In addition to human annoyance, building structures may be damaged by high levels of vibration. The levels of vibration that may cause building damage are far in excess of those that may cause annoyance. Consequently, if vibration levels are controlled to those relating to annoyance then it is highly unlikely that buildings will be damaged by demolition and construction vibration levels.

### Construction Traffic Noise

**10.99** Road traffic noise levels have been calculated with reference to methodology within the CRTN which contains an equation for the calculation of the Basic Noise Level (BNL) due to road traffic in terms of the 18-hour road traffic flow from 06:00 to 24:00 hours. The magnitude of a noise impact due to changes in road traffic noise levels has been assessed with reference to the assessment procedure outlined in the DMRB

**10.100** The criteria used for the assessment of changes in traffic noise arising from the demolition and construction works (referenced from Table 3.1 of the DMRB) are presented in Table 10.11.

**Table 10.11 Road Traffic Noise Assessment Criteria**

Noise Change Band, L <sub>A10,18h</sub>	Magnitude of Impact
0 dB(A)	No change
0.1 – 0.9 dB(A)	Very Low
1 – 2.9 dB(A)	Low
3 – 4.9 dB(A)	Medium
5 dB(A) or more	High

### Methodology for Determining Operational Effects

#### Road Traffic Noise

**10.101** The effects of operational road traffic noise have been assessed by considering the change in traffic flows following completion of the Proposed Development, with reference to both the CRTN (Ref. 10-21) and DMRB (Ref. 10-22). The following scenarios have been assessed using traffic data provided by the Transport Consultant:

- Scenario 1 – Existing baseline;
- Scenario 2 – Future baseline (without Development); and
- Scenario 3 – Future baseline + The Proposed Development.

**10.102** Calculation of road traffic noise for the 'with development' and 'without development' scenarios allowed the change in noise level due to road traffic associated with the Proposed Development to be derived using the BNL calculation methodology described in CRTN. The criteria applied for the assessment of changes in road traffic noise due to the Proposed Development are detailed in Table 10.11.

#### Building Services Noise

**10.103** The rating method detailed within BS 4142 is widely accepted by Local Authorities as a means of assessing building plant noise, and is referred to by LBTH in the MDD (Ref. 10-12). BS 4142 provides guidance as to

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the likely response at sensitive residential receptors to new fixed noise sources (e.g. building plant or services) through comparison of the 'rating level' of the new noise source with the existing 'background noise level'. The higher the 'rating' noise level is in comparison to the 'background' noise level, the greater the likelihood of noise complaints arising. BS 4142 requires separate analysis to be carried out for day and night time periods.

**10.104** The criteria used to assess changes in noise levels and the potential effects on sensitive residential receptors are based on guidance within BS 4142 and are presented in Table 10.12. The noise rating for the Proposed Development should not exceed the background noise level (derived from baseline noise measurement) as stated in Section 4.9 of the EIA Scoping Report submitted (July 2014).

**Table 10.12 BS 4142 Noise Rating**

Difference Between Rating Level <sup>1</sup> and Background Level <sup>2</sup>	Magnitude of Impact
No difference or less	Very Low
Between no difference and +5 dB(A)	Low
Between +5 and +10 dB(A)	Medium
+10 dB(A) or more	High

1 - The Rating Level is the noise level attributable to the new source(s), plus a 5 dB(A) penalty if the new source has tonal or intermittent characteristics;

2 - The Background Level is taken as the  $L_{A90}$ ; this is the ambient noise level in the absence of the source which is exceeded for 90% of the time.

**10.105** At this stage detailed information regarding fixed plant noise sources associated with the development are not known. Therefore, the criteria detailed in the table above have been used to set suitable noise criteria for any such noise sources affecting existing/proposed residential properties as a result of the Proposed Development.

## Limitations and Assumptions

**10.106** To assess the potential effect of the Proposed Development, it was necessary to determine the baseline conditions. It is considered that the baseline noise and vibration measurements, which were undertaken at the Site in March 2014 and June 2014, are representative of the typical noise and vibration environment of the Site.

**10.107** A series of assumptions were made regarding some elements of existing noise sources that have the potential to affect noise levels on the site. These assumptions are described in the noise monitoring methodology described in **ES Volume II, Appendix E** and are considered standard industry practice when modelling the propagation of noise.

**10.108** Construction noise predictions have been undertaken using typical items of plant that are used in such developments. These items of plant may not be fully representative of the plant that will be used during the construction process, which at this stage, are not yet known with any certainty. Noise predictions were carried out to represent a conservative scenario where all plant is operational on-site at the same time. Consequently, noise predictions may overestimate construction noise levels and can therefore be considered as worst case.

**10.109** It should be noted that the Site lies outside the 57 dB  $L_{Aeq,16h}$  noise contour for London City Airport (LCY) and is not in the proximity of LCY flight paths. Consequently, aircraft noise has not been specifically considered as a factor that may affect the suitability of the Site for development.

## Noise modelling

**10.110** To predict the noise levels at the facades of the proposed buildings within the Site, a noise model of the Proposed Development has been created using Cadna-A noise modelling software. The modelling methodology and output have been validated using the baseline noise measurements.

**10.111** Noise predictions of demolition and construction activities have also been undertaken using Cadna-A noise modelling software. Cadna-A applies methodologies within BS 5228 to predict demolition and construction noise.

**10.112** Details of the assumptions made within the assessment, together with the model input details can be found in **ES Volume III: Appendix E**.

## Assessment Methodology and Significance Criteria - Update 2015

### March 2015 ES Addendum

**10.113** Since the submission of the December 2014 ES, no changes have been made to the noise and vibration assessment methodology and the methodology presented in the December 2014 ES remains valid for the purposes of this ES Addendum.

### November 2015 Amendments

**10.114** The future operational year has been revised from 2017 to 2019 (refer **Chapter 5: Demolition and Construction**). Additionally, a reduction in commercial and office floor space is likely to result in a reduction in road traffic associated with the Amended Proposed Development. Consequently, operational road traffic flows have been updated to assess the potential change in road traffic noise using a future baseline and an operational opening year 'with development' of 2019.

**10.115** There have been no further changes to be made to the assessment methodology from that considered in the December 2014 ES or for the March 2015 ES Addendum. The methodology is considered to remain valid for the purposes of assessing the Amended Proposed Development.

