Parker House

Planning & Conservation Area Consent Applications

SD10: Noise Assessment

Prepared for Camden Council & E C Harris

November 2012

paul davis + partners
architects urban designers

London Borough of Camden

Parker House, Camden

Noise Assessment

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Executive Summary

Camden Council has appointed Peter Brett Associates LLP to undertake a noise assessment of a proposed residential development on Parker Street, Covent Garden. The council proposes to redevelop the existing shelter for homeless people into residential apartments.

The assessment has followed the principles of the National Planning Policy Framework and the policy requirements of Camden Council.

It has been determined that the site is suitable for residential development, in terms of the external noise levels.

The sound reduction performance required of the external building fabric has been assessed to ensure that the internal noise levels meet the criteria in British Standard 8233.

A qualitative assessment of construction works has been undertaken and noise limits suggested.

On the basis of this assessment, it is considered that noise does not pose a material constraint to the development of the site as currently proposed.

1 Introduction

1.1.1 Camden Council has appointed Peter Brett Associates LLP to undertake a noise assessment of their proposed development at Parker Street House, Covent Garden. The council proposes to redevelop the building to provide 43 residential units, three of which will be social rented.

1.1.2 The scope of the noise assessment includes consideration of the existing noise climate at the site, the suitability of the building for the proposed use, and the sound reduction performance requirements of the external building.

1.1.3 This report is based on noise surveys undertaken at the site, covering a full 24 hour period.

1.1.4 Whilst every effort has been made to ensure that this report is easy to understand, it is technical in nature; to assist the reader, an introduction to noise and an explanation of the terminology used in this report is contained in Appendix A.

2 Site Description

2.1 Existing Site Layout

2.1.1 The building, which is currently a homeless hostel, is located on Parker Street in Covent Garden. It is bordered by Parker Street to the south-east, and other buildings to the other three sides. These buildings include a mix of residential and commercial premises. The New London Theatre lies approximately 15m to the south-west of the site at its closest point.

2.1.2 The closest noise-sensitive receptors are Aldwych Buildings, which lie immediately to the south-west of the site, the properties on Macklin Street to the rear of the site, including St Joseph's Primary School, and properties on the other side of Parker Street.

2.2 Proposed Development

2.2.1 The applicant is seeking permission to redevelop the building to provide 43 residential units, three of which would be social rented. The proposed development, which is proposed over seven storeys (lower ground, ground and five upper floors) as shown in the Paul Davis and Partners' application drawings.

2.2.2 It is understood that no mechanical plant is proposed on the roof or external areas as part of the development.

3 Policy and Guidance

3.1 Local Authority Consultation

3.1.1 Camden Council's Environmental Health Department has been consulted as part of this assessment, to ensure their views are taken into account.

3.1.2 It was agreed that:

- The development should take account of Policy DP28 of the council's Local Development Framework.
- Noise from building services plant, where included, should be designed to achieve the noise limits set out in Policy DP28 of the council's Local Development Framework. It is understood that no plant is proposed as part of the development.
- A combination of a 24 hour measurement at roof level and shorter measurements at ground floor level would be acceptable. It would be acceptable to approximate the 24 hour noise levels at ground floor level using the 'comparative measurements' method set out in the *Calculation of Road Traffic Noise*.
- A qualitative assessment of construction noise would be sufficient at this stage.

3.2 National Planning Policy Framework

3.2.1 The Department for Communities and Local Government published the *National Planning Policy* Framework (NPPF) on 27th March 2012 and upon its publication, the majority of planning policy statements and guidance notes were withdrawn, including Planning Policy Guidance 24 *Planning and Noise*, which had contained the national policy position on noise from 1994.

3.2.2 The NPPF contains four aims, which are set out at paragraph 123 in Section 11 of the document, titled *Conserving and enhancing the natural environment*:

"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."*

3.2.3 There are two footnotes to the above guidance. The first footnote refers to the *Explanatory Note of the Noise Policy Statement for England*, which defines both *"significant adverse impacts on health and quality of life"* and *"adverse impacts on health and quality of life"* as described in the first two bullet points.

3.2.4 The second footnote indicates that the third bullet point is *"subject to the provisions of the Environmental Protection Act 1990 and other relevant law"*.

3.2.5 The NPPF states that planning decisions should be made in accordance with the Local Development Plans. It states in Annex 1 *Implementation*:

"210 Planning law requires that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise.

211 For the purposes of decision-taking, the policies in the Local Plan (and the London Plan) should not be considered out-of-date simply because they were adopted prior to the publication of this Framework.

212 However, the policies contained in this Framework are material considerations which local planning authorities should take into account from the day of its publication. The Framework must also be taken into account in the preparation of plans.

213 Plans may, therefore, need to be revised to take into account the policies in this Framework. This should be progressed as quickly as possible, either through a partial review or by preparing a new plan.

214 For 12 months from the day of publication, decision-takers may continue to give full weight to relevant policies adopted since 2004 even if there is a limited degree of conflict with this Framework.

215 In other cases and following this 12-month period, due weight should be given to relevant policies in existing plans according to their degree of consistency with this framework (the closer the policies in the plan to the policies in the Framework, the greater the weight that may be given)."

3.3 Noise Policy Statement for England

3.3.1 The Department for Environment Food and Rural Affairs published the *Noise Policy Statement for England* (NPSE) in March 2010. The explanatory note of NPSE defines the terms used in the NPPF:

"2.20 There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

2.21 Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur."

