Noise Assessment Report

159 – 161 Iverson Road, West Hampstead

Ocotober 2014

REPORT REF: NA/IR/20140925-RK

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A	For Initial Comment	Robert Kimber		Paul Canessa		25/09/2014
B	Client Revisions	Paul Canessa		Ryan Thrower		01/10/2014

Executive Summary

This document presents the assessment criteria of noise and vibration related Planning Conditions given in the permission for application 2013/7505/P dated 21 February 2014. Assessment for Planning Condition 6 relating to internal noise levels and Planning Condition 15 relating to external noise levels is presented.

The assessment shows the proposed scheme of sound insulation is sufficient to satisfy the requirements of Planning Condition 6.

The assessment for Planning Condition 15 shows that best practicable means have been employed to give provision for protection against external noise levels. Without possibility of further feasible attenuation measures it is recommended that noise levels higher than the requirements of Planning Condition 15 are accepted for both communal and private external amenity spaces.

As agreed with the case officer, the assessment for condition 14 will occur on the actual piles supporting the building – due in Oct/Nov 2014

Introduction

This report has been produced to assess the Consented Development at Iverson Road in accordance with the requirements of Planning Conditions 6a, and 15a of decision for application 2013/7505/P dated 21 February 2014. The development is two buildings ranging between one and six stories, comprising 19 residential units (Class C3), and 164sqm of employment floor space (Class B1c).

Within this document is a reproduction of the Planning Condition wording, summary of environmental noise data used and details of relevant construction proposals. Reference is made to manufacturer laboratory test data for similar systems is used to inform a statistical energy model of the build ups. The proposals are rated in terms of their apparent sound reduction index and likely in situ performance or resultant level difference.

The environmental noise survey data used in the assessments are from the reports 13P282 JT R1260-188A A[i] and P1498-REP01-SJF[ii]. The latter was submitted to Camden Planning Authority in support of the Planning Application for the adjacent site 163 Iverson Road; data has been reviewed and used to inform the assessment of 159 -161 Iverson Road due to the lack of accurate environmental noise data charactering Iverson Road in the former report. The environmental noise levels presented in the report for 163 Iverson Road agree with the broad L_{den} dB noise levels indicated by the DEFRA Noise Map[iii] .

Assessment Criteria

Planning Condition 6

The exact wording of Planning Condition 6 has been reproduced below for ease of reference.

a) Before building works commence on the site, a sound insulation scheme shall be submitted to and approved by the Local Planning Authority providing for the insulation of the proposed dwelling unit(s) so that externally generated noise from railway and road traffic do not cause internal noise levels to exceed an indoor ambient noise levels in unoccupied rooms of 30 dB(A) L_{Aeq} (1hour) and individual noise events shall not exceed 45 dB LAmax The development shall be carried out in accordance with the approved scheme and in such a manner to ensure that the above noise levels (from railway and road traffic) are maintained thereafter.

b) On completion of development, a test on each dwelling shall be carried out to verify compliance with this condition. A report shall be produced containing all raw data and showing how calculations have been made. The development shall not be occupied until a copy of the report has been submitted to and approved in writing by the Local Planning Authority. The report shall set out standards used, measurements locations, raw tabulated and graphically represented data, time, date etc.

The assessment in the following section address requirement a) of the above. It is assumed that the noise level limits apply to all habitable rooms, during both day time and night time periods. The LAmax dB parameter quantifies transient events when applied to transportation noise, such as a passing motorbike, release of pneumatic pressure on an HGV. As the highest LAmax dB noise level incident at a road traffic kerb has significant variation from individual events, the LAmax dB noise level typically not exceeded more than 10 to 15 times in a night is usually considered as suggested to be a suitable criteria by WHO Guidelines[iv].