## Baseline Conditions

### Monitoring Locations

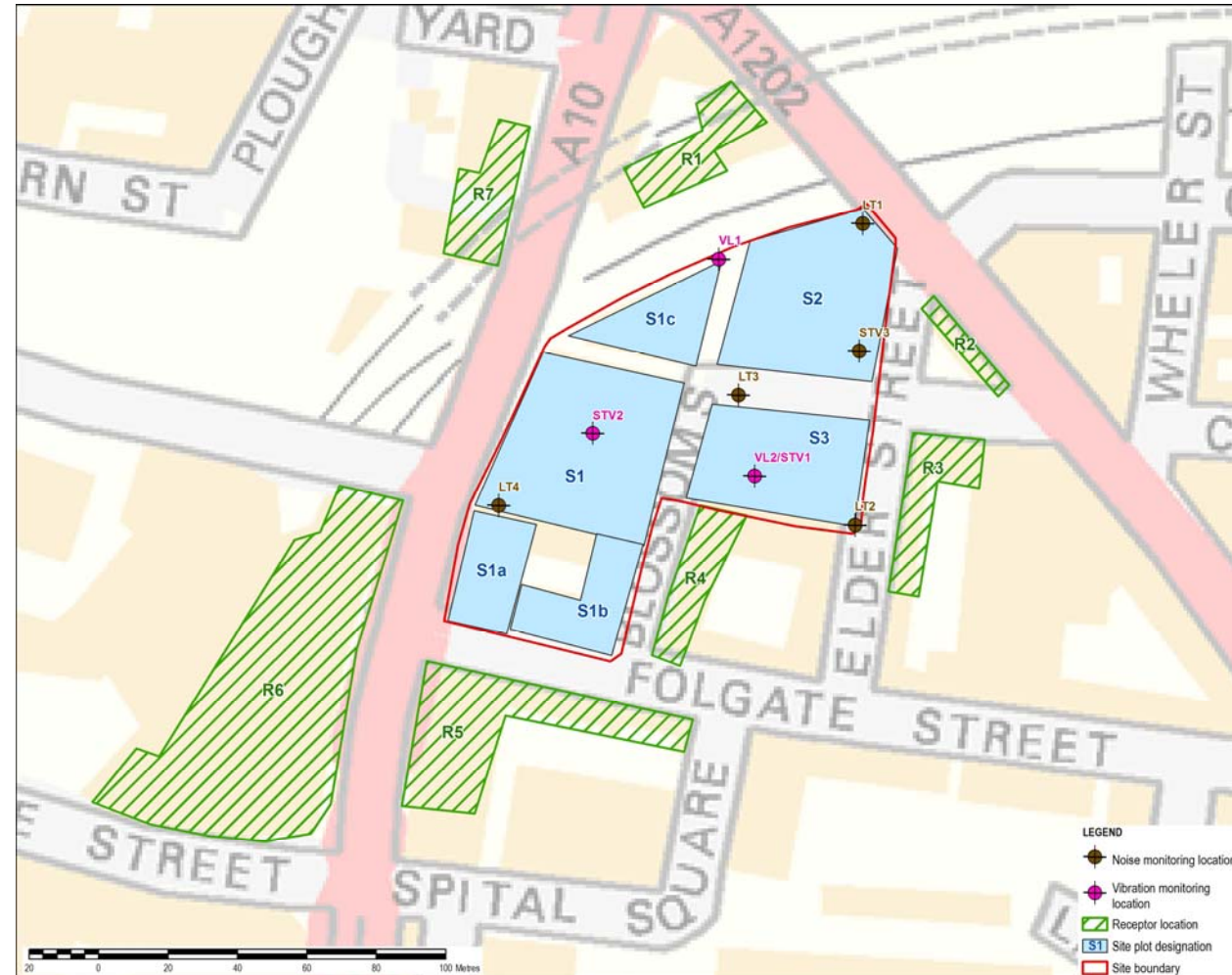
**10.116** The noise and vibration monitoring locations are presented in Figure 10-1 and summarized in Table 10.13. Table 10.18 presents the receptor locations associated with each monitoring location.

**Table 10.13 Summary of Monitoring Locations**

Monitoring location	Measurement start date and duration
LT1 (Noise)	4/4/2014 (6 days)
LT2 (Noise)	4/4/2014 (6 days)
LT3 (Noise)	28/3/2014 (7 days)
LT4 (Noise)	28/3/2014 (7 days)
VL1 (Vibration)	28/3/2014 (7 days)
VL2 (Vibration)	10/4/2014 (4 days)

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Figure 10.1 Noise and Vibration Monitoring Locations and Locations of Sensitive Receptors



## Noise Survey Results

10.117 The Site is located in an urban area within the LBTH. At the time of noise monitoring, the noise environment of the Site and surrounding area was identified as being influenced by several sources, most notably including:

- Rail traffic (overground railway located in a cutting to the north and east of the Site, and Central Line LUL running underneath the middle of the Site);
- Road traffic from the surrounding road network; and
- Aircraft flyover noise from City Airport which is located approximately 7 km from the Site.

10.118 It was noted during the Site visit that the dominant sources of noise at the Site were due to rail and road traffic with other sources making minimal contributions to the noise environment.

10.119 The long-term monitoring locations are presented in Figure 10-1 and the monitoring results are summarised in Table 10.14.

10.120 Detailed noise monitoring results are presented in *ES Volume III: Appendix E*.

Table 10.14 Summary of Noise Results - Long-Term Measurements (Free-field)

Position	Average Ambient Free Field Level dB L <sub>Aeq</sub> *		Lowest Background Level dB L <sub>A90</sub>	
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
LT1	72	69	58	49
LT2	57	55	49	44
LT3	62	61	53	52
LT4	71	69	58	54

\*A facade correction of -3 dB needs to be applied to levels measured at LT1, LT2 and LT4 to attain free-field values, which are used in site suitability assessments.

## Vibration Survey Results

10.121 The vibration environment at the Site is influenced by several sources including:

- Railway traffic (overground, located to the north and east);
- Railway traffic (underground, Central Line – runs through the Site);
- Road traffic on Commercial Street (negligible).

10.122 The vibration monitoring locations are presented in Figure 10-1 with each location chosen to identify levels of vibration from a specific existing source (either overground or LUL rail traffic). The results of the long-term vibration monitoring are summarised in Table 10.15.

Table 10.15 Summary of Vibration Results - Long Term Measurements

Position	Source	Period (date (time, 24hr))	Maximum* Daytime VDV ms <sup>-1.75</sup>	Maximum* Night-time VDV ms <sup>-1.75</sup>
VL1 (long term)	Overground rail traffic	28/3/14 (12:20) to 3/4/14 (11:20)	0.0702 (z-axis)	0.0433 (z-axis)
VL2 (long term)	LUL rail traffic	10/3/14 (11:40) to 14/4/14 (10:30)	0.0185 (z-axis)	0.0108 (z-axis)

\*Maximum VDV of complete day or night time periods over the measurement period

10.123 The results of the short-term vibration monitoring are summarised in Table 10.16.

Table 10.16 Summary of Vibration Results - Short Term Measurements

Position	Source	Period (date (time, 24hr))	Maximum Measured VDV ms <sup>-1.75</sup>
STV1	LUL rail traffic	4/4/14 (13:40) to (13:50)	0.0309 (z-axis)
STV2	LUL and overground rail traffic	14/4/14 (10:50) to (12:10)	0.0356 (z-axis)
STV3	LUL rail traffic	27/6/14 (10:05) to (12:15)	0.0136 (z-axis)

# 10 Noise and Vibration

## Sensitive Receptors

10.124 Sensitive receptors have been classed using AECOM's professional judgement depending on their use and subsequent sensitivity to noise and vibration as defined in Table 10.17 below.

**Table 10.17 Criteria Used to Define Sensitivity of Receptors**

Sensitivity	Description	Examples of Receptor Usage
High	Receptors where noise will significantly affect the function of a receptor	Auditoria/studios; Specialist medical/teaching centres; and Libraries.
Medium	Receptors where people or operations are particularly susceptible to noise	Residential; Quiet outdoor areas used for recreation; Conference facilities; Schools in daytime; and Hospitals/residential care homes.
Low	Receptors of low sensitivity to noise, where it may cause some distraction or disturbance	Offices; Restaurants; and Sports grounds when spectator or noise is not a normal part of the event and where quiet conditions are necessary (e.g. tennis, golf).
Very Low	Receptors where distraction or disturbance from noise is minimal	Residences and other buildings not occupied during working hours; Factories and working environments with existing high noise levels; and Sports grounds when spectator or noise is a normal part of the event.