3.3.2 The NPSE does not define the SOAEL numerically, stating at paragraph 2.22:

"2.22 It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."

3.3.3 There are three aims in the NPSE, which match, and expand upon, the first two bullet points in paragraph 123 of the NPPF and add a third aim that relates to a wider improvement in health and quality of life (the bold text is in the NPSE):

"The first aim of the Noise Policy Statement for England

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

2.23 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development (paragraph 1.8).

The second aim of the Noise Policy Statement for England

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

2.24 The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into

account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.

The third aim of the Noise Policy Statement for England

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

2.25 This aim seeks, where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development (paragraph 1.8), recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim."

3.3.4 It is clear that noise that would lead to significant adverse effects should be avoided, although there is no definition as to what constitutes a significant adverse effect. Similarly, noise should be mitigated where it is high enough to lead to adverse effects, but not so high that it leads to significant adverse effects.

3.4 The London Plan

3.4.1 The London Plan, titled *Spatial Development Strategy for Greater London* (July 2011) provides the policy context for managing noise through the regional planning process. Policy 7.15 *Reducing Noise and Enhancing Soundscapes* is relevant to the current proposals:

"Planning Decisions

B 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

c promoting new technologies and improved practices to reduce noise at source."

3.5 Local Development Framework

3.5.1 Camden Council adopted its Local Development Framework (LDF) in November 2010. The LDF sets out the council's *"strategy for managing growth and development in the borough, including where new homes, jobs and infrastructure will be located."*

3.5.2 Policy DP28 *Noise and Vibration* states:

"The Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for:

a) development likely to generate noise pollution; or

b) development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided.

Development that exceeds Camden's Noise and Vibration Thresholds will not be permitted.

The Council will only grant permission for plant or machinery if it can be operated without cause or harm to amenity and does not exceed our noise thresholds.

The Council will seek to minimise the impact on local amenity from the demolition and construction phases of development. Where these phases are likely to cause harm, conditions and planning obligations may be used to minimise the impact."

3.5.3 The council's *Noise and Vibration Thresholds* are set out in the text supporting Policy DP28.

3.5.4 Tables A and B in the supporting text relate to the road traffic and railway noise thresholds above which either planning permission will not be granted, or above which attenuation measures will be required. The guidance in Tables A and B is replicated in **Table 3.1**. Only the guidance relating to road traffic noise is shown in **Table 3.1** as railway noise is not present at Parker Street House.

Noise description and location of measurement	Period	Time	Permission Refused(1)	Attenuation Required(2)
Noise at 1m external to a sensitive façade	Day	0700-1900	72dB $L_{Aeq,12hrs}$	62dB $L_{Aeq,12hrs}$
	Evening	1900-2300	72dB $L_{Aeq,4hrs}$	57dB $L_{Aeq,4hrs}$
	Night	2300-0700	66dB $L_{Aeq,8hrs}$	52dB $L_{Aeq,1hr}$
Individual noise events several times an hour	Night	2300-0700	-	>82dB L_{ASmax}
Notes: (1) - full title in LDF is "Noise levels on residential site adjoining railways and roads at which planning permission will not be granted" (2) - full title in LDF is "Noise levels on residential streets adjoining railways and roads at and above which attenuation measures will be required"				

Table 3.1: Camden Council guidance on acceptable noise levels for residential development

3.6 British Standard 8233

3.6.1 Camden Council's LDF sets out the noise levels above which attenuation should be provided for residential buildings, as shown in **Table 3.1** of this report. However, the LDF does not set out the internal noise levels that should be achieved within the properties. To determine suitable internal noise levels, reference has been made to British Standard (BS) 8233 *Sound insulation and noise reduction for buildings – Code of practice*.

3.6.2 The scope of BS8233 is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes in the external noise climate.

3.6.3 The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in **Table 3.2**.

Criterion	Typical Situations	Design Range $L_{Aeq,T}$ dB	
		Good	Reasonable
Reasonable resting/sleeping conditions	Living rooms	30	40
	Bedrooms(1)	30	35
Note (1): For a reasonable standard in bedrooms at night, individual noise events (measured with fast time-weighting) should not normally exceed 45dB L_{Amax}			

Table 3.2: Indoor ambient noise levels in spaces when they are unoccupied, dB.

3.6.4 The time periods over which the above guidance applies should be appropriate for the period of use. The example given in BS8233 is for bedrooms, where the criteria apply over the period 23:00 hours to 07:00 hours.

3.7 Calculation of Road Traffic Noise

3.7.1 The *Calculation of Road Traffic Noise* (CRTN), published in 1988 by the former Department of Transport and The Welsh Office, sets out standard procedures for calculating noise levels from road traffic. The calculation method uses a number of input variables, including traffic flow volume, average vehicle speed, percentage of heavy goods vehicles, type of road surface, site geometry and the presence of noise barriers or acoustically absorbent ground, to predict the $L_{A10,18hour}$ or $L_{A10,1hour}$ noise level for any receptor point at a given distance from the road.

3.7.2 CRTN sets out a method for determining noise levels over a longer period than a given measurement duration by reference to a longer, simultaneous measurement. The CRTN method is described in terms of determining the 18 hour L_{A10} noise level, but the method is considered valid for other noise indices over other time periods. The Environmental Health Department of Camden Council has agreed this approach.