Planning Condition 15

The exact wording of Planning Condition 12 has been reproduced below for ease of reference.

a) Before building works commence on the site, a scheme shall be submitted to and approved by the Local Planning Authority providing full details of the acoustic measures to be incorporated to ensure that the steady noise level does not exceed 50 LAeq,T dB in open spaces (including balconies) and open communal areas.
The development shall be carried out in such a manner to ensure that the above noise levels (from railway and road traffic) are to be retained (including maintenance) for the next 15 years.

b) Prior to occupation a survey of each open communal amenity area including balconies shall be carried out to verify compliance with condition 15(a). A report shall be produced containing all raw data and showing how calculations have been made. A copy of such report shall be submitted to the Local Planning Authority for its approval in writing. The report shall include details of standards used, measurements locations, raw tabulated and graphically represented data, time, date etc.

The following section address the requirement of Planning Condition 15a.

Planning Condition 8

The exact wording of Planning Condition 8 has been reproduced below for ease of reference.

Prior to commencement on the relevant part of the development details of all internal/external plant, including an acoustic report which demonstrates that the equipment will comply with the requirements of condition 22 shall be submitted to and approved in writing by the local planning authority. The development shall be carried out in accordance the details thus approved and shall thereafter be maintained in effective order to the reasonable satisfaction of the Council.

It is interpreted that the "relevant part" of the development is the installation of any such building services plant that may emit noise levels in its operation. As details of the building services plant have not yet been determined the requirement of Planning Condition 8 is not addressed in this report

Planning Condition 14

The exact wording of Planning Condition 14 has been reproduced below for ease of reference.

a) Before building works commence on the site, a scheme shall be submitted to and approved in writing by the Local Planning Authority providing for adequate insulation of the proposed dwellings to prevent the transmission of vibration from road and railway traffic causing any discomfort to its occupants as measured and interpreted by BS.6472:1992 "Evaluation of human exposure to vibration in buildings [1 Hz to 80 Hz]."

b) The survey, as cited in acoustic report ref: 13P282 JT R1 260 - 188AA shall be carried out.

It is interpreted that "Before building works commence on the site" does not include demolition of existing buildings and enabling ground works. The vibration survey methodology in acoustic report ref: 13P282 JT R1 260 - 188AA is cited:

1. Measurement of ground-borne vibration in accordance with BS6472 at commencement of enabling groundwork's on site at two monitoring locations

2. Analysis and assessment of ground-borne vibration in accordance with BS6472 and LB Camden criteria to determine if perceptible vibration is acceptable in residential units at all floors.
3. Where assessment shows control of ground-borne vibration is required to comply with requirements of BS6472 and LB Camden criteria, develop a control scheme to include building isolation and separation of structure, fabric and services from ground. Submit report of vibration control scheme to LB Camden for review and approval.
4. Implement control scheme in full as agreed during construction.

Item 1 would need to take place on implementation or at least when enabling works on site allow the digging of test pits or setting of test piles.

Item 2 and 3 would need to occur at the earliest stage possible due to the cost and design implications of such control measures on structural and architectural requirements.

Item 4 would need to be an integral element of the construction process and not seen as an adjunct to it.

It is not economically feasible to bore "test" piles, all piling operations have to be completed when the piling rig is on site in one phase. A pit to the same depth of piles would not be safe or economic to construct. Therefore it has been agreed with London Borough of Camden Planning Case Officer for this development that the vibration survey will be conducted on the actual piles that will support the building. The survey and assessment is currently programmed for October /November 2014, hence this report contains no further address of Planning Condition 14 requirements.

Planning Condition 6 Assessment

The environmental noise survey reported in 13P282 JT R1260-188A A (Aulos Acoustics) undertaken in support of the Planning Application 2013/7505/P characterized noise levels incident near the railway boundary of the site at approximately the proposed northern façade. The noise survey did not however characterize noise levels incident at the boundary with Iverson Road. The noise levels incident at the proposed southern façade has been determined from noise survey reported in P1498-REP01-SJF (Sol Acoustics) submitted in support of a Planning Application for residential development on the neighboring site at 163 Iverson Road.

The noise survey reported in 13P282 JT R1260-188A A was conducted between Wednesday 30th October 2013 and Sunday 3rd November 2013. The survey data is considered representative of current environmental noise levels at the northern boundary. The noise survey reported in P1498-REP01-SJF was conducted between Wednesday 29th May 2013 and Thursday 30th May 2013. The free field external noise levels from both reports are summarized as shown in Table 3 below.