10.125 The nearest noise sensitive receptors to the Site have been selected for assessment through consideration that, if noise is suitably controlled at these receptors, then it will be suitably controlled at all other sensitive receptors. The receptors identified are listed in Table 10.18, with their locations presented in Figure 10-1. Each receptor location has been assigned a long-term measurement location with associated noise level data used for the assessment purposes.

**Table 10.18 Locations of Noise and Vibration Sensitive Residential Receptors**

Receptor	Receptor Address	Corresponding Measurement Location	Receptor Type	Sensitivity
R1	20A Shoreditch High Street	LT1	Residential	Medium
R2	142 Commercial Street	LT1	Residential	Medium
R3	4 Elder Street, London	LT2	Residential	Medium
R4	1 Blossom Street	LT3	Residential	Medium
R5	9 Folgate Street	LT3	Residential	Medium
R6	4 Norton Folgate, London	LT4	Commercial	Low
R7	221 Shoreditch High Street,	LT4	Residential/Commercial	Medium

## Baseline Conditions - Update 2015

### March 2015 ES Addendum

10.126 Since submission of the December 2014 ES, no significant development has occurred in the area of the Site that may result in significant changes to the baseline conditions.

## November 2015 Amendments

10.127 It is considered that there have not been any material changes to the baseline since the submission of the December 2014 ES and March 2015 ES Addendum, and that the baseline prepared for the December 2014 ES remains valid for the consideration of the likely impacts arising from the Amended Proposed Development.

## Assessment of the Suitability of the Site for the Proposed Uses

10.128 This section assesses the suitability of the Site for development in terms of noise and vibration. Where internal noise and vibration levels (as specified in relevant British Standards) that are desirable for new developments are not achievable through a typical building construction as part of the Proposed Development, mitigation measures have been recommended.

### PPG24 Assessment - Overview

10.129 The PPG24 assessment covers the residential component of the Proposed Development which is contained within S3. The suitability of the Site for the office and retail components of the Proposed Development has been assessed using BS 8233 criteria.

10.130 PPG24 noise contour plots have been generated from Cadna-A and are presented in **ES Volume III: Appendix E**. These noise contours show the propagation of noise across the residential part of the Site in its current state.

10.131 NEC classifications for mixed noise sources at the Site boundaries are summarised Table 10.19 based on these noise contours.

**Table 10.19 NEC Category Summary**

Site boundary and measurement location	Daytime 07:00 – 23:00 Corrected Average Free-Field dB L <sub>Aeq</sub>	NEC Category	Night-time 23:00 – 07:00 Corrected Average Free- Field dB L <sub>Aeq</sub>	NEC Category
Elder Street (LT2)	54	A	52	B
Fleur de Lis Street (LT3)	62	B	61	C

10.132 The PPG 24 noise contours represent a worst case scenario and indicate that the proposed residential part of the Site is within NEC A and NEC B during the day, and NEC B and NEC C during the night.

10.133 In line with the guidance set out in Table 10.4, noise mitigation measures should therefore be considered for areas of the Site which will be exposed to levels of noise within NEC C so that suitable internal noise levels are achieved.

10.134 It should be noted that NECs refer to noise levels on the Site at a height of 1.2 m to 1.5 m above ground level. Consequently, further assessment was carried out at different heights to identify how noise levels change as the proposed building heights increase.

### Assessment of the Suitability of the Site for Development

10.135 To achieve the internal noise levels detailed in Table 10.5, external noise ingress must be controlled by the building facade. Glazing recommendations have been defined using the R<sub>w</sub>+C<sub>tr</sub> index, an approach commonly used to specify the sound insulation requirements of facades affected by traffic noise (urban road traffic and low speed rail noise), and are provided as three numerical values, for example 4-16-6. These values relate to the: glazing thickness – air gap – glazing thickness, each in millimetres (mm).

10.136 Noise predictions have been carried out to determine the highest predicted noise level at each proposed building facade. Predicted daytime and night-time noise levels on the building facades can be seen graphically in **ES Volume III, Appendix E**. The noise contour plots are colour coded to provide an indication of mitigation requirements along each proposed building facade. The mitigation colour coding assumes that:

# 10 Noise and Vibration

- A partially open window provides an  $R_w+C_{tr}$  of approximately 15 dB;
- Thermal double glazing provides an  $R_w+C_{tr}$  of approximately 30 dB;
- Acoustic laminate double glazing can provide an  $R_w+C_{tr}$  of up to 40 dB; and
- Secondary glazing can provide an  $R_w+C_{tr}$  of up to 50 dB.

**10.137** In addition to glazing, all residential properties with a requirement for glazing above  $R_w+C_{tr}$  15 dB should be fitted with ventilation to remove the need to ventilate the building using open windows and thus breaking the acoustic seal of the building envelope. Ventilation units can be either passive or mechanical and should be designed so they are capable of performing to the same acoustic specification as the associated glazing.

**10.138** Noise predictions have been carried out to identify the highest predicted noise level incident on each building façade. Results of noise predictions along with a summary of the mitigation required for each development site / building in order to allow the development to meet internal noise level requirements (see Table 10.5), together with the associated typical façade constructions are presented in Table 10.20. It is noted that potential attenuation effects due to shielding by other buildings or reductions in noise levels with height are not considered here, accordingly a lower specification glazing could be applicable to certain parts of the building facades.

**Table 10.20 Predicted External Façade Noise Levels and Example Mitigation Requirements**

Building	Highest Predicted Day time $L_{Aeq,8h}$ (dB)		Typical* $L_{AFmax}$ (dB)	Example Glazing Specification (glazing thickness – air gap – glazing thickness (mm))
	Highest Predicted Day time $L_{Aeq,8h}$ (dB)	Highest Predicted Night time $L_{Aeq,8h}$ (dB)		
S1 (retail)	69			4 – 12 - 6 mm Double glazing
S1 (offices)	69			6.8 – 16 - 6.8 mm Acoustic laminate double glazing, or similar
S1a (offices)	70			6.8 – 16 - 6.8 mm Acoustic laminate double glazing, or similar
S1b (offices)	63			4 – 12 - 6 mm Double glazing
S1c (offices)	68			6.8 - 16 - 6.8 mm Acoustic laminate double glazing, or similar
S2 (retail)	77			6.8 – 16 - 6.8 mm Acoustic laminate double glazing, or similar
S2 (offices)	77			16.8 – 16 - 16.8 mm Acoustic laminate double glazing, or similar
Building	Highest Predicted Day time $L_{Aeq,8h}$ (dB)	Highest Predicted Night time $L_{Aeq,8h}$ (dB)	Typical* $L_{AFmax}$ (dB)	Example Glazing Specification (glazing thickness – air gap – glazing thickness (mm))
S3 (residential)	59	58	72	6.8 – 16 - 6.8 mm Acoustic laminate double glazing, or similar

\* Calculated as the 99<sup>th</sup> percentile level over the night time measurement data series

**10.139** Noise predictions indicate that suitable internal noise levels can be achieved in the Proposed Development through implementation of appropriate noise mitigation measures. Consequently, the Site is considered to be suitable for its proposed use.