3.7.3 The comparative measurement method is described in CRTN as follows:

"Comparative measurements of L_{10} (18-hour) may be made at a number of positions concurrently in terms of hourly L_{10} provided that the noise at each of the monitoring positions

is due to the same road carrying the same traffic under the same conditions. At one (control) position the noise should be measured through the period 0600 to 2400 hours on an average weekday. Relative measurements at the satellite positions should be made for not less than two identical periods each of at least 15 minutes duration concurrently with measurements at the control position. The measurements at each satellite position should be taken at least 2 hours apart during the 18-hour period. Mean differences in the corresponding values of hourly L_{10} may then be applied to the values of L_{10} (18-hour) measured at the control position to determine L_{10} (18-hour) for the satellite positions."

3.8 British Standard 5228

3.8.1 Part 1 of British Standard (BS) 5228: 2009 *Code of Practice for Noise and Vibration Control on Construction and Open Sites* sets out a methodology for predicting, assessing and controlling noise levels arising from a wide variety of construction and related activities, and it provides tables of sound power levels generated by a wide variety of construction plant to facilitate such predictions.

3.8.2 Noise generated by a construction site will depend upon a number of variables, the most significant of which are:

- the amount of noise generated by plant and equipment being used at the development site, generally expressed as a sound power level;
- the periods of operation of the plant at the development site, known as the 'on-time';
- the distance between the noise source and the receptor, known as the 'stand-off';
- the attenuation due to ground absorption or barrier screening effects; and
- the reflection of noise due to the presence of hard vertical faces such as walls.

3.8.3 Example criteria for the assessment of the significance of noise effects are given in Annex E of the standard. It notes in paragraph E.1 that:

"A pragmatic approach needs to be taken when assessing the noise effects of any construction project, i.e. the guidance provided below would generally only apply to projects of significant size, and lesser projects might not need to be assessed or might only require general consideration of noise effects and mitigation. Generally, the local planning authority, or a planning consultant experienced in these matters, will be able to advise as to the extent of the assessment that might be required".

3.8.4 BS5228 gives several examples of acceptable limits for construction or demolition noise. The most simplistic being based upon the exceedance of fixed noise limits as stated in paragraph E.2:

"Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut."

3.8.5 Paragraph E.2 goes on to state:

"Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed: 70 decibels (dBA) in rural, suburban areas away from main road traffic and industrial noise or 75 decibels (dBA) in urban areas near main roads in heavy industrial areas. These limits are for daytime working outside living rooms and offices."

3.8.6 It is acknowledged in BS5228 that these limits have progressed beyond a simplistic benchmark:

"The above principle has been expanded over time to include a suite of noise levels covering the whole day/week period taking into account the varying sensitivities through these periods."

3.8.7 BS5228 goes on to note in Annex E that:

"An alternative and/or additional method to determine the significance of construction noise levels is to consider the change in the ambient noise level with the construction noise. This reflects more conventional EIA methodologies for noise."

3.8.8 The example criteria included in BS5228 are shown in **Table 3.3**.

Assessment Category and Threshold Value Period (L_{Aeq})	Threshold Value, dB		
	Category A[1]	Category B[2]	Category C[3]
Night-time (23:00 to 07:00)	45	50	55
Evenings and weekends[4]	55	60	65
Daytime (07:00-19:00)	65	70	75

Notes:
[1] Category A: threshold values to use when ambient noise levels (rounded to the nearest 5 dB) are less than these values.
[2] Category B: threshold values to use when ambient noise levels (rounded to the nearest 5 dB) are the same as Category A values.
[3] Category C: threshold values to use when ambient noise levels (rounded to the nearest 5 dB) are higher than Category A values.
[4] 19:00-23:00 weekdays, 13:00-23:00 Saturdays and 07:00-23:00 Sundays

Table 3.3: BS5228 construction noise criteria

3.8.9 There are further notes to the table in BS5228, which state:

"Note 1: A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.

Note 2: If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to

occur if the total L_{Aeq} noise level for the period increases by more than 3dB due to construction activity.

Note 3: Applied to residential receptors only."

3.8.10 The information out in **Table 3.3** has been used to determine noise limits for the construction works (shown in Section 5 of this report), which, subject to the agreement of Camden Council, could form the basis of a noise control regime at the site.

3.8.11 Part 2 of BS5228 relates to vibration, which may be impulsive, such as that due to hammer-driven piling; transient, such as that due to vehicle movements along a railway; or continuous, such as that due to vibratory driven piling. The primary cause of community concern generally relates to building damage from both construction and operational sources of vibration, although the human body can perceive vibration at levels that are substantially lower than those required to cause building damage.

3.8.12 BS5228 indicates that vibration might be just perceptible at 0.14mm/s (peak particle velocity or ppv) in the most sensitive situations for most vibration frequencies associated with construction. The standard goes on to note that at 0.3mm/s vibration might be just perceptible in residential environments. At 1.0mm/s, vibration in residential environments is likely to cause complaint although it can be tolerated if prior warning and explanation has been given to the residents. At 10mm/s, vibration is likely to be intolerable for anything more than a very brief exposure.

3.8.13 Damage to buildings associated solely with groundborne vibration is not common and although vibration may be noticeable, there is little evidence to suggest that it produces cosmetic damage such as cracks in plaster unless the magnitude of the vibration is excessively high. The most likely impacts, where elevated levels of vibration do occur during the construction works, are associated with perception.