Table 3: Free field external noise levels as reported in 13P282 JT R1260-188A A and P1498-REP01-SJ

Position	***Period T***	***$L_{Aeq\ T}$ dB***	***L_{Amax} dB***
Railway Façade	Day 16 hour	61.0 dB	- dB
Railway Facade	Night 8 hour	53.0 dB	64.0dB
Iverson Road Façades	Day 16 hour	63.0 dB	- dB
Iverson Road Façades	Night 8 hour	58.0 dB	46 to 93 dB*

*Range of LAmax dB noise levels reported in the summary. The noise level used for this assessment has been taken from review of the Graph A4 in P1498-REP01-SJ. It is considered appropriate that the night levels of 78 dB L_{Amax} at Position 2 is used for night time noise levels and78 dB L_{Amax} for day time noise levels.

The Noise Mapping England prediction shows Lden dB noise level contours based on traffic sources. The location of the proposed façade is within the 60 dB (A) to 65 dB (A) noise band for both rail and road traffic. The summary of noise levels in Table 3 agrees with the Noise Mapping England prediction.

The spectrum of noise levels at each façade for day time and night periods has been determined from the data presented in reports 13P282 JT R1260-188A A and P1498-REP01-SJ. The spectral levels have been uniformly adjusted to meet the overall levels considered for assessment, according to the more appropriate night time L_{Amax} dB noise levels and are shown in Table 4 below.

Table 4: Noise Levels used in PC12 Assessment

Position	***Period T***	***Noise Level dB(A)***	***63 Hz***	***125 Hz***	***250 Hz***	***500 Hz***	***1000 Hz***	***2000 Hz***	***4000 Hz***	***8000 Hz***
Railway Façade	Day $L_{eq\ 16hr}$ dB	61	-	58.3	57.6	57.7	57.2	52.3	48.8	46.7
Railway Facade	Night $L_{eq\ 8hr}$ dB	53	-	50	49.1	48.5	46.2	41.6	46	47.2
Railway Facade	Typical Night L_{max} dB	64	-	60.7	57.9	58.2	55.5	52	58.2	59.3
Iverson Road Façades	Day $L_{eq\ 16hr}$ dB	65	69	63	58	58	60	55	52	-
Iverson Road Façades	Night $L_{eq\ 8hr}$ dB	55	64	57	54	53	54	52	49	-
Iverson Road Façades	Typical Night L_{max} dB	78	-	78.1	74.1	73.1	71.1	69.1	70.3	71.4

To predict internal noise levels with closed windows and either acoustically attenuated passive ventilation and mechanical extract or mechanical supply and extract ventilation, the sound insulation performances of the building envelope has been estimated. The calculation of internal noise levels has been based on a derivation from the empirically derived methodology set out in BS 12354 -3[v] and that in BS 8233: 2014[vi]. Estimated sound insulation of building elements and other calculation inputs are outlined below based on information provided. These outlines do not constitute a design specification.

The external wall construction throughout is considered to be of the form:

40 mm Stone rainscreen cladding
25mm Frame system
50mm Kingspan Kooltherm K8 Cavity Board
50mm Steel C Stud

2 x15mm Plasterboard + skim
Predicted apparent weighted sound reduction index: R'_w 57 dB (-4 Ctr)

The acoustic performance requirement for the windows varies depending on the location and orientation. The window types are listed below in Table 5. The glazing selection is from Saint Gobain laboratory test data, the performance is for the glass however the frame selected has to be acoustically suitable for the rating. The trickle ventilator acoustic performance data is from laboratory tests of the RW Simon Duco range.