## Assessment of Noise in Outdoor Amenity Areas

**10.140** Guidance provided in BS 8233 states an upper guideline value of 55 dB  $L_{Aeq,T}$  for outdoor amenity areas (e.g. gardens and patios) that is acceptable in higher noise environments, such as sites within urban environments which applies to the Site.

**10.141** It is accepted in BS 8233 that achieving the guideline values may not be practicable in high noise environments. Consequently, it is recommended that balconies within the Proposed Development are designed to achieve as low noise level as practicable through screening or building design.

## Ground-Borne Vibration

**10.142** Measured VDV<sub>s</sub> for buildings within the Proposed Development presented in Table 10.15 and Table 10.16 are lower than the threshold values that indicate ‘Low probability for adverse comments’ in Table 10.6. These measured VDV<sub>s</sub> account for vibration contributions from all significant vibration sources.

**10.143** A summary of the measurement results and related measurement positions for each development site are shown in Table 10.21. Detailed information on vibration monitoring locations, the assessment methodology and vibration survey results are shown in **ES Volume III, Appendix E**.

**Table 10.21 Predicted vibration levels**

Site Plot Location	Related Measurement Position	Predicted VDV ( $ms^{-1.75}$ )		Ground-borne noise $L_{ASmax}$ (dB)
		Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	
S1	Basement	<0.2	<0.1	≤40 (basement)
S2	VL1/Elder Street Basement	<0.2	<0.1	≤40 (ground floor/basement)
S3	VL2/STV1/Elder Street Basement	<0.2	<0.1	≤40 (lower ground/basement)

\* Calculated as the 90<sup>th</sup> percentile level over the measurement data series

## Ground-Borne Noise

**10.144** The predicted ground-borne noise levels (presented in Table 10.21) are below 40 dB  $L_{ASmax}$  for all locations within the Site. Ground-borne noise levels generally reduce as the vibration travels up a building. As such, the highest levels of ground-borne noise levels occur in the basement areas and there is an approximately 2 dB reduction per floor through a building. The initial assessment indicates that the 35 dB  $L_{AFmax}$  requirement can be met at the proposed ground floors and above without any specific mitigation measures.

**10.145** For the lower ground floor level, implementation of either building vibration isolation or a ‘box in box’ structure to the habitable rooms should be able to achieve the LBTH 35 dB  $L_{AFmax}$  requirement for ground-borne noise. It should be noted that while building vibration isolation has the potential to allow the proposed dwellings to meet the lower ground-borne noise criterion it is potentially an expensive solution and will require specialist advice on suitable foundation and isolation methods.

## Site Suitability – Update 2015

### March 2015 ES Addendum

**10.146** As the footprint and heights of the Revised Scheme remain as assessed in the December 2014 ES there is not expected to be any changes in the screening of noise sources from existing buildings. As such the predicted façade noise levels and glazing recommendations presented in the December 2014 ES (refer Table 10.20) remain valid. Consequently, the Site is considered to be suitable for its proposed use.

### November 2015 Amendments

**10.147** There have been no changes to the building footprints since the December 2014 ES and March 2015 ES Addendum, which identifies the highest predicted noise level at each of the buildings within the Site. As such, the façade noise levels predicted and glazing recommendations presented in the December 2014 ES (refer Table 10.20) remain valid and the Site (comprising the Amended Proposed Development) is considered to be suitable for its proposed use.

# 10 Noise and Vibration

## Environmental Design and Management

**10.148** If applicable, the way that potential environmental impacts have been or will be avoided, prevented, reduced or off-set through design and / or management of the Proposed Development are outlined below and will be taken into account as part of the assessment of the potential effects. Proposed environmental enhancements are also described where relevant.

**10.149** The measures accounted for both the demolition and construction, and operational phases are outlined below.

### Demolition and Construction

**10.150** No design and / or management measures are proposed at this stage of the Proposed Development.

### Operational

**10.151** No design and / or management measures are proposed for the operational stage of the Proposed Development.

### Environmental Design and Management - Update 2015

March 2015 ES Addendum

**10.152** No further environmental design / and or management measures were considered.

November 2015 Amendments

**10.153** No further environmental design and / or management measures were considered.

## Potential Effects and Mitigation Measures

**10.154** This section discusses noise and vibration effects to sensitive receptors arising from the Proposed Development during the demolition and construction phase and during operation of the Proposed Development.

**10.155** Where significant adverse effects are predicted to occur, mitigation measures have been identified in order to reduce the magnitude of these effects to an acceptable level.

### Site Preparation, Demolition and Construction Effects

#### Noise Effects

**10.156** The range of predicted construction noise levels at the identified receptors during demolition and construction of the Proposed Development, including construction vehicle movements on-site, are presented in Table 10.22. The range of predicted noise levels demonstrates how noise levels will vary during representative periods of high levels of demolition and construction activity at specified stages during the works.

**Table 10.22 Predicted Construction Noise Levels**

Receptor	Predicted Construction Noise Level $L_{Aeq,1h}$ dB			
	Month 6	Month 11	Month 16	Month 21
R1	79	79	77	77
R2	79	79	70	76
R3	79	79	70	77
R4	83	83	81	80
R5	82	82	80	79

Receptor	Predicted Construction Noise Level $L_{Aeq,1h}$ dB			
	Month 6	Month 11	Month 16	Month 21
R6	77	77	75	74
R7	74	74	72	71

**10.157** Based on the predicted noise levels, the potential effect for each construction period assessed at each receptor is provided in Table 10.23.

**Table 10.23 Significance of Construction Noise Effects**

Receptor	Receptor sensitivity	Ambient Noise Level $L_{Aeq,t}$ dB at Receptor	Significance of Effect due to Demolition and Construction Activities			
			Month 6	Month 11	Month 16	Month 21
R1	Medium	69	Moderate	Moderate	Moderate	Moderate
R2	Medium	69	Moderate	Moderate	Minor	Moderate
R3	Medium	54	Moderate	Moderate	Minor	Moderate
R4	Medium	59	Major	Major	Major	Moderate
R5	Medium	59	Major	Major	Moderate	Moderate
R6	Low	68	Minor	Minor	Minor	Negligible
R7	Medium	68	Minor	Minor	Minor	Minor

**10.158** The impact from the demolition and construction noise activities summarised in Table 10.23 indicate that likely noise levels at noise sensitive receptors are predicted to range from **negligible** to **major adverse** effects. It is likely that major adverse noise effects will only occur at receptors directly adjacent to development sites where the demolition and construction works will be taking place.

**10.159** It should be noted that the construction noise predictions are based on anticipated worst case months that are representative of high periods of construction activity where over the course of a working day all plant are operational at all areas of all worksites. In reality, it is likely that the worst case noise levels predicted will only occur for limited periods of time when plant are operational at the closest location to sensitive receptors.

**10.160** Noise mitigation measures and noise management plans should be put into place in order to avoid or minimise the impact of noise levels and the corresponding effects on noise sensitive receptors during the works. The preferred approach for controlling construction noise is to reduce noise levels at source where possible, but with due regard to practicality. Sometimes a greater noise level may be acceptable if the overall construction time, and therefore length of disruption, is reduced.