3.8.14 For cosmetic damage to residential properties in good condition, i.e. without any specific structural weaknesses, BS5228 repeats the guidance contained in BS7385: Part 2: 1993 *Evaluation and measurement for vibration in buildings - Part 2: Guide to damage levels from groundborne vibration*. It indicates that cosmetic damage may occur at peak particle velocities of 15mm/s and above.

4 Methodology

4.1 Environmental noise survey

4.1.1 An environmental noise survey was carried out at the site on 27th and 28th September 2012 to establish the existing noise levels. The survey methodology and results are set out below.

4.2 Survey methodology

4.2.1 The measurements were undertaken between 09:20 hours on Thursday 27th September 2012 and 10:30 hours on Friday 28th September 2012.

4.2.2 The equipment used during the survey is summarised in **Appendix B**. The sound level meters were calibrated before the measurements using the listed acoustic calibrator, and their calibration checked afterwards. No calibration drifts were found to have occurred. All of the equipment had been calibrated to a traceable standard by a UKAS-accredited laboratory within the 24 months preceding the survey.

4.2.3 Noise measurements were carried out at four positions, as shown in **Figure 1**, and described as follows:

- Position 1: a façade position on Parker Street, approximately 1.5 metres from the edge of the road.
- Position 2: a façade position on Macklin Street opposite the school entrance, 1m from the road.
- Position 3: a façade position on a first floor external gangway of the existing Parker Street House, overlooking the school playground to the rear of the building.
- Position 4: a free-field position on the roof of Parker Street House.

4.2.4 The microphones were set at a height of 1.5 metres above local ground level at all positions.

4.2.5 Position 1 was selected to obtain noise levels at the front façade of Parker Street House. Positions 2 and 3 were selected to obtain noise levels at the rear façade of Parker Street House, allowing for access constraints which limited the number of measurements that could be taken. Position 4 was a secure location where a full 24 hour measurement could be obtained as a reference for the other measurements. Position 4 acted as the control position, from the which the full daytime, evening and night-time noise levels could be determined at the satellite positions 1, 2 and 3 using the CRTN ‘comparative measurements’ method.

4.3 Survey Results

4.3.1 The weather during the measurements was largely acceptable for noise monitoring, it being dry with light winds for the majority of the survey. There was a short period of rain at approximately 18:40 hours. The roads were wet for a period after the rain, which may have elevated road traffic noise in the area. However, any elevation of road traffic noise will lead to a worst-case assessment.

4.3.2 The key noise sources during the survey were road traffic and local residents/pedestrians talking/shouting/laughing. Positions 3 and 4 would also have been affected by noise children in the playground to the rear of the site.

4.3.3 The noise survey results are set out in **Tables 4.1** and **4.2**. **Table 4.1** sets out the full survey results at the satellite positions 1, 2 and 3.

Position	Date	Start Time	End Time	$L_{Aeq,T}$	L_{A90}	L_{A10}	L_{AFmax}
1	27/09/2012	10:30	11:30	63.0	52.6	66.3	80.6
1	27/09/2012	14:00(1)	14:53	68.4	56.1	72.4	94.2
1	27/09/2012	17:57	18:39	67.4	57.3	71.3	87.2
1	27/09/2012	23:01	23:32	58.5	49.4	60.8	78.1
1	28/09/2012	00:01	00:32	54.5	47.1	55.0	75.9
1	28/09/2012	05:33	06:03	58.4	44.5	56.2	85.1
1	28/09/2012	06:55	08:00	60.5	50.3	61.0	84.7
2	27/09/2012	14:56	15:55	62.2	50.8	64.9	84.6
2	27/09/2012	23:33	23:59	49.8	43.7	49.8	73.9
3	28/09/2012	08:57	10:30	62.7	54.1	65.4	85.5

Note:
(1) – this measurement was unduly influenced by local residents shouting at the microphone. It has not been used in the subsequent assessment.

Table 4.1: Noise levels measured at satellite measurement positions, façade dB.

4.3.4 **Table 4.2** sets out a summary of the noise levels measured at Position 4, aggregated into daytime (07:00 – 19:00 hours), evening (19:00 – 23:00 hours) and night-time (23:00 – 07:00 hours) periods. The full survey results for Position 4 are set out in Appendix C.

Position	Period	$L_{Aeq,T}$	L_{AFmax}
4	Day	54.9	81.3
	Evening	50.6	70.0
	Night	45.6	70.9

Table 4.2: Summary of noise levels measured at roof level, free-field dB.

4.3.5 In addition to the full summary results set out in **Table 4.2**, the raw data gathered at Position 4 has been re-processed to obtain the L_{Aeq} noise levels for exactly the same periods as covered at the satellite positions. The measurements at Position 3 ran beyond the end of the measurements at Position 4, so the raw data gathered at Position 3 has also been re-processed to obtain a period that matches data gathered at Position 4.

All of the re-processed results are shown in **Table 4.3**. Only the L_{Aeq} noise index is shown, as it is this index that is to be determined using the CRTN 'comparative measurements' method for assessment against the criteria in Camden Council's Policy DP28.