Table 5: Glazing and Ventilation Acoustic Performance

Facing	*Level*	*Room*	*Glazing Rw + Ctr dB*	*Glazing Configuration*	*Ventilation Dnew dB*	
West	All Floors	Living	Rw 34, -4Ctr dB	4 (20) 6	Dnew 41 dB	Corto 10
West	All Floors	Bed	Rw 34, -4Ctr dB	4 (20) 6	Dnew 44 dB	Medio 10
Railway	All Floors	Bed	Rw 39, -3Ctr dB	10 (12) 12	Dnew 44 dB	Medio 10
East	All Floors	Living	Rw 34, -4Ctr dB	4 (20) 6	Dnew 41 dB	Corto 10
East	All Floors	Bed	Rw 39, -3Ctr dB	10 (12) 12	Dnew 44 dB	Medio 10
Iverson	All Floors	Living	Rw 45, -4Ctr dB	12 (20) 8.8 Silence	Dnew 47 dB	Alto 10
Iverson	All Floors	Bed	Rw 45, -4Ctr dB	12 (20) 8.8 Silence	Dnew 47 dB	Alto 10

The Dnew dB value of the product selected must be adjusted according to the number of ventilators fitted.
Dnew dB shall be increased by: 10 Iog10 S / S_{ref}
where S is the total vent area and S_{ref} is the vent reference area (in m^2) at which the $D_{n,\,e,\,w}$ dB value was measured.

To put it simply, each double in free area required increase the Dnew dB requirement by 3 dB; so if two trickle vents are required, these should each be rated $D_{n,e,w}$ 36 dB to achieve an overall performance of $D_{n,e,w}$ 33 dB. The number of ventilators required should be calculated in accordance with Approved Document F, using details of the ventilator free area, mechanical extract duty, and occupancy levels.

The room furnishings will have an effect on noise levels measured in the built development. Reverberant sound energy will add to the energy transmitted through the façade elements. It is often assumed that a domestic living room or bedroom has a reverberation time of 0.5 seconds. An estimate of the furnished but unoccupied rooms has been made, including essential items such as a bed in bedrooms, kitchen cupboards in the kitchen and a sofa in the living room. It is acknowledged that the commissioning tests are required by the Planning Condition to be conducted prior to occupation and will therefore not have beds or sofas. The measured values will be normalized to a reverberation time of 0.5 seconds to account for such differences.

The calculation of internal noise levels has been based on a derivation from the empirically derived methodology set out in BS 12354 -3[vii] and that in BS8233: 2014. The results of calculation for day time internal $L_{Aeq,\ 16\ hr}$ dB noise levels are set out in Table 7 below, based on mechanical extract with supply via trickle ventilators.

Table 7: Predicted Internal $L_{Aeq\ 16hr}$ dB, $L_{Aeq\ 8hr}$ dB and L_{Amax} dB Noise Levels

Façade Facing	**Floor Level**	**Room**	**Period T**	**Internal $L_{Aeq,\ T}$ dB**	**Internal L_{Amax} dB**	**Noise Level Limit**	**Margin**
West	All Floors	Living	Day 16 hour	29	-	L_{Aeq} 30 dB	1 dB
West	All Floors	Living	Night 8 hour	21	-	L_{Aeq} 30 dB	9 dB

West	All Floors	Bed	Day 16 hour	27	-	L_{Aeq} 30 dB	3 dB
West	All Floors	Bed	Night 8 hour	18	29	L_{Aeq} 30 dB and L_{Amax} 45 dB	L_{Aeq} 12 dB and L_{Amax} 16 dB
Railway	All Floors	Bed	Day 16 hour	30	-	L_{Aeq} 30 dB	0 dB
Railway	All Floors	Bed	Night 8 hour	21	31	L_{Aeq} 30 dB and L_{Amax} 45 dB	L_{Aeq} 9 dB and L_{Amax} 14 dB
East	All Floors	Living	Day 16 hour	29	-	L_{Aeq} 30 dB	1 dB
East	All Floors	Living	Night 8 hour	21	-	L_{Aeq} 30 dB	9 dB
East	All Floors	Bed	Day 16 hour	27	-	L_{Aeq} 30 dB	3 dB
East	All Floors	Bed	Night 8 hour	18	29	L_{Aeq} 30 dB and L_{Amax} 45 dB	L_{Aeq} 12 dB and L_{Amax} 16 dB
Iverson Road	All Floors	Living	Day 16 hour	30	-	L_{Aeq} 30 dB	0 dB
Iverson Road	All Floors	Living	Night 8 hour	24	-	L_{Aeq} 30 dB	6 dB
Iverson Road	All Floors	Bed	Day 16 hour	30	-	L_{Aeq} 30 dB	0 dB
Iverson Road	All Floors	Bed	Night 8 hour	24	42	L_{Aeq} 30 dB and L_{Amax} 45 dB	L_{Aeq} 6 dB and L_{Amax} 3 dB

The analysis has shown that with the proposed construction forms all internal accommodation spaces can be constructed so that noise levels are within the Planning Condition 6 noise level requirements.