**10.161** Measures are outlined within the 'Mitigation and Monitoring Measures' section and below is a summary of the measures proposed:

- Situating noisy plant away from sensitive locations;
- Use of barriers;
- Machinery run continuously shall be housed in a suitable acoustically lined enclosure;
- Vehicles, tools and plant use exhaust silencers;
- Pneumatic percussive tools should be fitted with mufflers or silencers
- Machines shut down when not in use;
- Avoid the use of impact tools where practicable;
- Hydraulic or electrical power equipment is used;
- Plant shall be maintained in good working order

**10.162** Adoption of these mitigation measures have the potential to reduce the magnitude of the noise impacts on surrounding receptors, resulting in likely **moderate adverse** effects (short term) as a worst case scenario.

# 10 Noise and Vibration

## Vibration Effects

**10.163** BS 5228 indicates that construction activities (particularly piling) usually only generate significant vibration effects when they are located within 20 m from sensitive locations. The potential impact depends on the type of piling, ground conditions, and receptor distance.

**10.164** Table 10.24 provides PPV levels for different piling techniques at various plan distances sourced from BS 5228 Part 2 (Ref. 10-19).

**Table 10.24 Example Piling Vibration Levels**

BS 5228 Reference No.	Soil Conditions	Piling Mode	Plan Distance (m)	PPV (mm/s)
101	Fill / dense ballast / London Clay	Augering	20	0.05
		Auger hitting base of hole	20	0.23
103	Fill clay	Augering	20	0.30
		Dollying casing	20	0.55
		Spinning off	20	0.44
104	Fill / sand / clay	Augering	15	0.10
		Auger hitting base of hole	14	0.30
		Mudding in	14	0.20
		Dollying casing	14	0.80

**10.165** As Table 10.25 outlines, the majority of existing vibration-sensitive receptors in the vicinity of the Site are located 10 metres or more away from the Site boundaries. The nearest existing sensitive residential receptor (R4 – address: 1 Blossom Street) is located at 1 m of the Site boundary.

**10.166** Based on the minimum separation distance between piling and the existing vibration-sensitive receptors, the example vibration levels in Table 10.24, and the construction works vibration criteria in Table 10.10; vibration levels from piling affecting sensitive receptors are unlikely to exceed a PPV of 1 mm/s (the level at which complaints are likely to be made by residents) for all sensitive receptors, except R4, see Table 10.25.

**Table 10.25 Distance of Vibration Receptors from the Site Boundary**

Receptor	Distance from the Site Boundary (m)	Potential Effect
R1	>20	Negligible
R2	10	Minor Adverse
R3	10	Minor Adverse
R4	1	Moderate Adverse
R5	10	Minor Adverse
R6	>20	Negligible
R7	>20	Negligible

**10.167** Therefore, vibration due to piling may have up to a **moderate adverse** effect on receptor location R4 depending on the location of piling in relation to the sensitive receptor. construction vibration effects for receptor locations, other than R4, are likely to be no worse than **minor adverse**.

**10.168** Mitigation measures should be put in place to ensure vibration effects are suitably controlled at R4. To ensure that potential vibration impacts due to piling are minimised when piling, it is recommended that a piling technique, such as auger piling, is adopted which is least likely to cause adverse vibration effects, to ensure that vibration is controlled to a **negligible to minor adverse** effect at worst at nearby receptors.

## Construction HGV / Road Traffic Noise

**10.169** Noise impacts that may arise due to construction traffic flows have been assessed based on information provided in **Chapter 5: Demolition and Construction** of this ES.

**10.170** A worst case number of daily construction movements (the daily average of movements for the worst case month) of 29 vehicles per day during the demolition phase has been used to assess potential demolition and construction traffic noise effects.

**10.171** Construction vehicles will follow a route which approaches the Site along Fleur De Lis Street, turn around within the Site S2 boundaries, and exit to the east on Commercial Street. An additional route will be used along Norton Folgate.

**10.172** An increase in vehicle movements on Commercial Street and Norton Folgate of 29 movements per day results in a percentage increase in road traffic of less than 1% (see baseline road traffic flows in Table 10.26). Typically, a 25% increase in road traffic relates to a 1 dB increase in noise. Consequently, an increase in road traffic of 1% will not result in an increase in noise of greater than 1 dB therefore according to the DMRB (Ref. 10-22) changes in road traffic noise due to construction traffic will result in a **negligible** effect on nearby sensitive receptors.

**10.173** Construction traffic on Fleur de Lis may result in an increase in noise at receptors adjacent to the road; however, it is unlikely that construction traffic movements will be of sufficient magnitude to result in significant noise effects. Consequently, it is estimated that construction traffic on Fleur de Lis will result in a **minor adverse** noise effect at nearby sensitive receptors.

**10.174** Although construction traffic has been predicted as having, at worst, an minor adverse effect, it is recommended that the following measures are employed as best practice to ensure that noise effects due to construction traffic remain insignificant. Measures are outlined within the 'Mitigation and Monitoring Measures' section and below is a summary of the measures proposed:

- Vehicles fitted with exhaust silencers;
- Vehicles maintained in good working order;
- Timeslots adopted for deliveries;
- Control of parking of vehicles near sensitive locations; and
- Clear signage for designated routes.

## Site Preparation, Demolition and Construction Effects - Update 2015

### March 2015 ES Addendum

**10.175** Since the submission of the December 2014 ES, no changes have been made to the demolition and construction methodology. Therefore the conclusions from the demolition and construction noise assessment presented in the December 2014 ES remains valid.

### November 2015 Amendments

**10.176** Taking into account the nature and scale of the proposed November 2015 Amendments, it is not considered that the Amended Proposed Development would result in any new or change to the likely effects and significance concluded within the December 2014 ES and March 2015 ES Addendum.

**10.177** It is considered that the likely residual effects concluded in the December 2014 ES and March 2015 ES Addendum remain valid.

## Effects Once the Site is Operational

### Road Traffic Noise

**10.178** The CRTN equations have been applied to the operational road traffic flow data in Table 10.26. Calculated BNLs and the changes in noise level between the baseline scenario (scenario 2) and full occupation of the Proposed Development (scenario 3) are presented in Table 10.27.

**10.179** The change in road traffic noise level has been calculated for each road link that road traffic associated with the Proposed Development is predicted to use. The resultant change in noise level is considered to be



# 10 Noise and Vibration

representative of the likely change in noise level that may be experienced at nearby noise sensitive receptors.

**Table 10.26 Changes in Road Traffic Flows due to the Operational Development**

Road Link	Description	Baseline Road Traffic Data		Future operational Road Traffic Data	
		AAWT*	HGV%	AAWT*	HGV%
1	Norton Folgate	18342	26	18724	26
2	Commercial Street	18675	13	18832	13
3	Folgate Street	1548	25	1655	28

\* Annual average weekday traffic

**Table 10.27 Changes in Road Traffic Noise due to Operational Development Road Traffic Flows**

Road Link	Description	Baseline BNL L <sub>A10,18h</sub> dB	Future Operational BNL L <sub>A10,18h</sub> dB	Difference dB	Significance
1	Norton Folgate	74.4	74.5	+0.1	Negligible
2	Commercial Street	72.5	72.5	0.0	Negligible
3	Folgate Street	63.5	64.2	+0.7	Negligible

**10.180** Comparison of calculated baseline BNLs with the future BNLs calculated from the predicted road traffic flows indicates that changes in road traffic flows as a result of the Proposed Development will result in a **negligible** effect on road traffic noise according to the criteria in Table 10.11.

### Building Services Plant Noise

**10.181** Table 10.28 presents the recommended operational noise limits for proposed building services plant experienced at nearby existing and proposed sensitive receptors. These operational noise limits have been derived from the background noise measurements as per the monitoring locations LT1 – LT4, presented in Table 10.14. The monitoring locations relevant to each sensitive receptor are shown within Table 10.28.