Position	Start Time	End Time	$L_{Aeq,T}$
4	10:30	11:30	55.8
4	17:57	18:39	53.6
4	23:01	23:32	45.7
4	00:01	00:32	47.6
4	05:33	06:03	44.6
4	06:55	08:00	49.0
4	14:56	15:55	53.3
4	23:33	23:59	48.8
4	08:57	09:22	53.7
3	08:57	09:22	62.8
Note: Noise levels measured at Position 3 were façade levels. Noise levels measured at Position 4 were free-field levels			

Table 4.3: Summary of re-processed noise levels, dB.

5 Assessment

5.1 Construction Works

5.1.1 No information is available on the proposed construction methods, so a detailed assessment is not possible at this stage. However, it is possible to set out general noise and vibration limits that could be adopted by Camden Council to protect local sensitive receptors.

5.1.2 Camden Council's Policy DP28 indicates that the council will seek to minimise the impact of construction and demolition works on local amenity. There are two key mechanisms available to the council to achieve this policy aim:

- limiting the construction hours; and
- limiting the noise and vibration levels at nearby receptors.

5.1.3 Hours for construction works are typically 08:00 to 18:00 hours Monday to Friday, and 08:00 to 13:00 hours on Saturdays. No work that generates off-site noise or vibration is generally allowed outside these hours, unless in an emergency. It is likely that Camden Council would require these working hours, or similar hours, and that they would be enforced by planning condition.

5.1.4 Noise limits for receptors close to Parker House have been determined in accordance with the approach shown in **Table 3.2** in line with BS5228, whereby the ambient noise level, rounded to the nearest 5dB, defines the assessment level. The daytime ambient noise levels at the front and rear of Parker House were 66dB and 64dB respectively. These both round to 65dB, which would result in a noise limit of 70dB for all receptors.

5.1.5 It should be noted that St Josephs Primary School is located to the rear of Parker House, and it may be appropriate to adopt a lower limit to protect the teaching environment at the school during the construction works. Similarly, where construction works coincide with sensitive activities at The New London Theatre, lower limits may be necessary.

5.1.6 A vibration limit of 1.0mm/s (PPV) would serve as an indicator of potential impact for both residential, educational and commercial receptors close to the site.

5.1.7 The selection of appropriate noise and vibration limits is the responsibility of Camden Council, however, the above suggestions are considered a reasonable starting point.

5.2 Noise-Sensitive Development

5.2.1 The survey results have been used to determine the suitability of the site for residential development in accordance with Policy DP28 of Camden Council's LDF.

5.2.2 The daytime, evening and night-time noise levels at the front and rear façades of the application site have been determined using the CRTN comparative measurements method.

These daytime, evening and night-time noise levels have then been assessed against the criteria in Policy DP28 of the council's LDF.

5.2.3 The mean difference between the noise levels measured at the control position, Position 4, and the three satellite positions, Positions 1, 2 and 3, have been calculated and are shown in **Table 5.1**. The mean differences for the daytime and night-time periods have been calculated separately. There were no measurements during the evening, so it is not possible to calculate the difference between the control and satellite positions during this period, however the assessment is still considered robust (see **paragraph.5.2.5**).

5.2.4 Although the measurements at Positions 2 and 3 were not in the same location, they were broadly similar, so it has been assumed that they are both representative of the rear façade. The differences between the control and satellite positions have been determined for the front (Position 1) and rear (Positions 2 and 3) of the application site.

Building Façade	Start Time	Noise Level at Control Position	Noise Level at Satellite Position	Difference	Average Difference	
					Day	Night
Front	10:30	55.8	63.0	+7.2	+10.8	+11.2
	17:57	53.6	67.4	+13.8		
	23:01	45.7	58.5	+12.8		
	00:01	47.6	54.5	+6.9		
	05:33	44.6	58.4	+13.8		
	06:55(1)	49.0	60.5	+11.5		
Rear	14:56	53.3	62.2	+8.9	+9.0	+1.0
	23:33	48.8	49.8	+1.0		
	08:57	53.7	62.8	+9.1		
Note: (1) – the majority of this measurement fell within the daytime period, so it has been included in the daytime average.						

Table 5.1: Determination of average difference between noise levels at control and satellite positions, dB.

5.2.5 The average daytime and night-time differences shown in **Table 5.1** have been used to determine the noise levels at the front and rear façades of the application building for the daytime, evening and night-time periods. It is assumed that the average differences between the noise levels at the control and satellite positions for the daytime are representative of the evening period as well.

5.2.6 The noise levels at the front and rear façades of the application building are shown in **Table 5.2**. The night-time maximum noise levels shown in **Table 5.2** were those measured at the satellite positions during the night-time. There is no need to adjust these measured values with reference to the control position, as they were typically caused by cars passing the front and rear of the building. They are therefore considered representative of the maximum noise levels at the front and rear façades as measured.

Building Façade	Period	$L_{Aeq,T}$	L_{AFmax}
Front façade	Day	65.7	-
	Evening	61.4	-
	Night	56.8	85.1

Building Façade	Period	$L_{Aeq,T}$	L_{AFmax}
Rear façade	Day	63.9	-
	Evening	59.6	-
	Night	46.6	73.9

Table 5.2: Noise levels at the application site, façade dB.

5.2.7 It can be seen from **Table 5.2** that the noise levels at Parker Street House are below the levels at which Camden Council would refuse planning permission for residential development. The site is therefore considered suitable for the proposed residential use.

5.2.8 The noise levels at both front and rear façades for the majority of the three periods considered are above the levels at which Camden Council would require attenuation measures to be installed. The exception is the night-time at the rear of the building where the noise levels are below the Camden Council thresholds for attenuation.