Mechanical extract or mechanical supply and extract systems are to be selected to that the combined environmental and services noise levels do not normally exceed L_{Aeq} 30 dB.

Planning Condition 15 Assessment

External noise levels reported at ground level in P1498-REP01-SJ were 65.4dB L_{Aeq} (16-hour). Where an acoustic barrier is installed at 2.4 meter height attenuation of 10dB may be given whilst in the barrier shadow zone. Such barrier is unlikely to provide 10 dB (A) attenuation at distance of more than 5m from the barrier. A larger barrier of approximately 5m would provide noise levels of less than 50 dB (A) up to 10m away. However, such a barrier would not be feasible due to visual implications. It is suggested that noise levels up to 55 dB (A) such be accepted due to impracticality of greater attenuation.

The proposed balconies on the Iverson Road façade will be exposed to noise levels of 65dB L_{Aeq}(16-hour). In order to attenuate external noise levels to less than 50 dB (A), the balconies would need to be fitted with a complete enclosure, and fitted with acoustically attenuated ventilation.

An alternative would be to provide 2m high toughened glass screens, and fit the walls and ceiling of the balcony with acoustically absorbent material. Such an arrangement would likely provide similar attenuation to an open window, approximately 10 dB (A), although in situ the level difference is more likely to be 6 to 8 dB(A) as it is unlikely sufficient absorption material can be fitted. External noise levels are therefore likely to be in the region of 57 to 59 dB (A) with this arrangement.

In consideration of balcony ambient noise levels generally, it should of course be borne in mind that these are not habitable spaces; residents have a choice as to whether or not they are used, at any given time.

Conclusion

NRG Consulting has carried out an assessment of the Consented Development at 159 – 161 Iverson Road, in accordance with the criteria of Condition 6 and 15 of permission dated dated 21 February 2014 of Application 2013/7505/P. The environmental noise levels used in assessment for Planning Condition 6 have been determined from reports 13P282 JT R1260-188A A[viii] and P1498-REP01-SJF[ix]. Sound insulation values for the proposed external wall, glazing and ventilation elements has been estimated from manufacturer data and calculation.

The assessment shown that all of the bedrooms and living rooms will achieve noise levels not greater than the requirements of Planning Condition 6.

The installation of an acoustic barrier between the development boundary and ground floor external amenity area will provide some protection from noise of rail traffic movements. Without possibility of further feasible attenuation measures it is recommended that noise levels higher than the requirements of Planning Condition 15 are accepted.

In view of all the above, the information presented with regard to the imposed Planning Conditions 6 and 15 is considered acceptable, in our opinion.

References

[i] Environmental Noise Assessment Report, Aulos Acoustics, November 2013
[ii] Environmental Intrusive Noise & Vibration Study, Sol Acoustics June 2013
[iii] Noise Mapping England, http://services.defra.gov.uk/wps/portal/noise/maps Accessed 23/09/2014
[iv] Guidelines for Community Noise, World Health Organisation, April 1999
[v] BS 12354 -3: 2003 Building acoustic - Estimation of acoustic performance of buildings from the performance of elements – Part 3: Airborne sound insulation against outdoor sound
[vi] BS 8233: 2014 - Guidance on sound insulation and noise reduction for buildings. BSI February 2014
[vii] BS 12354 -3: 2003 Building acoustic - Estimation of acoustic performance of buildings from the performance of elements – Part 3: Airborne sound insulation against outdoor sound
[viii] Environmental Noise Assessment Report, Aulos Acoustics, November 2013
[ix] Environmental Intrusive Noise & Vibration Study, Sol Acoustics June 2013