**10.182** Noise criteria presented in Table 10.12 define fixed plant noise as having a very low impact when the rating noise level does not exceed the measured background noise level.

**Table 10.28 Recommended Operational Noise Limits for Noise Sensitive Properties**

Receptor Group (associated monitoring location)	Daytime (07:00-23:00) Operational Noise Limit L <sub>Aeq,1 hour</sub> dB	Night-time (23:00-07:00) Operational Noise Limit L <sub>Aeq,5 minute</sub> dB
R1 (LT1)	58	49
R2 (LT1)	58	49
R3 (LT2)	49	44
R4 (LT3)	53	52
R5 (LT3)	53	52
R6 (LT4)	58	54
R7 (LT4)	58	54

**10.183** It is assumed that the building services plant will operate as intended and will not result in any noise which is tonal or impulsive in nature. Should the noise exhibit any acoustic features such as a continuous note (whine, hiss, screech, hum, etc.) or contain distinct impulses (bangs, clicks, clatters or thumps) then a 5 dB 'penalty' / correction should be imposed to the rating to account for the higher potential for annoyance, as described in BS 4142.

**10.184** It is assumed that the building services plant will be designed to achieve the recommended limits shown in Table 10.28; the potential noise arising from operational building services is likely to result in **negligible to minor adverse** effects.

### Effects Once the Site is Operational – Update 2015

#### March 2015 ES Addendum

**10.185** Since submission of the December 2014 ES, no material changes have been made to the operational traffic flows or building services plant. Therefore all conclusions from the completed and operational noise assessment presented in the December 2014 ES remain valid.

#### November 2015 Amendments

**10.186** The revised opening year of 2019 and the amendment to the commercial and office floor space in the Amended Proposed Development has required a reassessment of road traffic flows and a subsequent reassessment of potential changes in road traffic noise levels. The change in road traffic noise level has been calculated for each road link that road traffic associated with the Amended Proposed Development is considered to use. The predicted change in noise level is considered to be representative of the potential change in noise level that may be experienced at nearby noise sensitive receptors. Road traffic data are presented in Table 10.26A and results of calculations are presented in Table 10.27A.

**Table 10.26A Road Traffic Data for November 2015 Amendments**

Road Link	Description	Baseline Road Traffic Data		Future operational Road Traffic Data	
		AAWT*	HGV%	AAWT*	HGV%
1	Norton Folgate	19198	26	19551	26
2	Commercial Street	19545	13	19701	13
3	Folgate Street	1620	25	1717	26

\* Annual average weekday traffic

**Table 10.27A Changes in Road Traffic Noise for November 2015 Amendments**

Road Link	Description	Baseline BNL L <sub>A10,18h</sub> dB	Future Operational BNL L <sub>A10,18h</sub> dB	Difference dB	Significance
1	Norton Folgate	74.5	74.5	0.0	Negligible
2	Commercial Street	72.6	72.6	0.0	Negligible
3	Folgate Street	63.6	64.1	+0.5	Negligible

**10.187** Comparison of calculated baseline BNLs with the future BNLs calculated from the November 2015 amended road traffic flows indicates that changes arising from the Amended Proposed Development will result in a **negligible** effect on road traffic noise according to the assessment criteria (refer Table 10.11).

### Mitigation and Monitoring Measures

**10.188** This section outlines the mitigation measures proposed, that are over-and-above the environmental design and management measures discussed previously. Where appropriate, future monitoring and / or environmental management measures required to verify the effect predictions and/or fine tune mitigation measures, or ensure the potential effects are adequately controlled, are also outlined.

**10.189** The mitigation measures relating to both the demolition and construction and operational phases are outlined below.

# 10 Noise and Vibration

## Demolition and Construction Phase

**10.190** On-site, the implementation of good industry standards, guidance and practice procedures (i.e. Considerate Contractors scheme) will be followed in order to minimise noise effects. Noise and vibration will be managed to reduce impacts, and mitigation measures will be documented within a Construction Environmental Management Plan (CEMP), which will take into account relevant key guidance documents such as the LBTH CoCP and the GLA. Should construction activities be scheduled outside of normal working periods stipulated by LBTH (as defined in LBTH CoCP and **Chapter 5: Demolition and Construction**), consent will be required through the Section 61 process before these activities can commence.

### Mitigation of Demolition and Construction Noise

- Noisy plant or equipment shall be situated as far as possible from noise sensitive buildings; and
  - Barriers (e.g. site huts, acoustic sheds or partitions) will be used to reduce noise reaching noise sensitive buildings.
- 10.191** In addition to the mitigation measures listed above, the following provisions will be adhered to wherever practicable:
- Vehicles and mechanical plant used for the purpose of the works shall be fitted with effective exhaust silencers, maintained in good and efficient working order and operated in such a manner as to minimise noise emissions. The contractor shall ensure that all plant complies with the relevant statutory requirements;
  - Machines in intermittent use should be shut down or throttled down to a minimum when not in use;
  - Compressors should be fitted with properly lined and sealed acoustic covers which should be kept closed whenever in use;
  - Noise emitting machinery which is required to run continuously shall be housed in a suitable acoustically lined enclosure;
  - Pneumatic percussive tools should be fitted with mufflers or silencers of the type recommended by the manufacturers;
  - Equipment which breaks concrete, brickwork or masonry by bending or bursting or “nibbling” shall be used in preference to percussive tools. Avoid the use of impact tools where the Site is close to occupied premises;
  - Rotary drills and bursters activated by hydraulic, chemical or electrical power shall be used for excavating hard or extrusive material;
  - Equipment powered by mains electricity shall be used in preference to equipment powered by internal combustion engine or locally generated electricity;
  - Neither any part of the works nor any maintenance of plant shall be carried out in such a manner as to cause unnecessary noise except in the case of an emergency when the work is absolutely necessary for the saving of life or property or the safety of the works; and
  - Plant shall be maintained in good working order so that extraneous noise from mechanical vibration, creaking and squeaking is kept to a minimum.

### Mitigation of Demolition and Construction Vibration

**10.192** Recommended that a piling technique, such as auger piling, is adopted which is less likely to cause adverse vibration effects.

### Mitigation of Construction Traffic Noise

- Vehicles employed for any activity associated with the construction works will, where reasonably practicable:
  - be fitted with effective exhaust silencers; and
  - shall be maintained in good working order; and
  - operated in a manner such that noise emissions are controlled and limited as far as reasonably practicable;

- Time slots are adopted for deliveries to ensure that convoys of vehicles do not arrive simultaneously and to avoid unnecessary idling on site;
- Strict control to prevent temporary parking of construction vehicles in the vicinity of noise sensitive receptors near the Site; and
- The use of sufficient clear signage to ensure that construction vehicles use only designated routes.

## Mitigation and Monitoring Measures - Update 2015

### March 2015 ES Addendum

**10.193** No additional mitigation measures or changes to those measures identified previously are assessed as being required to alleviate the impacts associated with the proposed changes.

### November 2015 Amendments

**10.194** No additional mitigation measures or changes to those measures identified previously are assessed as being required to alleviate the impacts associated with the November 2015 Amendments.

## Residual Effects and Conclusions

### Residual Effects – Update 2015

**10.195** ~~The residual noise effects resulting from the Proposed Development are summarised in Table 10.29 below~~ presents the residual effects following the assessment of the Amended Proposed Development.