5.2.9 Consideration of appropriate attenuation measures is set out in **Section 6** of this report.

6 Mitigation Measures

6.1 Construction Works

6.1.1 At this stage, there is no information on the proposed construction methods, so it is not possible to carry out a detailed assessment of likely noise and vibration emissions. Noise and vibration limits are suggested in Section 5 of this report, which may form the basis of a control mechanism for the works.

6.1.2 The following measures could be implemented during the construction works to ensure that best practice is at the heart of the construction process. If appropriate, these measures could be enforced either through a Construction Environmental Management Plan or by planning condition:

- where appropriate, erect a hoarding around the entire perimeter of the site to screen noise from low level sources and/or street level receptors;
- control off-site parking of construction traffic on the public highway;
- implement a traffic management system at the site entrance to control traffic movements into and out of the site;
- minimise disturbance from reversing bleepers through measures such as site layout, provision of screening or use of broadband sound emitting reversing alarms;
- use of ‘silenced’ plant and equipment where possible;
- switch off vehicle engines where they are standing for a significant period of time;
- operate plant at low speeds where possible and incorporate automatic low speed idling;
- where possible, select electrically driven equipment in preference to internal combustion powered equipment, hydraulic power in preference to pneumatic power, and wheeled plant in preference to tracked plant;
- maintain all plant properly (keep greased, replace blown silencers, keep saws sharp, replace worn bearings, etc);
- lower materials rather than drop them;
- use of temporary screening or enclosures for static noisy plant to reduce noise emissions;
- use of plant that meets relevant EC Directive standards;

- ensure all contractors are familiar with the guidance in BS5228 (Parts 1 and 2) and incorporate it into contract documents;
- undertake noise and/or vibration measurements during noisy or vibratory works and manage works to acceptable levels.

6.2 Attenuation Measures

6.2.1 The noise levels at the front and rear façades of Parker House are below the levels at which Camden Council would refuse planning permission for residential development, so the site is considered suitable for the proposed residential use.

6.2.2 However, the noise levels at both front and rear façades were above the levels at which Camden Council require attenuation measures to be installed. Consideration has therefore been given to the sound reduction performance required of the external building fabric to ensure that the internal noise levels are suitable for residential occupation. The sound reduction performance requirements apply to the whole external building façade, however, since windows are typically the weakest link, in an acoustic sense, the performance requirements can be considered as applying to the glazing in particular.

6.2.3 In the absence of specific guidance in Camden Council's LDF on suitable internal noise levels, reference has been made to the guidance set out in BS8233.

6.2.4 The noise levels at each façade, rounded up to the nearest whole number, are shown in **Table 6.1**, together with the internal criteria from BS8233 and the resultant sound reduction performances required to achieve the criteria.

Building Façade	Period	Noise Index	Façade Noise Level	Target Noise Level	Required Sound Reduction Performance
Front	Day	$L_{Aeq,T}$	66	30-40	26 to 36
	Evening	$L_{Aeq,T}$	62	30-40	22 to 32
	Night	$L_{Aeq,T}$	57	30-35	22 to 27
	Night	L_{AFmax}	86	45	41
Rear	Day	$L_{Aeq,T}$	64	30-40	24 to 34
	Evening	$L_{Aeq,T}$	60	30-40	20 to 30
	Night	$L_{Aeq,T}$	47	30-35	12 to 17
	Night	L_{AFmax}	74	45	29

Table 6.1: Sound reduction performance requirements, dB.

6.2.5 It can be seen from **Table 6.1** that highest sound reduction performance requirements to control L_{Aeq} noise levels for the front and rear façades are 36dB and 34dB respectively. If Camden Council requires the 45dB maximum noise criterion to be achieved, the sound reduction performance requirement for bedrooms on the front façade increases to 41dB.

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

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

6.2.8 As road traffic noise was dominant at the site, the sound reduction performance requirements set out in **Table 6.1** should be interpreted as R_{TRA} values.

6.2.9 Glazing units capable of achieving 36dB R_{TRA} include Pilkington's 12.8/16/6 double glazing unit, where two panes of glass, one 12.8mm thick and one 6mm thick, are separated by a 16mm airgap. Similarly, glazing units capable of achieving 34dB R_{TRA} and 41dB R_{TRA} include Pilkington's 10.8/16/6 and 16.8/16/16.8 double glazing units respectively.

6.2.10 Glazing units other than those suggested above may be suitable and it is the responsibility of the glazing manufacturer to recommend and provide appropriate systems. The above analysis is provided to demonstrate that a design solution is feasible at the site for the purposes of a planning application and not for the purposes of detailed design or glazing procurement.

6.2.11 The detailed design of the proposed properties will affect both the required sound reduction performance and the appropriate selection of glazing units. The aspects of the detailed design that are important are the room dimensions, room finishes, window dimensions and the sound reduction performance of non-glazing elements. Further detailed consideration of the glazing components will be required once the detailed design is confirmed.

6.2.12 Internal noise levels should be considered in the context of room ventilation requirements. The target internal noise levels will only be achieved when windows are closed. An alternative means of ventilation will therefore be required to comply with the requirements of the Building Regulations Approved Document F.

6.2.13 The Building Research Establishment (BRE) has published an Information Paper on the acoustic performance of such passive ventilation systems. IP4/99: *Ventilators: Ventilation and Acoustic Effectiveness* (October 1999) details a study into the sound reduction performance of fourteen different window mounted trickle ventilators and seven different through-wall passive ventilators. The measured sound reduction performance, after taking into account flanking sound paths (i.e. sound paths that do not travel directly through the vent) and the effective area of the ventilator, ranged from 14 to 46dB.

6.2.14 Passive and mechanically assisted vents are available that meet or exceed the sound reduction required by the glazing elements.

7 Conclusions

7.1.1 Camden Council has appointed Peter Brett Associates LLP to undertake a noise assessment of their proposed development at Parker House, Covent Garden. The council proposes to redevelop the building to provide 43 residential units, three of which will be social rented.

7.1.2 The construction works have been considered qualitatively in the absence of details on the proposed construction methods. Noise and vibration limits and best practice measures have been suggested.

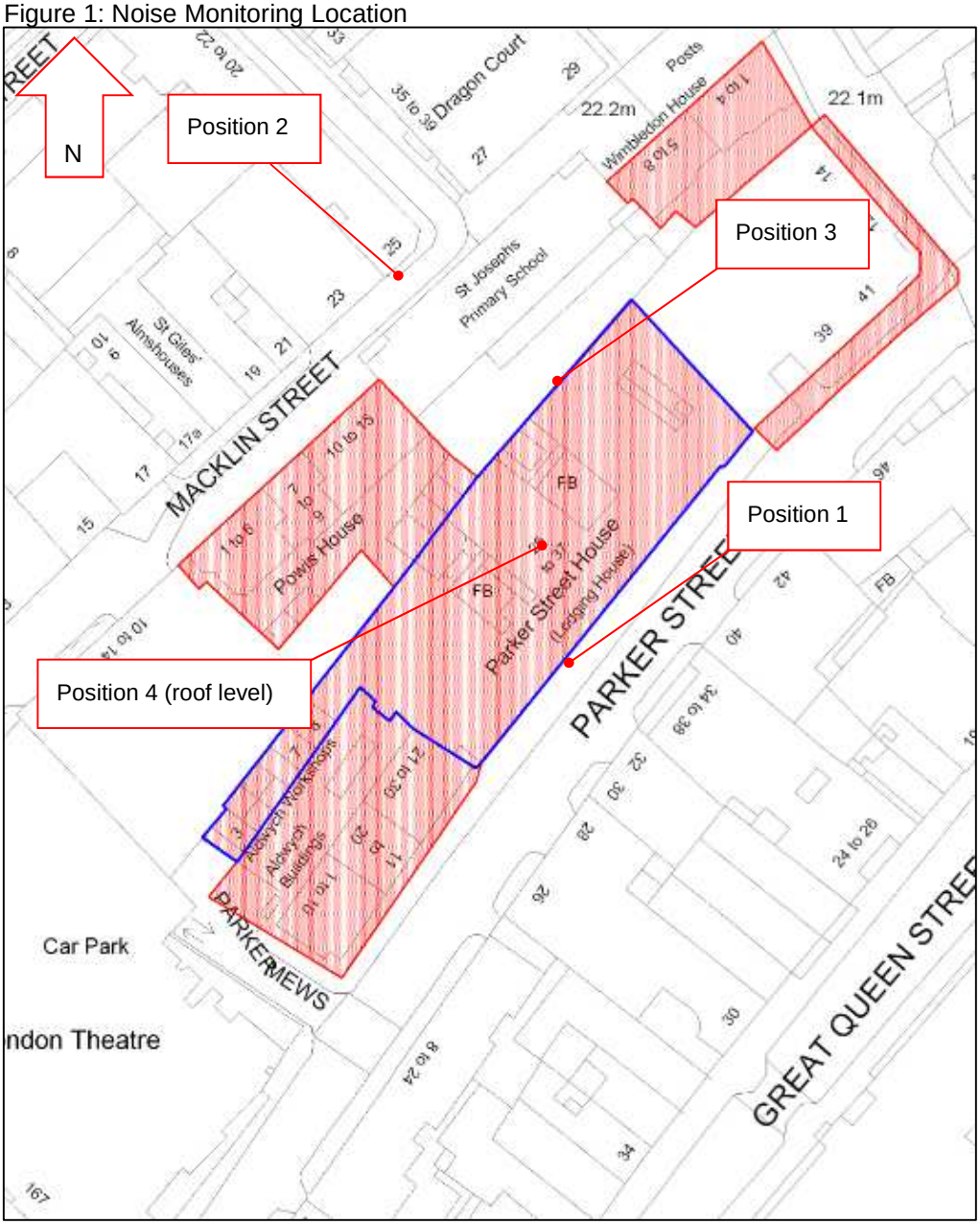
7.1.3 The noise levels at the site suggest that it is suitable for residential development, when assessed against Policy DP28 in Camden Council's Local Development Framework. However, attenuation measures will be required to ensure that the internal noise climate is suitable for residential occupation.

7.1.4 The sound reduction performances required of the external building fabric have been calculated, in particular for the windows, to ensure that the internal noise levels meet the criteria set out in British Standard 8233: 1999.

7.1.5 On the basis of this assessment, it is considered that noise does not pose a material constraint to the development of the site as currently proposed.

Figures

Figure 1: Noise Monitoring Location



Note:. The blue line shows the proposed development boundary. The red hatched area shows the area of Camden Council freehold.