**Table 10.29 Summary of Noise and Vibration Residual Effects**

Resource / Receptor	Effect (incorp. environmental design & management measures)	Mitigation and Monitoring	Residual Effect (incorp. mitigation & monitoring)	Significance Conclusion
<b>R1 – 20a Shoreditch High Street</b>				
Demolition and Construction (Noise)	Moderate Adverse	Maximise the distance between source and sensitive receptor. Implement best practice measures (BPM) noise control measures across Site through a CEMP	Minor Adverse	Not Significant
Demolition and Construction (Vibration)	Minor Adverse	Maximise the distance between source and sensitive receptor. Utilise piling methods that generate low levels of vibration where practicable	Negligible	Not Significant
Demolition and Construction Traffic	Negligible	None	Negligible	Not Significant
Noise from Building Services Plant	Negligible	None	Negligible	Not Significant
Operational Traffic (Noise)	Negligible	None	Negligible	Not Significant
<b>R2 – 142 Commercial Street</b>				
Demolition and Construction (Noise)	Moderate Adverse	Maximise the distance between source and sensitive receptor. Implement BPM noise control measures across Site through a CEMP	Minor Adverse	Not Significant
Demolition and	Minor Adverse	Maximise the distance between source and sensitive receptor. Utilise piling methods that generate low	Negligible	Not Significant

# 10 Noise and Vibration

Resource / Receptor	Effect (incorp. environmental design & management measures)	Mitigation and Monitoring	Residual Effect (incorp. mitigation & monitoring)	Significance Conclusion
Construction (Vibration)		levels of vibration where practicable		
Demolition and Construction Traffic	Negligible	None	<b>Negligible</b>	<b>Not Significant</b>
Noise from Building Services Plant	Negligible	None	<b>Negligible</b>	<b>Not Significant</b>
Operational Traffic (Noise)	Negligible	None	<b>Negligible</b>	<b>Not Significant</b>
<b>R3 – 4 Elder Street</b>				
Demolition and Construction (Noise)	Moderate Adverse	Maximise the distance between source and sensitive receptor. Implement BPM noise control measures across Site through a CEMP	<b>Minor Adverse</b>	<b>Not Significant</b>
Demolition and Construction (Vibration)	Minor Adverse	Maximise the distance between source and sensitive receptor. Utilise piling methods that generate low levels of vibration where practicable	<b>Negligible</b>	<b>Not Significant</b>
Demolition and Construction Traffic	Negligible	None	<b>Negligible</b>	<b>Not Significant</b>
Noise from Building Services Plant	Negligible	None	<b>Negligible</b>	<b>Not Significant</b>
Operational Traffic (Noise)	Negligible	None	<b>Negligible</b>	<b>Not Significant</b>
<b>R4 – 1 Blossom Street</b>				
Demolition and Construction (Noise)	Major Adverse	Maximise the distance between source and sensitive receptor. Implement BPM noise control measures across Site through a CEMP	<b>Moderate Adverse</b>	<b>Significant</b>
Demolition and Construction (Vibration)	Moderate Adverse	Maximise the distance between source and sensitive receptor. Utilise piling methods that generate low levels of vibration where practicable	<b>Minor Adverse</b>	<b>Not Significant</b>
Demolition and Construction Traffic	Negligible	None	<b>Negligible</b>	<b>Not Significant</b>
Noise from Building Services Plant	Negligible	None	<b>Negligible</b>	<b>Not Significant</b>
Operational Traffic	Negligible	None	<b>Negligible</b>	<b>Not Significant</b>

Resource / Receptor	Effect (incorp. environmental design & management measures)	Mitigation and Monitoring	Residual Effect (incorp. mitigation & monitoring)	Significance Conclusion
(Noise)				
<b>R5 – 9 Folgate Street</b>				
Demolition and Construction (Noise)	Major Adverse	Maximise the distance between source and sensitive receptor. Implement BPM noise control measures across Site through a CEMP	<b>Moderate Adverse</b>	<b>Significant</b>
Demolition and Construction (Vibration)	Minor Adverse	Maximise the distance between source and sensitive receptor. Utilise piling methods that generate low levels of vibration where practicable	<b>Negligible</b>	<b>Not Significant</b>
Demolition and Construction Traffic	Negligible	None	<b>Negligible</b>	<b>Not Significant</b>
Noise from Building Services Plant	Negligible	None	<b>Negligible</b>	<b>Not Significant</b>
Operational Traffic (Noise)	Negligible	None	<b>Negligible</b>	<b>Not Significant</b>
<b>R6 – 4 Norton Folgate</b>				
Demolition and Construction (Noise)	Negligible	None	<b>Negligible</b>	<b>Not Significant</b>
Demolition and Construction (Vibration)	Minor Adverse	Maximise the distance between source and sensitive receptor. Utilise piling methods that generate low levels of vibration where practicable	<b>Negligible</b>	<b>Not Significant</b>
Demolition and Construction Traffic	Negligible	None	<b>Negligible</b>	<b>Not Significant</b>
Noise from Building Services Plant	Negligible	None	<b>Negligible</b>	<b>Not Significant</b>
Operational Traffic (Noise)	Negligible	None	<b>Negligible</b>	<b>Not Significant</b>
<b>R7 – 221 Shoreditch High Street</b>				
Demolition and Construction (Noise)	Minor Adverse	Maximise the distance between source and sensitive receptor. Implement BPM noise control measures across Site through a CEMP	<b>Negligible</b>	<b>Not Significant</b>
Demolition and Construction (Vibration)	Minor Adverse	Maximise the distance between source and sensitive receptor. Utilise piling methods that generate low levels of vibration where practicable	<b>Negligible</b>	<b>Not Significant</b>
Demolition and Construction Traffic	Negligible	None	<b>Negligible</b>	<b>Not Significant</b>

# 10 Noise and Vibration

Resource / Receptor	Effect (incorp. environmental design & management measures)	Mitigation and Monitoring	Residual Effect (incorp. mitigation & monitoring)	Significance Conclusion
Noise from Building Services Plant	Negligible	None	Negligible	Not Significant
Operational Traffic (Noise)	Negligible	None	Negligible	Not Significant

## Conclusion – Update 2015

**10.196** Overall, the Amended Proposed Development does not result in any changes to the noise and vibration effects and significance presented in the December 2014 ES and March 2015 ES Addendum. As such, the conclusions set out within the March 2015 ES Addendum and the December 2014 ES remain valid.

## Effect Interactions and Cumulative Effect Assessment

### Assessment of Combined Effect of Individual Effects on a Single Receptor

**10.197** The combined effect of individual effects occurs when a single receptor is affected by more than one effect at any point in time. An exercise which tabulates the residual effects identified within the ES against relevant receptors, and identifies the potential for combined cumulative effects, has been undertaken.

**10.198** Reference should be made to **Chapter 16: Effect Interactions** for this ES for further details.

### Assessment of Cumulative Effect of the Proposed Development with Other Development Schemes

**10.199** This section assesses the potential effects of the Proposed Development in combination with the potential effects of other development schemes within the surrounding area. Based on the distance between the site and the identified cumulative schemes (identified in **Chapter 2: EIA Methodology** of this ES) there is potential for cumulative noise effects.