Appendix A: Glossary of Terminology

Noise is defined as unwanted sound. The human ear is able to respond to sound in the frequency range 18Hz (deep bass) to 18,000Hz (high treble) and over the audible range of 0dB (the threshold of perception) to 140dB (the onset of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting (filtering) mechanism is used. This reduces the importance of lower and higher frequencies, approximating the response of the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. Noise can be perceived to be louder or more noticeable if the source of the noise is observed; e.g. roads, trains, factories, building sites etc. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source. Various noise indices have been derived to describe the fluctuation of noise levels that vary over time. Usually, these noise indices relate to specific types of noise, and as such different noise indices are used to describe road traffic noise, background noise, construction noise, etc.

The weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement and the levels are denoted as dB(A) or L_{Aeq}, L_{A10}, etc, according to the parameter being measured.

Noise is measured on the decibel scale, which is logarithmic rather than linear. As a result of this, a 3dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3dB(A) is generally regarded as the minimum difference needed to perceive a change. **Table A.1** sets out examples of noise levels typically experienced during everyday activities. **Table A.2** sets out an explanation of the terminology used in this report.

Sound Level	Location
0 to 10dB(A)	Threshold of hearing
10 to 20dB(A)	Broadcasting studio
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside a factory or noisy pub
100 to 110dB(A)	Burglar Alarm at 1m
110 to 130dB(A)	Pneumatic drill at 1m away
140dB(A)	Threshold of Pain

Table A.1: Typical sound levels found in the environment

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa ($20x10^{-6}$ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by 20 $\log_{10}$ (s_1/s_2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$ or Background Noise Level	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 metres
Façade	At a distance of 1 metre in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS5969.
Displacement, Acceleration and Velocity Root Mean Square (r.m.s.) and Peak Values Peak Particle Velocity (PPV)	Vibration is an oscillatory motion. The magnitude of vibration can be defined in terms of displacement (how far from the equilibrium position that something moves), velocity (how fast something moves), or acceleration (the rate of change of velocity). When describing vibration, one must specify whether peak values are used (i.e. the maximum displacement or maximum velocity) or r.m.s. / r.m.q. values (effectively an average value) are used. Standards for the assessment of building damage are usually given in terms of peak velocity (usually referred to as Peak Particle Velocity, or PPV), whilst human response to vibration is often described in terms of r.m.s. or r.m.q. acceleration.
Root Mean Square (r.m.s.)	The r.m.s. value of a set of numbers is the square root of the average of the squares of the numbers. For a sound or vibration waveform, the r.m.s. value over a given time period is the square root of the average value of the square of the waveform over that time period.
Root Mean Quad (r.m.q.)	The r.m.q. value of a set of numbers is the fourth root of the average of the fourth powers of the numbers. For a vibration waveform, the r.m.q. value over a given time period is the fourth root of the average value of the fourth power of the waveform over that time period.

Table A.2 Terminology relating to noise and vibration

Appendix B: Noise Monitoring Equipment

Position	Equipment	Manufacturer	Serial Number	
Positions 1, 2 and 3	Type Black Solo 01 Sound Level Meter	01dB-Metravib	65211	03/05/2011
	Type PRE 21 S Preamplifier	01dB-Metravib	15667	03/05/2011
	Type MCE 212 Microphone	01dB-Metravib	103328	03/05/2011
	Type CAL 21 Calibrator	01dB	34113643	23/03/2012
Position 4	Type 140 Sound Level Meter	Norsonic	1403330	20/07/2011
	Type 1209 Preamplifier	Norsonic	12816	20/07/2011
	Type 1225 Microphone	Norsonic	96190	20/07/2011
	Type 1251 Calibrator	Norsonic	31313	20/07/2011

Table B.1: Noise monitoring equipment

Appendix C: Full Survey Results

Date	Start Time	Duration	$L_{Aeq,T}$	L_{AFmax}
27/9/2012	09:00	40 minutes	56.2	80.5
27/9/2012	10:00	1 hour	53.7	72.0
27/9/2012	11:00	1 hour	55.6	79.8
27/9/2012	12:00	1 hour	59.8	81.3
27/9/2012	13:00	1 hour	56.6	73.2
27/9/2012	14:00	1 hour	53.9	72.0
27/9/2012	15:00	1 hour	53.2	70.3
27/9/2012	16:00	1 hour	55.3	78.3
27/9/2012	17:00	1 hour	49.0	67.7
27/9/2012	18:00	1 hour	53.3	76.2
27/9/2012	19:00	1 hour	48.3	68.1
27/9/2012	20:00	1 hour	47.7	63.6
27/9/2012	21:00	1 hour	47.3	68.2
27/9/2012	22:00	1 hour	54.5	70.0
27/9/2012	23:00	1 hour	47.5	66.3
28/9/2012	00:00	1 hour	47.3	70.9
28/9/2012	01:00	1 hour	47.0	65.7
28/9/2012	02:00	1 hour	43.0	66.8
28/9/2012	03:00	1 hour	43.5	66.8
28/9/2012	04:00	1 hour	43.1	68.0
28/9/2012	05:00	1 hour	43.8	58.2
28/9/2012	06:00	1 hour	46.7	64.7
28/9/2012	07:00	1 hour	49.1	74.4
28/9/2012	08:00	1 hour	51.5	75.0
28/9/2012	09:00	20 minutes	53.8	71.2

Table C.1: Noise Levels Measured at Position 4, free-field dB