**10.200** There are six schemes in proximity to the Proposed Development which have the potential to result in cumulative effects, those being:

- Principal Place;
- The Stage, Shoreditch;
- Silwex House;
- 115 Curtain Road;
- Electricity Sub Station, Hearn Street; and
- Bishopsgate Goodsyrd.

**10.201** Considering the existing noise levels in the area and the acoustic screening provided by the intervening buildings, any schemes beyond the developments identified above are unlikely to add to the cumulative noise levels.

### Demolition and Construction Effects

**10.202** The demolition and construction phase of the Proposed Development will have the greatest potential to result in cumulative noise effects. It is not unusual for demolition and construction to take place on more than one development site in proximity to each other (the nearest other development site to the current development is approximately 20 m from the Site boundary), particularly in Central London, and the

contractor will undertake regular liaison meetings and reviews with neighbouring sites to plan works so that they do not cause unnecessary disruption.

**10.203** Additional noise effects upon the identified receptors may result in the event that demolition and construction works take place simultaneously at both the Proposed Development and the other developments listed above. The precise scale of additional noise effects will be dependent on the exact works taking place at each location; however the use of site hoardings and compliance with the mitigation measures detailed within this chapter will reduce these effects as far as possible. It has been assumed that the other developments will also be required to incorporate best available mitigation measures during their demolition and construction phases and that compliance will be monitored by LBTH.

**10.204** Detailed assessments of construction noise are not available for the other developments listed above so it is not possible to undertake a quantitative assessment of the cumulative noise effects. However, the number of other development schemes close to the Site means that cumulative construction impacts of an adverse nature are likely, with the degree of potential effect dependent on the location of the receptor relative to the Site and other development schemes considered / under construction.

**10.205** In view of this information, care should be taken to manage the works so that sensitive receptors are not subject to significant adverse cumulative levels of demolition/construction noise for extended periods of time due to simultaneous demolition and construction activities on adjacent sites.

### Operational Effects

#### Building Services Noise

**10.206** It is expected that building services noise from the cumulative schemes will be designed to achieve operational noise limits at the nearest noise sensitive receptor to each development. Consequently, it is considered that cumulative effect of building services plant noise would remain **negligible** assuming the same rating criteria are adopted for those developments as for the Proposed Development.

#### Operational Road Traffic

**10.207** The road traffic data used in the road traffic noise assessment contains a contribution from cumulative schemes and has been assessed against the current baseline flows. Therefore the results of the road traffic noise assessment (see Table 10.27) include the contribution of road traffic flows associated with the cumulative developments. Consequently, the cumulative effect of road traffic noise is **negligible** as presented in the Potential Effects and Mitigation Measures section above.

## Assessment of Cumulative Effect of the Site with Other Development Schemes - Update 2015

### March 2015 ES Addendum

**10.208** Cumulative impacts were assessed as negligible during demolition and construction and once the Proposed Development is completed and occupied in the December 2014 ES. As the list of cumulative schemes remains unchanged, the Cumulative Impact Assessment presented in the December 2014 ES remains valid.

### November 2015 Amendments

**10.209** The update to the cumulative schemes has been reviewed and an additional cumulative scheme has been identified at the location 201-207 Shoreditch High Street and 1 Fairchild Street. As concluded for the cumulative assessment presented within the December 2014 ES, considering the location of the scheme, the existing noise levels of the dense urban area, the assumption that the scheme employs appropriate mitigate and industry best practice, and the intervening buildings providing acoustic screening, it is unlikely that the additional scheme would significantly add to the cumulative noise levels to sensitive receptors.

**10.210** Consequently, although an additional cumulative development scheme has been identified, the conclusions of the cumulative noise and vibration assessment presented in the March 2015 ES Addendum and December 2014 ES remains valid.

# 10 Noise and Vibration

## Summary of the 2011 Consented Scheme

**10.211** An environmental noise report was prepared (October 2010) and provided an assessment of traffic noise effects to residential habitable rooms and offices, train noise and vibration effects into the development, noise and vibration effects from building services plant to existing and proposed residential properties and design of internal structures.

**10.212** The report made the following conclusions:

- Noise levels in the areas around the Site are considered to be typical of a city centre location with the main noise source being road traffic;
- Mitigation measures are recommended to minimise road traffic noise effects and consist of residential window treatments;
- Vibration effects caused by local train and road traffic movements are assessed as being within acceptable limits for residential and commercial buildings; and
- Noise emissions caused predominantly by external mechanical plant will be controlled to achieve acceptable levels of environmental noise.

## References

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- Ref. 10-2 Department for Communities and Local Government (DCLG), (2012) National Planning Policy Framework (NPPF)
- Ref. 10-3 Department of the Environment Planning Policy Guidance: Planning and Noise PPG 24 (1994).
- Ref. 10-4 Department for Communities and Local Government (DCLG), (2014) National Planning Practice Guidance.
- Ref. 10-5 Noise Policy Statement for England (2010), Department for Environment Food and Rural Affairs.
- Ref. 10-6 Greater London Authority, (2012); The London Plan – Spatial Development Strategy for Greater London.
- Ref. 10-7 Greater London Authority (2013): Revised Early Minor Alterations to the London Plan.
- Ref. 10-8 Greater London Authority, (2014); Draft Further Alterations to the London Plan.
- Ref. 10-9 Greater London Authority, (2004); City Soundings: The Mayor's London Ambient Noise Strategy.
- Ref. 10-10 Greater London Authority, (2014); The London Plan Supplementary Planning Guidance – Sustainable Design and Construction.
- Ref. 10-11 London Borough of Tower Hamlets, (2010); Core Strategy Development Plan Document.
- Ref. 10-12 London Borough of Tower Hamlets, (2013) Managing Development Document.
- Ref. 10-13 London Borough of Tower Hamlets, (2006); Code of Construction Practice.
- Ref. 10-14 London Borough of Tower Hamlets, (2012); EIA Scoping Guidance V2
- Ref. 10-15 BS 4142:1997 - Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas, BSi, London.
- Ref. 10-16 BS 7445 - Description and Measurement of Environmental Noise. Part 2: 1991 - Guide to the Acquisition of Data Pertinent to Land Use, BSi, London.
- Ref. 10-17 BS 8233:2014 – Guidance on sound insulation and noise reduction for buildings, BSi, London.
- Ref. 10-18 BS 6472:2008 - Guide to Evaluation of Human Exposure to Vibration in Buildings, BSi, London.
- Ref. 10-19 BS5228: 2009+A1:2014 - Noise and Vibration Control on Construction and Open Proposed Developments, BSi, London.
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- Ref. 10-21 Department of Transport/Welsh Office, (1998); Calculation of Road Traffic Noise.
- Ref. 10-22 Highways Agency, (2011); Design Manual for Road and Bridges Volume 11 Section 3 Part 7-Traffic Noise and Vibration.
- Ref. 10-23 British Council for Offices (BCO), (2009), Guide to Specification, Acoustics
- Ref. 10-24 Guidelines for Community Noise, (1999) World Health Organisation.
- Ref. 10-25 Transport for London, (2012), G1323 Noise and Vibration Asset Design Guidance.
- Ref. 10-26 Greater London Authority, (2015); The London Plan: Spatial Proposed Development Strategy for Greater London (Consolidated with Alterations since 2011).
- Ref. 10-27 Greater London Authority, (2015); Minor Alterations to The London Plan: Spatial Proposed Development Strategy for Greater London (Consolidated with Alterations since 2011).

